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## Utilising TSP Threat Information products in NTWC SOPs

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*Intergovernmental Coordination Group for Indian Ocean Tsunami Warning & Mitigation System (ICG/IOTWMS)  
North-Western Indian Ocean Member States Training Workshop:  
Review Standard Operating Procedures (SOPs) and Tsunami Service Provider (TSP) Products in Preparation for Exercise IOWave23  
7 – 8 August 2023*

# Caution !!

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## IOTWMS TSPs do not issue National warnings

- TSPs provide **information** and **data on tsunami threats as a guidance** to NTWCs.
- It remains the **responsibility of NTWCs** and **national authorities**, operating within the legal framework of **the sovereign nation** in which they reside and serve, to provide tsunami warnings, watches, and advisories to their public, their emergency response agencies and their government.
- As **TSPs have an Indian Ocean-wide scope**, they provide services to all NTWCs.
- An NTWC may elect to utilise services from one or more TSPs.
- All NTWCs should implement well-documented, routinely exercised and tested Standard Operating Procedures (SOPs) for staff to adhere to during tsunami events for the preparation and dissemination of tsunami threat and warning information.
- Staff competencies should be routinely tested against these SOPs.

# NTWC Responsibilities



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- ❑ Receive earthquake and tsunami information from TSPs through designated Tsunami Warning Focal Points (TWFPs)
- ❑ Monitor seismicity and tsunamis in real-time (optional)
- ❑ Analyse all information received / Accessed on TSP websites and assess the national tsunami threat
- ❑ Develop and issue timely warnings or cancellations to DMOs and other stakeholder agencies (and nationally agree if also the public, with community response actions developed beforehand in consultation with DMOs) in accordance with National Tsunami Warning and Emergency Response Plan

