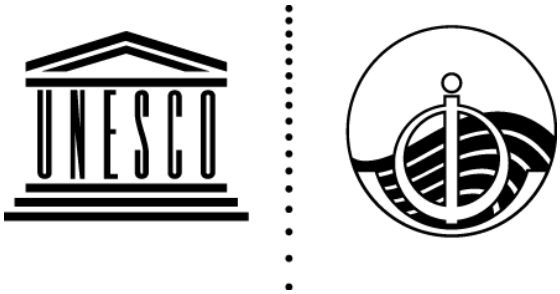
Intergovernmental Oceanographic Commission
Technical Series
153



EXERCISE INDIAN OCEAN WAVE 20
An Indian Ocean-wide Tsunami Warning and Communications Exercise

6–20 October 2020

Volume 2 Exercise Report

UNESCO

Intergovernmental Oceanographic Commission
Technical Series
153

EXERCISE INDIAN OCEAN WAVE 20

An Indian Ocean-wide Tsunami Warning and Communications Exercise

6–20 October 2020

Volume 2 Exercise Report

UNESCO 20XX

IOC Technical Series, 153 Vol.2
Perth, Month XXXX
English only

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

UNESCO/IOC. 20xx. *Exercise Indian Ocean Wave 20. An Indian Ocean-wide Tsunami Warning and Communications Exercise, 6–20 October 2020. Volume 2: Exercise Report*. Perth, UNESCO, IOC Technical Series No. 153.

Prepared by the Exercise IOWave20 Task Team for the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System.

IOWave20 Task Team Members: Weniza (Chair, Indonesia), Ali Khoshkholgh (Vice-Chair, Iran), Simon Allen (Australia), Ajay Kumar Bandela (India), Badar Al-Rumhi (Oman), Khalid Al-Wahaibi (Oman), Alqyadhan Al-Siyabi (Oman), Ameer Hyder (Paksitan).

(IOC/20XX/TS/153 Vol.2)

TABLE OF CONTENTS

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, IOC/2013/TS/99). 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 full-capacity IOTWMS system was exercised during IOWave14 (IOC/2015/TS/113Vol. 1 and Vol. 2), IOWave16 (IOC/2016/TS/128Vol.1 and Vol.2), and again during IOWave18 (IOC/2018/TS138Vol.1 and Vol.2).

Key milestones in exercise participation were achieved during IOWave16 where over 60,000 people evacuated and subsequently during IOWave18 where over 119,000 people evacuated.

The most recent exercise, held in October 2020, was impacted by the ongoing Covid-19 pandemic. Nonetheless, at least twenty counties participated in IOWave20, with six reporting community involvement but not necessarily evacuation (i.e. Indonesia, Kenya, Mauritius, Mozambique, Seychelles, Thailand).

The IOWave20 Task Team carefully monitored the developing pandemic and decided it was in the best interest of Indian Ocean Member States to reduce the scope and scale of the Exercise. Member States were encouraged to test communications protocols and conduct virtual tabletop exercises, as a minimum, to assess organizational standard operating procedures, plans and policies for tsunami warning and emergency response in the backdrop of a pandemic. By exercising during pandemic conditions, Member States had the opportunity to validate existing business continuity plans and arrangements. In the future, the Task Team should develop guidelines for conducting a virtual tabletop exercise based on the experience of IOWave20.

Noting the interest of some Member States in engaging communities that are not impacted by the pandemic in Exercise IOWave20, the Task Team recommended that this should be at the sole discretion of the Member State considering their unique situation with respect to Covid-19. Member States were advised to individually assess any health risks in the backdrop of the pandemic and only then decide on the appropriate level of participation in IOWave20, ensuring that there is no interference with physical distancing measures already in place.

The ICG/IOTWMS published guidelines for tsunami response during the Covid-19 pandemic and the IOWave20 Task Team encouraged Member States to update their standard operating procedures for a pandemic situation. Five countries reported updating their tsunami response procedures during the pandemic. A further eleven countries reported that they have future plans to adjust their response procedures for a pandemic environment.

The IOTWMS works as a “system of systems” with 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.

Continuing with the regular ocean-wide exercises about once every two years, the Twelfth session of the ICG/IOTWMS (ICG/IOTWMS-XII/3) held from 9 to 12 March 2019 in Kish Island, Iran, agreed to conduct the Exercise Indian Ocean Wave 20 (IOWave20, IOC/2020/TS/153Vol.1) on 6, 13, and 20 October 2020.

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.

The exercise was successful with 3 designated TSPs and 20 [out of 25] active Member States participating, mainly, Australia, Bangladesh, Comoros, India, Indonesia, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Thailand, United Arab Emirates and Yemen.

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. Nineteen active Member States provided feedback via a post-exercise survey questionnaire.

Key Findings

Exercise Participation

Exercise IOWave20 comprised, for the first time in Indian Ocean exercises, three earthquake scenarios held at one week intervals. Twenty IOTWMS Member States participated in one or more IOWave20 scenarios. Twelve Member States participated in only one scenario (i.e. Australia, Comoros, Madagascar, Malaysia, Mauritius, Mozambique, Myanmar, Oman, Singapore, South Africa, Sri Lanka and United Arab Emirates), four Member States participated in two scenarios (i.e. Bangladesh, India, Seychelles and Yemen), and four Member States participated in all three scenarios (i.e. Indonesia, Kenya, Pakistan and Thailand).

Nineteen of the reporting countries (100%) included the National Tsunami Warning Center in the exercise, seventeen countries (89%) included national disaster management organizations; fourteen countries (74%) included local disaster management organizations; nine (47%) countries involved the media, and six (32%) countries involved the community but not necessarily in evacuations.

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

Dissemination of TSP messages to NTWCs by email, GTS (the World Meteorological Organization [WMO] Global Telecommunications System) and SMS was very successful, with average message reception rates of 88% across all scenarios for GTS, 78% for email and 67% for SMS. The dissemination rate by fax was lower with the average of only 29% across the scenarios. Overall these results are similar to those achieved in the 6-monthly IOTWMS Communication Tests and in previous IOWave exercises of IOWave14, IOWave16 and IOWave18 with the exception of fax, which is the lowest since IOWave11.

Access rates to the tsunami threat information on TSP websites by NTWCs remain high. The average access rate across all types of TSP exchange products was 86%, 76% and 87% for TSPs Australia, India and Indonesia, respectively.

All TSP products were found useful for NTWCs formulating their national warnings. Among the most used are the Predicted Max Wave Amplitudes, Tsunami Wave Observations, Coastal Forecast Zone Threat Levels, Predicted Arrival Times T1 and T2, and Tsunami Wave Observations.

Warning status reporting by NTWCs to a TSP website slightly declined since IOWave18. In IOWave20, 67% of NTWC provided at least one warning status report to TSPs website in any scenario. In comparison, the average reporting rate was 78% during IOWave18.

Exercise Conduct

In order to assess the overall success of the exercise planning, organisation and conduct, Member States ranked activities of the IOWave20 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 3.7. Exercise documenation including manual, websites, and bulletins was assessed at 3.9. Exercise format and style including real-time operation and exercise messages similar to real those in a real event was ranked at 3.6 The Exercise evaluation was assessed at 3.7. As all activities were assessed between very good and extremely good (3–4) the conduct of IOWave20 is considered to be successful.

Reported Benefits and Suggested Enhancements for Future Exercises

Member States listed many benefits from the exercise including improved preparedness for real earthquakes and tsunami events; refined and tested standard operating procedures of for the pandemic situation; validated the NTWC timeline standard operating procedures, tested communication channels and protocols; exercised tsunami response plans, capacity building of key stakeholders (including first responders); increased communication and collaboration between related organisations (NTWC-DMO); event information exchange with neighboring countries; and evaluation of Tsunami Ready indicators in pilot villages (Odisha State, India).

Member States also suggested improvements for future exercises including to apply lessons learnt from the exercise; more tsunami training and awarenss and prepreparedness programmes, increased capacity building in tsunami modelling and tsunami evacuation maps, plans and procedures (TEMPP); scheduling a full scale exercise; SOP updates and training across all participating agencies, more stakeholder, community and media involvement; creation of an event specific website; standardation of TSP bulletin formats; and translation of the education materials to the local languages. Furthermore, Member States expressed the difficulty of holding the exercise during the pandemic and requested a guidance on virtual table top exercises. It was also suggested to establish a National board or Tsunami Working Groups in all countries and focus the exercise on implemenationand evaluation of the UNESCO-IOC Tsunami Ready indicators in more communities.

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 costliest 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 recent tsunami in Turkey and Greece (30 October 2020) once again remind us of the complexity facing the tsunami warning community.

The major challenge with tsunamis is that they are infrequent and can occur at any time, even during a pandemic which requires great persistence in sustaining the process of capacity building, preparedness and readiness to make quick and informed decisions on community evacuations by governments and emergency responders. Because of this reason, 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. In the context of the pandemic, the exercise provided an opportunity to validate existing business continuity plans and arrangements of capacity building, preparedness and quick decision evacuation. During 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.

Exercise IOWave20 was conducted during the first year of the Covid-19 pandemic. In the exercise lead-up there was much uncertainty in the extent of Covid-19 pandemic effects on countries around the world and in the Indian Ocean region. It was not clear how long the Covid-19 outbreak would last for and if it would have diminished, stabilised or escalated by the scheduled time of the Exercise Indian Ocean Wave 2020 (IOWave20) in October 2020. This brought about unique challenges in exercise conduct and participation. In response to the ongoing situation, the ICG/IOTWMS published guidelines for tsunami response during the Covid-19 pandemic and the IOWave20 Task Team encouraged Member States to update their standard operating procedures for a pandemic situation.

1.1 BACKGROUND

The Intergovernmenal Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) was established through IOC Assembly Resolution IOC-XXIII-12 (2005). Under the guidance of the ICG/IOTWMS, Member States collaborated in the development of the Indian Ocean Tsunami Warning and Mitigation System (IOTWMS). The IOTWMS is a system of systems with each National Tsunami Warning Centre (NTWC) of the active Member States issuing tsunami warnings to their respective communities based on the tsunami threat information provided by three Tsunami Service Providers (TSPs) of Australia, India and Indonesia.

Recognizing the importance of tsunami exercises as a means to test the tsunami warning systems while increasing education and readiness, UNESCO/IOC conducted its first basin-wide exercise in the Pacific Ocean in May 2006. Six Indian Ocean Wave (IOWave) Exercises

have now taken place in 2009, 2011, 2014, 2016, 2018 and 2020.The end-to-end tsunami warning system was initially tested in the Indian Ocean-wide tsunami warning and response exercise IOWave09 (October 2009) and came into operation immediately following IOWave11 (October 2011). The ICG/IOTWMS subsequently conducted ocean-wide exercises during IOWave14 (September 2014), IOWave16 (September 2016), and IOWave18 (September 2018). Exercise IOWave18 improved upon the previous exercises with all 24 active Member States participating, a record 119,000 people evacuating, and communities in India and Oman piloting the Indian Ocean Tsunami Ready framework [now referred to as UNESCO/IOC Tsunami Ready].

In 2020, the most recent exercise comprised of three scenarios: Java trench, Andaman trench, and Makran trench, placing the entire Indian Ocean basin under threat. The scenarios were conducted one week apart and allowed the individual Member States to decide the type and number of exercises to participate in. Participation in multiple exercise scenarios, at least at the NTWC and NDMO level, had the advantage of allowing standard operating procedure issues identified during the first exercise to be corrected and exercised again. It also encouraged the testing of different elements of the standard operating procedures because the tsunami arrival times were varied for each scenario.

During the Twelth session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS-XII/3) held in Kish Island, I.R. of Iran, from 9 to 12 March 2019, it was decided to conduct an Indian Ocean-wide Tsunami Warning and Communication Exercise (IOWave20) during the second half of 2020. A Task Team was established to organise it, with membership comprising Australia, India, Indonesia, Iran, Pakistan, and Oman.

The IOWave20 Task Team carefully monitored the developing pandemic and decided it was in the best interest of Indian Ocean Member States to reduce the scope and scale of the Exercise. Member States were encouraged to test communications protocols and conduct virtual tabletop exercises, as a minimum, to assess organizational standard operating procedures, plans and policies for tsunami warning and emergency response in the backdrop of a pandemic. By exercising during pandemic conditions, Member States had the opportunity to validate existing business continuity plans and arrangements. In the future, the Task Team should develop guidelines for conducting a virtual tabletop exercise based on the experience of IOWave20.

Noting the interest of some Member States in engaging communities that are not impacted by the pandemic in Exercise IOWave20, the Task Team recommended that this should be at the sole discretion of the Member State considering their unique situation with respect to Covid-19. Member States were advised to individually assess any health risks in the backdrop of the pandemic and only then decide on the appropriate level of participation in IOWave20, ensuring that there is no interference with physical distancing measures already in place.

1.2 EXERCISE CONDUCT AND PARTICIPATION

Exercise IOWave20 (IOC/2020/TS/153Vol.1) was conducted on 6, 13 and 20 October 2020. At least (20) active IOTWMS Member States participated. The participating Member States were:

- National Tsunami Warning Centres (NTWCs): Australia, Bangladesh, Comoros, India, Indonesia, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Thailand, United Arab Emirates and Yemen.
- Tsunami Service Providers (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 IOWave20 are contained in ANNEX I.

Exercise IOWave20 comprised, for the first time in Indian Ocean exercises, three earthquake scenarios conducted at 1 week intervals on 6, 13 and 20 October. Each scenario was held in real time over a 1-hour duration. The scenario details are given in Table 1.

Scenario	**1. Java Trench**	**2. Andaman Trench**	**3. Makran Trench**
Date	6 October 2020 (Tuesday)	13 October 2020 (Tuesday)	20 October 2020 (Tuesday)
Time	03:00 UTC	04:00 UTC	06:00 UTC
Magnitude	M 9.1	M9.2	M9.0
Depth	10 km	10 km	10 km
Latitude	10.40 S	12.65 N	24.80 N
Longitude	112.80 E	93.50 E	62.20 E
Location	South of Java, Indonesia	Off west coast of Andaman Islands, India	Off coast of Pakistan

Table 1. Earthquake parameters for the 3 IOWave20 scenarios:
Java trench, Andaman trench and Makran trench.

