Maritime Products for NAVAREAs

UNESCO Intergovernmental Coordination Group Indian Ocean Tsunami Warning & Mitigation System (ICG/IOTWMS)

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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 authorized by the ICG/IOTWMS or by its Steering Group (SG).

Version Control:

Version	Date	Authors	Comments	Authorizing Group
1	20 August 2025	• J. Padmanabham -WG2 Chair • Robert Greenwood, WG2-Vice-Chair • Yedi Dermadi, WG2-Vice Chair • Srinivasa Kumar Tummala, Head-ICG/IOTWMS	User Guide for NAVAREA Co-coordinators	SG/ICG Secretariat

1. Introduction on the IOTWMS

The Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) of UNESCO-IOC, plays a pivotal role in ensuring provision of timely tsunami forecast information across the Indian Ocean region through a network of 3 Tsunami Service Providers and National Tsunami Warning Centres / Tsunami Warning Focal Points in 27 Indian Ocean Member States. Currently the TSPs of Australia (Joint Australian Tsunami Warning Centre (JATWC) operated by Bureau of Meteorology), India (Indian Tsunami Early Warning Centre (ITEWC) operated by INCOIS) and Indonesia (InaTEWS operated by BMKG) are operational and providing services for the whole of the IOTWMS Area of Service (AOS). This "system-of-systems" approach, designed for operational redundancy, 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.

IOTWMS Services comprise the following levels:

- **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

IOTWMS TSPs issue two types of products:

- **TSP** "**Exchange**" products for NTWCs consist of a combination of textual bulletins, graphics, password-protected websites, and data files in agreed formats. The availability of exchange products on password-protected TSP websites is communicated to NTWC contacts via GTS, email, and SMS. The issuance of national warnings based on the information provided by the TSPs remains the responsibility of NTWCs.

- **TSP** "**Public**" products for public contain only earthquake/non-seismic source information, a qualitative tsunami-genesis statement, tsunami wave observations, and a summary of national warning statuses issued by NTWCs. NTWCs provide current warning-status summaries to TSPs during an event using a web-based feedback form. A summary of the national warning status reported by the NTWCs is made publicly available by the TSPs via their websites:
    - TSP–India: https://tsunami.incois.gov.in/TEWS/NTWCStatusSummary.jsp;
    - TSP–Australia: http://www.bom.gov.au/tsunami/iotwms/;
    - TSP–Indonesia: https://rtsp.bmkg.go.id/publicbull.php.

2. Background on Tsunami Messages for Maritime Community

The Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) of the Intergovernmental Oceanographic Commission (UNESCO-IOC) through extensive consultations with the International Hydrographic Organization (IHO) World-Wide Navigational Warning Service Sub-Committee (WWNWS-SC) has facilitated the development of a standardized framework for tsunami service messages tailored to the maritime community. The IOC recommended that all ICGs adopt protocols to ensure Tsunami Service Providers (TSPs) issue timely and consistent tsunami messages to NAVAREA Coordinators within their region for dissemination to maritime stakeholders. NAVAREA Coordinators would then convert these TSP messages into maritime safety broadcasts (SafetyNet, SafetyCast, or NAVTEX) to rapidly inform ships at sea.

3. Overview of NAVAREAs in the IOTWMS

The oceans of the world are divided into 21 distinct regions called NAVAREAS. For each NAVAREA, one of the countries with coasts bordering NAVAREA has the responsibility to issue navigational warnings to the ships within. An overview map of the NAVAREAS is given in Figure 1. There are 5 NAVAREAS that cover the Indian Ocean areas – VII, VIII, IX, X and XI. The country responsible for each NAVAREA is given in Table 1. That country supports an individual called the NAVAREA Coordinator who is the authority responsible for collecting, coordinating, and issuing the navigational warnings.

Figure 1. Boundaries of the world's 21 NAVAREAS (not authoritative).

Table 1. NAVAREAS in the Indian Ocean Region, countries responsible and coverage in Indian Ocean

ID	Country Responsible	Coverage in Indian Ocean (Countries or Territories or Other Geographic Locations)
VII	South Africa	Comoros, Kenya, Madagascar, Mozambique, South Africa
VIII	India	Bangladesh, France (Indian ocean territories), India, Maldives, Mauritius, Myanmar, Seychelles, Somalia, Sri Lanka, Tanzania
IX	Pakistan	Djibouti, Iran, Oman, Pakistan, United Arab Emirates, Yemen
X	Australia	Australia
XI	Japan	Indonesia, Malaysia, Singapore, Thailand, Timor-Leste

4. Commencement of NAVAREA Tsunami Messages

In accordance with the TOWS-WG-XII recommendations, NAVAREA tsunami messages shall commence for the potential / confirmed tsunami threat information from the IOTWMS Tsunami Service Providers (TSPs).

