Definition of Services provided by Tsunami Service Providers of the IOTWMS

1 December 2022

Contents

Document Control Page

Governance / Ownership:
This document defines the advisory services to be provided by Tsunami Service Providers (TSPs) in the Indian Ocean Tsunami Warning and Mitigation System (IOTWMS). It is an official document of the Intergovernmental Coordination Group for the IOTWMS (ICG/IOTWMS).

Changes to this document can only be authorised by the ICG/IOTWMS or by its Steering Group (SG).

Version Control:

Version	Date	Authors	Comments	Authorising Group
1	2/12/09	Steering Group	Original definition	SG Meeting, Perth, 2 December 2009
2	26/03/15	Steering Group, Peter Coburn, Srinivasa Kumar	Many additions/updates, including: • Document control/governance • Maps defining AOR and Earthquake Source Zones. • Earthquake source zones for Service Level 2 products reduced to IO, Pacific and South Atlantic. • Specification of Exchange and Public Bulletin formats • Specification of WMO GTS headers for bulletins • Specification of 100km maximum earthquake depth for Service Level 2 products. • Specification of 200km maximum inland distance for coastal earthquakes. • TSP Key Performance Indicators and Reporting • Procedures for: o Reporting performance o Event assessments o Naming of tsunamigenic earthquakes o Handling simultaneous events	SG Meetings: Perth, 10-11 December 2013 Jakarta, 26 November 2014 ICG/IOTWS-X Meeting, Muscat, 24-26 March 2015

			○ Regular tests Also incorporated recommendations of TTTWO & TOWS-WG VIII meetings of March 11-13, 2015 (Pending recommendations of the IOC Assembly) • AoS and ESZ Maps • Event Assessment Template • Post-event assessment threshold revisions • Reporting of Water Levels • Introduction Section • Annexure-7 comprising definition, roles & responsibilities of NTWCs/TSPs, capability requirements of TSPs and procedure for achieving TSP status	
3	20/04/17	Peter Coburn, Srinivasa Kumar, Mohammad Mokhtari	Addition of requirement for TSPs to give at least 3 months' notice to NTWCs of TSP service changes Changes to Exchange and Public Bulletin Templates: • Addition of "REVISED" for changed earthquake details • Addition of bulletin-type indicator (e.g. "TYPE-II") to Exchange bulletin header Clarification that Earthquake Bulletins are not to be issued once Service Level 2 Bulletins have begun to be issued. Changed threshold earthquake magnitude for KPI 2 "Probability of detection of Indian Ocean earthquakes" from 6.5 to 6.8, to allow for the 0.3 magnitude accuracy target specified in KPI 3. Inclusion of procedures for handling multiple earthquakes in quick succession, as contained in the draft Global Service Definition Document (GSDD) developed by the TOWS-WG Task Team on Tsunami Watch Operations.	Steering Group Meetings: Perth, 19-20 August 2015 Perth, 17-18 January 2017 ICG/IOTWMS-XI Meeting, Kuala Lumpur, 18-20 April 2017

			Update of specification for reporting sea-levels, for consistency with Global Service Definition Document (GSDD). Addition of KPIs related to "Functional Status" of TSPs, from GSDD, and removal of redundant TSP Performance KPI 15. Replacement of IOTWS acronym with IOTWMS. Revised Area of Service (AOS) Map (Annexure-1) and introduced Global Area of Responsibility Map of the ICGs (Annexure-1A) consistent with the decision of the TOWS-WG (February, 2016) and adopted by the IOC EC (June 2016). It may be noted that these latest revisions do not affect the IOTWMS TSP service as defined in Version 2 of this document, but provide clarification of the service for the Banda / Java Sea areas.	
4	25/02/19	Peter Coburn	Whole document: Replaced AOR (area of responsibility) with AOS (area of service) Paras 1, 39: Addition of 1 month's notice for TSP service changes not affecting NTWC operations. Paras 13, 22: Addition of GTS centre identifier "CCCC" in GTS headers for Exchange and Public Bulletins. Para 22: Addition of explanatory note about Public Bulletins not having associated Notification Messages. Para 27: New procedure following issue of false or incorrect TSP messages. Para 38: Swapped numbering of KPIs 3 and 5, and KPIs 7 and 8, to be consistent with Performance Reporting Template in Annex 3 and with previous reporting practice. Annexes 1, 1A: Updated IOTWMS and Global Area of Service maps. Annex 3: Addition of KPI 9 False / Incorrect Bulletins Issued Annexes 5, 6: Dates in all bulletin headings now upper-case. Annexes 5, 6: Addition of Final Bulletin – No Tsunami Observed templates Annexes 5, 6: Addition of templates for Cancellation Messages	

			Annex 6: Correction to heading in Public Earthquake Bulletin (replace “INDIAN OCEAN” with “PUBLIC”) Annex 7: Addition to NTWC Roles and Responsibilities specifying when national warning status is to be reported.	
5	1/12/22	Yuelong Miao, Robert Greenwood	Glossary of terms: Added IHO Para 3: Added guidance regarding issuing of NAVAREA products Para 10: added clarification that SL-2 bulletins may be issued for earthquakes less than magnitude 8.0 that have been assessed as causing threat to the IOTWMS CFZs Para 11: Added guidance regarding issuing of service level 2 products for non-seismic and complex source events Para 40: Modified KPI 2 and added explanatory note to KPIs 1,3,4,5,6 Annexure 3: Added target definitions Annexure 5 and 6: changed “Revised” to “Updated” for earthquake magnitude in IOTWMS TSP bulletin templates Annexure 5-7: Added new highlighting scheme to indicate sections that would change for non-seismic and complex source events. Annexure 7: added a new bulletin category: TSP NAVAREA products with template and examples. Moved Annexure 7 to Annexure 8	

Glossary of Terms

AOS:	Area of Service of a Tsunami Warning System
BMKG:	Badang Meteorologi Klimatologi dan Geofisika (Indonesia)
CFZ:	Coastal Forecast Zone in the Indian Ocean
GIS:	Geographic Information System
GSDD:	Global Service Definition Document of TOWS-WG
GTS:	Global Telecommunications System (WMO)
ICG/IOTWMS:	Intergovernmental Coordination Group for the IOTWMS
IHO:	International Hydrographic Organization
InaTEWS:	Indonesian Tsunami Early Warning System
INCOIS:	Indian Centre of Ocean Information Services
IOC:	Intergovernmental Oceanographic Commission
IOTWMS:	Indian Ocean Tsunami Warning and Mitigation System
ITWEC:	Indian Tsunami Early Warning Centre
JATWC:	Joint Australian Tsunami Warning Centre
NTWC:	National Tsunami Warning Centre
PTWS:	Pacific Tsunami Warning and Mitigation System
SG	Steering Group for the ICG/IOTWMS
TOWS-WG:	Tsunami and Other Ocean Hazards Warning and Mitigation Systems Working Group
TOWS-WG TT:	TOWS-WG Inter-ICG Task Team on Tsunami Watch Operations
TSP:	Tsunami Service Provider
Tsunameter:	Tsunami-detection and measurement devices (typically a deep-ocean buoy with a bottom pressure sensor and a surface comms buoy)
USGS:	United States Geological Survey
UNESCO:	United Nations Educational, Scientific and Cultural Organisation
WMO:	World Meteorological Organisation

Introduction

The IOTWMS is a "system-of-systems" with operational robustness achieved through multiple Tsunami Service Providers (TSPs), each of which has implemented an Indian Ocean tsunami threat assessment system providing real-time information to the NTWCs of Indian Ocean countries during tsunami events.

The ICG/IOTWMS has specified that there must be at least two TSPs covering all parts of the Indian Ocean, to ensure redundancy and robust operations during tsunami events. This "system-of-systems" approach requires all seismic, sea level, and tsunami threat information provided by TSPs to be interoperable, i.e. TSPs are to use common and agreed formats for data and information exchange, are to meet agreed TSP Service Definition requirements, and are to share information on procedures and processes. Currently the TSPs of Australia, India and Indonesia are operational and providing SL-1 and SL-2 services for the IOTWMS Area of Service (AOS). Each TSP provides services for the whole of the IOTWMS AOS – see Annexure-1 for the Area of Service (AOS) map for all three TSPs. Also see Annexure-1A for the Global AOS Map for all ICGs.

The definitions of NTWC and TSPs, their roles & responsibilities, TSP capability requirement and procedure for achieving TSP status are described in Annexure-8.

In general, there are three Service Levels defined for TSPs to provide to NTWCs:

Service Level 1: TSPs provide initial earthquake source information for potentially tsunamigenic earthquakes occurring in the IOTWMS Earthquake Source Zone (ESZ), plus a qualitative tsunami threat assessment.

Service Level 2: TSPs provide detailed quantitative tsunami threat assessments for all Indian Ocean coastal zones, including:

- Estimated Wave Amplitude (offshore/coastline)
- Estimated Time of Arrival (coastline)
- Potential threat zones
- Sea level verification information

Service Level 3: NTWCs under bilateral agreements with TSPs will develop and implement enhanced tsunami warning information systems utilising:

- Inundation mapping
- Risk and hazard assessments

The following section details the services to be provided by the IOTWMS TSPs to the NTWCs.

Services to be Provided

1. TSP services shall consist of TWO types of products (i) Exchange products for NTWCs and (ii) Public products for the general public. TSP services shall be treated as **Information** to NTWCs. National Warnings shall remain the responsibility of NTWCs unless bilateral arrangements are established between an NTWC and a TSP. TSPs shall give at least three (3) months' notice to NTWCs of any TSP service changes affecting NTWC operations, or one (1) month's notice for other changes.

2. TSP **exchange products** shall consist of a combination of textual bulletins, emails, graphics, password-protected web sites and data files in agreed formats. The availability of exchange products on password-protected TSP websites is made known by sending notification messages to NTWC contacts through GTS, email, fax and SMS. The passwords on TSP websites shall be changed at least annually.

3. Through bilateral agreements, NTWCs may request TSPs to directly send TSP exchange products to them.

4. Through agreement with IHO, TSPs are asked to provide NAVAREA products each time Potential Threat, Confirmed Threat, ND Final bulletins are issued in the agreed format as per Annexure 7.

5. TSP **public products** shall consist of a combination of textual bulletins, graphics and public web sites.

6. TSP public bulletins and exchange bulletins shall follow standard formats. In addition, bulletins should clearly indicate intended audience and provide reference to other authoritative centres responsible for issuing bulletins within the Indian Ocean Area of Service. Wherever applicable, appropriate statements should be included in bulletins for recipients to understand that the bulletins issued refer to a main shock, aftershock or a new event. Standard terminology is to be followed to report sea level observations. Example bulletins are given in Annexure-5 (exchange bulletins) and Annexure-6 (public bulletins).

7. A map of the Area of Service (AOS) depicting the coastal areas for which IOTWMS TSPs are the authoritative centres for the issuing of tsunami bulletins under the IOTWMS framework is given as Annexure-1. This map is derived from the Global AOS Map of the ICGs (Annexure-1A) finalised by the TOWS-WG and adopted by the IOC Executive Council or the IOC Assembly.

8. A map of the Earthquake Source Zones to be used by IOTWMS TSPs for differentiating earthquakes occurring within and outside the Indian Ocean is given as Annexure-2.

Commencement of Services

9. Service Level 1: TSP services for an earthquake event shall commence whenever an undersea or coastal (up to 200 km inland and regardless of depth) earthquake is recorded in the Indian Ocean, Pacific Ocean or South Atlantic source zones (refer Annexure 2) with a magnitude ≥ 6.5. The first exchange and public bulletins issued shall be Type 1 Earthquake Bulletin (Service Level 1 product).

10. Service Level 2: If the earthquake is within 100km depth and:

- occurred in the Indian Ocean source zone, or
- has a magnitude ≥ 8.0 and occurred in the Pacific Ocean or South Atlantic Ocean source zones. This does not preclude TSPs from issuing SL-2 bulletins for earthquakes less than magnitude 8.0 that they have assessed as causing threat to the IOTWMS CFZs.

a TSP threat assessment shall be carried out followed by the issuing of exchange bulletins of Type 2 No Threat / Potential Threat, Type 3 Confirmed Threat and Type 4 Final Bulletin as the situation mandates (Service Level 2 products), plus the corresponding public bulletins.

11. Service Level 2 products may also be issued for non-seismic and complex source events if a regional or ocean wide scale tsunami has been generated or there is reason to believe one may have been generated. This is an area for future development and is not a current requirement. Due to the nature of non-seismic and complex source events and the limitations of current

operational setups there it is high likelihood that many of them will not be detected in a timely manner. If a TSP chooses to respond to a non-seismic and complex source event, they should modify the standard templates as per Annexure-5.

12. TSP threat assessments shall only be modified during an event if new seismic data becomes available or if observations compared to model forecasts changes the threat assessment.

Exchange Products

13. "**Exchange**" products are intended for NTWC use only and contain predicted tsunami wave amplitudes and arrival times based on tsunami models run by each TSP, together with a simple threat/no threat status for each of the IOTWMS Coastal Forecast Zones, based on an agreed wave-height threshold.

14. The agreed wave-height threshold for considering a country under threat shall be a predicted positive wave amplitude **≥ 0.5 metre** at any Coastal Forecast Zone (CFZ) in that country. This shall be known as the **Threat Threshold**. The amplitude shall be that occurring on the shore-line. For TSPs using the Green's Law approximation from deep water values, the shore-line shall be taken to be at 1 metre depth. If NTWCs nominate a different threshold for their country, TSPs shall use that.

15. TSPs shall:

- Display exchange products on TSP password-protected websites and send notification messages to NTWCs when these products are updated. Notification messages sent via the GTS shall use the following "TTAAii CCCC" header identifiers:
    - TSP India: WEIO20 DEMS
    - TSP Indonesia: WEIO22 WIIX
    - TSP Australia: WEIO24 AMMC
- Only send exchange products directly to NTWCs by bi-lateral agreement between an NTWC and a TSP, as specified in paragraph 3.

16. TSP exchange bulletins can be categorised into **FOUR** types:

Type 1: Earthquake Bulletin containing earthquake parameters and a qualitative statement on tsunamigenic potential based on earthquake location, magnitude and depth.

Type 2: Threat Assessment Bulletin containing earthquake parameters and in one of the following two formats based on a quantitative threat assessment using model predictions:

- **No Threat Bulletin** if no CFZ in the Indian Ocean AOS is above the threat threshold, or
- **Potential Threat Bulletin** if one or more CFZs in the Indian Ocean AOS are above the threat threshold. Potential Threat Bulletins shall also list every above-threshold CFZ, the predicted arrival time of its first wave above threshold, and the predicted height of its largest wave.

Type 3: Confirmed Threat Bulletin containing earthquake parameters, the quantitative threat information for each above-threshold CFZ (as for Potential Threat Bulletins), and real-time sea level observations confirming tsunami generation.

Type 4: Final Bulletin issued when water levels from multiple gauges confirm that either no tsunami waves above threat threshold were generated, or at 120 minutes after the **last forecast exceedance of the 0.5 metre threat threshold** at the last Indian Ocean member state, as long as above-threshold waves are not being reported.