## Understand the Message Types / Bulletin Types and Purpose

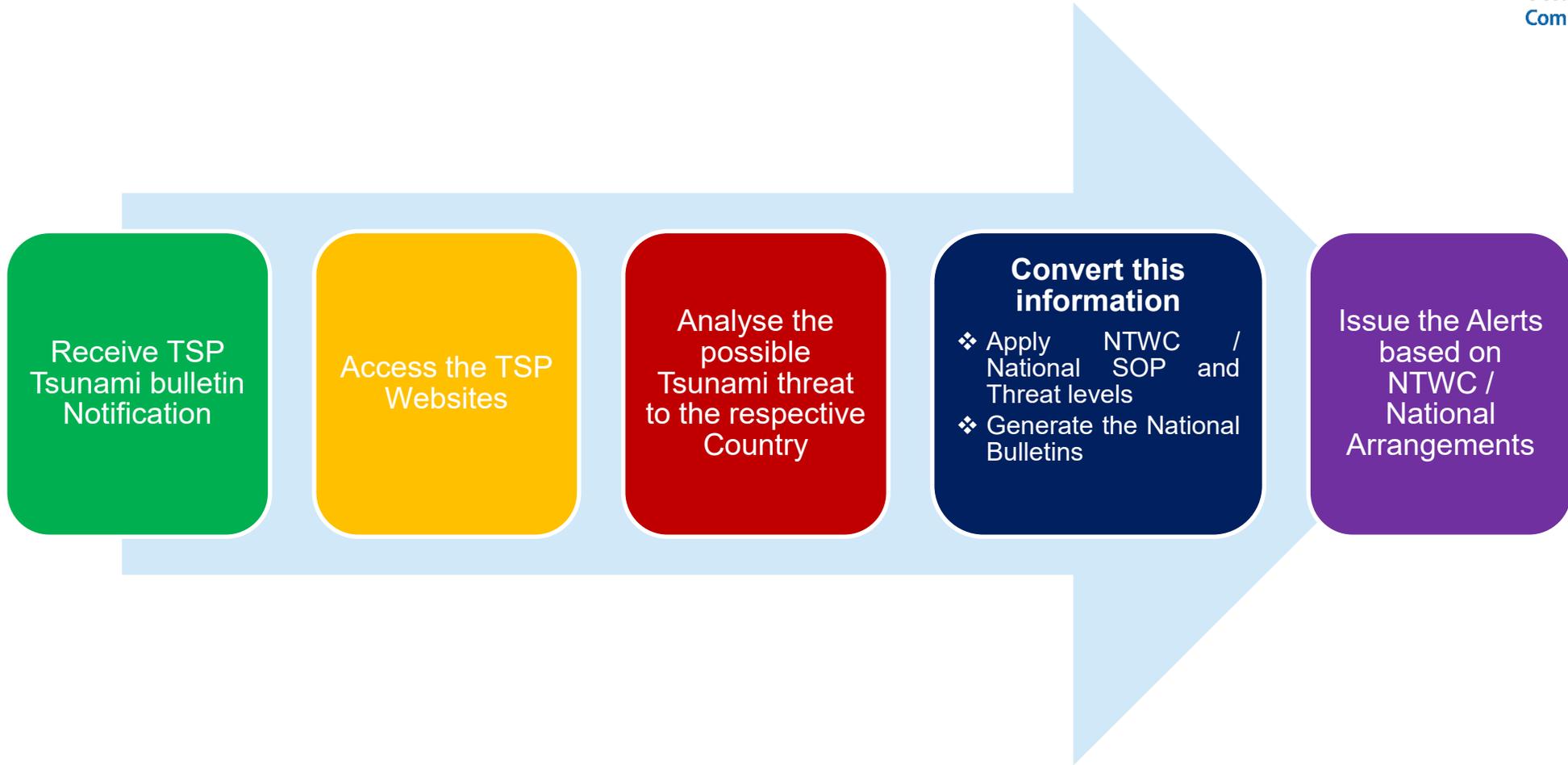
Message Type	Description	Purpose
Notification Message		Alert NTWCs to generation/update of bulletins and other threat information on the TSP websites
Exchange Bulletin Type 1	Earthquake Bulletin	Provide earthquake parameters and a qualitative statement of the tsunamigenic potential
Exchange Bulletin Type 2	Threat Assessment Bulletin	Provide initial forecast of tsunami threat. Two sub-types: <ul style="list-style-type: none"> <li>- No Threat Bulletin</li> <li>- Potential Threat Bulletin</li> </ul>
Exchange Bulletin Type 3	Confirmed Threat Bulletin	Provide forecast of tsunami threat and confirming sea-level observations
Exchange Bulletin Type 4	Final Bulletin	Advise on finalisation of tsunami threat
Cancellation Message		Inform NTWCs that a Notification Message previously issued was false or incorrect, and is now cancelled

# Utilization of TSP products – Process Chart



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# Access TSP Websites – for Updated Information



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**IOTWMS-TSP Australia**  
Tsunami Service Provider for the Indian Ocean Tsunami Warning and Mitigation Service (IOTWMS)  
A service provided by the Joint Australian Tsunami Warning Centre (JATWC), operated by the Australian Bureau of Meteorology and Geoscience Australia

**Recent Events**

- 10:27 UTC 02 July 2023 Mag 6.7 Tonga Islands
- 18:06 UTC 15 June 2023 Mag 7.0 South of Fiji Islands
- 06:00 UTC 07 June 2023 Mag 9.0 NICOBAR ISLANDS, INDIA REGION \*\*\* TEST EVENT \*\*\*
- 14:56 UTC 21 May 2023 Mag 6.8 Prince Edward Islands Region
- 01:50 UTC 20 May 2023 Mag 7.3 Southeast of Loyalty Islands
- 02:57 UTC 19 May 2023 Mag 7.6 Southeast of Loyalty Islands
- 16:02 UTC 10 May 2023 Mag 7.5 Tonga Islands
- 03:13 UTC 28 April 2023 Mag 6.5 South of Fiji Islands
- 20:00 UTC 24 April 2023 Mag 6.9 Southern Sumatra, Indonesia
- 00:41 UTC 24 April 2023 Mag 7.2 Kermadec Islands Region
- 04:31 UTC 18 April 2023 Mag 6.6 South of Fiji Islands
- 09:55 UTC 14 April 2023 Mag 7.0 Java, Indonesia
- 03:06 UTC 03 April 2023 Mag 6.5 Near East Coast of Kamchatka
- 18:04 UTC 02 April 2023 Mag 7.0 New Guinea, Papua New Guinea
- 17:12 UTC 18 March 2023 Mag 6.8 Near Coast of Ecuador
- 00:56 UTC 16 March 2023 Mag 7.2 Kermadec Islands Region
- 00:55 UTC 16 March 2023 Mag 6.8 Kermadec Islands Region
- 06:41 UTC 04 March 2023 Mag 6.6 Kermadec Islands, New Zealand