Eight (8) ICG/IOTWMS Member States participated in the Java scenario, thirteen (13) participated in the Andaman scenario and thirteen (13) participated in the Makran scenario.

- Java scenario participants: Australia, Bangladesh, Indonesia, Kenya, Pakistan, South Africa, Thailand and Yemen.
- Andaman scenario participants: Bangladesh, India, Indonesia, Kenya, Malaysia, Myanmar, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Thailand and Yemen.
- Makran scenario participants: Comoros, India, Indonesia, Kenya, Madagascar, Mauritius, Mozambique, Oman, Pakistan, Seychelles, Thailand, United Arab Emirates, and Yemen.

All nineteen reporting countries exercised their tsunami warning and mitigation SOPs to varying degrees. All nineteen countries (100%) involved national tsunani warning centers; 17 countries (89%) involved national disaster management organisations; 14 countries (74%) involved local disaster management organisations, 9 countries (47%) had media representatives participate; and 6 countries (32%) included communities. The level of Member State participation in IOWave20 is provided in Annex II: Table II-1.

Member States reported on the type of exercise(s) conducted. Out of the nineteen reporting Member States, 10 (59%) conducted table top exercises, 6 (35%) conducted orientation

exercises, 6 (35%) conducted functional exercises, 3 (18%) conducted drills, and none conducted full scale exercises. The types of exercise conducted in each Member State are detailed in Annex II: Table II-2.

Following the exercise, Member States were asked to complete an online survey questionnaire describing their participation in the exercise. Moreover, international observers provided independent virtual observations of the exercise in Indonesia, Pakistan, and Sri Lanka. A lessons-learnt workshop on Exercise IOWave20 was held online from 11 to 12 November 2020. The IOWave20 Exercise Report is a compilation of 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

2.1.1.1 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 V.

IOTWS-TSP	**Java Scenario (out of total 8 responses)**			
	Email	**GTS**	**SMS**	**Fax**
Australia	75%	86%	63%	25%
India	75%	100%	75%	38%
Indonesia	75%	86%	88%	25%
Average	**75%**	**90%**	**75%**	**29%**
IOTWS-TSP	**Andaman Scenario (out of total 12 responses)**			
	Email	**GTS**	**SMS**	**Fax**
Australia	83%	92%	67%	33%
India	75%	92%	58%	33%
Indonesia	75%	83%	75%	25%
Average	**78%**	**89%**	**67%**	**31%**
IOTWS-TSP	**Makran Scenario (out of total 12 responses)**			
	Email	**GTS**	**SMS**	**Fax**
Australia	67%	82%	75%	27%
India	83%	82%	58%	36%
Indonesia	92%	91%	45%	18%
Average	**81%**	**85%**	**60%**	**27%**

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

TSP notification message receipt modes from most timely to least timely were Email, GTS, SMS and Fax. Very little difference in timeliness was observed between GTS and SMS, which were both above 80%.

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

2.1.1.2 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 regarless 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.

IOTWMS-TSP	**Java Scenario – Messages received anytime** (within 15 minutes)			
	Email	**GTS**	**SMS**	**Fax**
Australia	**76%** (74%)	**76%** (62%)	**52%** (50%)	**24%** (24%)
India	**69%** (60%)	**83%** (71%)	**69%** (66%)	**29%** (29%)
Indonesia	**74%** (66%)	**77%** (69%)	**54%** (49%)	**23%** (14%)
Average	**73%** (67%)	**79%** (67%)	**58%** (55%)	**25%** (22%)
IOTWMS-TSP	**Andaman Scenario – Messages received anytime** (within 15 minutes)			
	Email	**GTS**	**SMS**	**Fax**
Australia	**87%** (87%)	**82%** (82%)	**64%** (64%)	**53%** (27%)
India	**82%** (73%)	**75%** (75%)	**49%** (49%)	**33%** (33%)
Indonesia	**76%** (67%)	**65%** (65%)	**62%** (51%)	**18%** (18%)
Average	**82%** (79%)	**74%** (74%)	**58%** (55%)	**35%** (26%)
IOTWMS-TSP	**Makran Scenario – Messages received anytime** (within 15 minutes)			
	Email	**GTS**	**SMS**	**Fax**
Australia	**98%** (69%)	**73%** (73%)	**85%** (75%)	**16%** (9%)
India	**80%** (67%)	**62%** (62%)	**51%** (45%)	**29%** (24%)

Indonesia	**91%** (91%)	**69%** (69%)	**56%** (45%)	**22%** (18%)
Average	**90%** (76%)	**68%** (68%)	**64%** (55%)	**22%** (17%)

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 73%, 82% and 90% for the Java, Andaman and Makran scenarios respectively. This was followed closely by GTS and SMS, while Fax is the least effective out of all four communication methods. Additional points concerning email reception:

- There was little difference in the reception rates for messages received during the Java and Andaman scenarios.
- There was little difference in the reception rate between messages received at any time and those received within 15 minutes of issue, indicating that most email messages were received within 15 minutes of issue.

GTS was the second most effective method of communication with average reception rates for the three scenarios of 74%, 79% and 68%. SMS was the next most effective method with average reception rates of 58%, 58% and 64%. The Email and GTS reception rates were similar in each scenario and most messages were received within 15 minutes. TSP Australia achieved higher Email, GTS, and SMS reception rates during the Andaman and Makran scenarios and TSP India achieved higher GTS and SMS reception rates during the Java scenario compared with the other TSPs.

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

2.1.1.3 Comparison with Previous Exercise and Tests – Message Delivery

The above findings of the relative strength of each delivery method showed averaging improvement trend across the past exercises and communication tests, particularly with regard to the SMS delivery method.

Figure 1 below shows the TSP to NTWC message delivery success rates in this exercise compared with IOWave11, IOWave14, IOWave16, IOWave18, IOWave20 and the regular 6-monthly IOTWMS communications tests.

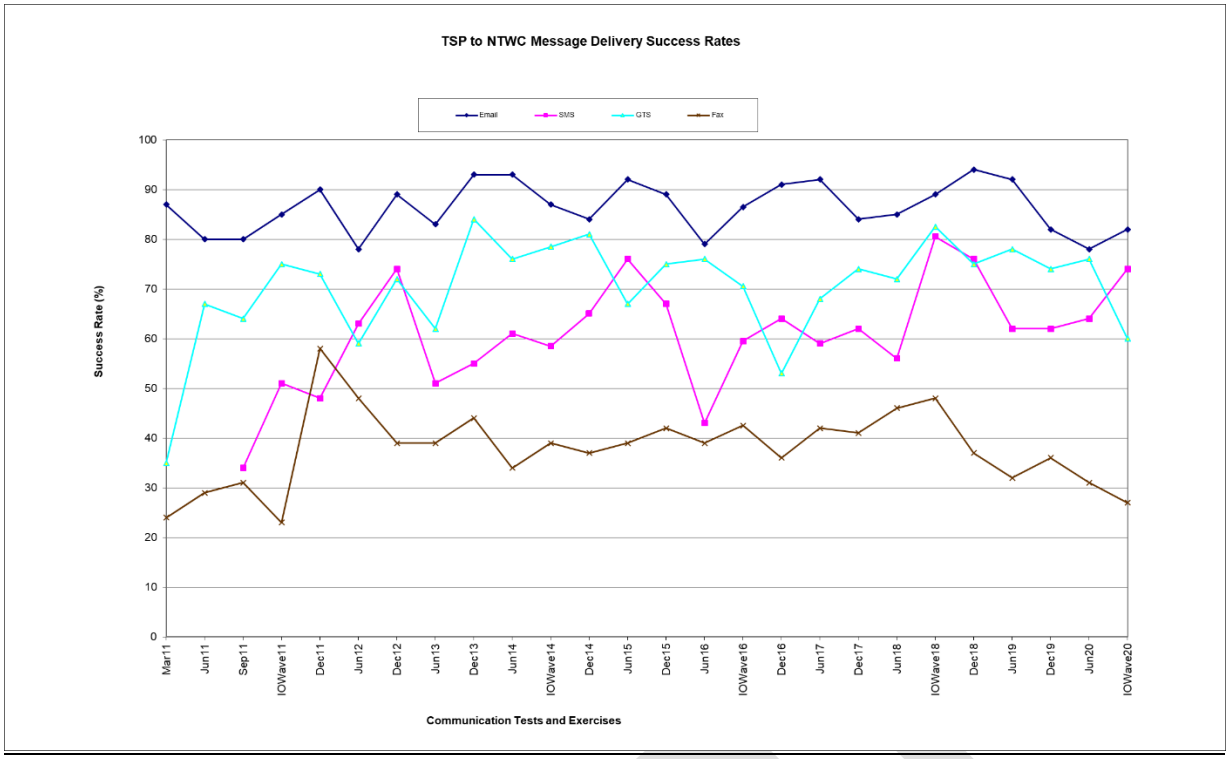


Figure 1. TSP to NTWC message delivery success rates in this exercise of IOWave20 compared with those of IOWave11, IOWave14, IOWave16, IOWave18 and regular IOTWMS communication tests. Figures are the average delivery rates for each medium across all TSPs (and across both scenarios for IOWave14, IOWave16 IOWave18 and IOWave20).

2.1.2 Objective 1: Issues for follow-up

Email Delivery

TSP Australia

- Investigate why Bangladesh did not receive any emails.
- Investigate why Indonesia, Kenya, Mauritius, Pakistan, Myanmar, Singapore, and Yemen did not receive some emails.

TSP India

- Investigate why Australia did not receive any emails.
- Investigate why Indonesia, Kenya, Malaysia, Myanmar, Mauritius, Pakistan did not receive some emails.

TSP Indonesia

- Investigate why Bangladesh did not receive any emails.
- Investigate why Indonesia, Kenya, Malaysia, Myanmar, Singapore, South Africa, United Arab Emirates and Yemen did not receive some emails.

GTS Delivery

Working Group 2 / Secretariat to work with WMO

- Investigate why Bangladesh did not receive any GTS messages.
- Investigate why Indonesia, Madagascar, Mauritius, Pakistan and Seychelles did not receive some GTS messages from TSP Australia.
- Investigate why Pakistan, Malaysia and Seychelles did not receive some GTS messages from TSP India.

- Investigate why Indonesia, Singapore, Malaysia, Myanmar, Pakistan, Seychelles did not receive some GTS messages from TSP Indonesia

SMS Delivery

TSP Australia

- Investigate why India, Indonesia, Kenya, Myanmar, Pakistan, and South Africa did not receive some SMS messages.

TSP India

- Investigate why Indonesia, Madagascar, Mauritius, Malaysia, Myanmar, Oman, Pakistan, Seychelles, United Arab Emirates and Yemen did not receive some SMS messages.

TSP Indonesia

- Investigate why Australia, Indonesia, Kenya, Madagascar, Myanmar, Pakistan, Seychelles, Singapore, South Africa, United Arab Emirates and Yemen did not receive some SMS messages.

Fax Delivery

Working Group 2

- Noting the low rate of fax receiption in the exercise (and previous IOTWMS communication tests), investigate if it is beneficial to continue TSP notification bulletin delivery via fax to all Member States.

TSP Australia

- Investigate why Comoros, Australia, Bangladesh, India, Indonesia, Kenya, Madagascar, Mauritius, Oman, Pakistan, Seychelles, Singapore and United Arab Emirates did not receive some fax messages.

TSP India

- Investigate why Bangladesh, Indonesia, Madagascar, Kenya, Malaysia, Myanmar, Pakistan, Seychelles and United Arab Emirates did not receive some fax messages.

TSP Indonesia

- Investigate why Mozambique did not receive any fax messages. Investigate why Bangladesh, Madagascar, Indonesia, Kenya, Myanmar, Oman, Pakistan, Seychelles, Singapore and United Arab Emirates did not receive some 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.

2.2.1 Objective 2: Results

This objective has two parts. The first part is about whether NTWC can access each TSP website, and which particular information or products was accessed. The second part is about whether a NTWC used TSP tsunami threat information in the production of their national warnings, and which particular products were used.

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.

2.2.2 TSP Web Access

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

Seventeen (89%) of participating countries were able to access the TSP websites. However, Mozambique and Thailand were unable to access any TSP websites due to technical issues. TSP Indonesia was accessed the most, followed by TSP Australia and then TSP India.

TSP	Exchange Product Viewed	Any scenario (17 NTWCS reporting)
TSP-Australia	Bulletins	88%
	Coastal Zone Threat Map	82%
	Threat Table	88%
	Maximum Amplitude Map	88%
	Tsunami Travel Time Map	82%
TSP-India	Bulletins	76%
	Coastal Zone Threat Map	76%
	Threat Table	76%
	Maximum Amplitude Map	76%
	Tsunami Travel Time Map	76%
TSP-Indonesia	Bulletins	82%
	Coastal Zone Threat Map	88%
	Threat Table	88%
	Maximum Amplitude Map	88%
	Tsunami Travel Time Map	88%

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

No countries reported the use of additional TSP exchange products (e.g. Spatial Files) on the password protected websites.

2.2.2.1 Comparison with Previous Exercises and Tests – Web Access

All of the reporting Member States (100%) accessed at least one TSP website (ANNEX VII). This is the highest access rate achieved to date when examining previous exercises and IOTWMS communication tests (Figure 2). However, Australia and Indonesia did not make use of the TSP tsunami threat information in their national warnings because they reply on their own national systems (ANNEX VIII).