17. The exchange bulletins issued for an event by each TSP shall be sequentially numbered regardless of the bulletin type.

18. Multiple Type 1 Earthquake Bulletins may be issued for a single event, but only if earthquake parameters are revised, and only until the first Service Level 2 (Type 2 or 3) Bulletin is issued. Thereafter revised earthquake parameters shall be included in the Service Level 2 Bulletins.

19. Multiple Type 2 No Threat or Potential Threat Bulletins may be issued. Conditions which shall trigger an additional bulletin issue are hourly updates or when the threat assessment has changed. An additional Type 2

Bulletin may also be issued when earthquake parameters have been revised, and if the revision leads to a change in threat assessment.

20. Multiple Type 3 Confirmed Threat Bulletins may be issued. The first bulletin should be issued when the first observations confirming tsunami generation are received. Conditions which shall trigger an additional bulletin issue are hourly updates, when higher-than-expected tsunami wave observations are received, or when the threat assessment has changed. "Higher-than-expected" tsunami wave observations are those whose amplitude is so far above the expected maximum for that location that the TSP may conduct a re-assessment of the tsunami threat level. An additional Type 3 Bulletin may also be issued when earthquake parameters have been revised, and if the revision leads to a change in threat assessment.

21. Only one Type 4 Final Bulletin will be normally issued for each event. However, a supplementary final bulletin may be issued if significant additional information becomes available.

22. The formats of TSP exchange bulletins and notification messages are specified in Annexure 5.

Public Products

23. **"Public"** products shall only contain earthquake information, a qualitative tsunami-genesis statement, tsunami wave observations and a summary of national warning statuses issued by NTWCs. Tsunameters shall only be listed as having observed a tsunami, but no numerical height values shall be provided. **NTWCs shall provide current warning status summaries to TSPs during an event using a web-based feedback form.** The summary may take the form of a category scale and will be reflected in the TSP public pages:

- 0: No Threat
- 1: Watch
- 2: Warning
- 3: All Clear or Cancellation

24. TSPs shall:

- Display public products on TSP Public Websites
- Send public bulletins in text format to the GTS and as an email to the IOC Public List Server for all events of magnitude ≥ 6.5 in the Indian Ocean and ≥ 8.0 in the Pacific or South Atlantic Oceans. For events from Magnitude 6.5 to 7.9 outside the Indian Ocean earthquake source zone (Annexure-2), no public bulletins shall be sent to the GTS or to the IOC Public List Server. Public bulletins messages sent via the GTS shall use the following "TTAAii CCCC" header identifiers:
  - TSP India: WEIO21 DEMS
  - TSP Indonesia: WEIO23 WIIX
  - TSP Australia: WEIO25 AMMC

  Note: For Exchange Bulletins, an associated Notification Message is sent on the GTS and to the IOC public email list server, not the Exchange Bulletin itself. However Public Bulletins do not have an associated Notification Message – the Public Bulletin itself is sent on the GTS and to the IOC public email list server.

25. TSP Public bulletins are categorised into **FOUR** types, corresponding to the four types of Exchange bulletins:

Type 1: Earthquake Bulletin containing earthquake parameters and a qualitative statement of tsunamigenic potential based on earthquake location, magnitude and depth.

Type 2: Threat Assessment Bulletin containing earthquake parameters and in one of the following two formats:

- **No Threat Bulletin** if an exchange No Threat Bulletin has been issued for this event, or
- **Potential Threat Bulletin** if an exchange Potential Threat Bulletin has been issued for this event. The public Potential Threat Bulletin shall not contain any quantitative threat assessment information, but shall contain a summary of the national warning statuses reported by NTWCs.

Type 3: Confirmed Threat Bulletin if an exchange Confirmed Threat Bulletin has been issued for this event. The public Confirmed Threat Bulletin shall not contain any quantitative threat assessment information, but shall contain earthquake parameters, a summary of the national warning statuses reported by NTWCs and real-time sea level observations confirming tsunami generation.

Type 4: Final Bulletin if an exchange Final Bulletin has been issued for this event. The public Final Bulletin shall contain earthquake parameters, a summary of the national warning statuses reported by NTWCs and real-time sea level observations of the generated tsunami waves, if any.

26. The public bulletins issued for an event by each TSP shall be sequentially numbered regardless of the bulletin type. Public bulletins shall be issued immediately following the issuing of the corresponding type of Exchange bulletin, or when the national warning status reported by any NTWC changes.

27. The formats of TSP public bulletins are specified in Annexure 6.

Finalisation of Services

28. TSP services shall conclude for a specific event when the expected time for the last predicted above-threshold wave of all Indian Ocean CFZs has passed, plus 2 hours, as long as above-threshold waves are not being reported. Within 24 hours of the services concluding for an event, all TSP web pages for NTWCs shall indicate no threats are in place. Old event bulletins shall be placed into an online archive.

Issue of False or Incorrect Messages

29. If a TSP issues a false or incorrect TSP Notification Message and its associated TSP Public Bulletin, the TSP shall immediately issue cancellation messages to all the recipients of both types of message indicating that the original message or bulletin was issued incorrectly and should be ignored. The cancellation message formats are specified in Annexures 5 and 6.

Communication and Interoperability between TSPs

30. **There shall be minimal manual inter-TSP contact during an event.** The arrangements for this contact are yet to be determined. Post-event comparisons of TSP products shall be carried out by the TSPs. As well as operational differences, the comparisons shall focus on the differences between the zones selected to be under threat and the maximum shore-line wave amplitudes.

31. TSPs will use common spatial data sets to define the CFZs. This will ensure interoperability between the TSPs and NTWCs. Feedback from NTWCs shall be used to fine tune the data.

32. The primary aim of interoperability is to simplify inter-TSP comparisons through having a common spatial data set. The spatial data defines the specific CFZs for which forecasts are to be made. The data is in the form of an industry standard ESRI GIS shape file.

33. The shape file format consists of a series of files in binary format. Most of these files should only change on an occasional basis as NTWCs provide input as to preferred CFZs and their names, or if there is a change in the IOTWMS AOS. The 'static' data defining the zones shall be made available to TSPs and NTWCs via the password-protected web sites.

34. The dynamic components of the shape file are contained inside a DBF format file. This file lists the attributes for each zone. During an event, the DBF format file shall be updated with the TSP forecasts and placed in the password-protected web site.

35. Any proposed changes to the spatial data shall be documented to ensure consistency. Any changes required to this spatial dataset are to be carried out by a GIS qualified person at one TSP and shared with the other TSPs, and in consultation and agreement with affected NTWCs.

Detailed TSP Services to NTWCs

36. Detailed TSP services to NTWCs shall be at the highest level of spatial resolution that can be supported. Every CFZ in the spatial data shall be provided with a unique set of data.

37. Fields provided shall include:

- **Maximum positive wave amplitude at the shore-line**. This field shall be known as *'max_beach'*. For TSPs using a deep water forecast and an approximation method to derive *max_beach* the shore-line value shall be taken to be the value approximated at 1 metre depth. The unit shall be metres.
- **Maximum positive wave amplitude in deep water in each coastal zone.** This field shall be known as *'max_deep'*. This field shall be provided if an approximation method (e.g. Green's Law) is used to approximate *max_beach* from deep water values. The unit shall be metres.
- **If *max_deep* is provided, the depth of the water where the *max_deep* occurs shall be provided.** This field shall be known as '*depth'*. The unit shall be metres.
- **Threat Category** based on the maximum wave height at the shore-line. This shall be a "No Threat/Threat" category system.
- **Four model-based times**. The times shall be given as the number of whole minutes after the earthquake. The times shall be:
    i. T1: Estimated time of arrival of first tsunami wave with positive or negative amplitude as calculated by forecast model.
    ii. T2: Estimated time of arrival of first tsunami wave amplitude over basin-specific threat threshold with positive or negative amplitude as calculated by forecast model.
    iii. T3: Estimated time of arrival of maximum tsunami wave with positive amplitude as calculated by forecast model.

iv. T4: Estimated time of arrival of last tsunami wave with positive amplitude over basin-specific threat threshold as calculated by forecast model.

- **Observed sea levels**. In accordance with the Global Service Definition Document (GSDD) of the TOWS-WG, the observed sea levels shall be reported in UTC and shall include O3 defined below as recorded at sea-level stations at the time of reporting. Other possible observed sea-levels that could be reported are also described below:

    i. O1: Observed time of arrival of first distinguishable tsunami wave with positive or negative amplitude as measured by sea level stations

    i. O2: Observed time of arrival of first tsunami wave with positive or negative amplitude over basin-specific threat threshold as measured by sea level stations.

    ii. O3: Observed time of arrival of maximum tsunami wave with positive amplitude as measured by sea level stations.

    iii. O4: Observed time of arrival of last tsunami wave with positive amplitude over basin-specific threat threshold as measured by sea level stations.

38. Amplitude relative to sea level to be used as the common measure of a tsunami and should be defined in the message. All TSPs to report forecast and observations as amplitude relative to sea level at the time of the forecast or observation. Amplitude is measured as

    i. The absolute value of the difference between a particular peak or trough of the tsunami and sea level at that time, or

    ii. Half the difference between an adjacent trough and peak and can be corrected for the change of tide between that trough and peak.

TSP Key Performance Indicators (KPIs)

39. Each TSP shall record its performance during the inter-sessional period against the listed Key Performance Indicators in a common format that follows the example in Annexure 3. The performance shall be presented by individual TSPs during the ICG. A comparison of the performance of all the TSPs during the inter-sessional period shall be presented by the ICG Working Group 2 and also made available via the TSP websites.

40. Key Performance Indicators – TSP Performance:

No.	Key Performance Indicator	Target Value
1	Elapsed time from earthquake to issuance of first Earthquake Bulletin	10 minutes^
2	Probability of detection of earthquakes with Mw>=6.8 (USGS final value) in the IOTWMS ESZ	100%
3	Accuracy of earthquake magnitude	0.3 *^
4	Accuracy of earthquake hypocenter depth	30 km *^
5	Accuracy of earthquake hypocenter location	30 km *^
6	Elapsed time from earthquake to issuance of first Threat Assessment Bulletin	20 minutes^
7	Probability of detection of tsunami above threat threshold	100%
8	Accuracy of the tsunami forecast amplitude/height	Factor of 2
9	Number of false or incorrect bulletins issued	0
10	Accuracy of time arrival of tsunami (0.02m amplitude)	Within 5% of travel time #
11	Accuracy of time of arrival of 1st significant wave (0.1m)	Within 5% of travel time
12	Accuracy of threat threshold exceedance	Within 5% #
13	Percent of IO countries issued a timely product as defined above	100%
14	Elapsed time from any product issuance to potential receipt by NTWC Contact	5 minutes ##
15	Percent of regular Comms Tests participated in	100%

Notes:

** In comparison with final USGS parameters for the earthquake (at 1 month after the earthquake). TSP earthquake parameters used are the final parameters issued by TSPs during the event, noting that for earthquakes with magnitude ≥ 8.5 the elapsed time for an accurate magnitude is 15 to 30 minutes. Magnitudes given in the first Earthquake Bulletins for large earthquakes can therefore be inaccurate.*

 # ICG Working Group 2 to further review these target figures after a detailed study to confirm achievable values.

Some communications issues are outside the control of the TSPs.

^ Only earthquakes where the USGS final value is >M6.8 are considered for reporting purposes

41. Key Performance Indicators – TSP Functional Status:

No.	Key Performance Indicator	Target Value
1	Operational 24 hours/day, seven days /week (24/7)	99.5%
2	Notify TWFPs and NTWCs of planned major service changes	> 3 months
3	Notify TWFPs and NTWCs of planned minor service changes (not affecting NTWC operations)	> 1 month
4	Notify TWFPs and NTWCs of planned major interruptions	> 3 months
5	Return to service after planned interruptions	< 1 day
6	Return to service after unplanned interruptions in an event	<30 minutes

Event Assessments

42. Post-event assessments and questionnaires are valuable. TSPs, in conjunction with the IOTWMS Secretariat and IOTIC, shall conduct post-event assessments when any of the following conditions are met:

- One or more TSPs predicted tsunami waves of at least 1 metre amplitude for one or more countries, or
- Waves of at least 1 metre amplitude were observed but not predicted by any TSP.
- Over and above this trigger level, the final decision to implement a survey should be decided by the regional Tsunami Information Centre (TIC) in consultation with the ICG Steering Group and Secretariat taking into consideration whether the tsunami resulted in a national response in 1 or more countries.

43. The TOWS-WG Task Teams on Tsunami Watch Operations and Disaster management and Preparedness jointly have come up with a standard set of questions which was recommended by the TOWS WG VIII which can used in post-event assessments. The template is shown in Annexure-4.

Procedure for Naming Tsunamigenic Earthquakes

44. In accordance with the Global Service Definition Document (GSDD) of the TOWS-WG, potentially tsunamigenic earthquakes (i.e. those requiring the issuing of Service Level 2 products) may be named by TSPs using a scheme based on the Flinn-Engdahl geographic designator plus the year of the event, plus a sequence number to allow for multiple events in the region within a calendar year. An example would be "Banda Sea-2013-1".

A subsequent Banda Sea event in 2013 would be designated "Banda Sea-2013-2".

45. If an event proves to be significant, the final name could be decided in consultation with the country in which it occurred. Procedure for Handling Multiple Earthquakes in Quick Succession.

46. Details are to be defined. However, in general, if multiple tsunamigenic earthquakes occur in quick succession and within the same earthquake source zone, TSPs should include mention of the subsequent event in the bulletins they are already issuing for the first event, rather than commencing the issuing of a new series of bulletins, to avoid confusion at the NTWCs.

Procedure for Handling Non-Worst-Case Earthquake Events

47. Details to be defined. Background: The 11 April 2012 magnitude 8.6 earthquake off the West Coast of North Sumatra was a largely "strike-slip" event without the large vertical displacement of the sea floor typical of "subductive" or "thrust" events which can generate large tsunamis. The largest tsunami waves recorded for this event were around 1 metre, in comparison with TSP predictions (from models assuming subductive earthquake geometry) of around 8, 15 and 17 metres. TSPs should examine procedures for handling non-worst-case events such as these.