**EARTHQUAKE: Tonga Islands 10:27 UTC 02 July 2023 Mag 6.7**

**INFORMATION FOR BULLETIN 1. Earthquake Bulletin 1038UTC 02 Jul 2023**

Exchange Bulletins Threat Map Threat Table Deep Water Wave Amplitude Map Travel Times Map NTWC Status Reporting Form Ot

IDY68503

TSUNAMI BULLETIN NUMBER 1 (TYPE-I EARTHQUAKE BULLETIN)  
IOTWMS TSUNAMI SERVICE PROVIDER AUSTRALIA (JATWC)  
ISSUED AT 1038 UTC Sunday 02 July 2023

... 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 AUSTRALIA has detected an earthquake with the following preliminary information:

Magnitude: 6.7 Mwp  
Depth: 227km  
Date: 02 Jul 2023  
Origin Time: 1027 UTC  
Latitude: 17.8775  
Longitude: 174.982W  
Location: Tonga Islands

2. EVALUATION

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 AUSTRALIA will monitor the situation and may issue further bulletins if new information becomes available.

**Indian Tsunami Early Warning System**  
Ministry of Earth Sciences - Government of India

Home About TSP Archived Events COMMS TEST

Home / Seismic/Tsunami Events

Seismic Activity for past 90 days with magnitude ≥ 6.5M

Origin Time(UTC)	Region Name	Latitude(Deg)	Longitude(Deg)	Depth(km)	Magnitude	Regional Bulletins
02 Jul 2023 10:27:00	Tonga Islands	17.79S	175.17W	243.0	6.5M	Public Exchange
15 Jun 2023 18:06:00	South of Fiji Islands	23.09S	176.96W	193.0	6.6M	Public Exchange
20 May 2023 01:50:00	Southeast of Loyalty Islands	22.94S	170.51E	10.0	7.0M	Public Exchange
19 May 2023 02:57:00	Southeast of Loyalty Islands	23.17S	170.75E	10.0	7.4M	Public Exchange
10 May 2023 16:02:00	Tonga Islands	15.65S	174.56W	220.0	7.1M	Public Exchange
24 Apr 2023 20:00:00	Southern Sumatra, Indonesia	.69S	98.71E	10.0	6.8M	Public Exchange