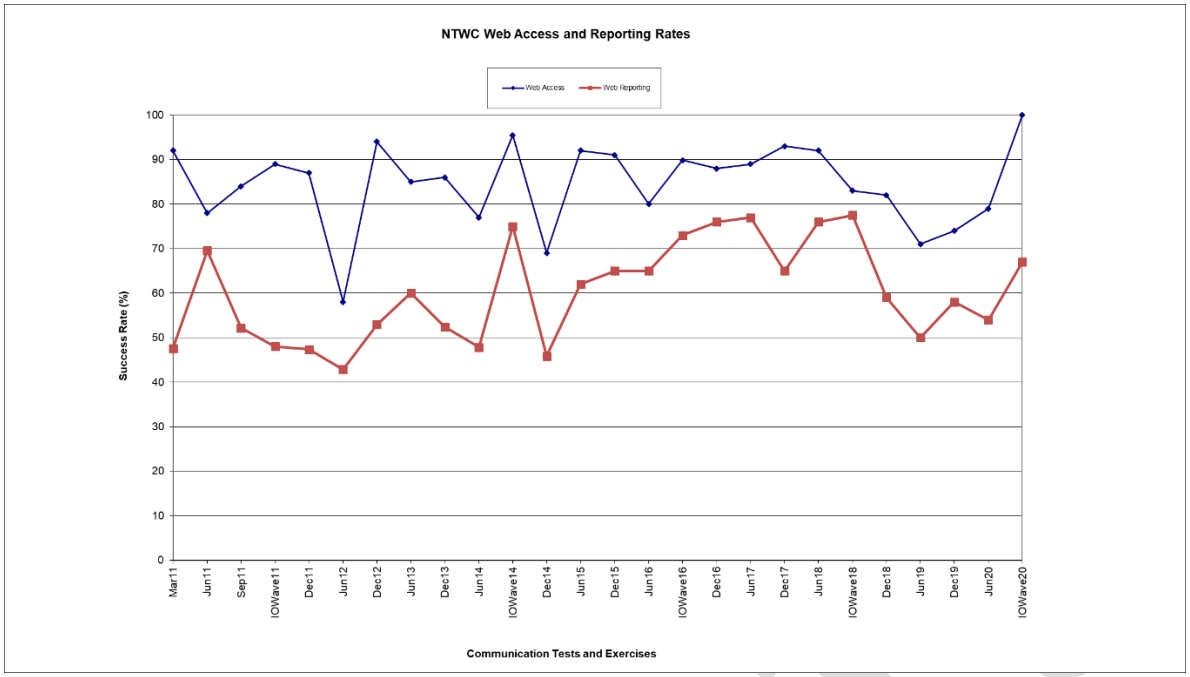


Figure 2. Percentage (or Rate) of NTWCs accessing TSP websites (blue line) and reporting warning status to TSPs (red line) in IOWave20 compared with IOWave11, IOWave14, IOWave16, IOWave18 and 6-monthly IOTWMS communication tests.

2.2.2.2 TSP Products Used to Formulate National Warnings

A summary of NTWC responses to this question is given in Table 5 below. Australia and Indonesia did not use the threat information from the TSP websites to produce their national warnings since they possess independent threat assessment capabilities for the exercise scenarios.

In this exercise all threat assessment information provided by TSPs was used by many NTWCs in formulating their own warnings. Among the most used are the Predicted Max Wave Amplitudes, Coastal Forecast Zone Threat Levels, the first wave (T1) Predicted Arrival Time, and Tsunami Wave Observations.

2.2.3 Objective 2: Issues for follow-up

- Secretariat to check with Mozambique and Thailand if they routinely have issues with accessing the websites of the three TSPs.

TSP	TSP Tsunami Threat Information	All Scenarios (15 NTWCs reporting)
TSP-Australia	Tsunami Wave Observations	53%
	T1 Predicted Wave Arrival Time	53%
	T2 Predicted Wave Arrival Time	53%
	T3 Predicted Wave Arrival Time	40%
	T4 Predicted Wave Arrival Time	40%
	Predicted Maximum Wave Amplitudes	73%
	Coastal Forecast Zone Threat Levels	33%
	Other	20%
TSP-India	Tsunami Wave Observations	73%
	T1 Predicted Wave Arrival Time	60%
	T2 Predicted Wave Arrival Time	73%
	T3 Predicted Wave Arrival Time	53%
	T4 Predicted Wave Arrival Time	33%
	Predicted Maximum Wave Amplitudes	67%
	Coastal Forecast Zone Threat Levels	53%
	Other	13%
TSP-Indonesia	Tsunami Wave Observations	53%
	T1 Predicted Wave Arrival Time	60%
	T2 Predicted Wave Arrival Time	47%
	T3 Predicted Wave Arrival Time	47%
	T4 Predicted Wave Arrival Time	40%
	Predicted Maximum Wave Amplitudes	80%
	Coastal Forecast Zone Threat Levels	53%
	Other	20%

Table 5. Percentage of NTWCs using TSP tsunami threat information to formulate national warnings in each scenario.

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 overall NTWC warning status reporting rate was 67% for any scenario during the entire exercise. This rate is slightly lower than that of IOWave14, IOWave16, and IOWave18 (see red curve on Figure 2). However, the IOWave20 reporting rates were much lower for individual scenarios with 40% for the Java scenario, 42% for the Andaman scenario, and 54% for the Makran scenario.

All NTWC's warning status report were displayed on the TSP Australia's public webpage www.bom.gov.au/tsunami/iotwms on the interactive global map.

Countries provided the following reasons not reoring their warning status on a TSP website:

- Kenya: All of our observing systems are not currently working.
- Malaysia: The exercise did not involve any other local agencies.
- Pakistan: We are unable to login on TSP reporting forms.
- Singapore: Forgot to report the warning status on the website.
- South Africa: Login issues with TSP-India.

The number of status reports that each NTWC provided to TSPs has been diverse. The same phenomenon has also been observed in previous exercises. While some NTWCs only reported once, countries like India, Indonesia and Myanmar reported at least 3 times in Andaman scenario and India, Indonesia, Madagascar, Malaysia, United Arab Emirates and Yemen in Makran scenario in synchonisation with the number of warning updates they produced for their respective countries. So clearly there is a consistency issue there.

The timing of reporting their warning status also varied a lot from country to country. This variation may be related to the different timing of warnings being issued by each country but it could also be due to some NTWCs not reporting immediately following their warning release.

2.3.2 1.1.2 Objective 3: Issues for follow-up

- ICG/IOTWMS continues to stress the importance of such warning status reporting by NTWCs for the overall effectiveness of the IOTWMS system

- IOTWMS Regional SOP training workshops provides consistent training on when and how often for NTWCs to report their warning status to TSPs. The general principle is to report immediately after the first advice for your country, and then report whenever there is a change in that advice till the advice is lifted or cancelled.

3. IOTWMS-IOTIC POST IOWAVE20 WEBINAR ON LESSONS LEARNT DURING EXERCISE INDIAN OCEAN WAVE 2020

As a follow up to the IOWave20 exercise, IOC/UNESCO Indian Ocean Tsunami Information Centre and the ICG/IOTWMS Secretariat organized a *Post-IOWave20 Webinar on Lessons Learnt during Exercise Indian Ocean Wave 2020* held online from 11 to 12 November 2020.

All Indian Ocean Member States were invited to the workshop, particularly countries that took part in IOWave20.

Thirty seven (32) participants from 23 Member States of the IOTWMS attended the workshop, consisting of Australia, Bangladesh, Comoros, India, Indonesia, Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Tanzania, Timor Leste, United Arab Emirates, and Yemen . In addition, one international exercise observer from Germany, and 2 international exercise observers from the Global Disaster Resilience Center (GDRC) at the University of Huddersfield, United Kingdom participated in the workhop.

The aim of the workshop was to serve as a platform to share experiences and lessons learned during Indian Ocean Tsunami Wave Exercise 2020. Exercise IOWave20 Task Team Chair, Member State and observer presentations are aviable on the event website: http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=2746.

3.1 COMMUNITY INVOLVEMENT

Despite the ongoing pandemic, six Member States reported communitiy involvement.

Indonesia held an evacuation drill at the New Yogyakarta International Airport. Participation involved 120 person including PT Angkasa Pura, which is responsible for airport management and other stakeholders. The main objective of the drill was maily to practice evacuation in a tsunami emergency situation by giving an appropriate response based on each group's standard operating procedures. The other objectives were to test the new dissemination mode, WRS New Generation, and to evaluaiton the airport infrastructure preparedness in case of a tsunami emergency.

In Kenya three coastal communities participated in the exercise: Kwale (5-6 October), Mombasa (12-13 October), and Kilifi (19-20 October). Communities were involved in tsunami awareness activities and interviews were conducted with key community stakeholders on their tsunami response (i.e. lifeguards).

In Mauritius a limited simulation exercise was carried out at the level of the National Disaster Risk Reduction and Management Centre for a small coastal locality.

Mozambique and Thailand responded to the survey that commumities were involved, but did provide details.

Seychelles noted the participation of community stakeholders including Indian Ocean Tuna (staff residence), Eden Island (tourism, marina, commercial), Seychelles Maritime Academcy and Seychelles Petroleum Company during a full scale exercise on 13 October.

3.2 OBSERVER REPORTS

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.

Exercise observations were reported on from Indonesia, Sri Lanka and Paksitan.

Observations of the Indonesian virtual table-top exercise focused on the warning chain and exercise management. In general, the virtual table top was very well planned and well implemented and the participation was also impressive. Over 450 stakeholders partcipated in the exercise held of 6 October for the Java scenario. Warning messages were issued according to schedule. In general, the National Disaster Mangement Agency and Media had a good understanding of the warning messages. However the local DMO provinces, districts and cities do not all understand the warning messages. Similar obervations were noted in terms of the stakeholder's response such that local DMO standard operating procedures require attention.

In Sri Lanka, oberservations of the Andaman scenario held on 13 October validated that terms of reference 1-3 were met. With the exception of restrictions that had a major impact on the scope of the exercise in having the participation of communities in the exercise, it can be concluded that the exercise was satisfactory. Exercise IOWave20 simulated Sri Lanka being put in a tsunami warning situation and required NTWC and the NDMO to activate their SOPs. Accordingly, the primary motive for IOWave20 was to enhance tsunami preparedness at every level.In this context, IOWave20 stimulated the development, training, testing and evaluation of SOPs. In particular, national to district level communication was tested across four districts (Batticaloa, Hambantota, Kalutara, and Trincomalee).

Remote observation of Pakistan's activity in the Makran scenario was conducted on 20 October with a focus on NTWC operations. A timeline of analysis and documentation of observations indicated that the NTWC warning sequence and timeline followed NTWC SOP and seems to be adequate for the simulated scenario. It was noted that the NTWC Bulletin 1 was based on national EQ data and send out before the first TSP notification was received. Access by NTWC Paksitan to TSP websites and NTWC status reporting was not possible. Therefore the NTWC bulletin did not concider TSP warning or observational information (i.e. tide gauge).

3.3 LESSONS LEARNT FROM IOWAVE20

The recommendations arising during the Post-IOWave20 webinar are directed towards (i) the Exercise IOWave Task Team and Secretariat, (ii) Working Group 1 on Tsunami Risk, Community Awareness and Preparedness and the Indian Ocean Tsunami Information Centre (IOTIC), and (iii) Working Group 2 on Tsunami Detection Warning, and Dissemination. They related to the areas of exercise planning, and the downstream and upstream tsunami warning system, respectively.

3.3.1 Exercise Planning

- IOWave Exercises should use scenarios that are suitable for all Member States to participate, 3 scenarios worked well for coverage.
- Holding the scenarios 1-week apart worked well.
- The Exercise should be conducted in September prior to the cyclone season and the preparation period [Australia; India]. However, after IOWave18 it was noted that September is inconvenient for some countries due to Monsoon and Floods [Pakistan, India, Sri Lanka] and hot weather [Oman].

- Coordinate with PTWS to ensure Exercises occur in opposite years [Australia, Indonesia]. *This has been raised in TOWS-WG and can be raised again.*
- International observers should be included in future exercises (such as IORA) [India] and virtual observations should be utilised more widely.
- Consider informing more national leaders of the Exercise in addition to the Tsunami National Contacts.
- Document the lessons learnt and changes triggered from the Exercise (i.e. establish a Preparations

3.3.2 Downstream

- Member States should update their SOPs for the pandemic situation with support from WG1-IOTIC.
- Where possible, communities should be encouraged to test/verify the UNESCO-IOC Tsunami Ready Indicators during the Exercise.
- Encourage countries to conduct regular exercises at least every year between IOWaves. They could align with communication tests.
- WG1-IOTIC should provide guidelines for conducting virtual table-top exercises.

3.3.3 Upstream

- Establish a work mechanism between NTWCs and TSPs to solve communication issues (i.e. non-receipt of messages).
- WG-2 to identify reliable tide gauge stations with fast transmission rates.
- Consider having the TSPs send an sms/email notification whenever there are tsunami product updates (ex. Tide gauge observations).
- Conduct a risk assessment of upstream tsunami warning including dissemination of tsunami warnings, reliable resources, etc.