Procedure for Handling Multiple Earthquakes in Quick Succession

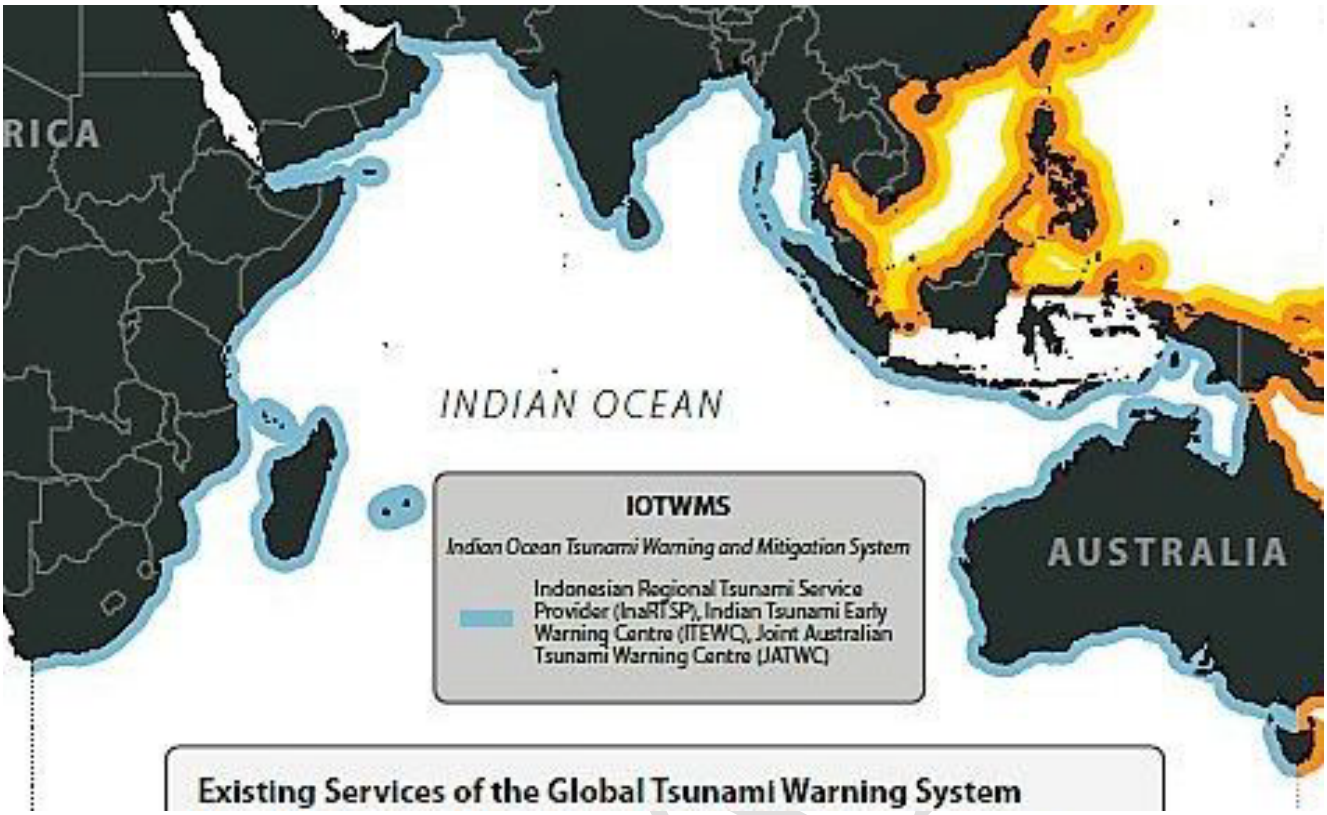
48. In accordance with the Global Service Definition Document (GSDD) of the TOWS-WG, if multiple tsunamigenic earthquakes occur in quick succession and within the same earthquake source zone, TSPs shall include mention of the subsequent event in the Exchange Bulletins and Public Bulletins they are already issuing for the first event, rather than commencing the issuing of a new series of bulletins, to avoid confusion at the NTWCs. It is important to take into consideration the time and spatial extent between the events. When successive tsunamigenic earthquakes are referred to in one bulletin, it should be made very clear in the initial part of

the bulletin, so that the receiving centre understands that the bulletin is for a main shock, aftershock or a new event. Terminology in update bulletins should make clear reference to the subject of the update (earthquake parameters, aftershock, sea-level observations, threat levels and/or area of threat).

Regular IOTWMS Tests

49. TSPs shall conduct regular Communication Tests, at least twice a year, in which TSPs send test notification messages to NTWCs and NTWCs access TSP websites, including the lodging of test NTWC warning status reports. TSPs shall collaborate with the IOTWMS Secretariat in the preparation and issuing of a Communication Test Manual at least one month before the test, and in the production of a Test Report within 3 months of the test.
50. TSPs shall participate in regular IOTWMS "IOWave" exercises, and are encouraged to make their representatives available to join Task Teams set up by the ICG or SG to coordinate, conduct and report on IOWave exercises.

Annexure-1: IOTWMS TSP Area of Service (AOS) Map

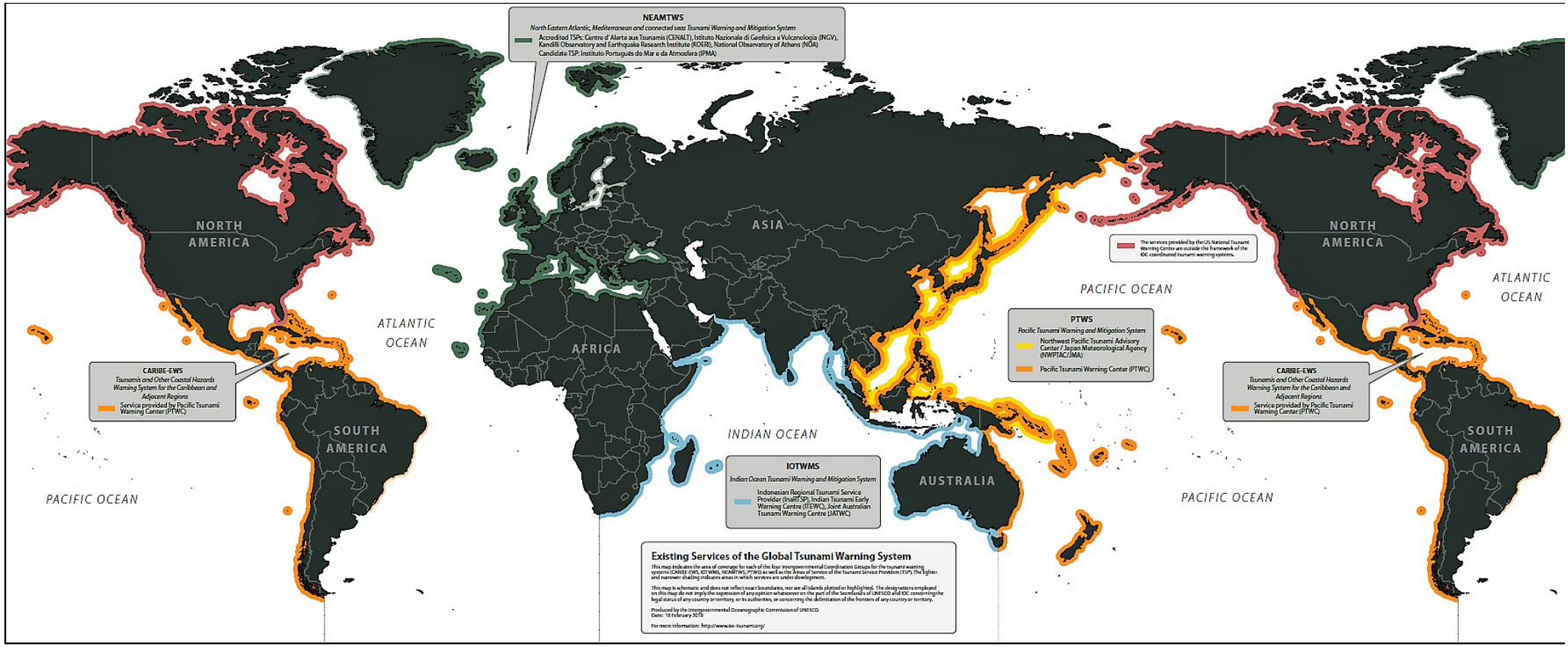


IOTWMS TSP Area of Service (AOS) Map: Defines the coastal areas (shown in blue) for which TSPs are the authoritative centres for the issuing of tsunami bulletins under the IOTWMS framework. This is a subset of the Global Area of Service Map of ICGs shown in Annexure-1A.

NOTES:

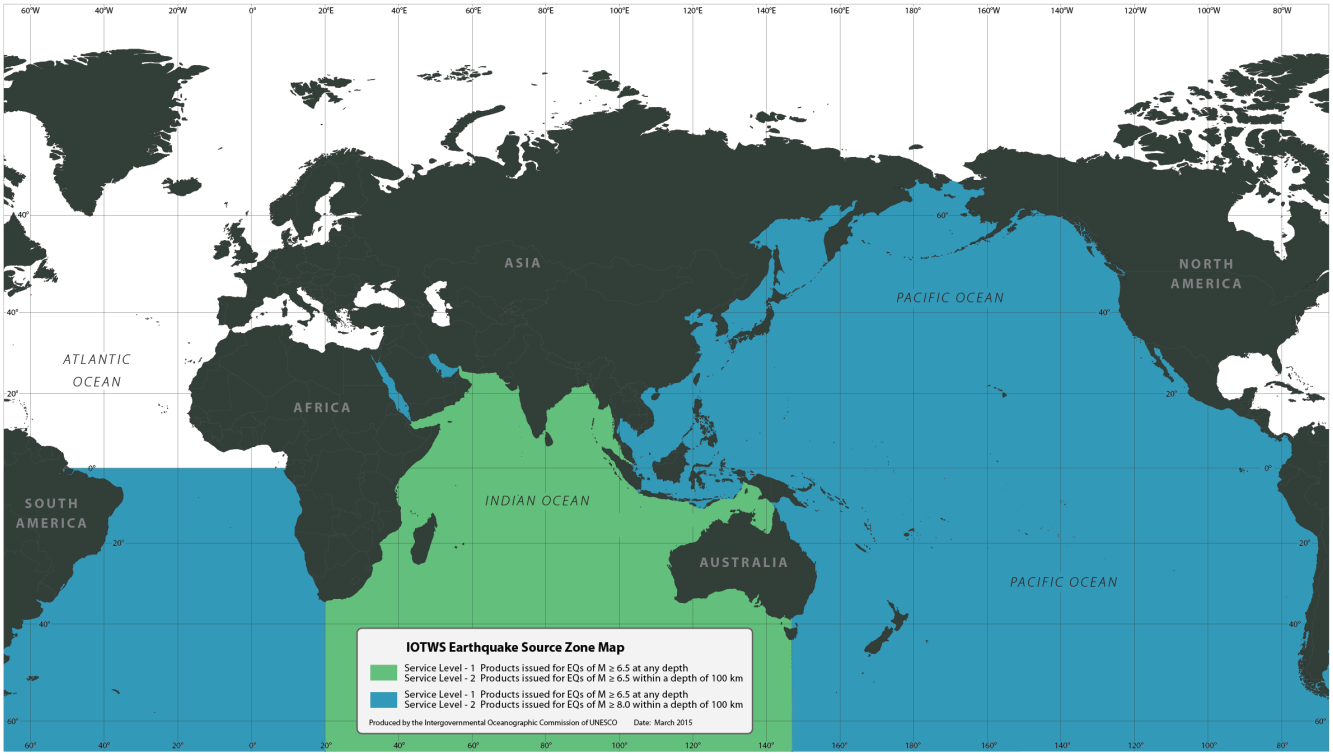
1. ***Indonesia has indicated (TOWS-WG Inter ICG Task Team on Tsunami Watch Operations Meeting, October 2014) that it no longer requires IOTWMS-provided services for the Java Sea / Banda Sea. A further update was received from Indonesia (TOWS-WG Inter ICG Task Team on Tsunami Watch Operations Meeting, February 2016) that BMKG as an NTWC is now able to provide tsunami threat information for events originating in the Banda and Java Sea regions and no longer requires a backup service for these events. Hence this area is shown as not being covered by any IOTWMS TSP and is a part of the domestic service of BMKG.***
2. ***The AOS map is maintained by the TOWS-WG and changes may be proposed from time to time. Any changes require the formal agreement of the IOC (Assembly or Executive Council).***
3. ***This version of the AOS map was generated on 15 February 2018 by the TOWS-WG Task Team on Tsunami Watch Operations and was accepted at the TOWS WG-XI meeting on 17 February 2018.***

Annexure-1A: Global Area of Service Map of ICGs



Global Area of Service (AOS) Map of the ICGs, accepted by the TOWS-WG (Eleventh Meeting; Paris, France; 16-17 February 2018)

Annexure-2: IOTWMS Earthquake Source Zone (ESZ) Map



IOTWMS Earthquake Source Zone (ESZ) Map:

- Service Level 1 products (Earthquake Bulletins) are issued for all magnitude ≥ 6.5 earthquakes occurring in **any** of the shaded zones.
- In addition, Service Level 2 products (No Threat, Potential Threat, Confirmed Threat, Final Bulletin) are issued for all earthquakes **within 100km depth** and of **magnitude ≥ 6.5 occurring in the green-shaded Indian Ocean zone** or **magnitude ≥ 8.0 in the blue-shaded Pacific or South Atlantic zones**.
- For earthquakes from magnitude 6.5 to 7.9 outside the Indian Ocean earthquake source zone (blue Pacific or South Atlantic zones), no Service Level 1 bulletins shall be sent to the GTS or to the IOC Public List Server.

NOTES:

1. ***The ESZ map is maintained by the TOWS-WG and changes may be proposed from time to time. Any changes require the formal agreement of the IOC (Assembly or Executive Council).***
2. ***This version of the Map was generated in March 2015 by the Task Team on Tsunami Watch Operations and the TOWS WG-VIII, and approved by the IOC Assembly in June 2015.***

Annexure-3: TSP Performance Reporting Template Example and Target Definition

TSP Performance Against KPIs for Calendar Year 2017

	Service Level 1 EQ Bulletins					Service Level 2 Threat / No Threat Bulletins			General
TSP	KPI 1 ET First EQ Bull Target: 10 mins (% met)	KPI 2 POD IO EQs ≥ M6.8 Target: 100%	KPI 3 EQ Mag Target: 0.3 (% met)	KPI 4 EQ Depth Target: 30 km (% met)	KPI 5 EQ Location Target: 30 km (% met)	KPI 6 ET First Threat Bull Target: 20 mins (% met)	KPI 7 POD Tsunami Waves Target: 100%	KPI 8 Tsunami Height Accuracy Target: Factor of 2	KPI 9 False / Incorrect Bulletins Issued Target: 0
Australia	12.7 min (22.5%)	n/a*	0.20 (90.6%)	17.2 (78.6%)	25.1 (73.8%)	15.5 min (75.0%)**	n/a***	n/a***	-
India	10.7min (46.7%)	n/a*	0.15 (96.0%)	12.72 (95.2%)	12.7 (100.0%)	27.7 min (0.0%)**	n/a***	n/a***	-
Indonesia	19.9 min (40.7%)	n/a*	0.18 (82.1%)	15.94 (89.3%)	29.76 (82.1%)	27.4 min (62.5%)**	n/a***	n/a***	-

* KPI 2: No IO events >= M6.8
** KPI 6:
Australia issued 4 No Threat Bulletins
India issued 3 No Threat Bulletins
Indonesia issued 8 No Threat Bulletins
*** KPI 7,8: No events caused threat-level tsunami waves

Meets Target	Near Target	Misses Target

	Service Level 1 EQ Bulletins					Service Level 2 Threat / No Threat Bulletins			General
TSP	KPI 1 ET First EQ Bull Target: 10 mins (% met)	KPI 2 POD EQs Target: 100%	KPI 3 EQ Mag Target: 0.3 (% met)	KPI 4 EQ Depth Target: 30 km (% met)	KPI 5 EQ Location Target: 30 km (% met)	KPI 6 ET First Threat Bull Target: 20 mins (% met)	KPI 7 POD Tsunami Waves Target: 100%	KPI 8 Tsunami Height Accuracy Target: Factor of 2	KPI 9 False / Incorrect Bulletins Issued Target: 0
Meets Target	<10 min	100%	<0.3	<30 km	<30 km	<20 min	100%	50-200%	0
Near Target	10-15min	90-100%	0.3-0.45	30-45 km	30-45 km	20-30 min		25-50% or 200-400%	1
Misses Target	>15 min	<90%	>0.45	>45 km	>45 km	>30 min	<100%	>400% or <25%	2+

Annexure-4: Post - Event Assessment Template

[EVENT NAME]
POST-EVENT ASSESSMENT QUESTIONNAIRE

COUNTRY: _____

Contact Details

Contact Name:		
Name of Organisation		
Address		
Phone		Fax:
Email		
Name of National Tsunami Warning Centre (NTWC)		
NTWC Contact Email		
Name of National Disaster Management Office or equivalent (NDMO)		
NDMO Contact Email		

Instructions

This is an electronic form which can be filled out in several ways:

1) If you use Microsoft Word software you can fill out the form electronically. To tick checkboxes (yes/no answers), you can either use the tab button or the mouse to move to the required answer. Written answers can be typed in the grey area next to the questions, and the area will expand to fit longer answers.
2) If the form fields don't work, then you can type your answers next to the relevant question.
3) **Please give all times in UTC, not local time**.
4) Please include as much information as possible in your answers. If there is not enough room on the questionnaire form, then please send extra information in a separate document.
5) Where multiple answers are possible, please feel free to tick more than one box.