**AGENCY FOR METEOROLOGY CLIMATOLOGY AND GEOPHYSICS**  
Indonesia Tsunami Service Provider

You are logged as: USER

Home Public Bulletin About the TSP Seismic Network Contact Us Logout

**Earthquake Event List**

Earthquake Event List Earthquake Event Map

Page 1 of 12

Origin Time (UTC)	Mag	Depth (km)	Latitude	Longitude	Location	Type	Bulletin Number	Bulletin Type	Event Group
2023-07-02 10:27:27	7.2	82	17.97S	174.75W	Tonga Islands	REAL EVENT	1	EARTHQUAKE BULLETIN	202307021027
2023-06-15 18:06:22	6.9	161	22.82S	176.44W	South of Fiji Islands	REAL EVENT	1	EARTHQUAKE BULLETIN	202306151806
2023-06-07 06:00:00	9.0	10	7.2N	92.9E	Nicobar Islands, India Region (CommTE-EST-Jun-2023)	TEST EVENT	4	FINAL BULLETIN	202306070600COM
2023-06-07 06:00:00	9.0	10	7.2N	92.9E	Nicobar Islands, India Region (CommTE-EST-Jun-2023)	TEST EVENT	3, 1	CONFIRMED THREAT BULLETIN	202306070600COM
2023-06-07 06:00:00	9.0	10	7.2N	92.9E	Nicobar Islands, India Region (CommTE-EST-Jun-2023)	TEST EVENT	2	THREAT ASSESSMENT BULLETIN	202306070600COM
2023-06-07 06:00:00	9.0	10	7.2N	92.9E	Nicobar Islands, India Region (CommTE-EST-Jun-2023)	TEST EVENT	1	EARTHQUAKE BULLETIN	202306070600COM
2023-05-20 01:50:59	7.5	17	22.96S	170.57E	Southeast of Loyalty Islands	REAL EVENT	1	EARTHQUAKE BULLETIN	202305200150
2023-05-19 02:57:05	7.9	28	23.13S	170.81E	Southeast of Loyalty Islands	REAL EVENT	1	EARTHQUAKE BULLETIN	202305190257
2023-05-10 16:02:01	7.5	224	15.67S	174.48W	Tonga Islands	REAL EVENT	1	EARTHQUAKE BULLETIN	202305101602
2023-04-28 03:13:38	6.5	589	24.95S	179.64E	South of Fiji Islands	REAL EVENT	1	EARTHQUAKE BULLETIN	202304280313
2023-04-24 20:00:57	6.9	84	0.93S	98.39E	Southern Sumatra, Indonesia	REAL EVENT	2	THREAT ASSESSMENT BULLETIN	202304242000
2023-04-24 20:00:57	7.3	84	0.93S	98.39E	Southern Sumatra, Indonesia	REAL EVENT	1	EARTHQUAKE BULLETIN	202304242000
2023-04-24 00:41:56	7.0	62	29.98S	177.29W	Kermadec Islands, New Zealand	REAL EVENT	1	EARTHQUAKE BULLETIN	202304240041
2023-04-14 09:55:46	6.5	604	6.12S	112E	Java, Indonesia	REAL EVENT	1	EARTHQUAKE BULLETIN	202304140955
2023-04-03 03:06:55	6.7	75	5.9N	150.3E	Near East Coast of Kamchatka	REAL EVENT	1	EARTHQUAKE BULLETIN	202304030306

**Current Time (UTC)**  
Jul 04, 2023  
09:44:46

**Miscellaneous**

- Earthquake Event List
- Earthquake Event Map
- Performance Indicator

**Links**

- NTWC Status Reporting Form (India)
- TSP Australia Website
- TSP India Website
- IOC-UNESCO Website
- ICG/IOTWMS Secretariat Website
- PTWC Website
- JMA Website