ANNEX I

NATIONAL EXERCISE CONTACTS

AUSTRALIA

Mr Simon ALLEN
Bureau of Meteorology, Melbourne
700 Collins Street, Docklands
Melbourne VIC 3001
Australia
Email: simon.allen@bom.gov.au

BANGLADESH

Mr Md. Momenul ISLAM
Meteorologist and Officer in Charge
Bangladesh Meteorological Department
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

Mr Saifou-Dine ALIANI TOIHA
In-Charge of Research
Agence Nationale de l'Aviation Civile et de
la Météorologie
Route d'Itsambouni
Moroni B.P. 72
Comoros
Tel: +269 3343924
Email: alianitoiha@yahoo.fr

FRANCE (INDIAN OCEAN TERRITORIES)

Mr. Souka CHITTAPHONG-REMY
Deputy Head
Regional Crisis Management Centre
Prefecture de La Réunion
Place du Barachois
SAINT DENIS La REUNION 97400
Réunion
Email:
francois.chittaphong@reunion.pref.gouv.fr

INDIA

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

INDONESIA

Mr Rahmat TRIYONO
Head of Earthquake and Tsunami Centre
Indonesian Agency for Meteorology,
Climatology and Geophysics (BMKG)
Jl. Angkasa 1 No.2
DKI Jakarta 10610
Indonesia
Email: rahmat.triyono@gmail.com

IRAN

Dr Ali KHOSHKHOLGH
Assistant Professor
Iranian National Institute for
Oceanography and Atmospheric Science
No.3 Etemad Zadeh St.
Tehran 014155-4781
Iran (Islamic Republic of)
Tel: +98 9126 208 073
Email: a_khosh@inio.ac.ir

KENYA

Dr Sagero Obaigwa PHILIP
Principal Meteorologist
Kenya Meteorological Department
P.O. Box 30259
Nairobi 00100
Kenya
Tel: +254-722271652
Email: phsagero@gmail.com

MADAGASCAR

Mr Jean Bernardo
ANDRIANAIVOARISOA
Researcher

Institute and Observatory of Geophysics in Antananarivo (IOGA)
P.O. Box 3843
Antananarivo 101
Madagascar
Tel: +261 223 0182
Email: andrijb08@gmail.com

Mr Ramarolahy Rina ANDRIANASOLO
Associate Researcher
Institute and Observatory of Geophysics in Antananarivo (IOGA)
P.O. Box 3843
Antananarivo 101
Madagascar
Tel: +261 2022 30182
Email: rinaranamana@gmail.com

MALAYSIA

Mr Zaidi Bin ZAINAL ABIDIN
Malaysian Meteorological Department
Jalan Sultan
Petaling Jaya Selangor 46667
Malaysia
Email: zaidi@met.gov.my

MALDIVES

Ms Faroosh ALI
Senior Program Officerl
National Disaster Management Centre
H. Rihijehi Koshi Ameenee Magu
Male'
Maldives
Email: faroosha.ali@ndma.gov.mv

MAURITIUS

Dr Renganaden VIRASAMI
Mauritius Meteorological Services
St Paul Road
Vacoas 73449
Mauritius
Tel: +230 58117569
Email: rvirasami@govmu.org

MOZAMBIQUE

Mr Dennis GUIAMBA
Information Management Officer
National Operative Center for Emergency-CENOE
Instituto Nacional de Gestão de Calamidades
Av. 19 de Outubro Recinto da Base Aérea de Mavalane
Maputo 1101
Mozambique
Tel: +258 21477211
Email: dennis.guiamba@gmail.com

MYANMAR

Dr Yin Myo MIN HTWE
Deputy Director
Department of Meteorology and Hydrology, Nay Pyi Taw
No. 50, Kaba-Aye Pagoda Road
Mayangone Township,
Myanmar
Tel: +959250954653
Email: jianyou.wu007@gmail.com

OMAN

Mr Khalid Ahmed AL-WAHAIBI
Directorate General of Meteorology & Air Navigation
P.O. Box 1
Muscat Oman
Email: k.alwahaibi@met.gov.om

PAKISTAN

Mr Ameer HYDER
National Seismic Monitoring andTsunami Early Warning Centre, Karachi
Pakistan Meteorological Department
Karachi Pakistan
Email: free2hyder@yahoo.com

Mr Karam KHAN
Meteorologist
National Tsunami Warning Centre, Karachi
Pakistan Meteorological Department, Karachi
Regional Meteorological Centre
Karachi Pakistan
Tel: +92 21 9261 423
Email: karamkhan31@hotmail.com

SEYCHELLES

Ms Vicky BERLOUIS
Department of Risk and Disaster Management
P.O.Box 445

Global Village, Block Block B, Suite No. 3,
Mont Fleuri
Victoria Mahe Seychelles
Email: vberlouis@drdm.gov.sc

SINGAPORE

Ms Weilin HU
Senior Meteorologist
Meteorological Service Singapore
PO Box 8 Changi Airport Post Office
Singapore 819643
Tel: +65 6546 9962/5059
Email: Hu_weilin@nea.gov.sg

SOUTH AFRICA

Mr Keven 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 Sunil JAYAWEERA
Director (Preparedness)
Disaster Management Centre
3rd, 4th Floor, 120/2 Vidya Mawatha
Colombo 00700
Sri Lanka
Email: jayaweera_s@yahoo.com

THAILAND

Mr Bhumrindra TAUVAROTAMA
Department of Disaster Prevention and Mitigation
3/12 U-Thong Nok Rd, Dusit
Bangkok 10300
Thailand
Email: bhumrindra@gmail.com

TIMOR LESTE

Mr Martinho FATIMA
Deputy Chief
National Disaster Management Directorate
Ministry of Social Solidarity
Dili East Timor Timor-Leste
Tel: +670 3322597
Email: martinho.fatima@mss.gov.tl

TANZANIA

Mr Samwel MBUYA
Manger of Forecasting Services
Tanzania Meteorological Agency
P.O. Box 3056
Dar es Salaam United Republic of Tanzania
Tel: +255 764750980
Email: samwel.mbuya@meteo.go.tz

YEMEN

Mr Mohammed Ali AL-ERYANI
Director of Assessment and Recovery
General Director of Environmental Emergency and Disaster
Ministry of Water & Environment
P.O. Box 19237Sana'a YemenTel: 00967-770627746
Email: m.aleryani@yahoo.com

UNITED ARAB EMIRATES

Mr Mohamed AL EBRI
Director of Meteorology Department
National Center of Meteorology
19th Street
Al Shawamekh
United Arab Emirates
Email: MAlebri@ncms.ae

ANNEX II

MEMBER STATE PARTICIPATION

Country		Java 06-Oct	Andaman 13-Oct	Makran 20-Oct
Australia	AUS	Yes	No	No
Bangladesh	BAN	Yes	Yes	No
Comoros	COM	No	No	Yes
India	IN	No	Yes	Yes
Indonesia	IND	Yes	Yes	Yes
Kenya	KEN	Yes	Yes	Yes
Madagascar	MAD	No	No	Yes
Malaysia	MAL	No	Yes	No
Mauriitius	MAU	No	No	Yes
Mozambique	MZ	No	No	Yes
Myanmar	MM	No	Yes	No
Oman	OM	No	No	Yes
Pakistan	PK	Yes	Yes	Yes
Seychelles	SY	No	Yes	Yes
Singapore	SIN	No	Yes	No
South Africa	SA	Yes	Yes	No
Sri Lanka*	SLK	No	Yes	No
Thailand	THA	Yes	Yes	Yes
UAE	UAE	No	No	Yes
Yemen	YEM	Yes	Yes	Yes

Table II-1. Member State Scenario(s) Exercised

*(*Sri Lanka did not complete the online evaluation)*

Stakeholder	% MS	# MS	AUS	BAN	COM	IN	IND	KEN	MAD	MAL	MAU	MZ	MM	OM	PK	SY	SIN	SA	THA	UAE	YEM
NTWC	100%	19	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NDMO	89%	17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LDMO	74%	14	Yes	Yes	Yes	Yes	Yes	Yes	-	No	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Media	47%	9	No	Yes	No	No	Yes	Yes	-	No	-	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	-
Community	32%	6	No	No	No	No	Yes	Yes	-	No	Yes	Yes	No	No	No	Yes	No	No	Yes	No	-

Table II-2. Member State Participation Levels

AUS=Australia, BAN=Bangladesh, COM=Comoros, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

% MS= percentage of Member States answering yes, # MS = Number of Member States who provided an answer

ANNEX III

TYPES OF EXERCISES CONDUCTED

Exercise Type	% MS	# MS	AUS	BAN	COM	IN	IND	KEN	MAD	MAL	MAU	MZ	MM	OM	PK	SY	SIN	SA	THA	UAE	YEM
Orientation	35%	6	No	No	No	No	No	Yes	No	Yes	No	No		No	No	No		Yes	Yes	Yes	Yes
Drill	18%	3	No	No	No	No	No	No	No	No	Yes	Yes		No	No	No		No	Yes	No	No
Tabletop	59%	10	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No		Yes	No	Yes		No	Yes	No	Yes
Functional	35%	6	Yes	No	Yes	No	No	No	No	No	Yes	No		No	Yes	Yes		No	Yes	No	No
Full Scale	0%	0	No	No	No	No	No	No	No	No	No	No		No	No	No		No	No	No	No

Table III-1. Types of Exercises Conducted

AUS=Australia, BAN=Bangladesh, COM=Comoros, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

% MS= percentage of Member States answering yes, # MS = Number of Member States who provided an answer

Note: Member States in grey did not answer this question and are excluded from the total.

ANNEX IV

NATIONAL TSUNAMI WARNING CENTRES

Country	National Tsunami Warning Centre (NTWC)
Australia	Joint Australian Tsunami Warning Centre
Bangladesh	Bangladesh Meteorological Department
Comoros	Agence Nationale de l'Aviation Civile et de la Météorologie
India	Indian Tsunami Early Warning Centre, INCOIS
Indonesia	Agency Of Meteorology Climatology and Geophysics (BMKG)
Kenya	Kenya Meteorological Department
Madagascar	
Malaysia	National Weather and Geophysics Operation Centre, MMD
Mauritius	Mauritius Meteorological Services
Mozambique	
Myanmar	Department of Meteorology and Hydrology
Oman	Civil Aviation Authoriity - DGMET - NMHEWC
Pakistan	Pakistan Meteorological Department
Seychelles	Seychelles Meteorological Authority
Singapore	National Environment Agency / Meteorological Service Singapore
South Africa	South African Weather Service
Thailand	Department of Disaster Prevention and Mitigation
UAE	National Center of Meteorology
Yemen	General Directorate of Emergency and Environmental Disasters

ANNEX V

TIMELINESS OF TSP NOTIFICATION DELIVERY MEDIUMS: JAVA SCENARIO

Java Scenario (8 out of 8 NTWCs reporting)		Received in time	Total	AUS	BAN	IND	KEN	PK
TSP-Australia	GTS	86%	7	Received in time	Not reported	Received in time	Received Late	Received in time
	Fax	25%	8	Not received	Not received	Not received	Not received	Received in time
	Email	75%	8	Received in time	Not received	Received in time	Received in time	Received in time
	SMS	63%	8	Received in time	Received in time	Not received	Received in time	Not received
TSP-India	GTS	100%	7	Received in time	Not reported	Received in time	Received in time	Received in time
	Fax	38%	8	Received in time	Not received	Not received	Not received	Not received
	Email	75%	8	Not received	Received in time	Received in time	Received in time	Received in time
	SMS	75%	8	Received in time	Received in time	Not received	Received in time	Not received
TSP-Indonesia	GTS	86%	7	Received in time	Not reported	Received in time	Received Late	Received in time
	Fax	25%	8	Received Late	Not received	Not received	Not received	Not received
	Email	75%	8	Received in time	Not received	Received in time	Received in time	Received in time
	SMS	88%	8	Received in time	Received in time	Received in time	Received in time	Not received

Java Scenario (8 out of 8 NTWCs reporting)		SA	THA	YEM
TSP-Australia	GTS	Received in time	Received in time	Received in time
	Fax	Not received	Received Late	Received in time
	Email	Received Late	Received in time	Received in time
	SMS	Not received	Received in time	Received in time
TSP-India	GTS	Received in time	Received in time	Received in time
	Fax	Not received	Received in time	Received in time
	Email	Received Late	Received in time	Received in time
	SMS	Received in time	Received in time	Received in time
TSP-Indonesia	GTS	Received in time	Received in time	Received in time
	Fax	Not received	Received in time	Received in time
	Email	Received Late	Received in time	Received in time
	SMS	Received in time	Received in time	Received in time

Table V.1. Timeliness of TSP Notification Delivery Mediums for the Java 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, IND=Indonesia, KEN=Kenya, PK=Pakistan, SA=South Africa, THA=Thailand, YEM=Yemen

TIMELINESS OF TSP NOTIFICATION DELIVERY MEDIUMS: ANDAMAN SCENARIO

Andaman Scenario (12 out of 12 NTWCs reporting)		Received in time	Total	BAN	IN	IND	KEN	MAL
TSP-Australia	GTS	92%	12	Not received	Received in time	Received in time	Received in time	Received in time
	Fax	33%	12	Not received	Received Late	Not received	Not received	Received Late
	Email	83%	12	Not received	Received in time	Received in time	Received in time	Received in time
	SMS	67%	12	Received in time	Received in time	Not received	Received in time	Received in time
TSP-India	GTS	92%	12	Not received	Received in time	Received in time	Received in time	Received in time
	Fax	33%	12	Not received	Received in time	Not received	Not received	Received Late
	Email	75%	12	Received in time	Received in time	Received in time	Received in time	Received in time
	SMS	58%	12	Received in time	Received in time	Not received	Received in time	Not received
TSP-Indonesia	GTS	83%	12	Not received	Received in time	Received in time	Received in time	Received in time
	Fax	25%	12	Not received	Not received	Not received	Not received	Not received
	Email	75%	12	Not received	Received in time	Received in time	Received in time	Received in time
	SMS	75%	12	Received in time	Not received	Received in time	Received in time	Received in time

Andaman Scenario (12 out of 12 NTWCs reporting)		MM	PK	SY	SIN	SA	THA	YEM
TSP-Australia	GTS	Received in time	Received in time	Received in time	Received in time	Received in time	Received in time	Received in time
	Fax	Received Late	Received in time	Not received	Received in time	Not received	Received in time	Received in time
	Email	Received in time	Received in time	Received in time	Received in time	Received Late	Received in time	Received in time
	SMS	Received in time	Not received	Received Late	Received in time	Not received	Received in time	Received in time
TSP-India	GTS	Received in time	Received in time	Received in time	Received in time	Received in time	Received in time	Received in time
	Fax	Not received	Not received	Not received	Received in time	Not received	Received in time	Received in time
	Email	Received Late	Received Late	Received in time	Received in time	Received Late	Received in time	Received in time
	SMS	Not received	Not received	Not received	Received in time	Received in time	Received in time	Received in time
TSP-Indonesia	GTS	Received in time	Received Late	Received in time	Received in time	Received in time	Received in time	Received in time
	Fax	Not received	Not received	Not received	Received in time	Not received	Received in time	Received in time
	Email	Received in time	Received Late	Received in time	Received in time	Received Late	Received in time	Received in time
	SMS	Received in time	Received Late	Received Late	Received in time	Received in time	Received in time	Received in time

Table V.2. Timeliness of TSP Notification Delivery Mediums for the Andaman 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.