You may also print the questionnaire and fill out by hand, then scan/email or fax it back to us.

We may need to contact you to clarify your answers, so please include a contact phone number where we can reach you.

EVENT NAME
POST-EVENT ASSESSMENT QUESTIONNAIRE

SECTION A –TSUNAMI SERVICE PROVIDER (to be completed by NTWC)

1) **How (through what information source) and at what time (UTC) did you learn that a big earthquake had taken place?**

   How (Information Source): Time (UTC):

2) **Did you receive the first notification message from TSP 1 (0000 UTC), TSP 2 (0000 UTC), or TSP 3 (0000 UTC)?**

   Yes ☐ No ☐

   If YES to either or all, at what time was the message received (UTC)?

   TSP 1: TSP 2: TSP 3 :

3) **If yes, how did you receive the messages (cross more than one box if appropriate)?**

   Email: ☐ Fax: ☐ GTS: ☐

   Phone: ☐ SMS ☐ Other ☐

4) **Were subsequent messages received from TSP 1, 2 and 3?**

   Yes ☐ No ☐

If YES, please complete the tables on the following pages (all times in UTC please).

1. TSP 1 Messages

Notification Message	Time Received (UTC)	How Received	TSP Website Accessible? (Y/N)	Reported NTWC Status to TSP (via web/email/fax/other)?	Comments
xxxx UTC Message 1		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Message xx		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Message xx		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Final Message		GTS			
		Fax			
		Email			
		SMS			

Footnote: TICs in association with the ICG Secretariats in each basin will incorporate finer changes to the tables based on the number of TSPs operating in the basin, messages issued by each TSP for the event being reviewed, modes of communication being used in the ICG, etc

2. TSP 2Messages

Notification Message	Time Received (UTC)	How Received	TSP Website Accessible? (Y/N)	Reported NTWC Status to TSP (via web/email/fax/other)?	Comments
xxxx UTC Message 1		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Message xx		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Message xx		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Final Message		GTS			
		Fax			
		Email			
		SMS			

3. TSP 3 Messages

Notification Message	Time Received (UTC)	How Received	TSP Website Accessible? (Y/N)	Reported NTWC Status to TSP (via web/email/fax/other)?	Comments
xxxx UTC Message 1		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Message xx		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Message xx		GTS			
		Fax			
		Email			
		SMS			
		Other			
xxxx UTC Final Message		GTS			
		Fax			
		Email			
		SMS			

4). Was information received from any other sources? If so, please fill out the tables below:

Notification Message	Time Received (UTC)	How Received	TSP Website Accessible? (Y/N)	Reported NTWC Status to TSP (via web/email/fax/other)?	Comments
xxxx UTC Message 1		GTS			
		Fax			
		Email			
		SMS			
xxxx UTC Message x		GTS			
		Fax			
		Email			
		SMS			
		GTS			

xxxx UTC Message x		**Fax**			
		Email			
		SMS			
xxxx UTC Message x		**GTS**			
		Fax			
		Email			
		SMS			

5) Was information about the earthquake received from other sources?

Yes ☐ No ☐ If YES, please provide details:

6) Did you receive notification messages from the TSPs about aftershocks ?

Yes ☐ No ☐

If so, please provide details in the table below:

RTSP 1	Time UTC	RTSP 2	Time UTC	RTSP 3	Time UTC
No 1		**No 1**		**No 1**	
No 2		**No 2**		**No 2**	
No 3		**No 3**			
No 4		**No 4**			
No 5					

SECTION B – NATIONAL ACTIONS

The purpose of this section is to find out what actions were taken by National Tsunami Warning Centres, including independent analysis of the event, notification of relevant organisations, issuing and cancellation of warnings.

7) Were any earthquake parameters calculated at the national level?

Yes ☐ No ☐

If YES, please specify:

	Origin Time (UTC)	**Location (Lat and Long)**	**Depth**	**Magnitude**	**Type of Mag.**	**Time UTC**
1st estimate						
2nd estimate						

8) Was any action taken BEFORE receiving the TSP messages?

Yes ☐ No ☐

If YES, please give details:

9) What action was taken AFTER receiving the first message? Please list times (UTC) as well as actions. Include details of organisations or government agencies contacted.

Action Taken	**Time (UTC)**

(Add more rows if necessary)

10) Did your National Tsunami Warning Centre issue a tsunami warning and tsunami related information to other agencies and/or the public?

Yes: ☐ No: ☐

If NO, then please go to Section C

If YES, please specify:

Type of information released, and to which agencies	**Time (UTC)**

11) How was the warning issued to agencies?

Method used to communicate information with agencies	**Yes/No**
Phone (indicate whether by commercial or dedicated line)	
SMS	
Email	
Fax	
Other	

12) Was a tsunami warning and tsunami related information issued to the public?

Yes: ☐ No: ☐

Type of information released to the public	**Issued by**	**Time (UTC)**

13) Was the decision <u>to issue or not to issue</u> a tsunami warning to the public based on messages from the RTSPs or on messages from other sources, or on information determined by your National Tsunami Warning Centre?

TSP 1: ☐ TSP 2: ☐ TSP 3: ☐

Other Source (Specify): ☐ National TWC: ☐

14) If a tsunami warning was issued to the public, was a tsunami wave height forecast provided?

Yes ☐ No ☐

15) How was the warning/information communicated with the public?

Method used to communicate information with the public	**Yes/No**
Telephone	
SMS	
Cell/mobile phone broadcast	
Public Radio	
Public TV	
Twitter	
Facebook	
RSS	
Websites	
Sirens	
Public announcement systems	
Public call centre	
Police	
Door-to-door announcements	
Other (specify)	

16) Who is responsible for communicating with the national Media?

NTWC/TWFP ☐

NDMO ☐

Both ☐

17) Did your National Tsunami Warning Centre or Disaster Management Organisation send tsunami warning information to the national media?

Yes ☐ No ☐

If YES, please specify:

Type of electronic media (TV, radio):

Please mention the radio and TV stations:

Mode of communication used to send information to media (email, fax, SMS etc):

Type of information broadcast by national media (breaking news, running text etc):

Time of first broadcast (UTC):

18) If a warning was issued, at what time was the warning cancelled (UTC)? What was the reason for cancellation? How was this information communicated to the public?

Time of Cancellation:

Reason for Cancellation:

Communication method:

19) Were there any communication problems with distributing the tsunami warning or cancellation information? (e.g., mobile phone network or websites overload or broken, people not answering phones, etc).

Yes ☐ No ☐

If YES, please provide details:

SECTION C – NATIONAL RESPONSE

The purpose of this section is to find out what the national and local response was to the event after the tsunami warning had been issued by the National Tsunami Warning Centre.

20) Do you have a formal national Standard Operating Procedure (SOP) or plan for tsunami response?

Yes: ☐ No: ☐

21) Were any actions taken by the National Disaster Management Organisation (or equivalent national response organisation)?

Yes: ☐ No: ☐

If YES, provide details**:**

Action taken by National Disaster Management Organisation	**Time (UTC)**

(Add more rows if necessary)

22) Did the National Disaster Management Organisation (or equivalent) maintain communication with the National Tsunami Warning Centre throughout the event?

Yes: ☐ No: ☐

If YES, provide details**:**

23) Did the National Disaster Management Organisation (or equivalent) maintain communication with local/regional disaster management organisations (or equivalent)?

Yes: ☐ No: ☐

If YES, provide details**:**

Conveying: ☐

Conveying and guidance/instructions: ☐

24) Were any actions taken by the local/regional disaster management organisations (or equivalent)?

Yes: ☐ No: ☐

If YES, provide details**:**

Action taken by local/regional disaster management organisations	Time (UTC)

(Add more rows if necessary)

25) Were any areas evacuated?

Yes: ☐ No: ☐

If YES, please provide details in the following table:

Area Evacuated	Time (UTC)	Estimated No. People Evacuated

(Add more rows if necessary)

26) Were Tsunami inundation maps available for evacuated areas?

Yes: ☐ No: ☐

If YES, please provide details**:**

27) If an evacuation occurred, did the process happen smoothly?

Yes: ☐ No: ☐

If NO, please provide details of problems encountered:

28) Did people in some areas self-evacuate before a warning was issued?

Yes: ☐ No: ☐

If YES, please provide details in the following table:

Area	**Time (UTC)**	**Estimated No. People who Self-Evacuated**

(Add more rows if necessary)

SECTION D – MONITORING AND MODELLING

29) Were sea level data monitored during the event?

Yes ☐ No ☐

If YES, which stations were monitored and how where they monitored?

Sea Level station	Monitoring method
	GTS ☐ Tide Tool ☐ IOC Sea Level Station Monitoring Facility ☐ Other ☐
	GTS ☐ Tide Tool ☐ IOC Sea Level Station Monitoring Facility ☐ Other ☐
	GTS ☐ Tide Tool ☐ IOC Sea Level Station Monitoring Facility ☐ Other ☐
	GTS ☐ Tide Tool ☐ IOC Sea Level Station Monitoring Facility ☐ Other ☐
	GTS ☐ Tide Tool ☐ IOC Sea Level Station Monitoring Facility ☐ Other ☐

(Add more rows if necessary)

If "Other" please specify:

30) If the answer to question 30 is NO, does your National Tsunami Warning Centre know how to access sea level data over the GTS, on the IOC Sea Level Station Monitoring Facility, Tide Tool, or other sources?

GTS: Yes ☐ No ☐

IOC Sea Level Facility: Yes ☐ No ☐

Tide Tool: Yes ☐ No ☐

Other: Yes ☐ No ☐

31) Did your National Tsunami Warning Centre use any numerical model tsunami scenarios during the event (deep-ocean propagation and/or coastal inundation models)?

Yes: ☐ No: ☐

If "Yes" please specify:

SECTION E – COMMUNITY PREPAREDNESS

32) From 0 (none) to 4 (very high) please rank the scientifically assessed level of tsunami hazard, the level of community awareness of that hazard, and the level of pre-existing community tsunami preparedness in 5 of the main communities affected by this event

Scientifically known tsunami hazard (please write the name of the community):

Community	0	1	2	3	4
No 1: _____	☐	☐	☐	☐	☐
No 2: _____	☐	☐	☐	☐	☐
No 3: _____	☐	☐	☐	☐	☐
No 4: _____	☐	☐	☐	☐	☐
No 5:_____	☐	☐	☐	☐	☐

Level of community awareness of the known tsunami hazard for the same communities:

Community	0	1	2	3	4
No 1: _____	☐	☐	☐	☐	☐
No 2: _____	☐	☐	☐	☐	☐
No 3: _____	☐	☐	☐	☐	☐
No 4: _____	☐	☐	☐	☐	☐
No 5:_____	☐	☐	☐	☐	☐

Level of tsunami preparedness before the event (for the same communities above):

Community	0	1	2	3	4
No 1: _____	☐	☐	☐	☐	☐
No 2: _____	☐	☐	☐	☐	☐
No 3: _____	☐	☐	☐	☐	☐
No 4: _____	☐	☐	☐	☐	☐
No 5:_____	☐	☐	☐	☐	☐

33) Have there been any community preparedness activities prior to the event?

Yes: ☐ No: ☐

If Yes:

Community	Tsunami Exercise (when)	Tsunami Education in schools	Participatory evacuation planning	Evacuation maps	Shelter facilities
No 1: _____	☐ _____	☐	☐	☐	☐
No 2: _____	☐_____	☐	☐	☐	☐
No 3: _____	☐_____	☐	☐	☐	☐
No 4: _____	☐_____	☐	☐	☐	☐
No 5:_____	☐_____	☐	☐	☐	☐

34) Has there been any government support with regards to the following prior to the event?

Community	Tsunami signage	Vertical evacuation	Hazard mapping	Evacuation route mapping
No 1: _____	☐	☐	☐	☐
No 2: _____	☐	☐	☐	☐
No 3: _____	☐	☐	☐	☐
No 4: _____	☐	☐	☐	☐
No 5:_____	☐	☐	☐	☐

SECTION F – CAPACITY DEVELOPMENT REQUIREMENTS

Capacity development is a fundamental component of all IOC UNESCO programmes. To assist us to prioritise and plan our future training activities within our limited resources, please indicate the training needs you consider to be high priority for your country.

35) What sort of training events or other assistance from IOC would be useful for your NTWC, NDMO and other response organisations in the next 12 months?

Seismic training ☐

Sea Level training ☐

Risk Assessment training ☐

Standard Operating Procedures training ☐

Inundation modelling training ☐

Media awareness training ☐

Community awareness and preparedness training ☐

Exercises and drills training ☐

Other – please specify:

SECTION G – OTHER INFORMATION

Please feel free to provide any further information you would like to be included in the report. This could include comments which you can type below, or attachments such as photographs, or any other documents you consider relevant. We would particularly welcome copies of any national post-event assessment reports that are available

Annexure-5: TSP Exchange Bulletin Templates

Contents - Templates and Examples for:

NOTE:
Exchange TSP Bulletins are made available to NTWCs only (via the TSP websites), to provide specific advice to them of predicted tsunami threats to their coastal territories. The specific threat advice provided (predicted wave heights and arrival times) requires expert interpretation and is intended for use by NTWCs in formulating their national tsunami warnings – it is not provided to the public in Public TSP Bulletins, to avoid them being misinterpreted as TSP-issued warnings for Indian Ocean countries.