**Documentation**

- TSP Indonesia User Manual
- TSP Australia User Manual
- TSP India User Manual

## TSP- Australia

<https://reg.bom.gov.au/tsunami/rtsp/>

## TSP- India

<https://tsunami.incois.gov.in/TEWS/TSP>

## TSP- Indonesia

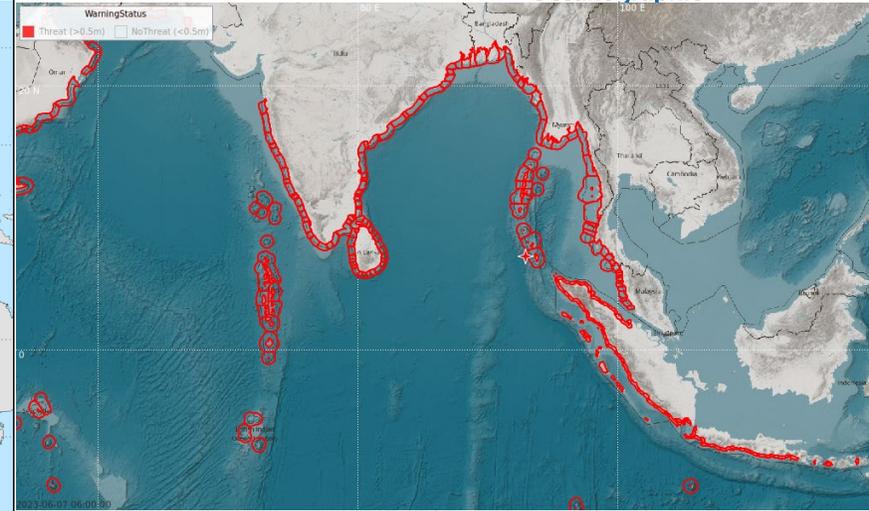
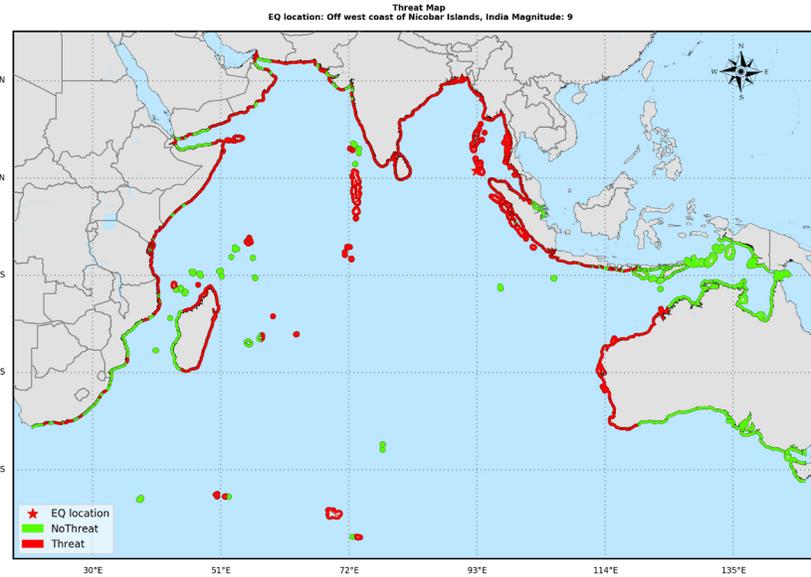
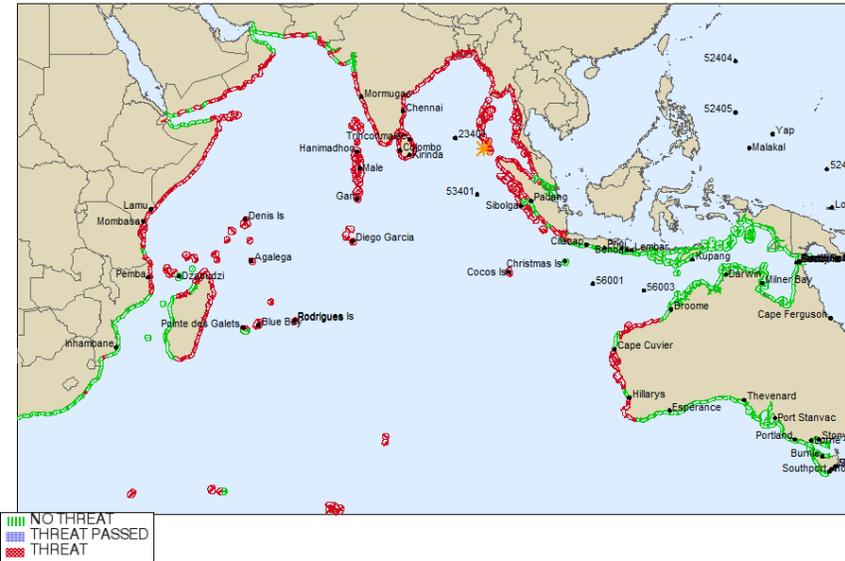
<https://rtsp.bmkg.go.id/>

# Observe the Threat Status



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- Access the TSP website
- Understand and Interpret the possible tsunami threat for the respective Country.
- Apply NTWC SOP, Convert the tsunami information to Threat status.