BAN=Bangladesh, IN=India, IND=Indonesia, KEN=Kenya, MAL=Malaysia, MM=Myanmar, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, YEM=Yemen

TIMELINESS OF TSP NOTIFICATION DELIVERY MEDIUMS: MAKRAN SCENARIO

Makran Scenario (12 out of 13 NTWCs reporting)		eived in t	Total	COM	IN	IND	KEN	MAD	MAU
TSP-Australia	GTS	82%	11	Not reported	Received in time	Received in time	Received in time	Not received	Received Late
	Fax	27%	11	Not reported	Not received	Not received	Not received	Not received	Not received
	Email	67%	12	Received Late	Received Late	Received in time	Received in time	Received in time	Received in time
	SMS	75%	12	Received in time	Received in time	Not received	Received in time	Received in time	Received in time
TSP-India	GTS	82%	11	Not reported	Received in time	Received in time	Received in time	Not received	Received in time
	Fax	36%	11	Not reported	Received in time	Not received	Not received	Not received	Received in time
	Email	83%	12	Received in time	Received in time	Not received	Received in time	Received in time	Received in time
	SMS	58%	12	Received in time	Received in time	Not received	Received in time	Received in time	Received in time
TSP-Indonesia	GTS	91%	11	Not reported	Received in time	Received in time	Received in time	Not received	Received in time
	Fax	18%	11	Not reported	Not received	Not received	Not received	Not received	Not received
	Email	92%	12	Received in time	Received in time	Received in time	Received in time	Received in time	Received in time
	SMS	45%	11	Not reported	Not received	Received in time	Received in time	Not received	Received in time

Makran Scenario (12 out of 13 NTWCs reporting)		eived in t	Total	OM	PK	SY	THA	UAE	YEM
TSP-Australia	GTS	82%	11	Received in time	Received in time	Received in time	Received in time	Received in time	Received in time
	Fax	27%	11	Received in time	Not received	Not received	Received in time	Not received	Received in time
	Email	67%	12	Received in time	Received Late	Received in time	Received in time	Received Late	Received in time
	SMS	75%	12	Received in time	Received Late	Received Late	Received in time	Received in time	Received in time
TSP-India	GTS	82%	11	Received in time	Received in time	Received in time	Received in time	Received Late	Received in time
	Fax	36%	11	Received Late	Not received	Not received	Received in time	Not received	Received in time
	Email	83%	12	Received in time	Received in time	Received in time	Received in time	Received Late	Received in time
	SMS	58%	12	Not received	Not received	Not received	Received in time	Received Late	Received in time
TSP-Indonesia	GTS	91%	11	Received in time	Received in time	Received in time	Received in time	Received in time	Received in time
	Fax	18%	11	Received Late	Not received	Not received	Received in time	Not received	Received in time
	Email	92%	12	Received in time	Received in time	Received in time	Received in time	Not received	Received in time
	SMS	45%	11	Not received	Received Late	Received Late	Received in time	Not received	Received in time

Table V-3. 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.

COM=Comoros, IN=India, IND=Indonesia, KEN=Kenya, MAD=Madagascar, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

ANNEX VI

TSP MESSAGES RECEIVED FROM NTWCS

Java Scenario: Email

Java Scenario	Email Message No		AUS	BAN	IND	KEN	PK	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	03:00	Test Start	03:03	-	03:03	03:03	-	03:03		03:00	5	71%		5	71%	
	03:14	Message 1	03:15	-	03:14	03:15	03:14	03:14		03:14	6	86%		6	86%	
	03:14	Message 2	03:15	-	03:15	03:16	03:15	03:15		03:14	6	86%		6	86%	
	03:25	Message 3	03:26	-	03:43	03:26	03:25	03:26		03:25	6	86%		6	86%	
	03:34	Message 4	03:36	-	-	03:36	03:52	03:35		03:34	5	71%		4	57%	
	03:42	Message 5	03:43	-	-	03:43	-	03:43		03:42	4	57%	**76%**	4	57%	**74%**
IOTWS-TSP INDIA	03:00	Test Start	-	03:00	02:58	03:00	03:00	03:32		03:00	6	86%		5	71%	
	03:05	Message 1	-	03:05	-	03:05	03:05	03:37		03:05	5	71%		4	57%	
	03:15	Message 2	-	03:15	03:15	03:17	03:16	03:33		03:15	6	86%		5	71%	
	03:31	Message 3	-	03:32	-	03:35	-	03:32		03:31	4	57%		4	57%	
	03:44	Message 4	-	03:35	-	-	-	03:45		03:44	3	43%	**69%**	3	43%	**60%**
IOTWS-TSP INDONESIA	03:00	Test Start	-	-	-	-	03:00	-		03:00	2	29%		2	29%	
	03:08	Message 1	03:21	-	03:08	03:09	03:32	03:31		03:08	6	86%		4	57%	
	03:13	Message 2	03:17	-	03:13	03:13	03:33	03:16		03:13	6	86%		5	71%	
	03:30	Message 3	03:31	-	03:30	03:30	03:33	03:32		03:30	6	86%		6	86%	
	04:00	Message 4	04:05	-	04:00	04:02	04:14	04:11		04:00	6	86%	**74%**	6	86%	**66%**

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

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member States in grey did not answer this question and are excluded from the total.

AUS=Australia, BAN=Bangladesh, IND=Indonesia, KEN=Kenya, PK=Pakistan, SA=South Africa, THA=Thailand, YEM=Yemen

Andaman Scenario: Email

Andaman Scenario	Email Message No		BAN	IN	IND	KEN	MAL	MM	PK	SY	SIN	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	04:00	Test Start	-	04:00	04:00	04:01	04:04	04:01	04:01	04:01	-	04:01		04:00	9	82%		9	82%	
	04:10	Message 1	-	04:10	04:10	04:11	04:15	-	04:11	04:11	04:01	04:11		04:10	9	82%		9	82%	
	04:12	Message 2	-	04:12	04:12	04:13	04:16	04:13	04:13	04:13	04:13	04:13		04:12	10	91%		10	91%	
	04:20	Message 3	-	04:20	04:20	04:21	04:24	04:18	04:21	04:21	04:21	04:21		04:20	10	91%		10	91%	
	04:51	Message 4	-	04:51	04:51	04:52	04:55	04:52	04:52	04:52	04:52	04:52		04:40	10	91%	**87%**	10	91%	**87%**
IOTWS-TSP INDIA	03:59	Test Start	04:00	03:59	-	-	04:03	-	04:32	04:05	03:58	04:00		04:00	8	73%		7	64%	
	04:05	Message 1	04:05	04:05	-	-	04:10	04:38	04:32	04:07	04:04	-		04:05	8	73%		6	55%	
	04:16	Message 2	04:15	04:16	04:14	04:24	04:20	04:24	04:32	04:12	04:15	04:17		04:15	11	100%		10	91%	
	04:31	Message 3	04:30	04:32	-	04:32	-	04:32	05:00	04:28	04:31	04:33		04:30	9	82%		8	73%	
	05:00	Message 4	05:00	05:00	04:58	-	05:04	05:00	-	05:00	04:58	05:01		05:00	9	82%	**82%**	9	82%	**73%**
IOTWS-TSP INDONESIA	04:00	Test Start	-	-	-	-	-	-	-	04:03	-	-		04:00	2	18%		2	18%	
	04:08	Message 1	-	04:08	04:08	04:09	04:14	04:03	04:11	04:09	04:08	04:11		04:08	10	91%		10	91%	
	04:13	Message 2	-	04:13	04:13	04:14	04:19	04:13	04:13	04:13	04:13	04:18		04:13	10	91%		10	91%	
	04:30	Message 3	-	04:30	04:30	04:31	04:36	04:32	04:33	04:31	04:31	04:33		04:30	10	91%		10	91%	
	05:00	Message 4	-	05:10	05:00	05:02	05:14	05:02	05:03	05:00	05:00	05:03		05:00	10	91%	**76%**	10	91%	**76%**

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

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member State in grey did not answer this question and are excluded from the total.

BAN=Bangladesh, IN=India, IND=Indonesia, KEN=Kenya, MAL=Malaysia, MM=Myanmar, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, YEM=Yemen

Makran Scenario: Email

Makran Scenario	Email Message No		COM	IN	IND	KEN	MAD	MAU	MZ	OM	PK	SY	THA	UAE	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	06:00	Test Start	06:53	06:51	06:00	06:02	05:57	-		06:01	06:53	06:00		06:53	06:00	10	91%		6	55%	
	06:12	Message 1	06:53	06:51	06:12	06:14	06:08	06:00		06:13	06:53	06:12		06:53	06:12	11	100%		7	64%	
	06:15	Message 2	06:53	06:52	06:15	06:17	06:13	06:12		06:16	06:53	06:16		06:53	06:15	11	100%		7	64%	
	06:25	Message 3	06:53	06:52	06:25	06:29	06:25	06:15		06:25	06:53	06:26		06:53	06:25	11	100%		7	64%	
	06:40	Message 4	06:53	06:52	06:40	06:42	06:40	06:40		06:40	06:53	06:41		06:53	06:40	11	100%	**98%**	11	100%	**69%**
IOTWS-TSP INDIA	05:59	Test Start	06:00	05:59	-	06:01	05:57	-		06:01	06:01	06:02		06:00	06:05	9	82%		9	82%	
	06:05	Message 1	06:25	06:27	-	-	06:22	06:00		-	06:26	06:12		06:25	-	7	64%		2	18%	
	06:16	Message 2	06:16	06:14	-	06:18	06:14	06:17		06:17	06:18	06:15		06:16	07:21	10	91%		9	82%	
	06:32	Message 3	06:33	06:32	-	06:34	06:30	06:32		06:34	06:34	06:31		06:33	07:21	10	91%		9	82%	
	07:02	Message 4	07:03	07:01	-	-	06:40	07:02		07:02	07:03	07:02		07:03	-	8	73%	**80%**	8	73%	**67%**
IOTWS-TSP INDONESIA	06:00	Test Start	06:02	06:00	06:00	06:02	06:00	06:00		06:00	06:02	06:01		-	06:00	10	91%		10	91%	
	06:08	Message 1	06:10	06:08	06:08	06:10	06:08	06:10		06:10	06:10	06:09		-	06:08	10	91%		10	91%	
	06:13	Message 2	06:14	06:14	06:13	06:15	06:13	06:16		06:14	06:16	06:14		-	06:13	10	91%		10	91%	
	06:30	Message 3	06:32	06:30	06:30	06:32	06:30	06:32		06:30	06:33	06:31		-	06:30	10	91%		10	91%	
	07:00	Message 4	07:03	07:00	07:00	07:02	07:00	07:02		07:00	07:02	07:01		-	07:00	10	91%	**91%**	10	91%	**91%**

Table VI-3. Summary of Email messages received by each NTWC for the Makran Scenario

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member States in grey did not answer this question and are excluded from the total.

COM=Comoros, IN=India, IND=Indonesia, KEN=Kenya, MAD=Madagascar, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Java Scenario: GTS

Java Scenario	GTS Message No		AUS	BAN	IND	KEN	PK	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	03:00	Test Start	03:03	-	03:04	03:56	03:00	03:04		03:00	6	86%		5	71%	
	03:14	Message 1	03:14	-	03:16	03:56	03:19	03:15		03:14	6	86%		5	71%	
	03:14	Message 2	03:15	-	03:17	03:56	03:19	03:16		03:14	6	86%		5	71%	
	03:25	Message 3	03:25	-	03:45	03:56	03:25	03:26		03:25	6	86%		4	57%	
	03:34	Message 4	03:35	-	-	03:56	-	03:36		03:34	4	57%		3	43%	
	03:42	Message 5	03:43	-	-	03:56	-	03:44		03:42	4	57%	**76%**	4	57%	**62%**
IOTWS-TSP INDIA	03:00	Test Start	03:00	-	03:02	03:56	03:00	03:01		03:00	6	86%		5	71%	
	03:05	Message 1	03:05	-	03:07	03:56	03:05	03:06		03:06	6	86%		5	71%	
	03:15	Message 2	03:16	-	03:18	03:56	03:19	03:17		03:15	6	86%		5	71%	
	03:31	Message 3	03:32	-	03:33	03:56	-	03:32		03:31	5	71%		4	57%	
	03:44	Message 4	03:45	-	03:46	03:56	03:44	03:45		03:45	6	86%	**83%**	6	86%	**71%**
IOTWS-TSP INDONESIA	03:00	Test Start	-	-	-	03:56	03:00	-		03:00	3	43%		3	43%	
	03:08	Message 1	03:08	-	03:10	03:56	03:08	03:09		03:08	6	86%		5	71%	
	03:13	Message 2	03:13	-	03:15	03:56	03:13	03:13		03:13	6	86%		5	71%	
	03:30	Message 3	03:30	-	03:32	03:56	03:30	03:31		03:30	6	86%		5	71%	
	04:00	Message 4	04:00	-	04:02	03:56	04:00	04:01		04:00	6	86%	**77%**	6	86%	**69%**

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

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member States in grey did not answer this question and are excluded from the total.