A) EXCHANGE BULLETIN NOTIFICATION MESSAGE Template:

(Variable fields in red; explanatory comments in /* blue /*; modification required for non-seismic and complex source events highlighted in yellow)

```
WEIO20 DEMS 090515                                                    /* WMO GTS header */
------------------------------------------------------------------------
TSUNAMI BULLETIN NOTIFICATION MESSAGE NUMBER 2                       /* message issue number */
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                        /* TSP name */
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011                        /* issue date/time */
------------------------------------------------------------------------
TO:   INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWC)
FROM: IOTWMS-TSP INDIA

NOTIFICATION:
IOTWMS-TSP INDIA HAS JUST ISSUED TSUNAMI BULLETIN NUMBER 2 FOR
THE INDIAN OCEAN, BASED ON THE FOLLOWING EARTHQUAKE EVENT:
/* (UPDATED) to be added only after a magnitude change since previous message */
MAGNITUDE:    9.0 MWP (UPDATED)                                      /* EQ magnitude and type */
DEPTH:        10 KM                                                  /* EQ depth */
DATE:         09 FEB 2011                                            /* EQ date UTC */
ORIGIN TIME:  0500 UTC                                               /* EQ time UTC */
LATITUDE:     7.20N                                                  /* EQ latitude */
LONGITUDE:    92.90E                                                 /* EQ longitude */
LOCATION:     NICOBAR, INDIA                                         /* EQ location */

TO VIEW THE BULLETIN GO TO THE IOTWMS-TSP INDIA WEBSITE AT:

http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

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

GENERAL PUBLIC INFORMATION FOR THIS EVENT IS AVAILABLE FROM:

INDIAN TSUNAMI EARLY WARNING CENTRE (ITEWC)
INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES (INCOIS)
ADDRESS:"OCEAN VALLEY", PRAGATHI NAGAR (BO), NIZAMPET (SO),
HYDERABAD - 500 090, INDIA
PHONE:  91-40-23895011
FAX:    91-40-23895012
EMAIL:  tsunami@incois.gov.in
WEB:    www.incois.gov.in

END OF NOTIFICATION MESSAGE
------------------------------------------------------------------------
```

NOTE: This message is sent by TSPs to NTWCs via the GTS, and by email and fax. It has a maximum line length of 69 characters and uses upper-case letters (except for case-sensitive web links), in accordance with specifications for the GTS (WMO) and AFTN (ICAO) communication networks. An abbreviated version of this message is sent by TSPs via mobile phone SMS messaging to NTWCs.

EXCHANGE BULLETIN NOTIFICATION MESSAGE Example:

```
WEIO20 DEMS 090515
------------------------------------------------------------------------
TSUNAMI BULLETIN NOTIFICATION MESSAGE NUMBER 2
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------
TO:   INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWC)
FROM: IOTWMS-TSP INDIA

NOTIFICATION:
IOTWMS-TSP INDIA HAS JUST ISSUED TSUNAMI BULLETIN NUMBER 2 FOR
THE INDIAN OCEAN, BASED ON THE FOLLOWING EARTHQUAKE EVENT:

MAGNITUDE:   9.0 MWP (UPDATED)
DEPTH:       10 KM
DATE:        09 FEB 2011
ORIGIN TIME: 0500 UTC
LATITUDE:    7.20N
LONGITUDE:   92.90E
LOCATION:    NICOBAR, INDIA

TO VIEW THE BULLETIN GO TO THE IOTWMS-TSP INDIA WEBSITE AT:

http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

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

GENERAL PUBLIC INFORMATION FOR THIS EVENT IS AVAILABLE FROM:

INDIAN TSUNAMI EARLY WARNING CENTRE (ITEWC)
INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES (INCOIS)
ADDRESS:"OCEAN VALLEY", PRAGATHI NAGAR (BO), NIZAMPET (SO),
HYDERABAD - 500 090, INDIA
PHONE:  91-40-23895011
FAX:    91-40-23895012
EMAIL:  tsunami@incois.gov.in
WEB:    www.incois.gov.in

END OF NOTIFICATION MESSAGE
------------------------------------------------------------------------
```

B) Type 1 EXCHANGE EARTHQUAKE BULLETIN Template:

(Variable fields in red; explanatory comments in /* blue */)

```
--------------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 1 (TYPE-I EARTHQUAKE BULLETIN)      /* bulletin issue number */
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)         /* TSP name */
ISSUED AT 0505 UTC WEDNESDAY 09 FEBRUARY 2011               /* issue date/time */
--------------------------------------------------------------------------------

... EARTHQUAKE BULLETIN ...

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

1. EARTHQUAKE INFORMATION

IOTWMS-TSP INDONESIA has detected an earthquake with the following preliminary
information:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:   9.0 MWP (UPDATED)                    /* EQ magnitude and type */
Depth:       10 km                                /* EQ depth */
Date:        09 Feb 2011                          /* EQ date UTC */
Origin Time: 0500 UTC                             /* EQ time UTC */
Latitude:    7.20N                                /* EQ latitude */
Longitude:   92.90E                               /* EQ longitude */
Location:    Nicobar, India                       /* EQ location */

2. EVALUATION
/* EQ mag between 6.5 and 7.9 in Pacific or South Atlantic source zones only */
Although this earthquake may be capable of generating a tsunami in the
Pacific or South Atlantic Ocean, based on historical data and tsunami
modelling it is not capable of generating a tsunami affecting the Indian
Ocean region. However IOTWMS-TSP INDONESIA will monitor the situation and
may issue further bulletins if new information becomes available.

OR
/* EQ mag ≥ 6.5 in IO, or ≥ 8.0 in Pacific or South Atlantic source zones */
Based on historical data and tsunami modelling, this earthquake may be
capable of generating a tsunami affecting the Indian Ocean region.
IOTWMS-TSP INDONESIA will monitor sea level gauges near the earthquake to
determine if a tsunami was generated and will issue further bulletins
for this event.

Further information on this event will be available at:
http://inatews.bmkg.gov.id

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

4. OTHER INDIAN OCEAN TSUNAMI SERVICE PROVIDERS:
Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://reg.bom.gov.au/tsunami/rtsp/
IOTWMS-TSP INDIA:      http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

5. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
```

```
Website: http://www.bmkg.go.id

END OF BULLETIN
--------------------------------------------------------------------------------
```

Type 1 EXCHANGE EARTHQUAKE BULLETIN Example:

```
--------------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 1 (TYPE-I EARTHQUAKE BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)
ISSUED AT 0505 UTC WEDNESDAY 09 FEBRUARY 2011
--------------------------------------------------------------------------------

... EARTHQUAKE BULLETIN ...

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

1. EARTHQUAKE INFORMATION

IOTWMS-TSP INDONESIA has detected an earthquake with the following preliminary
information:

Magnitude:   9.0 Mwp (UPDATED)
Depth:       10 km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

2. EVALUATION
Based on historical data and tsunami modelling, this earthquake may be
capable of generating a tsunami affecting the Indian Ocean region.
IOTWMS-TSP INDONESIA will monitor sea level gauges near the earthquake to
determine if a tsunami was generated and will issue further bulletins
for this event.

Further information on this event will be available at:
http://inatews.bmkg.gov.id

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

4. OTHER INDIAN OCEAN TSUNAMI SERVICE PROVIDERS:
Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://reg.bom.gov.au/tsunami/rtsp/
IOTWMS-TSP INDIA:      http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

5. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN
--------------------------------------------------------------------------------
```

C) Type 2 EXCHANGE NO THREAT BULLETIN Template:

(Variable fields in red; explanatory comments in /* blue */; modification required for non-seismic and complex source events highlighted in yellow)

```
------------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 2 (TYPE-II THREAT ASSESSMENT BULLETIN)/* bulletin issue number */
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)          /* TSP name */
ISSUED AT 0415 UTC MONDAY 07 FEBRUARY 2011                  /* issue date/time */
------------------------------------------------------------------------------

... NO TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION (preliminary)                  /* may delete (preliminary) */
IOTWMS-TSP INDONESIA has detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:    9.0 MWP (UPDATED)                          /* EQ magnitude and type */
Depth:        20km                                       /* EQ depth */
Date:         07 Feb 2011                                /* EQ date UTC */
Origin Time:  0400 UTC                                   /* EQ time UTC */
Latitude:     7.28S                                      /* EQ latitude */
Longitude:    104.30E                                    /* EQ longitude */
Location:     Jabar, Indonesia                           /* EQ location */

2. EVALUATION
Based on pre-run model scenarios, there is NO THREAT to countries in the Indian
Ocean.                                                   /* describes type of assessment */

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

4. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDONESIA for this event unless
other information becomes available.

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

5. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmg.go.id

END OF BULLETIN
------------------------------------------------------------------------------
```

Type 2 EXCHANGE NO THREAT BULLETIN Example:

```
--------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 2 (TYPE-II THREAT ASSESSMENT BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)
ISSUED AT 0415 UTC MONDAY 07 FEBRUARY 2011
--------------------------------------------------------------------------

... NO TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA has detected an earthquake with the following details:

Magnitude:   7.3 Mwp
Depth:       20km
Date:        07 Feb 2011
Origin Time: 0400 UTC
Latitude:    7.28S
Longitude:   104.30E
Location:    Jabar, Indonesia

2. EVALUATION
Based on pre-run model scenarios, there is NO THREAT to countries in the Indian
Ocean.

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

4. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDONESIA for this event unless
other information becomes available.

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

5. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN
--------------------------------------------------------------------------
```

D) Type 2 EXCHANGE POTENTIAL THREAT BULLETIN Template:

(Variable fields in red; explanatory comments in /* blue */; modification required for non-seismic and complex source events highlighted in yellow)

```
------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 2 (TYPE-II THREAT ASSESSMENT BULLETIN)/* bulletin issue number */
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)          /* TSP name */
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011               /* issue date/time */
------------------------------------------------------------------------

... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION (preliminary)                 /* may delete (preliminary) */
TSP INDONESIA has detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:   9.0 MWP (UPDATED)                          /* EQ magnitude and type */
Depth:       10km                                       /* EQ depth */
Date:        09 Feb 2011                                /* EQ date UTC */
Origin Time: 0500 UTC                                   /* EQ time UTC */
Latitude:    7.20N                                      /* EQ latitude */
Longitude:   92.90E                                     /* EQ longitude */
Location:    Nicobar, India                             /* EQ location */

2. EVALUATION
Earthquakes of this size are capable of generating tsunamis. However, so far
there is no confirmation about the triggering of a tsunami.

An investigation is under way to determine if a tsunami has been triggered.
This TSP will monitor sea level gauges and report if any tsunami wave activity
has occurred.

Based on pre-run model scenarios, the zones listed below are POTENTIALLY
UNDER THREAT.                                           /* describes type of assessment */


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

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

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

The threat is deemed to have passed two hours after the forecast time for last
exceedance of the 0.5m threat threshold for a zone. As local conditions can
cause a wide variation in tsunami wave action, CANCELLATION of national
warnings and ALL CLEAR determination must be made by national/state/local
authorities.
/* Country */
AUSTRALIA
/* Coastal Zone Name                    T2 Time/Date    max_beach "Threat Passed" if T4+2   */
/*                                         (UTC)           (m)    hours has passed for CFZ */
COCOS ISLAND                         0718Z 09 Feb 2011   1.3m  Threat Passed
CHRISTMAS ISLAND                     0755Z 09 Feb 2011   0.9m  Threat Passed
```

```
KALBARRI TO NORTH CAPE            1005Z 09 Feb 2011  2.4m
...

BANGLADESH
KUTUBDIA ISLAND                   0752Z 09 Feb 2011  0.9m  Threat Passed
BARISAL                           0816Z 09 Feb 2011  1.3m
...

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

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

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

6. CONTACT INFORMATION
TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN
--------------------------------------------------------------------------------
```

Type 2 EXCHANGE POTENTIAL THREAT BULLETIN Example:

```
--------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 2 (TYPE-II THREAT ASSESSMENT BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011
--------------------------------------------------------------------------

... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA has detected an earthquake with the following details:

Magnitude:   9.0 Mwp (UPDATED)
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

2. EVALUATION
Earthquakes of this size are capable of generating tsunamis. However, so far
there is no confirmation about the triggering of a tsunami.

An investigation is under way to determine if a tsunami has been triggered.
This TSP will monitor sea level gauges and report if any tsunami wave activity
has occurred.

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

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

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

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

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

AUSTRALIA
COCOS ISLAND                    0718Z 09 Feb 2011  1.3m  Threat Passed
CHRISTMAS ISLAND                0755Z 09 Feb 2011  0.9m  Threat Passed
KALBARRI TO NORTH CAPE          1005Z 09 Feb 2011  2.4m

BANGLADESH
KUTUBDIA ISLAND                 0752Z 09 Feb 2011  0.9m  Threat Passed
BARISAL                         0816Z 09 Feb 2011  1.3m

4. ADVICE
```

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

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

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

6. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN

E) Type 3 EXCHANGE CONFIRMED THREAT BULLETIN Template:

(Variable fields in red; explanatory comments in /* blue */; modification required for non-seismic and complex source events highlighted in yellow)

```
--------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 4 (TYPE-III CONFIRMED THREAT BULLETIN)/* bulletin issue number
*/IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)         /* TSP name */
ISSUED AT 0555 UTC WEDNESDAY 09 FEBRUARY 2011                /* issue date/time */
--------------------------------------------------------------------------

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

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

1. EARTHQUAKE INFORMATION (preliminary)                  /* may delete (preliminary) */
IOTWMS-TSP INDONESIA has detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:   9.0 MWP (UPDATED)                           /* EQ magnitude and type */
Depth:       10km                                        /* EQ depth */
Date:        09 Feb 2011                                 /* EQ date UTC */
Origin Time: 0500 UTC                                    /* EQ time UTC */
Latitude:    7.20N                                       /* EQ latitude */
Longitude:   92.90E                                      /* EQ longitude */
Location:    Nicobar, India                              /* EQ location */

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

Nicobar (India)                 12.34N  91.65E  0520Z 09 Feb 2011  2.7m
Padang (Indonesia)               3.34S  93.42E  0550Z 09 Feb 2011  1.3m
/* Station (Country)             Long    Lat     OT3 Time/Date UTC   Max Amplitude (m) */
Based on pre-run model scenarios, the zones listed below are POTENTIALLY
UNDER THREAT.                                            /* describes type of assessment */


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

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

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

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

/* Country */
AUSTRALIA
/* Coastal Zone Name                  T2 Time/Date    max_beach "Threat Passed" if T4+2   */
/*                                       (UTC)           (m)    hours has passed for CFZ */
COCOS ISLAND                       0718Z 09 Feb 2011  1.3m  Threat Passed
CHRISTMAS ISLAND                   0755Z 09 Feb 2011  0.9m  Threat Passed
```

```
KALBARRI TO NORTH CAPE            1005Z 09 Feb 2011  2.4m
...

BANGLADESH
KUTUBDIA ISLAND                   0752Z 09 Feb 2011  0.9m  Threat Passed
BARISAL                           0816Z 09 Feb 2011  1.3m
...


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

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

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

6. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN
--------------------------------------------------------------------------
```