Tsunami Wave Amplitude	Threat Status
EWA $\geq$ 0.5 Meters	Threat
EWA $<$ 0.5 Meters	No Threat

# Analyse the information on TSP-Websites (Exchange bulletins) and assess the possible tsunami threat to the Country



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Filter by

Country	State/Territory	Zone	T1(UTC)	T2(UTC)	T3(UTC)	T4(UTC)	Amplitude(m)	ThreatStatus
MADAGASCAR	ANTSIRANANA	VOHEMAR	07-Jun-2023 13:29	07-Jun-2023 13:57	07-Jun-2023 13:58	-	1.1	Threat
MADAGASCAR	TOAMASINA	TOAMASINA AIRPORT	07-Jun-2023 13:57	07-Jun-2023 14:27	07-Jun-2023 18:02	08-Jun-2023 06:58	1.1	Threat
MADAGASCAR	FIANARANTSOA	AMBAHY	07-Jun-2023 14:14	07-Jun-2023 14:33	07-Jun-2023 19:23	08-Jun-2023 06:40	1.0	Threat
MADAGASCAR	TOAMASINA	TAMPOLO	07-Jun-2023 14:01	07-Jun-2023 14:36	07-Jun-2023 14:37	-	1.1	Threat
MADAGASCAR	TOLIARA	MANANTENINA	07-Jun-2023 14:35	07-Jun-2023 14:51	07-Jun-2023 23:41	08-Jun-2023 07:00	1.0	Threat
MADAGASCAR	ANTSIRANANA	FARAFAGANA	07-Jun-2023 14:21	07-Jun-2023 16:48	07-Jun-2023 16:48	-	0.5	Threat
MADAGASCAR	GLORIOSO ISLANDS MADAGASCAR	GLORIOSO ISLANDS	07-Jun-2023 13:54	07-Jun-2023 17:11	07-Jun-2023 17:06	-	0.9	Threat
MADAGASCAR	TOLIARA	SAMPONA	07-Jun-2023 15:18	07-Jun-2023 18:24	08-Jun-2023 02:22	08-Jun-2023 06:58	0.9	Threat
MADAGASCAR	ANTSIRANANA	ANOROTSANGANA	07-Jun-2023 13:36	07-Jun-2023 20:05	07-Jun-2023 16:14	-	0.7	Threat
MADAGASCAR	MAHAJANGA	BALY	07-Jun-2023 14:31	07-Jun-2023 22:54	07-Jun-2023 20:02	-	0.7	Threat
MADAGASCAR	ANTSIRANANA	AMBANJA	07-Jun-2023 14:20	08-Jun-2023 06:14	08-Jun-2023 01:20	-	0.6	Threat

Public Bulletin Exchange Bulletin Notification Bulletin Threat Table Threat Map Traveltime Map SSHMax Map