AUS=Australia, BAN=Bangladesh, IND=Indonesia, KEN=Kenya, PK=Pakistan, SA=South Africa, THA=Thailand, YEM=Yemen

Andaman Scenario: GTS

Andaman Scenario	GTS Message No		BAN	IN	IND	KEN	MAL	MM	PK	SY	SIN	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	04:00	Test Start	-	04:00	04:02	04:02	04:00	03:59	04:00	-	04:00	04:01		04:00	9	82%		9	82%	
	04:10	Message 1	-	04:10	04:12	04:11	04:10	04:10	04:12	-	04:10	04:11		04:11	9	82%		9	82%	
	04:12	Message 2	-	04:12	04:14	04:15	04:12	04:13	04:12	-	04:12	04:13		04:13	9	82%		9	82%	
	04:20	Message 3	-	04:20	04:22	04:23	04:20	04:19	04:20	-	04:20	04:21		04:22	9	82%		9	82%	
	04:51	Message 4	-	04:51	04:53	04:52	04:57	04:51	04:51	-	04:51	04:52		04:42	9	82%	**82%**	9	82%	**82%**
IOTWS-TSP INDIA	03:59	Test Start	-	03:59	04:01	04:01	03:59	03:59	04:00	-	03:59	04:00		04:00	9	82%		9	82%	
	04:05	Message 1	-	04:05	04:07	04:08	04:05	04:09	04:05	-	04:05	04:06		04:08	9	82%		9	82%	
	04:16	Message 2	-	04:16	04:18	04:18	-	04:16	04:15	-	04:16	04:17		04:19	8	73%		8	73%	
	04:31	Message 3	-	04:32	04:35	04:34	-	04:33	04:35	-	04:32	04:33		04:35	8	73%		8	73%	
	05:00	Message 4	-	05:00	05:02	04:50	-	05:15	-	-	05:00	05:01		05:06	7	64%	**75%**	7	64%	**75%**
IOTWS-TSP INDONESIA	04:00	Test Start	-	-	-	04:09	-	-	-	-	-	-		04:05	2	18%		2	18%	
	04:08	Message 1	-	04:08	04:10	04:11	-	04:09	04:08	-	04:08	04:09		04:14	8	73%		8	73%	
	04:13	Message 2	-	04:13	04:15	04:15	-	04:13	04:13	-	04:13	04:14		04:19	8	73%		8	73%	
	04:30	Message 3	-	04:30	04:32	04:31	04:30	04:29	04:30	-	04:30	04:30		04:36	9	82%		9	82%	
	05:00	Message 4	-	05:00	05:02	04:50	05:05	05:15	05:00	-	05:00	05:01		05:07	9	82%	**65%**	9	82%	**65%**

Table VI-5. Summary of GTS messages received by each NTWC for the Andaman Scenario

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member State in grey did not answer this question and are excluded from the total.

BAN=Bangladesh, IN=India, IND=Indonesia, KEN=Kenya, MAL=Malaysia, MM=Myanmar, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, YEM=Yemen

Makran Scenario: GTS

Makran Scenario	GTS Message No		COM	IN	IND	KEN	MAD	MAU	MZ	OM	PK	SY	THA	UAE	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	06:00	Test Start	-	06:00	06:01	06:02	-	06:00		06:00	06:00	-		06:00	06:00	8	73%		8	73%	
	06:12	Message 1	-	06:12	06:13	06:13	-	06:13		06:12	06:12	-		06:12	06:12	8	73%		8	73%	
	06:15	Message 2	-	06:15	06:17	06:16	-	06:16		06:15	06:17	-		06:15	06:15	8	73%		8	73%	
	06:25	Message 3	-	06:25	06:27	06:27	-	06:27		06:25	06:25	-		06:25	06:25	8	73%		8	73%	
	06:40	Message 4	-	06:40	06:42	06:41	-	06:41		06:40	06:40	-		06:40	06:40	8	73%	**73%**	8	73%	**73%**
IOTWS-TSP INDIA	05:59	Test Start	-	05:59	06:02	06:01	-	06:00		06:00	06:01	-		06:00	-	7	64%		7	64%	
	06:05	Message 1	-	-	-	-	-	06:00		-	06:08	-		-	06:00	3	27%		3	27%	
	06:16	Message 2	-	06:16	06:19	06:18	-	06:18		06:17	06:17	-		06:17	06:18	8	73%		8	73%	
	06:32	Message 3	-	06:32	06:34	06:34	-	06:34		06:33	06:33	-		06:33	06:40	8	73%		8	73%	
	07:02	Message 4	-	07:02	07:04	07:03	-	07:04		07:02	07:02	-		07:02	07:12	8	73%	**62%**	8	73%	**62%**
IOTWS-TSP INDONESIA	06:00	Test Start	-	06:00	06:01	06:01	-	06:00		06:00	06:01	-		06:00	-	7	64%		7	64%	
	06:08	Message 1	-	06:08	06:10	06:09	-	06:09		06:08	06:08	-		06:08	-	7	64%		7	64%	
	06:13	Message 2	-	06:13	06:15	06:14	-	06:14		06:13	06:13	-		06:13	06:22	8	73%		8	73%	
	06:30	Message 3	-	06:30	06:32	06:32	-	06:32		06:31	06:31	-		06:31	06:39	8	73%		8	73%	
	07:00	Message 4	-	07:00	07:02	07:01	-	07:01		07:00	07:01	-		07:00	07:11	8	73%	**69%**	8	73%	**69%**

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

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member States in grey did not answer this question and are excluded from the total.

COM=Comoros, IN=India, IND=Indonesia, KEN=Kenya, MAD=Madagascar, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Java Scenario: SMS

Java Scenario	SMS Message No		AUS	BAN	IND	KEN	PK	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	03:00	Test Start	03:03	03:00	-	03:03	-	-		03:00	4	57%		4	57%	
	03:14	Message 1	03:15	03:15	-	03:26	-	-		03:15	4	57%		4	57%	
	03:14	Message 2	03:15	03:18	-	03:15	-	-		03:16	4	57%		4	57%	
	03:25	Message 3	03:26	03:26	-	-	-	-		03:27	3	43%		3	43%	
	03:34	Message 4	03:35	03:35	-	03:50	-	-		03:36	4	57%		3	43%	
	03:42	Message 5	03:43	03:43	-	-	-	-		03:45	3	43%	**52%**	3	43%	**50%**
IOTWS-TSP INDIA	03:00	Test Start	03:00	03:00	-	03:00	-	03:00		03:01	5	71%		5	71%	
	03:05	Message 1	03:06	03:05	-	03:05	-	03:06		03:06	5	71%		5	71%	
	03:15	Message 2	03:17	03:15	-	03:17	-	03:17		03:33	5	71%		4	57%	
	03:31	Message 3	03:32	03:31	-	03:32	-	03:32		03:44	5	71%		5	71%	
	03:44	Message 4	03:45	03:45	-	03:45	-	03:45		-	4	57%	**69%**	4	57%	**66%**
IOTWS-TSP INDONESIA	03:00	Test Start	-	03:00	-	-	-	-		-	1	14%		1	14%	
	03:08	Message 1	03:08	03:09	03:14	03:16	-	-		-	4	57%		4	57%	
	03:13	Message 2	03:21	03:14	03:24	03:18	-	03:15		-	5	71%		5	71%	
	03:30	Message 3	04:00	03:30	03:34	03:37	-	03:33		-	5	71%		4	57%	
	04:00	Message 4	04:02	04:00	04:26	04:11	-	-		-	4	57%	**54%**	3	43%	**49%**

Table VI-7. Summary of SMS messages received by each NTWC for the Java Scenario

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member State in grey did not answer this question and are excluded from the total.

AUS=Australia, BAN=Bangladesh, IND=Indonesia, KEN=Kenya, PK=Pakistan, SA=South Africa, THA=Thailand, YEM=Yemen

Andaman Scenario: SMS

Andaman Scenario	SMS Message No		BAN	IN	IND	KEN	MAL	MM	PK	SY	SIN	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	04:00	Test Start	04:00	-	-	04:01	04:02	04:02	-	04:02	04:02	-		04:00	7	64%		7	64%	
	04:10	Message 1	04:10	04:11	-	04:14	04:11	-	-	04:11	04:11	-		04:11	7	64%		7	64%	
	04:12	Message 2	04:12	-	-	-	04:13	04:13	-	04:13	04:13	-		04:13	6	55%		6	55%	
	04:20	Message 3	04:20	04:20	-	04:20	04:20	04:20	-	04:20	04:20	-		04:22	8	73%		8	73%	
	04:51	Message 4	04:40	04:52	-	-	04:52	04:52	-	04:52	04:52	-		04:42	7	64%	**64%**	7	64%	**64%**
IOTWS-TSP INDIA	03:59	Test Start	04:00	04:00	-	04:00	-	-	-	-	04:00	04:00		04:05	6	55%		6	55%	
	04:05	Message 1	04:05	04:05	-	04:06	-	-	-	-	04:06	04:06		04:10	6	55%		6	55%	
	04:16	Message 2	04:15	04:17	-	04:17	-	-	-	-	04:17	04:17		04:20	6	55%		6	55%	
	04:31	Message 3	04:30	04:32	-	04:33	-	-	-	-	04:32	04:32		04:36	6	55%		6	55%	
	05:00	Message 4	05:00	05:01	-	-	-	-	-	-	-	-		05:08	3	27%	**49%**	3	27%	**49%**
IOTWS-TSP INDONESIA	04:00	Test Start	04:00	-	-	-	04:00	-	-	-	-	-		-	2	18%		2	18%	
	04:08	Message 1	04:08	-	04:15	04:16	04:12	04:14	-	04:19	04:11	04:24		-	8	73%		7	64%	
	04:13	Message 2	04:14	-	04:31	04:18	04:18	04:18	-	04:34	04:22	04:30		-	8	73%		5	45%	
	04:30	Message 3	04:30	-	04:38	04:42	04:37	04:35	-	04:46	04:42	04:34		-	8	73%		7	64%	
	05:00	Message 4	05:00	-	05:06	05:05	05:07	05:08	05:34	05:07	05:05	-		-	8	73%	**62%**	7	64%	**51%**

Table VI-8. Summary of SMS messages received by each NTWC for the Andaman Scenario

---

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member State in grey did not answer this question and are excluded from the total.

BAN=Bangladesh, IN=India, IND=Indonesia, KEN=Kenya, MAL=Malaysia, MM=Myanmar, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, YEM=Yemen

Makran Scenario: SMS

Makran Scenario	SMS Message No		COM	IN	IND	KEN	MAD	MAU	MZ	OM	PK	SY	THA	UAE	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	06:00	Test Start	06:10	-	-	-	06:00	-		06:01	07:30	06:01		06:00	06:00	7	64%		6	55%	
	06:12	Message 1	06:12	06:12	-	06:12	06:12	06:00		06:12	07:30	06:12		06:12	06:12	10	91%		9	82%	
	06:15	Message 2	06:18	06:15	-	06:14	06:15	06:12		06:15	07:30	06:15		06:15	06:15	10	91%		9	82%	
	06:25	Message 3	06:25	06:25	-	06:25	06:25	06:15		06:25	07:30	06:25		06:25	06:25	10	91%		9	82%	
	06:40	Message 4	06:40	06:40	-	07:03	06:40	06:40		06:40	07:30	06:40		06:40	06:40	10	91%	**85%**	8	73%	**75%**
IOTWS-TSP INDIA	05:59	Test Start	06:00	06:00	-	-	06:00	-		-	-	-		06:00	06:05	5	45%		5	45%	
	06:05	Message 1	-	-	-	-	-	06:00		-	-	-		-	-	1	9%		1	9%	
	06:16	Message 2	06:17	06:17	-	06:17	06:17	06:17		-	07:50	-		06:17	07:21	8	73%		7	64%	
	06:32	Message 3	06:33	06:32	-	06:32	06:32	06:32		-	-	-		06:32	07:21	7	64%		6	55%	
	07:02	Message 4	07:03	07:02	-	07:02	07:02	07:02		-	06:50	-		07:02	-	7	64%	**51%**	6	55%	**45%**
IOTWS-TSP INDONESIA	06:00	Test Start	06:02	-	06:08	06:03	-	06:04		-	07:35	06:06		-	-	6	55%		5	45%	
	06:08	Message 1	06:10	-	06:19	06:18	-	06:10		-	07:35	06:19		-	-	6	55%		5	45%	
	06:13	Message 2	06:14	-	06:28	06:20	-	06:22		-	07:36	06:25		-	-	6	55%		5	45%	
	06:30	Message 3	06:32	-	06:38	06:50	-	06:34		-	07:36	06:38		-	-	6	55%		4	36%	
	07:00	Message 4	07:03	-	07:08	07:05	-	07:04		07:15	07:36	07:06		-	-	7	64%	**56%**	6	55%	**45%**

Table VI-9. Summary of SMS messages received by each NTWC for the Makran Scenario

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member States in grey did not answer this question and are excluded from the total.

COM=Comoros, IN=India, IND=Indonesia, KEN=Kenya, MAD=Madagascar, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Java Scenario: Fax

Java Scenario	Fax Message No		AUS	BAN	IND	KEN	PK	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	03:00	Test Start	03:05	-	-	-	-	-		03:00	2	29%		2	29%	
	03:14	Message 1	-	-	-	-	03:15	-		03:15	2	29%		2	29%	
	03:14	Message 2	-	-	-	-	03:15	-		03:17	2	29%		2	29%	
	03:25	Message 3	-	-	-	-	03:27	-		03:28	2	29%		2	29%	
	03:34	Message 4	-	-	-	-	-	-		03:39	1	14%		1	14%	
	03:42	Message 5	-	-	-	-	-	-		03:44	1	14%	**24%**	1	14%	**24%**
IOTWS-TSP INDIA	03:00	Test Start	03:01	-	-	-	-	-		03:02	2	29%		2	29%	
	03:05	Message 1	03:07	-	-	-	-	-		03:07	2	29%		2	29%	
	03:15	Message 2	03:18	-	-	-	-	-		03:17	2	29%		2	29%	
	03:31	Message 3	03:33	-	-	-	-	-		03:33	2	29%		2	29%	
	03:44	Message 4	03:46	-	-	-	-	-		03:46	2	29%	**29%**	2	29%	**29%**
IOTWS-TSP INDONESIA	03:00	Test Start	-	-	-	-	-	-		03:01	1	14%		1	14%	
	03:08	Message 1	03:34	-	-	-	-	-		03:09	2	29%		1	14%	
	03:13	Message 2	03:38	-	-	-	-	-		03:14	2	29%		1	14%	
	03:30	Message 3	03:53	-	-	-	-	-		03:32	2	29%		1	14%	
	04:00	Message 4	-	-	-	-	-	-		04:02	1	14%	**23%**	1	14%	**14%**

Table VI-10. Summary of Fax messages received by each NTWC for the Java Scenario

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member State in grey did not answer this question and are excluded from the total.