In the IOTWMS Area of Service, the Tsunami Service Providers (TSPs) issue a series of bulletins to NTWCs in stages. The first message is usually an Earthquake Information Bulletin (Type-I), which provides event details and a qualitative statement. If forecast modelling indicates tsunami amplitudes of 0.5 m or more in any Coastal Forecast Zone (CFZ), a Potential Tsunami Threat Bulletin (Type-II) is issued. When sea-level observations confirm tsunami generation, a Confirmed Tsunami Threat Bulletin (Type-III) is sent, supported by hourly supplementary updates as new observations become available. Once sea-level data confirm that the threat has ended, a Final Bulletin is issued. If required, a Cancellation Bulletin may also be released to correct or withdraw a previous message. This step-by-step approach allows TSPs to provide rapid early information based on initial seismic analysis and then refine forecasts using numerical models and tide gauge/sea-level data.

Maritime Safety (NAVAREA) messages are only disseminated from Type-II onwards, once a potential or confirmed threat is identified and continues until the Final or Cancellation message.

The threshold for listing countries under threat in the NAVAREA products is currently based on:

(i) Positive Estimated Wave Amplitude equal to or exceeding 0.5 M at the coast of IOTWMS Member States as assessed by the TSPs - aligning with the recommendations of the TOWS-WG

(ii) Threat Status as reported by the NTWCs of the IOTWMS Member States - aligning with the Public bulletin dissemination policy of the ICG/IOTWMS.

It may be noted that the TSP threat assessments for an event might vary due to the differences in data used or forecasting methods. While recommended best practices to be adopted in such situations are discussed with the users in training workshops, national warnings issued by the NTWCs should always take precedence.

Table 2. Example of TSP timelines for issue of Bulletins.

Time since earthquake	**TSP Bulletin**	**Message No. (TSP→NTWC)**	**Message No. (TSP→NAVAREA) Maritime Message**	**Purpose**
~10 min	**Type-I** Earthquake Information	1	–	Basic Earthquake information with qualitative statement. No NAVAREA messages
~20 min	**Type-II** Potential Tsunami Threat (≥0.5 m in any CFZ)	2	1	First NAVAREA "Potential Tsunami Threat" message
~30-45 min	**Type-III** Confirmed Tsunami Threat (based on sea-level data + models)	3	2	NAVAREA "Confirmed Tsunami Threat"
Every 1 hr (if needed)	**Type-III Supplementary** (updated sea-level data)	4, 5 … up to last but one	–	Hourly updates to NTWCs while waves observed. NAVAREA message updates will be issued only if the list of impacted countries changes either based on TSP evaluation or feedback received from NTWCs.
xx hours (varies)	**Final Bulletin** (threat ended, waves <0.5 m)	e.g., 22	3	Final NAVAREA message
Anytime	**Cancellation** (if error)	XX	XX	Cancellation NAVAREA message

Feedback from the IOWave25 received from the NAVAREA coordinators and the IHO WWNWS-SC will be discussed in the ICG/IOTWMS in finalisation of the content, keeping in view of the specialised requirements of the NAVAREA Coordinators vis-à-vis the extant public bulletin dissemination policy of the IOTWMS.

5. Message Content

Maritime Messages are designed to be concise, providing only essential information. Unlike TSP's Threat Exchange Messages for the NTWC, they do not contain estimated tsunami arrival times at designated warning points, forecast tsunami amplitudes for coastal locations, readings from sea level gauges, nor general safety information about the tsunami hazard. National warnings remain the responsibility of NTWCs.
Information contained in the messages does include, however:

Tsunami potential / confirmed Threat Information Message

- Header
    - Message Number
    - Issued by TSP for the IOTWMS
    - Issued Time and Date in UTC
- NAVAREAS that the information applies to
- Information about the earthquake/non-seismic source that generated the tsunami
- Countries, territories, and other places with a forecast coastal tsunami hazard
- Information for ships about the tsunami information
- Instructions to ships

Final Message

- Header
- Statement that the threat has largely passed
- Instructions to ships

6. Message Dissemination

All the 3 TSPs in the IOTWMS will disseminate maritime bulletins by email to all the NAVAREA coordinators in the IOTWMS Area of Service to aid in issuing their NAVAREA Warnings within their areas of responsibility. When threat assessment from different TSPs varies, The ICG/IOTWMS Secretariat will coordinate with the WWNWS-SC and the NAVAREA Coordinators to assist TSPs maintain the authorised email list for operational dissemination of maritime products to the NAVAREA Coordinators.

7. NAVAREA Templates and Sample Examples

Contents - Templates and Examples for:

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 ...