Type 3 EXCHANGE CONFIRMED THREAT BULLETIN Example:

```
------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 4 (TYPE-III CONFIRMED THREAT BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)
ISSUED AT 0555 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

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

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA has detected an earthquake with the following details:

Magnitude:   9.0 Mwp
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

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

Nicobar (India)                  12.34N  91.65E  0520Z 09 Feb 2011  2.7m
Padang (Indonesia)                3.34S  93.42E  0550Z 09 Feb 2011  1.3m

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

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

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

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

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

AUSTRALIA
COCOS ISLAND                     0718Z 09 Feb 2011  1.3m  Threat Passed
CHRISTMAS ISLAND                 0755Z 09 Feb 2011  0.9m  Threat Passed
KALBARRI TO NORTH CAPE           1005Z 09 Feb 2011  2.4m

BANGLADESH
KUTUBDIA ISLAND                  0752Z 09 Feb 2011  0.9m  Threat Passed
BARISAL                          0816Z 09 Feb 2011  1.3m

4. ADVICE
This bulletin is being issued as advice. Only national/state/local authorities
```

and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

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

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

6. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN

F) Type 4 EXCHANGE FINAL BULLETIN Template – Tsunami Observed:

(Variable fields in red; explanatory comments in /* blue */; modification required for non-seismic and complex source events highlighted in yellow)

```
------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 9 (TYPE-IV FINAL BULLETIN)          /* bulletin issue number */
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)         /* TSP name */
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011               /* issue date/time */
------------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:    9.0 MWP (UPDATED)                          /* EQ magnitude and type */
Depth:        10km                                       /* EQ depth */
Date:         09 Feb 2011                                /* EQ date UTC */
Origin Time:  0500 UTC                                   /* EQ time UTC */
Latitude:     7.20N                                      /* EQ latitude */
Longitude:    92.90E                                     /* EQ longitude */
Location:     Nicobar, India                             /* EQ location */

2. EVALUATION
Data from sea-level gauges confirmed that a tsunami was generated.

The expected period of significant tsunami waves is now over for all threatened
Indian Ocean countries, based on IOTWMS-TSP INDONESIA modelling.

Because local conditions can cause a wide variation in tsunami wave action,
CANCELLATION of national warnings and ALL CLEAR determination must be made by
national/state/local authorities. Please be aware that dangerous currents can
continue for several hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS                             /* This Section is OPTIONAL */
Listed below are maximum wave amplitudes recorded at the specified locations.
Note that wave amplitude is measured relative to normal sea level; it is NOT
the crest-to-trough wave height.

LOCATION                 LAT    LON     TIME      DATE        AMPL
-----------------------  ------ -------  -----  -----------  -----
/* Station (Country)      Lat     Long    OT3 Time/Date UTC   Max Amplitude(m) */
Campbell Bay (Nicobar)    6.90N  93.74E  0504Z  09 Feb 2011  11.0m
Nancowry (Nicobar)        7.96N  93.53E  0515Z  09 Feb 2011  10.0m
Port Blair (Nicobar)     11.66N  92.76E  0557Z  09 Feb 2011   6.0m
Chennai (India)          13.10N  80.30E  0714Z  09 Feb 2011   4.0m
Pondicherry (India)      11.76N  79.79E  0717Z  09 Feb 2011   4.3m

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

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDONESIA for this event unless
additional information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://reg.bom.gov.au/tsunami/rtsp/
```

IOTWMS-TSP INDIA: http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

6. CONTACT INFORMATION

IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN

Type 4 EXCHANGE FINAL BULLETIN Example – Tsunami Observed:

```
--------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 9 (TYPE-IV FINAL BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011
--------------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA detected an earthquake with the following details:

Magnitude:    9.0 Mwp
Depth:        10km
Date:         09 Feb 2011
Origin Time:  0500 UTC
Latitude:     7.20N
Longitude:    92.90E
Location:     Nicobar, India

2. EVALUATION
Data from sea-level gauges confirmed that a tsunami was generated.

The expected period of significant tsunami waves is now over for all threatened
Indian Ocean countries, based on IOTWMS-TSP INDONESIA modelling.

Because local conditions can cause a wide variation in tsunami wave action,
CANCELLATION of national warnings and ALL CLEAR determination must be made by
national/state/local authorities. Please be aware that dangerous currents can
continue for several hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS
Listed below are maximum wave amplitudes recorded at the specified locations.
Note that wave amplitude is measured relative to normal sea level: it is NOT
the crest-to-trough wave height.

LOCATION                LAT    LON     TIME      DATE        AMPL
----------------------  ------ ------- -----  -----------  -----
Campbell Bay (Nicobar)   6.90N  93.74E  0504Z  09 Feb 2011  11.0m
Nancowry (Nicobar)       7.96N  93.53E  0515Z  09 Feb 2011  10.0m
Port Blair (Nicobar)    11.66N  92.76E  0557Z  09 Feb 2011   6.0m
Chennai (India)         13.10N  80.30E  0714Z  09 Feb 2011   4.0m
Pondicherry (India)     11.76N  79.79E  0717Z  09 Feb 2011   4.3m

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

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDONESIA for this event unless
additional information becomes available.

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

6. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
```

```
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN
--------------------------------------------------------------------------
```

G) Type 4 EXCHANGE FINAL BULLETIN Template – No Tsunami Observed:

(Variable fields in red; explanatory comments in /* blue */; modification required for non-seismic and complex source events highlighted in yellow)

```
---------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 9 (TYPE-IV FINAL BULLETIN)          /* bulletin issue number */
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)         /* TSP name */
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011               /* issue date/time */
---------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:    9.0 MWP (UPDATED)                        /* EQ magnitude and type */
Depth:        10km                                     /* EQ depth */
Date:         09 Feb 2011                              /* EQ date UTC */
Origin Time:  0500 UTC                                 /* EQ time UTC */
Latitude:     7.20N                                    /* EQ latitude */
Longitude:    92.90E                                   /* EQ longitude */
Location:     Nicobar, India                           /* EQ location */

2. EVALUATION
No tsunami wave observations were recorded for this event.

The expected period of significant tsunami waves is now over for all
potentially-threatened Indian Ocean countries, based on IOTWMS-TSP INDONESIA
modelling.

Because local conditions can cause a wide variation in tsunami wave action,
CANCELLATION of national warnings and ALL CLEAR determination must be made by
national/state/local authorities. Please be aware that dangerous currents can
continue for several hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS                    /* This Section is OPTIONAL */
No tsunami wave observations.

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

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDONESIA for this event unless
additional information becomes available.

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

6. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
```

P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN

Type 4 EXCHANGE FINAL BULLETIN Example – No Tsunami Observed:

```
------------------------------------------------------------------------
TSUNAMI BULLETIN NUMBER 9 (TYPE-IV FINAL BULLETIN)
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS)
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA detected an earthquake with the following details:

Magnitude:    9.0 Mwp
Depth:        10km
Date:         09 Feb 2011
Origin Time:  0500 UTC
Latitude:     7.20N
Longitude:    92.90E
Location:     Nicobar, India

2. EVALUATION
No tsunami wave observations were recorded for this event.

The expected period of significant tsunami waves is now over for all threatened
Indian Ocean countries, based on IOTWMS-TSP INDONESIA modelling.

Because local conditions can cause a wide variation in tsunami wave action,
CANCELLATION of national warnings and ALL CLEAR determination must be made by
national/state/local authorities. Please be aware that dangerous currents can
continue for several hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS
No tsunami wave observations.

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

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDONESIA for this event unless
additional information becomes available.

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

6. CONTACT INFORMATION
IOTWMS-TSP INDONESIA:
METEOROLOGICAL CLIMATOLOGICAL AND GEOPHYSICAL AGENCY (BMKG)
Address: Jl. Angkasa I no.2 Kemayoran, Jakarta, Indonesia, 10720
Tel.: +62 (21) 4246321/6546316
Fax: +62 (21) 6546316/4246703
P.O. Box 3540 Jakarta
Website: http://www.bmkg.go.id

END OF BULLETIN
------------------------------------------------------------------------
```

H) EXCHANGE BULLETIN CANCELLATION MESSAGE Template:

(Variable fields in red; explanatory comments in /* blue */)

```
WEIO20 DEMS 090529                                          /* WMO GTS header */
------------------------------------------------------------------------
TSUNAMI BULLETIN CANCELLATION MESSAGE
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)              /* TSP name */
ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011              /* issue date/time */
------------------------------------------------------------------------
TO:   INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWC)
FROM: IOTWMS-TSP INDIA
CANCELLATION MESSAGE ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011:

THE TSUNAMI BULLETIN NOTIFICATION MESSAGE LISTED BELOW WAS ISSUED
IN ERROR AND IS CANCELLED. PLEASE IGNORE THE MESSAGE.

ORIGINAL MESSAGE:

... Copy Original Message Here ...                  /* Full copy of false or incorrect message */
```

NOTE: This message is sent by TSPs to NTWCs via the GTS, and by email and fax. It has a maximum line length of 69 characters and uses upper-case letters (except for case-sensitive web links), in accordance with specifications for the GTS (WMO) and AFTN (ICAO) communication networks. An abbreviated version of this message is sent by TSPs via mobile phone SMS messaging to NTWCs.

EXCHANGE BULLETIN CANCELLATION MESSAGE Example:

```
WEIO20 DEMS 090529
------------------------------------------------------------------------
TSUNAMI BULLETIN CANCELLATION MESSAGE
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------
TO:   INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWC)
FROM: IOTWMS-TSP INDIA

CANCELLATION MESSAGE ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011:

THE TSUNAMI BULLETIN NOTIFICATION MESSAGE LISTED BELOW WAS ISSUED
IN ERROR AND IS CANCELLED. PLEASE IGNORE THE MESSAGE.

ORIGINAL MESSAGE:

WEIO20 DEMS 090515
------------------------------------------------------------------------
TSUNAMI BULLETIN NOTIFICATION MESSAGE NUMBER 2
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------
TO:   INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWC)
FROM: IOTWMS-TSP INDIA

NOTIFICATION:
IOTWMS-TSP INDIA HAS JUST ISSUED TSUNAMI BULLETIN NUMBER 2 FOR
THE INDIAN OCEAN, BASED ON THE FOLLOWING EARTHQUAKE EVENT:

MAGNITUDE:   9.0 MWP (UPDATED)
DEPTH:       10 KM
DATE:        09 FEB 2011
ORIGIN TIME: 0500 UTC
LATITUDE:    7.20N
LONGITUDE:   92.90E
LOCATION:    NICOBAR, INDIA

TO VIEW THE BULLETIN GO TO THE IOTWMS-TSP INDIA WEBSITE AT:

http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

------------------------------------------------------------------------
INDIAN TSUNAMI EARLY WARNING CENTRE (ITEWC)
INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES (INCOIS)
ADDRESS:"OCEAN VALLEY", PRAGATHI NAGAR (BO), NIZAMPET (SO),
HYDERABAD - 500 090, INDIA
PHONE:  91-40-23895011
FAX:    91-40-23895012
EMAIL:  tsunami@incois.gov.in
WEB:    www.incois.gov.in

END OF NOTIFICATION MESSAGE
------------------------------------------------------------------------
```

Annexure-6: TSP Public Bulletin Templates

Contents - Templates and Examples for:

NOTE:
Public TSP Bulletins are issued to provide advice to the general public of earthquakes and tsunamis affecting the Indian Ocean, and of the national warning statuses reported by NTWCs, but they **do not** contain the specific threat advice (predicted wave heights and arrival times) that is provided to NTWCs in the TSP Exchange Bulletins.

Type 1 PUBLIC EARTHQUAKE BULLETIN Template:

(Variable fields in red; explanatory comments in blue)

```
WEIO21 DEMS 090505                                              /* WMO GTS header */
-----------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 1                                /* bulletin seq no */
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                   /* TSP name */
ISSUED AT 0505 UTC WEDNESDAY 09 FEBRUARY 2011                   /* issue date/time */
-----------------------------------------------------------------------

... EARTHQUAKE BULLETIN ...

This bulletin applies to areas within and bordering the Indian Ocean
and is issued by Tsunami Service Provider INDIA in support of the
UNESCO/IOC Indian Ocean Tsunami Warning and Mitigation System (IOTWMS).

For information applying to areas outside the Indian Ocean refer to
the relevant Tsunami Warning and Mitigation Systems listed in section
6 below.

1. EARTHQUAKE INFORMATION

IOTWMS-TSP INDIA has detected an earthquake with the following
preliminary information:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:    9.0 MWP (UPDATED)                                 /* EQ magnitude and type */
Depth:        10km                                              /* EQ depth */
Date:         09 Feb 2011                                       /* EQ date UTC */
Origin Time:  0500 UTC                                          /* EQ time UTC */
Latitude:     7.20N                                             /* EQ latitude */
Longitude:    92.90E                                            /* EQ longitude */
Location:     Nicobar, India                                    /* EQ location */

2. EVALUATION
/* EQ mag between 6.5 and 7.9 in Pacific or South Atlantic source zones only */
Based on historical data and tsunami modelling, this earthquake
is not capable of generating a tsunami affecting the Indian Ocean
region. No further bulletins will be issued unless the situation
changes.

OR
/* EQ mag ≥ 6.5 in IO, or ≥ 8.0 in Pacific or South Atlantic source zones */
Based on historical data and tsunami modelling, this earthquake
may be capable of generating a tsunami affecting the Indian Ocean
region. IOTWMS-TSP INDIA will monitor the situation to determine
if a tsunami was generated and will issue further bulletins as
information becomes available.

Further information on this event will be available at:
http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
Indian Ocean countries. The tsunami warning status reported by NTWCs
For their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp
4. OTHER INDIAN OCEAN TSUNAMI SERVICE PROVIDERS
```

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA: http://www.bom.gov.au/tsunami/IOTWMS/
IOTWMS-TSP INDONESIA: http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

Type 1 PUBLIC EARTHQUAKE BULLETIN Example:

```
WEIO21 DEMS 090505
------------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 1
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0505 UTC WEDNESDAY 09 FEBRUARY
------------------------------------------------------------------------

... EARTHQUAKE BULLETIN ...

This bulletin applies to areas within and bordering the Indian Ocean
and is issued by Tsunami Service Provider INDIA in support of the
UNESCO/IOC Indian Ocean Tsunami Warning and Mitigation System (IOTWMS).

For information applying to areas outside the Indian Ocean refer to
the relevant Tsunami Warning and Mitigation Systems listed in section
6 below.

1. EARTHQUAKE INFORMATION

IOTWMS-TSP INDIA has detected an earthquake with the following
preliminary information:

Magnitude:   9.0 Mwp (UPDATED)
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

2. EVALUATION
Based on historical data and tsunami modelling, this earthquake
may be capable of generating a tsunami affecting the Indian Ocean
region. IOTWMS-TSP INDIA will monitor the situation to determine
if a tsunami was generated and will issue further bulletins
as information becomes available.

Further information on this event will be available at:
http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. OTHER INDIAN OCEAN TSUNAMI SERVICE PROVIDERS
Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA:  http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
```

Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

B) Type 2 PUBLIC NO THREAT BULLETIN Template:

(Variable fields in red; explanatory comments in blue; modification required for non-seismic and complex source events highlighted in yellow)

```
WEIO21 DEMS 090515                                              /* WMO GTS header */
-----------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 2                                /* bulletin seq no */
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                   /* TSP name */
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011                   /* issue date/time */
-----------------------------------------------------------------------

... NO TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION (preliminary)                  /* may delete (preliminary) */
IOTWMS-TSP INDIA has detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:   9.0 MWP (UPDATED)                          /* EQ magnitude and type */
Depth:       20km                                       /* EQ depth */
Date:        07 Feb 2011                                /* EQ date UTC */
Origin Time: 0400 UTC                                   /* EQ time UTC */
Latitude:    7.28S                                      /* EQ latitude */
Longitude:   104.30E                                    /* EQ longitude */
Location:    Jabar, Indonesia                           /* EQ location */

2. EVALUATION
Based on pre-run model scenarios, there is NO THREAT to countries in
the Indian Ocean. No further bulletins will be issued unless the
situation changes.

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. OTHER INDIAN OCEAN TSUNAMI SERVICE PROVIDERS
Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA:  http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel:     91-40-23895011
Fax:     91-40-23895012
Email:   tsunami@incois.gov.in
Website: www.incois.gov.in

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN
```

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

Type 2 PUBLIC NO THREAT BULLETIN Example:

```
WEIO21 DEMS 090515
------------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 2
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

... NO TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDONESIA has detected an earthquake with the following details:

Magnitude:   7.3 Mwp
Depth:       20km
Date:        07 Feb 2011
Origin Time: 0400 UTC
Latitude:    7.28S
Longitude:   104.30E
Location:    Jabar, Indonesia

2. EVALUATION
Based on pre-run model scenarios, there is NO THREAT to countries in
the Indian Ocean. No further bulletins will be issued unless the
situation changes.

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. OTHER INDIAN OCEAN TSUNAMI SERVICE PROVIDERS
Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA:  http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel:     91-40-23895011
Fax:     91-40-23895012
Email:   tsunami@incois.gov.in
Website: www.incois.gov.in

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):
------------------------------------------------------
Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/
```

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

C) Type 2 PUBLIC POTENTIAL THREAT BULLETIN Template:

(Variable fields in red; explanatory comments in blue; modification required for non-seismic and complex source events highlighted in yellow)

```
WEIO21 DEMS 090515                                              /* WMO GTS header */
-----------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 2                                /* bulletin seq no */
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                   /* TSP name */
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011                   /* issue date/time */
-----------------------------------------------------------------------

... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION (preliminary)                  /* may delete (preliminary) */
IOTWMS-TSP INDIA has detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:   9.0 MWP (UPDATED)                            /* EQ magnitude and type */
Depth:       10km                                         /* EQ depth */
Date:        09 Feb 2011                                  /* EQ date UTC */
Origin Time: 0500 UTC                                     /* EQ time UTC */
Latitude:    7.20N                                        /* EQ latitude */
Longitude:   92.90E                                       /* EQ longitude */
Location:    Nicobar, India                               /* EQ location */

2. EVALUATION
Based on pre-run model scenarios, there is a POTENTIAL TSUNAMI THREAT
to countries in the Indian Ocean.

IOTWMS-TSP INDIA will monitor sea level gauges and report if any tsunami
wave activity has occurred.

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. UPDATES
Additional bulletins will be issued by IOTWMS-TSP INDIA for this event as
more information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA:  http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel:     91-40-23895011
```

Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

Type 2 PUBLIC POTENTIAL THREAT BULLETIN Example:

```
WEIO21 DEMS 090515
------------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 2
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0515 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDIA has detected an earthquake with the following details:

Magnitude:   9.0 Mwp (UPDATED)
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

2. EVALUATION
Based on pre-run model scenarios, there is a POTENTIAL TSUNAMI THREAT
to countries in the Indian Ocean.

IOTWMS-TSP INDIA will monitor sea level gauges and report if any tsunami
wave activity has occurred.

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. UPDATES
Additional bulletins will be issued by IOTWMS-TSP INDIA for this event as
more information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA:  http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel:     91-40-23895011
Fax:     91-40-23895012
Email:   tsunami@incois.gov.in
Website: www.incois.gov.in
```

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

D) Type 3 PUBLIC CONFIRMED THREAT BULLETIN Template:

(Variable fields in red; explanatory comments in blue; modification required for non-seismic and complex source events highlighted in yellow)

```
WEIO21 DEMS 090555                                              /* WMO GTS header */
-----------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 3                                /* bulletin seq no */
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                   /* TSP name */
ISSUED AT 0555 UTC WEDNESDAY 09 FEBRUARY 2011                   /* issue date/time */
-----------------------------------------------------------------------

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

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

1. EARTHQUAKE INFORMATION (preliminary)                  /* may delete (preliminary) */
IOTWMS-TSP INDIA has detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:   9.0 MWP (UPDATED)                           /* EQ magnitude and type */
Depth:       10km                                        /* EQ depth */
Date:        09 Feb 2011                                 /* EQ date UTC */
Origin Time: 0500 UTC                                    /* EQ time UTC */
Latitude:    7.20N                                       /* EQ latitude */
Longitude:   92.90E                                      /* EQ longitude */
Location:    Nicobar, India                              /* EQ location */

2. EVALUATION
Sea level observations have confirmed that a TSUNAMI WAS GENERATED and
there MAY BE A THREAT TO SOME INDIAN OCEAN COUNTRIES.

Maximum wave amplitudes observed so far:

Nicobar (India)          12.34N  91.65E  0520Z 09 Feb 2011  2.7m
Padang (Indonesia)        3.34S  93.42E  0550Z 09 Feb 2011  1.3m

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. UPDATES
Additional bulletins will be issued by IOTWMS-TSP INDIA for this event as
more information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA:  http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
```

Hyderabad - 500 090, India
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

Type 3 PUBLIC CONFIRMED THREAT BULLETIN Example:

```
WEIO21 DEMS 090555
------------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 3
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0555 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

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

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDIA has detected an earthquake with the following details:

Magnitude:   9.0 Mwp
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

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

Nicobar (India)              12.34N  91.65E  0520Z 09 Feb 2011  2.7m
Padang (Indonesia)            3.34S  93.42E  0550Z 09 Feb 2011  1.3m

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. UPDATES
Additional bulletins will be issued by IOTWMS-TSP INDIA for this event as
more information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA:  http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA:  http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel:     91-40-23895011
Fax:     91-40-23895012
Email:   tsunami@incois.gov.in
Website: www.incois.gov.in
```

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

E) Type 4 PUBLIC FINAL TSUNAMI BULLETIN Template – Tsunami Observed:

(Variable fields in red; explanatory comments in blue; modification required for non-seismic and complex source events highlighted in yellow)

```
WEIO21 DEMS 091220                                                  /* WMO GTS header */
-----------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 9                                    /* bulletin seq no */
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                       /* TSP name */
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011                       /* issue date/time */
-----------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDIA detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:   9.0 MWP (UPDATED)                                      /* EQ magnitude and type */
Depth:       10km                                                   /* EQ depth */
Date:        09 Feb 2011                                            /* EQ date UTC */
Origin Time: 0500 UTC                                               /* EQ time UTC */
Latitude:    7.20N                                                  /* EQ latitude */
Longitude:   92.90E                                                 /* EQ longitude */
Location:    Nicobar, India                                         /* EQ location */

2. EVALUATION
Data from sea-level gauges confirmed that a tsunami was generated.

The expected period of significant tsunami waves is now over for all
Threatened Indian Ocean countries, based on IOTWMS-TSP INDIA modelling.

Because local conditions can cause a wide variation in tsunami wave
action, CANCELLATION of national warnings and ALL CLEAR determination
must be made by national/state/local authorities. The tsunami warning
status reported by National Tsunami Warning Centres (NTWCs) of
IOTWMS member states for their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

Please be aware that dangerous currents can continue for several
hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS                                        /* This Section is OPTIONAL */
Listed below are maximum wave amplitudes recorded at the specified
locations. Note that wave amplitude is measured relative to normal
sea level; it is NOT the crest-to-trough wave height.

LOCATION                  LAT     LON     TIME      DATE         AMPL
----------------------  ------ -------  -----  -----------  -----
Campbell Bay (Nicobar)    6.90N  93.74E  0504Z  09 Feb 2011  11.0m
Nancowry (Nicobar)        7.96N  93.53E  0515Z  09 Feb 2011  10.0m
Port Blair (Nicobar)     11.66N  92.76E  0557Z  09 Feb 2011   6.0m
Chennai (India)          13.10N  80.30E  0714Z  09 Feb 2011   4.0m
Pondicherry (India)      11.76N  79.79E  0717Z  09 Feb 2011   4.3m

4. ADVICE
This bulletin is being issued as advice. Only national/state/local
authorities and disaster management officers have the authority to
```

make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

For more detailed information, please refer to the tsunami advisory bulletins issued by the National Tsunami Warning Centres (NTWCs) of IOTWMS member states. The tsunami warning status reported by NTWCs for their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDIA for this event unless additional information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA: http://www.bom.gov.au/tsunami/iotws/
IOTWMS- TSP INDONESIA: http://rtsp.bmkg.go.id

6. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

7. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

Type 4 PUBLIC FINAL TSUNAMI BULLETIN Example – Tsunami Observed:

```
WEIO21 DEMS 091220
------------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 9
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDIA detected an earthquake with the following details:

Magnitude:   9.0 Mwp
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

2. EVALUATION
Data from sea-level gauges confirmed that a tsunami was generated.

The expected period of significant tsunami waves is now over for all
Threatened Indian Ocean countries, based on IOTWMS-TSP INDIA modelling.

Because local conditions can cause a wide variation in tsunami wave
action, CANCELLATION of national warnings and ALL CLEAR determination
must be made by national/state/local authorities. The tsunami warning
status reported by National Tsunami Warning Centres (NTWCs) of
IOTWMS member states for their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

Please be aware that dangerous currents can continue for several
hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS
Listed below are maximum wave amplitudes recorded at the specified
locations. Note that wave amplitude is measured relative to normal
sea level; it is NOT the crest-to-trough wave height.

LOCATION                 LAT    LON     TIME      DATE       AMPL
----------------------  ------ -------  -----  -----------  -----
Campbell Bay (Nicobar)   6.90N  93.74E  0504Z  09 Feb 2011  11.0m
Nancowry (Nicobar)       7.96N  93.53E  0515Z  09 Feb 2011  10.0m
Port Blair (Nicobar)    11.66N  92.76E  0557Z  09 Feb 2011   6.0m
Chennai (India)         13.10N  80.30E  0714Z  09 Feb 2011   4.0m
Pondicherry (India)     11.76N  79.79E  0717Z  09 Feb 2011   4.3m

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
```

IOTWMS member states. The tsunami warning status reported by NTWCs for their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDIA for this event unless additional information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA: http://www.bom.gov.au/tsunami/iotws/
IOTWMS- TSP INDONESIA: http://rtsp.bmkg.go.id

6. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

7. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):---
-
Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

F) Type 4 PUBLIC FINAL TSUNAMI BULLETIN Template – No Tsunami Observed:

(Variable fields in red; explanatory comments in blue; modification required for non-seismic and complex source events highlighted in yellow)

```
WEIO21 DEMS 091220                                                  /* WMO GTS header */
-----------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 9                                    /* bulletin seq no */
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                       /* TSP name */
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011                       /* issue date/time */
-----------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDIA detected an earthquake with the following details:

/* (UPDATED) to be added only after a magnitude change since previous message */
Magnitude:    9.0 MWP (UPDATED)                                     /* EQ magnitude and type */
Depth:        10km                                                  /* EQ depth */
Date:         09 Feb 2011                                           /* EQ date UTC */
Origin Time:  0500 UTC                                              /* EQ time UTC */
Latitude:     7.20N                                                 /* EQ latitude */
Longitude:    92.90E                                                /* EQ longitude */
Location:     Nicobar, India                                        /* EQ location */

2. EVALUATION
No tsunami wave observations were recorded for this event.

The expected period of significant tsunami waves is now over for all
potentially-threatened Indian Ocean countries, based on IOTWMS-TSP
INDIA modelling.

Because local conditions can cause a wide variation in tsunami wave
action, CANCELLATION of national warnings and ALL CLEAR determination
must be made by national/state/local authorities. The tsunami warning
status reported by National Tsunami Warning Centres (NTWCs) of
IOTWMS member states for their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

Please be aware that dangerous currents can continue for several
hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS                          /* This Section is OPTIONAL */
No tsunami wave observations.

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp
```

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDIA for this event unless additional information becomes available.

Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA: http://www.bom.gov.au/tsunami/iotws/
IOTWMS- TSP INDONESIA: http://rtsp.bmkg.go.id

6. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

7. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

Type 4 PUBLIC FINAL TSUNAMI BULLETIN Example – No Tsunami Observed:

```
WEIO21 DEMS 091220
------------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 9
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 1220 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

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

1. EARTHQUAKE INFORMATION
IOTWMS-TSP INDIA detected an earthquake with the following details:

Magnitude:   9.0 Mwp
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

2. EVALUATION
No tsunami wave observations were recorded for this event.

The expected period of significant tsunami waves is now over for all
potentially-threatened Indian Ocean countries, based on IOTWMS-TSP
INDIA modelling.

Because local conditions can cause a wide variation in tsunami wave
action, CANCELLATION of national warnings and ALL CLEAR determination
must be made by national/state/local authorities. The tsunami warning
status reported by National Tsunami Warning Centres (NTWCs) of
IOTWMS member states for their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

Please be aware that dangerous currents can continue for several
hours after the main tsunami waves have passed.

3. TSUNAMI WAVE OBSERVATIONS
No tsunami wave observations.

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

For more detailed information, please refer to the tsunami advisory
bulletins issued by the National Tsunami Warning Centres (NTWCs) of
IOTWMS member states. The tsunami warning status reported by NTWCs for
their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

5. UPDATES
No further bulletins will be issued by IOTWMS-TSP INDIA for this event
unless additional information becomes available.

Other IOTWMS-TSPs may issue additional information at:
```

IOTWMS-TSP AUSTRALIA: http://www.bom.gov.au/tsunami/iotws/
IOTWMS- TSP INDONESIA: http://rtsp.bmkg.go.id

6. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

7. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

G) PUBLIC BULLETIN CANCELLATION MESSAGE Template:

(Variable fields in red; explanatory comments in blue)

```
WEIO21 DEMS 090529                                              /* WMO GTS header */
------------------------------------------------------------------------
TSUNAMI BULLETIN CANCELLATION MESSAGE
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)                 /* TSP name */
ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011                 /* issue date/time */
------------------------------------------------------------------------

CANCELLATION MESSAGE ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011:

THE TSUNAMI BULLETIN MESSAGE LISTED BELOW WAS ISSUED IN ERROR AND
IS CANCELLED. PLEASE IGNORE THE MESSAGE.

ORIGINAL MESSAGE:

... Copy Original Message Here ...                  /* Full copy of false or incorrect message */
```

NOTE: This message is sent by TSPs to NTWCs via the GTS, and by email and fax. It has a maximum line length of 69 characters and uses upper-case letters (except for case-sensitive web links), in accordance with specifications for the GTS (WMO) and AFTN (ICAO) communication networks. An abbreviated version of this message is sent by TSPs via mobile phone SMS messaging to NTWCs.