AUS=Australia, BAN=Bangladesh, IND=Indonesia, KEN=Kenya, PK=Pakistan, SA=South Africa, THA=Thailand, YEM=Yemen

Andaman Scenario: Fax

Andaman Scenario	Fax Message No		BAN	IN	IND	KEN	MAL	MM	PK	SY	SIN	SA	THA	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	04:00	Test Start	-	04:02	-	-	04:04	04:25	04:00	-	04:04	-		04:02	6	55%		5	45%	
	04:10	Message 1	-	05:33	-	-	04:52	04:22	04:31	-	05:14	-		04:13	6	55%		2	18%	
	04:12	Message 2	-	05:32	-	-	04:53	04:23	04:33	-	05:15	-		04:15	6	55%		2	18%	
	04:20	Message 3	-	05:34	-	-	04:54	04:24	04:33	-	05:16	-		04:22	6	55%		3	27%	
	04:51	Message 4	-	05:24	-	-	04:55	05:48	-	-	05:17	-		04:42	5	45%	**53%**	3	27%	**27%**
IOTWS-TSP INDIA	03:59	Test Start	-	04:00	-	-	04:02	-	-	-	03:59	-		04:06	4	36%		4	36%	
	04:05	Message 1	-	04:06	-	-	04:06	-	-	-	04:05	-		04:13	4	36%		4	36%	
	04:16	Message 2	-	04:17	-	-	04:18	-	-	-	04:16	-		04:22	4	36%		4	36%	
	04:31	Message 3	-	04:33	-	-	-	-	-	-	04:32	-		04:37	3	27%		3	27%	
	05:00	Message 4	-	05:01	-	-	-	-	-	-	05:01	-		05:09	3	27%	**33%**	3	27%	**33%**
IOTWS-TSP INDONESIA	04:00	Test Start	-	-	-	-	n/a	-	-	-	-	-		04:04	2	18%		2	18%	
	04:08	Message 1	-	-	-	-	n/a	-	-	-	-	-		04:13	2	18%		2	18%	
	04:13	Message 2	-	-	-	-	n/a	-	-	-	-	-		04:19	2	18%		2	18%	
	04:30	Message 3	-	-	-	-	n/a	-	-	-	-	-		04:37	2	18%		2	18%	
	05:00	Message 4	-	-	-	-	n/a	-	-	-	-	-		05:06	2	18%	**18%**	2	18%	**18%**

Table VI-11. Summary of Fax messages received by each NTWC for the Andaman Scenario

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member State in grey did not answer this question and are excluded from the total.

BAN=Bangladesh, IN=India, IND=Indonesia, KEN=Kenya, MAL=Malaysia, MM=Myanmar, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, YEM=Yemen

Makran Scenario: Fax

Makran Scenario	Fax Message No		COM	IN	IND	KEN	MAD	MAU	MZ	OM	PK	SY	THA	UAE	YEM	Tot	%	Ave	Tot*	%*	Ave*
IOTWS-TSP AUSTRALIA	06:00	Test Start	-	-	-	-	-	-		-	-	-		-	06:02	1	9%		1	9%	
	06:12	Message 1	-	-	-	-	-	-		07:02	-	-		-	06:13	2	18%		1	9%	
	06:15	Message 2	-	-	-	-	-	-		07:05	-	-		-	06:16	2	18%		1	9%	
	06:25	Message 3	-	-	-	-	-	-		07:04	-	-		-	06:27	2	18%		1	9%	
	06:40	Message 4	-	-	-	-	-	-		07:03	-	-		-	06:41	2	18%	**16%**	1	9%	**9%**
IOTWS-TSP INDIA	05:59	Test Start	-	06:00	-	-	-	06:00		06:19	-	-		-	06:05	4	36%		3	27%	
	06:05	Message 1	-	-	-	-	-	-		06:42	-	-		-	06:10	2	18%		1	9%	
	06:16	Message 2	-	06:17	-	-	-	06:18		07:10	-	-		-	06:15	4	36%		3	27%	
	06:32	Message 3	-	06:32	-	-	-	-		06:33	-	-		-	06:33	3	27%		3	27%	
	07:02	Message 4	-	07:02	-	-	-	-		07:03	-	-		-	07:04	3	27%	**29%**	3	27%	**24%**
IOTWS-TSP INDONESIA	06:00	Test Start	-	06:00	-	-	-	-		-	-	-		-	06:03	2	18%		2	18%	
	06:08	Message 1	-	06:08	-	-	-	-		-	-	-		-	06:11	2	18%		2	18%	
	06:13	Message 2	-	06:13	-	-	-	-		-	-	-		-	06:16	2	18%		2	18%	
	06:30	Message 3	-	06:30	-	-	-	-		08:20	-	-		-	06:34	3	27%		2	18%	
	07:00	Message 4	-	07:00	-	-	-	-		09:00	-	-		-	07:07	3	27%	**22%**	2	18%	**18%**

Table VI-12. Summary of Fax messages received by each NTWC for the Makran Scenario

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, - message not received, blank space = no answer provided. Highlighted times indicate that the message was received more than 15 minutes after being issued.

Note: Member States in grey did not answer this question and are excluded from the total.

COM=Comoros, IN=India, IND=Indonesia, KEN=Kenya, MAD=Madagascar, MAU=Mauritius, OM=Oman, PK=Pakistan, SY=Seychelles, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

ANNEX VII

TSP EXCHANGE PRODUCTS ACCESSED BY NTWCS

All Scenarios (11 out of 15 NTWCs Reporting)		%Y	Total	AUS	BAN	COM	IN	IND	KEN	MAD	MAL	MAU	MZ	MM	OM	PK	SY	SIN	SA	THA	UAE	YEM
TSP-Australia	Bulletins	88%	17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	Yes	Yes	Yes	Yes	Yes		No	Yes
	Coastal Zone Threat Map	82%	17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	Yes	Yes	Yes	Yes	Unable to access		No	Yes
	Threat Table	88%	17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	Yes	Yes	Yes	Yes	Unable to access		Yes	Yes
	Maximum Amplitute Map	88%	17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	Yes	Yes	Yes	Yes	Unable to access		Yes	Yes
	Tsunami Travel Time Map	82%	17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	Yes	Yes	Yes	Yes	Unable to access		No	Yes
TSP-India	Bulletins	76%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	No	No	Yes	Yes	Yes		Yes	Yes
	Coastal Zone Threat Map	76%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	No	No	Yes	Yes	Unable to access		Yes	Yes
	Threat Table	76%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	No	No	Yes	Yes	Unable to access		Yes	Yes
	Maximum Amplitute Map	76%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	No	No	Yes	Yes	Unable to access		Yes	Yes
	Tsunami Travel Time Map	76%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	No	No	Yes	Yes	Unable to access		Yes	Yes
TSP-Indonesia	Bulletins	82%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	Yes	Yes	Yes	Yes	Yes		No	Yes
	Coastal Zone Threat Map	88%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		No	Yes
	Threat Table	88%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		No	Yes
	Maximum Amplitute Map	88%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		No	Yes
	Tsunami Travel Time Map	88%	17	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		No	Yes
	Any Product from Any TSP	100%	17	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes

Table VII-1. TSP Exchange Products Accessed by NTWCs during the all Scenarios

AUS=Australia, BAN=Bangladesh, COM=Comoros, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Total = total number of NTWCs who answered the question, %Y = percentage of NTWC that access the exchange product relative to total

Note: Member States in grey did not answer this question and are excluded from the total.

ANNEX VIII

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

Member State	TSP Tsunami Threat info used?	If no, why was the tsunami threat information not used?
Australia	No	The Australian national warning system makes use of its own, tailored tsunami threat assessments which are calibrated against past events affecting Australia.
Bangladesh	Yes	
Comoros	Yes	
India	Yes	
Indonesia	No	In order to covered the national warnings area, TSP Indonesia has more coverage than others.
Kenya	Yes	
Madagascar	Yes	
Malaysia	Yes	
Mauriitius	Yes	
Mozambique		
Myanmar	Yes	
Oman	Yes	
Pakistan	Yes	
Seychelles	Yes	
Singapore	Yes	
South Africa	Yes	
Thailand		
UAE	Yes	
Yemen	Yes	

Table VIII-1. Tsunami Threat Information from TSP Websites Overview

Note: Member States in grey did not answer this question and are excluded from the total.

All Scenarios (11 out of 15 NTWCs Reporting)		%Y	Total	AUS	BAN	COM	IN	IND	KEN	MAD	MAL	MAU	MZ	MM	OM	PK	SY	SIN	SA	THA	UAE	YEM
TSP-Australia	Tsunami Wave Obervations	53%	15		No	No	No		Yes	Yes	No	Yes		Yes	No	Yes	Yes	Yes	No		No	Yes
	T1 Predicted Wave Arrival Time	53%	15		No	Yes	No		Yes	No	Yes	Yes		Yes	No	No	Yes	Yes	No		No	Yes
	T2 Predicted Wave Arrival Time	53%	15		No	Yes	No		Yes	Yes	No	Yes		Yes	No	No	Yes	Yes	No		No	Yes
	T3 Predicted Wave Arrival Time	40%	15		No	Yes	No		No	No	No	Yes		Yes	No	No	Yes	Yes	No		No	Yes
	T4 Predicted Wave Arrival Time	40%	15		No	Yes	No		Yes	No	No	Yes		Yes	No	No	Yes	No	No		No	Yes
	Predicted Max Wave Amplitudes	73%	15		No	Yes	No		Yes	No	Yes	Yes		Yes	Yes	Yes	Yes	Yes	No		Yes	Yes
	CFZ Theat Levels	33%	15		No	Yes	No		No	No	No	No		Yes	No	No	Yes	Yes	No		Yes	No
	Other	20%	15		No	No	No		Yes	Yes	No	No		No	No	No	No	No	No		No	Yes
TSP-India	Tsunami Wave Obervations	73%	15		Yes	Yes	Yes		Yes	Yes	No	Yes		Yes	No	No	Yes	Yes	No		Yes	Yes
	T1 Predicted Wave Arrival Time	60%	15		Yes	Yes	Yes		No	No	Yes	Yes		Yes	No	No	Yes	Yes	No		Yes	No
	T2 Predicted Wave Arrival Time	73%	15		Yes	Yes	Yes		Yes	Yes	No	Yes		Yes	No	No	Yes	Yes	No		Yes	Yes
	T3 Predicted Wave Arrival Time	53%	15		No	Yes	Yes		Yes	No	No	Yes		Yes	No	No	Yes	Yes	No		Yes	No
	T4 Predicted Wave Arrival Time	33%	15		No	Yes	Yes		No	No	No	Yes		Yes	No	No	Yes	No	No		No	No
	Predicted Max Wave Amplitudes	67%	15		Yes	Yes	Yes		Yes	Yes	Yes	Yes		Yes	No	No	Yes	Yes	No		No	No
	CFZ Theat Levels	53%	15		Yes	Yes	Yes		No	Yes	No	No		Yes	No	No	Yes	Yes	No		No	Yes
	Other	13%	15		No	No	No		Yes	Yes	No	No		No	No	No	No	No	No		No	No

Table VIII-2. Tsunami Threat Information from TSP Websites used by NTWCs to Produce National Warnings during all Scenarios

AUS=Australia, BAN=Bangladesh, COM=Comoros, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Total = total number of NTWCs who answered the question, %Y = percentage of NTWC that access the exchange product relative to total

Note: Member States in grey did not answer this question and are excluded from the total.

All Scenarios (11 out of 15 NTWCs Reporting)		%Y	Total	AUS	BAN	COM	IN	IND	KEN	MAD	MAL	MAU	MZ	MM	OM	PK	SY	SIN	SA	THA	UAE	YEM
TSP-Indonesia	Tsunami Wave Obervations	53%	15		No	No	No		Yes	Yes	No	Yes		Yes	No	Yes	Yes	Yes	No		No	Yes
	T1 Predicted Wave Arrival Time	60%	15		No	Yes	No		Yes	No	Yes	Yes		Yes	No	No	Yes	Yes	Yes		No	Yes
	T2 Predicted Wave Arrival Time	47%	15		No	Yes	No		Yes	Yes	No	Yes		Yes	No	No	Yes	Yes	No		No	No
	T3 Predicted Wave Arrival Time	47%	15		No	Yes	No		Yes	No	No	Yes		Yes	No	No	Yes	Yes	No		No	Yes
	T4 Predicted Wave Arrival Time	40%	15		No	Yes	No		Yes	No	No	Yes		Yes	No	No	Yes	No	No		No	Yes
	Predicted Max Wave Amplitudes	80%	15		No	Yes	No		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		No	Yes
	CFZ Theat Levels	53%	15		No	Yes	No		Yes	Yes	No	No		Yes	No	No	Yes	Yes	Yes		No	Yes
	Other	20%	15		No	No	No		Yes	Yes	No	No		No	No	No	No	No	No		No	Yes

Table VIII-2 (continued). Tsunami Threat Information from TSP Websites used by NTWCs to Produce National Warnings during all Scenarios

AUS=Australia, BAN=Bangladesh, COM=Comoros, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Total = total number of NTWCs who answered the question, %Y = percentage of NTWC that access the exchange product relative to total

Note: Member States in grey did not answer this question and are excluded from the total.

ANNEX IX

NTWC NATIONAL TSUNAMI WARNING STATUS REPORTS TO TSPS

All Scenarios (18 out of 19 NTWCs Reporting)	%Y	Total	AUS	BAN	COM	IN	IND	KEN	MAD	MAL	MAU	MZ	MM	OM	PK	SY	SIN	SA	THA	UAE	YEM
	67%	18	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes		Yes	Yes

Table IX-1. NTWC National Tsunami Warning Status Reports to TSPs during any IOWave20 scenario

Note: Member State in grey did not answer this question and are excluded from the total.

Java Scenario (5 out of 8 NTWCs reporting)	%Y	AUS	BAN	IND	KEN	PK	SA	THA	YEM
Did your NTWC send reports of its warning Status to the TSPs?	40%	Yes	No		No	No	Yes		
At what time (UTC) did the NTWC first report its status?	-	03:26	-		-	-	03:51		
How many status reports did the NTWC send to the TSPs?	-	2	0		-	-	1		

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

AUS=Australia, BAN=Bangladesh, COM=Comoros, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Total = total number of NTWCs who answered the question, %Y = percentage of NTWC that access the exchange product relative to total

Note: Member States in grey did not answer this question and are excluded from the total.

Andaman Scenario (10 out of 12 NTWCs reporting)	%Y	BAN	IN	IND	KEN	MAL	MM	PK	SY	SIN	SA	THA	YEM
Did your NTWC send reports of its warning Status to the TSPs?	42%	Yes	Yes	Yes	No	No	Yes	No	Yes	No	No		
At what time (UTC) did the NTWC first report its status?	-	-	04:22	04:24	-	-	04:06	-	-	-	-		
How many status reports did the NTWC send to the TSPs?	-	2	3	3	-	-	4	-	-	-	-		

Table IX-3. NTWC National Tsunami Warning Status Reports to TSPs during the Andaman Scenario

Makran Scenario (12 out of 13 NTWCs reporting)	%Y	COM	IN	IND	KEN	MAD	MAU	MZ	OM	PK	SY	THA	UAE	YEM
Did your NTWC send reports of its warning Status to the TSPs?	54%	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes		Yes	Yes
At what time (UTC) did the NTWC first report its status?	-	-	06:26	06:20	-	06:37	06:16	-	-	-	-		06:36	06:46
How many status reports did the NTWC send to the TSPs?	-	-	3	3	-	4	4	-	1	-	-		3	3

Table IX-4. NTWC National Tsunami Warning Status Reports to TSPs during the Andaman Scenario

AUS=Australia, BAN=Bangladesh, COM=Comoros, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Total = total number of NTWCs who answered the question, %Y = percentage of NTWC that access the exchange product relative to total

Note: Member States in grey did not answer this question and are excluded from the total.

ANNEX X

GENERAL QUESTIONS

General Questions	Total	Ave	AUS	BAN	COM	IN	IND	KEN	MAD	MAL	MAU	MZ	MM	OM	PK	SY	SIN	SA	THA	UAE	YEM
Exercise planning and communication: Timeliness and usefulness of information from the ICG/IOTWMS Secretariat	18	3.7	3	4	4	4	4	4	3	3	4	4	4	2	4	4	4	4		4	4
Exercise documentation: Manual, websites, bulletins	18	3.9	3	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4		4	4
Exercise format and style: Real-time operation, exercise messages similar to real events	18	3.6	2	3	4	4	4	4	3	4	4	4	3	4	4	3	4	3		3	4
Post-exercise evalaution: Web-based survey	18	3.7	3	4	2	4	4	4	4	3	4	4	4	4	4	4	4	3		4	4

Table X.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, IN=India, IND=Indonesia, KN=Kenya, MAD=Madagascar, MAL=Malaysia, MAU=Mauritius, MZ=Mozambique, MM=Myanmar, OM=Oman, PK=Pakistan, SY=Seychelles, SIN=Singapore, SA=South Africa, THA=Thailand, UAE=United Arab Emirates, YEM=Yemen

Total = total number of NTWCs who answered the question, Ave = average rank across all member states that answered the question

Note: Member State in grey did not answer this question and are excluded from the total.

Observer Questions	Total	Ave	IND	PK	SY
Feedback provided by the exercise observers	3	3.3	4	3	3
Information for the post-exercise evaluation provided by the exercise observers	3	3.7	4	4	3

Table X.2. Observer Questions: Member States ranked the activities from 4 (extremely good), 3 (very good), 2 (good) to 1 (poor)

IND=Indonesia, PK=Pakistan, SY=Seychelles,

Total = total number of NTWCs who answered the question, Ave = average rank across all member states that answered the question

Member State	Standard Operating Procedures updates with respect to the pandemic situation:
India	ICG/IOTWMS issued Guidelines for Tsunami Warning Services, Evacuation and sheltering during COVID-19 circulated to National and Local Disaster Management Organizations to update their SOPs with respect to a pandemic situation. All the DMOs followed COVID-19 guidelines and participated accordingly in the IOWave20 exercise.
Pakistan	This office has been followed pandemic SOP. We use less staff for operation and social distancing. This office has not included schools. community and Media.
Singapore	Revised the SOP in March 2020 to streamline the process as well as improve the clarity of the required response actions in the event of a tsunami
United Arab Emirates	There will be an awareness messages to the Communities at risk to follow up all the pandemic precautions such as: • Ensure you are wearing protective mask and gloves at all times. • Ensure to maintain proper social distancing (2m). • Sanitize often • No handshaking is allowed with others. • Throw used masks or gloves in the dedicated Trash.

Table X.3. Standard Operating Procedure updates with respect to the pademic situation

Member State	Additional Feedback
Bangladesh	Some TSP Bulletins we not received properly. Every Six month or each year need to verify NTWC Fax Number, Focal person E-mail etc. Also If any changes in TSP the web access user name & password, it is important to officially sent to TNC and NTWC focal point.
Comoros	Preparing and conducting the exercise IOWave20 (real event) when changes have taken place in the leadership of responsible institutions and stakeholders was delicate. Especially in a context where the new leader would not have the necessary information, in institutions where there are still significant gaps. we wonder how we could have done better (what training / information for the new leaders in DRR agencies (for Tsunami in particular)?)
India	ITEWC would like to thanks ICG/IOTWMS and IOTIC of IOC-UNESCO for the IOWave20 exercise.
Kenya	The exercise was limited to reviewing of the SOPs only. This is due to the strict COVID-19 protocols that had to be followed.
Madagascar	Sometimes we confused TSP interface web browser, so we spend time to check the feedback report, T2, Estimated arrival time,... for each TSPs.
Malaysia	Participating in the IOWave20 Exercise is challenging as the covid19 pandemic is still going on. Hopefully, in the next exercise we will be able to do better.
Mauritius	No fax were received from TSPs Indonesia and Australia. Only two fax were received from TSP India. On the other hand, GTS performance at dissemination from TSPs to NTWC was very good.
Mozambique	For a country like Mozambique where the occurrence of a tsunami is not very prevalent, much remains to be done as a challenge on tsunami perception. We still have to spread more and we are better prepared in terms of infrastructure and communication, having teams prepared and assembled for eventual tsunami situations. The concept of evacuation routes such as producing, escape scenarios, warning systems still needs to be improved and matured.
Myammar	IOWave-20 exercise time is during the COVID-19 pandemic and all of RTSPs sent just 4 bulletin to NTWCs but NTWC of Myanmar continue issued Tsunami Cancellation based on the clear situation from Tsunami Wave and our SOP. We have followed our SOPs at this exercise.
Pakistan	The password of reporting form was not working. The planning of observers was made during last moment. The exercise could be made online through conference call, So issue of login can be solved. similarly one can get suggestion and advice as well.
Seychelles	It was a well organised and information from IOC was received timely. It was an opportunity to see the plan of the different sectors in the country. It provide the opportunity to see the gaps and weakness that exist regarding preparedness and response. As it is during a time of pandemic it was an opportunity to see how the plan need to be improve to accommodate for this issue.
Singapore	The tsunami exercises are very useful in helping NTWCs to validate their SOPs.

Table X.4. Additional feedback

ANNEX XI

IN-COUNTRY BENEFITS OF THE EXERCISE

AUSTRALIA

- Exercising the warning centre's role as a Tsunami Service Provider for the IOTWMS.
- Exercising the liaison and communication protocols between the NTWC and the NDMO & LDMOs.
- Exercising activation of the tsunami response plans of the participating LDMOs.

BANGLADESH

- Capacity building of relevant official on how to respond during a real tsunami event.
- Gaining knowledge about the communication status of each important stakeholder. Though we observe some lack and limitation and hope this will be overcome after the exercise.

COMOROS

- Validation of the NTWC timeline SOP presented to the pre-IOWave20 webinar.
- Using NDMO timeline SOP presented at the pre-IOWave20 webinar according to the tsunami plans and discovering of several gaps in the NDMO structure and plans.
- A new dimension in the NTWC, NDMO collaboration (training of NDMO staff by the NTWFP).

INDIA

- Validated 3 objectives of IOWave, i.e. (i) 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, (ii) 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, and (iii) the reporting by NTWCs to the TSPs of their National Tsunami Warning Status.
- IOWave20 exercise benefited to test communication channels between NTWC and DMOs. Testing warning chain and SOPs of DMOs through virtual tabletop exercise.
- Using IOWave20 exercise as an opportunity, Odisha State Disaster Management Authority (OSDMA) evaluated Tsunami Ready indicators in piloted Tsunami Ready villages with limited members on 13th October 2020.

INDONESIA

- Coordinating the Tsunami Early Warning Chain with all stakeholders towards understanding and refreshing the SOP for Tsunami Warning.
- Due to pandemic, COVID-19 situation the IOWave20 exercise was held by virtual table top exercise through zoom application. We applied the health protocol for not gathered people, so that we only conducted a small drill in the new airport in Yogyakarta.
- Despite through the virtual way, the experts of tsunami as observer still were able to work effectively by recommending the opinions in order to improve tsunami warning in our country.

KENYA

- Reviewing the SOP between NTWC-NDOC-LDMC
- We held a stakeholder discussion on coastal mapping

- Identify the gaps that need to be addressed for early warning

MADAGASCAR

- NTWC SOP
- NDMO SOP
- Testing our communications

MALAYSIA

- Having our system tested for readiness
- By comparing the result of the tsunami data provided by the TPS with our own

MAURITIUS

- An excellent exercise to test communication between TSPs and NTWC
- Good opportunity to test communications between NTWC and first responders. It helped to identify gaps in communication.
- IOWave 2020 was used to strengthen the involvement of the first responders and they were tasked to review and update their plans and working procedures.

MOZAMIBIQUE

- Refresh our national plans
- Test virtual exercises as an alternative
- Remember the threat of tsunami wave

MYAMAR

- Using existing SOPs.
- Testing communication systems.
- Improving the cooperation with TSPs.

OMAN

- Test dissemination by NMHEWC bulletin messages to other agencies
- Test the reception by other agencies of the NMHEWC messages
- Test SOPs of all agencies

PAKISTAN

- No response provided

SEYCHELLES

- Creating awareness on tsunami for different stakeholders at governmental, private, and parastatal level
- Testing of communication level from international to national level
- Reviewing of SOP and identification of strength and weakness for the system in place

SINGAPORE

- Testing the communication links with TSPs
- Validating our internal SOP

- Testing the communication links with NDMO and other stakeholders

SOUTH AFRICA

- Testing in-country message dissemination (especially via/between email servers)
- Testing SOP during pandemic

THAILAND

- No response provided

UNITED ARAB EMIRATES

- Validating the access to the tsunami bulletins and other products provided by the TSPs.
- Exchanging information with neighbouring countries regarding the event.
- Building our knowledge from other countries experiences and practices for tsunami response and mitigation.

YEMEM

- Yemen still receive bulletin messages from TSPs.
- Despite the difficult circumstances, Yemen still participates in receiving periodic exercises, and sends all data that reach it from the regional centres for early warning of the tsunami.
- Activating the roles and tasks of all parties related to the tsunami disaster in Yemen.

ANNEX XII

IMPROVEMENTS FOR FUTURE EXERCISES

AUSTRALIA

- Using operational warning dissemination channels and webpages.
- Exercising coordination between the media units of the participating agencies.
- Improving the pre-exercise preparation including system configuration, SOPs update and training at each participating agency.

BANGLADESH

- Involve more stakeholders in workshop of how to conduct IOWave exercise
- Participate in a functional or full scale exercise.

COMOROS

- Raising awareness among decision-makers.
- Closing the gaps observed at Comoros NDMO level.
- Involving all stakeholders in testing their functionalities and through IOTR testing in pilot communities.

INDIA

- During IOWave exercise, considering COVID-19 pandemic situation, tested only communication protocols and organization of SOPs. Future exercises may be improved by involving local communities.
- More training, awareness and preparedness programs.
- IOC-UNESCO Tsunami Ready indicators will be evaluated in all Tsunami Ready implemented communities.

INDONESIA

- Tsunami drill
- National board implemented in specific area
- Involving the experts from other country and create a website especially for IOWave which as follow as the documentations, bulletin, report from the event.

KENYA

- Involving the communities in all coastal areas
- Translate the educational materials to the local languages
- Work with private sectors, especially the hotel sector, along the coast for better preparedness

MADAGASCAR

- Training
- Exercise drill
- Involving the community level

MALAYSIA

- If it is done when there is no pandemic

- If there is any guidance using a virtual tabletop exercise

MAURITIUS

- Continuous capacity building of NTWC
- Harmonising and upgrading of existing infrastructure in the region for tsunami preparedness
- Sharing of experience at regional level on tsunami preparedness

MOZAMIBIQUE

- No response provided

MYAMAR

- Supporting technical assistance and software of tsunami modelling to member state countries.
- Developing inundation maps and evacuation route maps.
- Further improving cooperation with TSPs.

OMAN

- No response provided

PAKISTAN

- Involve our community in future.
- We will also involve media.
- If possible, include evacuation plans.

SEYCHELLES

- Ensuring that there is commitment from all stakeholders at international and national level
- Having dedicated team that is responsible for preparing ensuring that there is continued preparedness for tsunami
- Having an inventory of all trained personal in tsunami in Seychelles.

SINGAPORE

- Standardizing the formats of bulletins issued by all TSPs
- To vary the ETA and wave heights in the tsunami bulletins, instead of using fixed values in the series of bulletins issued by each of the TSPs

SOUTH AFRICA

- Real-time access to TSP India site (“CAPTCHA” security) is unnecessarily cumbersome and tedious and significantly impedes fast, effective, online logging of “country status”.
- Whilst significant care has been taken by the 3 TSPs to offer replicated information to ensure redundancy, all “country status” requests are redirected back to TSP India (see suggestion above). Suggest reverting to logging of “country status” directly available on each of the three TSPs.

THAILAND

- No response provided

UNITED ARAB EMIRATES

- Validate the verbal warning by the TSPs and NTWCs by establishing a continuity plan for the warning dissemination in case the internet communication was down or delayed.
- Identify the proper TSP for each country to refer to get the tsunami products, so they will not be confused in the real event, however they are all accessible.
- Allocate an emergency focal point for each country either from TSPs to NTWCs to contact in case any country does not does not get the information/warning in the proper time (for real event).

YEMEM

- For Yemen situation, we are looking for some support to NTWC and NDMO from IOTWMS to develop
- We look forward in the future from IOTWMS to support Yemen authorities related to the tsunami disaster in Yemen (training, modern equipment, other needs)