PUBLIC BULLETIN CANCELLATION MESSAGE Example:

```
WEIO21 DEMS 090529
------------------------------------------------------------------------
TSUNAMI BULLETIN CANCELLATION MESSAGE
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011
------------------------------------------------------------------------

FROM: IOTWMS-TSP INDIA

CANCELLATION MESSAGE ISSUED AT 0529 UTC WEDNESDAY 09 FEBRUARY 2011:

THE TSUNAMI BULLETIN MESSAGE LISTED BELOW WAS ISSUED IN ERROR
AND IS CANCELLED. PLEASE IGNORE THE MESSAGE.

ORIGINAL MESSAGE:

WEIO21 DEMS 090505
------------------------------------------------------------------------
PUBLIC TSUNAMI BULLETIN NUMBER 1
IOTWMS TSUNAMI SERVICE PROVIDER INDIA (ITEWC)
ISSUED AT 0505 UTC WEDNESDAY 09 FEBRUARY
------------------------------------------------------------------------

... EARTHQUAKE BULLETIN ...

This bulletin applies to areas within and bordering the Indian Ocean
and is issued by Tsunami Service Provider INDIA in support of the
UNESCO/IOC Indian Ocean Tsunami Warning and Mitigation System (IOTWMS).

For information applying to areas outside the Indian Ocean refer to
the relevant Tsunami Warning and Mitigation Systems listed in section
6 below.

1. EARTHQUAKE INFORMATION

IOTWMS-TSP INDIA has detected an earthquake with the following
preliminary information:

Magnitude:   9.0 Mwp (UPDATED)
Depth:       10km
Date:        09 Feb 2011
Origin Time: 0500 UTC
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar, India

2. EVALUATION
Based on historical data and tsunami modelling, this earthquake
may be capable of generating a tsunami affecting the Indian Ocean
region. IOTWMS-TSP INDIA will monitor the situation to determine
if a tsunami was generated and will issue further bulletins
as information becomes available.

Further information on this event will be available at:
http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

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

For more detailed information, please refer to the tsunami advisory bulletins issued by the National Tsunami Warning Centres (NTWCs) of IOTWMS member states. The tsunami warning status reported by NTWCs for their countries can be found at:
http://www.incois.gov.in/Incois/tsunami/NTWCFeedbackStatus.jsp

4. OTHER INDIAN OCEAN TSUNAMI SERVICE PROVIDERS
Other IOTWMS-TSPs may issue additional information at:
IOTWMS-TSP AUSTRALIA: http://www.bom.gov.au/tsunami/iotws/
IOTWMS-TSP INDONESIA: http://rtsp.bmkg.go.id

5. CONTACT INFORMATION
IOTWMS-TSP INDIA:
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address: "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO),
Hyderabad - 500 090, India
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

6. TSUNAMI WARNING SYSTEMS OUTSIDE THE INDIAN OCEAN

Pacific Tsunami Warning and Mitigation System (PTWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

North West Pacific Tsunami Advisory Centre (NWPTAC)
http://www.jma.go.jp/en/tsunami/

US National Tsunami Warning Centre (US NTWC)
http://wcatwc.arh.noaa.gov/

Joint Australian Tsunami Warning Centre (JATWC)
http://www.bom.gov.au/tsunami/

Northeast Atlantic, Mediterranean and Connected Seas (NEAMTWS):

French National Tsunami Warning Centre (CENALT)
http://www.info-tsunami.fr

Institute of Geodynamics, National Observatory of Athens
http://www.gein.noa.gr/en/

Kandilli Observatory and Earthquake Research Institute, Turkey
http://www.koeri.boun.edu.tr/2/en/

Caribbean and Adjacent Regions (CARIBE EWS):

Pacific Tsunami Warning Centre (PTWC)
http://ptwc.weather.gov/

END OF BULLETIN

Annexure-7: TSP NAVAREA Templates and Examples

Contents - Templates and Examples for:

A) Type 2 NAVAREA POTENTIAL THREAT BULLETIN
B) Type 3 NAVAREA CONFIRMED THREAT BULLETIN
C) Type 4 NAVAREA FINAL BULLETIN – Tsunami Observed
D) Type 4 NAVAREA FINAL BULLETIN – No Tsunami Observed
E) NAVAREA BULLETIN CANCELLATION MESSAGE

NOTE:
NAVAREA TSP Bulletins are made available to NAVAREA Coordinators by subscription to aid in issuing their NAVWarnings within their areas of responsibility.

A) Type 2 NAVAREA POTENTIAL THREAT BULLETIN Template:

(Variable fields in red; modification required for non-seismic and complex source events highlighted in yellow)

TSP AUSTRALIA TSUNAMI BULLETIN NUMBER 1 FOR

NAVAREA VII, NAVAREA VIII, NAVAREA X, NAVAREA XI

EAST INDIAN OCEAN, NORTH INDIAN OCEAN, SOUTHWEST INDIAN OCEAN, WEST INDIAN OCEAN

TSUNAMI THREAT MESSAGE ISSUED BY TSUNAMI SERVICE PROVIDER AUSTRALIA IN SUPPORT OF THE UNESCO/IOC INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM AT 0016 UTC Monday 01 May 2015.
A TSUNAMI IS POSSIBLE TO BE GENERATED BY A MAGNITUDE 8.9 EARTHQUAKE THAT OCCURRED NEAR SOUTH OF BALI, INDONESIA [10.00S, 115.97E] AT 0000 UTC 01 May 2015.
HAZARDOUS TSUNAMI WAVES ARE FORECAST FOR SOME COASTS OF AUSTRALIA, FRANCE (INDIAN OCEAN TERRITORIES), INDONESIA, MADAGASCAR, MAURITIUS, SOUTH AFRICA, SRI LANKA, TIMOR-LESTE
TSUNAMI WAVES ARE NOT A HAZARD TO SHIPS IN DEEP WATER BUT CAN CAUSE STRONG CURRENTS AND RAPID SEA LEVEL CHANGES IN SHALLOW WATER, AS WELL AS INUNDATION OF THE COAST. SHIPS APPROACHING THE COAST SHOULD CONSULT LOCAL AUTHORITIES REGARDING LOCAL CONDITIONS AND ADVICES.

B) Type 3 NAVAREA CONFIRMED THREAT BULLETIN Template:

(Variable fields in red; modification required for non-seismic and complex source events highlighted in yellow)

TSP AUSTRALIA TSUNAMI BULLETIN NUMBER 2 FOR

NAVAREA VII, NAVAREA VIII, NAVAREA X, NAVAREA XI

EAST INDIAN OCEAN, NORTH INDIAN OCEAN, SOUTHWEST INDIAN OCEAN, WEST INDIAN OCEAN

TSUNAMI CONFIRMED THREAT MESSAGE ISSUED BY TSUNAMI SERVICE PROVIDER AUSTRALIA IN SUPPORT OF THE UNESCO/IOC INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM AT 0016 UTC Monday 01 May 2015.
A TSUNAMI HAS BEEN GENERATED BY A MAGNITUDE 8.9 EARTHQUAKE THAT OCCURRED NEAR SOUTH OF BALI, INDONESIA [10.00S, 115.97E] AT 0000 UTC 01 May 2015.
HAZARDOUS TSUNAMI WAVES ARE FORECAST FOR SOME COASTS OF AUSTRALIA, FRANCE (INDIAN OCEAN TERRITORIES), INDONESIA, MADAGASCAR, MAURITIUS, SOUTH AFRICA, SRI LANKA, TIMOR-LESTE
TSUNAMI WAVES ARE NOT A HAZARD TO SHIPS IN DEEP WATER BUT CAN CAUSE STRONG CURRENTS AND RAPID SEA LEVEL CHANGES IN SHALLOW WATER, AS WELL AS INUNDATION OF THE COAST. SHIPS APPROACHING THE COAST SHOULD CONSULT LOCAL AUTHORITIES REGARDING LOCAL CONDITIONS AND ADVICES.

C) Type 4 NAVAREA FINAL BULLETIN Template – Tsunami Observed:

(Variable fields in red; modification required for non-seismic and complex sourceevents highlighted in yellow)

TSP AUSTRALIA TSUNAMI BULLETIN NUMBER 13 FOR

NAVAREA VII, NAVAREA VIII, NAVAREA X, NAVAREA XI

EAST INDIAN OCEAN, NORTH INDIAN OCEAN, SOUTHWEST INDIAN OCEAN, WEST INDIAN OCEAN

TSUNAMI CANCELLATION MESSAGE ISSUED BY TSUNAMI SERVICE PROVIDER AUSTRALIA IN SUPPORT OF THE UNESCO/IOC INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM AT 0000 UTC 01 May 2015.
THE THREAT HAS NOW LARGELY PASSED FOR THE TSUNAMI GENERATED BY A MAGNITUDE 8.9 EARTHQUAKE THAT OCCURRED NEAR SOUTH OF BALI, INDONESIA [10.00S, 115.97E] AT 0000 UTC 01 May 2015.
HOWEVER, SHIPS APPROACHING THE COAST SHOULD STILL CONSULT LOCAL AUTHORITIES REGARDING LOCAL CONDITIONS AND ADVICES.

D) Type 4 NAVAREA FINAL BULLETIN Template – No Tsunami Observed:

(Variable fields in red; modification required for non-seismic and complex source events highlighted in yellow)

TSP AUSTRALIA TSUNAMI BULLETIN NUMBER 13 FOR

NAVAREA VII, NAVAREA VIII, NAVAREA X, NAVAREA XI

EAST INDIAN OCEAN, NORTH INDIAN OCEAN, SOUTHWEST INDIAN OCEAN, WEST INDIAN OCEAN

TSUNAMI CANCELLATION MESSAGE ISSUED BY TSUNAMI SERVICE PROVIDER AUSTRALIA IN SUPPORT OF THE UNESCO/IOC INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM AT 0000 UTC 01 May 2015.
NO TSUNAMI WAS OBSERVERED FROM A MAGNITUDE 8.9 EARTHQUAKE THAT OCCURRED NEAR SOUTH OF BALI, INDONESIA [10.00S, 115.97E] AT 0000 UTC 01 May 2015.
HOWEVER, SHIPS APPROACHING THE COAST SHOULD STILL CONSULT LOCAL AUTHORITIES REGARDING LOCAL CONDITIONS AND ADVICES.

E) NAVAREA BULLETIN CANCELLATION MESSAGE Template:

Variable fields in red

```
TSUNAMI BULLETIN CANCELLATION MESSAGE
IOTWMS TSUNAMI SERVICE PROVIDER AUSTRALIA (JATWC)
ISSUED AT 1235 UTC WEDNESDAY 16 NOVEMBER 2022
------------------------------------------------------------------------
TO:   NAVAREA COORDINATORS

THE TSUNAMI BULLETIN NOTIFICATION MESSAGE LISTED BELOW WAS ISSUED
IN ERROR AND IS CANCELLED. PLEASE IGNORE THE MESSAGE.

ORIGINAL MESSAGE:

... Copy Original Message Here ...
```

Annexure-8: NTWC and TSP Roles and Responsibilities

National Tsunami Warning Centre: A centre officially designated by the government to monitor and issue tsunami warnings and other related statements within their country according to established national Standard Operating Procedures.

Roles and responsibilities of a NTWC:

- Responsible for making decisions, using TSP advice of their choice, and issuing all tsunami warnings to its communities.
- Report their national warning status on the TSP status reporting page the first time a national warning is issued and subsequently every time the national warning status changes.
- Consult with and provide information to TSPs on coastal forecast zones.
- Bilateral arrangements may be developed with TSPs for advice on how to utilise TSP products to determine local impacts/threats.
- Utilise TSP products for initialising inundation model output/selecting inundation scenarios.
- Conduct hazard mapping and risk assessments using source hazard information (e.g. historic/potential earthquakes, volcanoes) inundation models/maps and vulnerability assessment.
- Provide information/warnings and work with emergency management authorities on how to determine threat zones and develop/select appropriate evacuation maps.

Tsunami Service Provider: Centre that monitors seismic and sea level activity and issues timely tsunami threat information within an ICG framework to National Tsunami Warning Centres/Tsunami Warning Focal Points and other TSPs operating within an ocean basin. The NTWCs/TWFPs may use these products to develop and issue tsunami warning for their countries. TSPs may also issue Public messages for an ocean basin and act as National Tsunami Warning Centres providing tsunami warnings for their own countries.

Roles and Responsibilities of a TSP:

- Determine and provide timely initial earthquake information (magnitude, location, depth, time, confidence levels).

- Determine more specific threat information using output from scenario databases produced by tsunami models, using earthquake source information and verified by sea level information.
- Provide timely tsunami watch information for use in preparation and issuing of national tsunami warnings by NTWCs.
- Provide timely standardised Situation Reports (SitReps) for use by other TSPs and NTWCs.
- Share information with other TSPs and NTWCs via, for example, GTS, web sites, RSS feeds, fax, emails, etc, in standard formats.
- Coordinate updates, cancellation and finalisation advice with TSPs.
- Regular testing and exercising to determine system performance (including communication channels to NTWCs, decision tools, etc)
- Perform calibration and validation of detection and forecasting tools and models
- Define their own region for provision of service, which may include the whole Indian Ocean, a sub-region of the Indian Ocean, or a single country (mainly useful for other TSPs).

TSP Capability Requirements:

- Access to real time data sources and production of standardised seismic and sea level parameters, e.g. all centres use the same magnitude scale (Mw) for inter-comparison of earthquake information regionally. (Note: TSPs and NTWCs may use different scales nationally, e.g. when dealing with local events because they are faster to calculate.).
- Maintain or have access to numerical model scenarios consistent with the benchmarks recommended by Working Group 2 for their area of coverage to enable the provision of a deep-ocean tsunami amplitude to determine countries that may be affected based on agreed thresholds.
- Revise their watch and threat information in light of additional seismic and sea level data.
- Provide products in globally standard formats.
- Issue products in a timely manner.
- Exchange warnings freely and timely on the GTS and Internet (including bilateral agreements for tailored services).

- Adequate trained and experienced staff, utilities, and resources to operate functionally 24 hours per day, seven days per week (24/7).
- Adequate infrastructure and back-up facilities to continue operating during power cuts and national emergencies, such as:
    - all critical equipment on 30-min UPS
    - generator or alternative power backup, with 1 day of back-up capability
    - all critical equipment operating in duplicate
    - all critical communications circuits with backup

Procedure for achieving TSP status:

- Adopt the common Coastal Forecast Zones (CFZs), harmonized web page layout, and bulletin formats and content as established by WG2.
- Make a presentation to WG2 demonstrating the attainment of capability requirements as agreed by ICG
- Begin exchange bulletins with other TSPs
- Participate in Comms Tests/ IOWave Exercises
- Have performance reviewed by WG2 and presented to ICG
- Begin providing TSP threat information to NTWCs upon agreement of the ICG