Country	Location	T1 (UTC)	T2 (UTC)	T3 (UTC)	T4 (UTC)	EWI	Status
11. MADAGASCAR							
MADAGASCAR	VOHEMAR	2023-06-07 13:24:00	2023-06-07 13:31:00	2023-06-07 17:17:15	2023-06-07 18:00:00	1.29	Threat
MADAGASCAR	ANOROTSANGANA	2023-06-07 13:23:30	2023-06-07 13:51:30	2023-06-07 17:18:15	2023-06-07 17:57:15	0.78	Threat
MADAGASCAR	TAMPOLO	2023-06-07 13:47:30	2023-06-07 14:03:00	2023-06-07 17:52:30	2023-06-07 18:00:00	0.87	Threat
MADAGASCAR	AMBAHY	2023-06-07 14:00:15	2023-06-07 14:14:15	2023-06-07 16:24:15	2023-06-07 17:58:15	0.81	Threat
MADAGASCAR	FARAFAGANA	2023-06-07 14:08:15	2023-06-07 14:15:45	2023-06-07 15:59:30	2023-06-07 18:00:00	1.35	Threat
MADAGASCAR	MANANTENINA	2023-06-07 14:18:30	2023-06-07 14:27:15	2023-06-07 16:35:00	2023-06-07 16:49:30	0.87	Threat
MADAGASCAR	SAMPONA	2023-06-07 14:54:15	2023-06-07 15:04:30	2023-06-07 16:14:45	2023-06-07 17:45:15	0.89	Threat
MADAGASCAR	TOAMASINA AIRPORT	2023-06-07 13:45:00	2023-06-07 16:01:30	2023-06-07 17:08:00	2023-06-07 18:00:00	0.65	Threat
MADAGASCAR	GLORIOSO ISLANDS	2023-06-07 13:45:15	2023-06-07 16:55:45	2023-06-07 17:47:30	2023-06-07 17:48:30	0.67	Threat

Exchange Bulletins Threat Map Threat Table Deep Water Wave Amplitude Map Travel Times Map NTWC Status Reporting Form Other Data

**SELECT COUNTRY:**

- AUSTRALIA
- BANGLADESH
- COMOROS
- DJIBOUTI
- FRANCE
- INDIA
- INDONESIA
- IRAN
- KENYA
- MADAGASCAR
- MALAYSIA
- MALDIVES
- MAURITIUS
- MOZAMBIQUE
- MYANMAR
- OMAN
- PAKISTAN
- SEYCHELLES
- SINGAPORE
- SOMALIA
- SOUTH AFRICA
- SRI LANKA
- TANZANIA
- THAILAND
- TIMOR-LESTE
- UNITED ARAB EMIRATES
- UNITED KINGDOM
- YEMEN

(Red = Threat, Blue = Threat Passed, Green = No Threat)

**ZONE PREDICTIONS FOR MADAGASCAR:**

COUNTRY ZONE	MAX BEACH (m)	MAX DEEP (m)	DEPTH AT MAX DEEP (m)	T1 (UTC) First Wave	T2 (UTC) First Above Threat Level	T3 (UTC) Max Wave	T4 (UTC) Last Above Threat Level	THREAT CATEGORY
ANOROTSANGANA	1.1	0.42	47	07 Jun 1324Z	07 Jun 1332Z	07 Jun 1542Z	07 Jun 2218Z	Threat
VOHEMAR	1.08	0.32	129	07 Jun 1322Z	07 Jun 1330Z	07 Jun 1428Z	07 Jun 1608Z	Threat
AMBANJA	0.47	0.13	165	07 Jun 1416Z		07 Jun 1622Z		No Threat
FARAFAGANA	1.64	0.5	116	07 Jun 1402Z	07 Jun 1412Z	07 Jun 1556Z	07 Jun 2352Z	Threat
EUROPA ISLAND	0.18	0.03	1384	07 Jun 1548Z		07 Jun 1638Z		No Threat
AMBAHY	1.05	0.27	233	07 Jun 1350Z	07 Jun 1402Z	07 Jun 1546Z	07 Jun 1628Z	Threat
GLORIOSO ISLANDS	0.39	0.07	1010	07 Jun 1344Z		07 Jun 1356Z		No Threat
JUAN DE NOVA ISLAND	0.18	0.03	1186	07 Jun 1510Z		07 Jun 1516Z		No Threat
BALY	0.63	0.25	41	07 Jun 1430Z	07 Jun 1626Z	07 Jun 1632Z	07 Jun 1812Z	Threat
TAMOTAMO	0.33	0.05	1875	07 Jun 1440Z		07 Jun 1452Z		No Threat
TOAMASINA AIRPORT	0.55	0.18	88	07 Jun 1338Z	07 Jun 1404Z	07 Jun 1406Z	07 Jun 1550Z	Threat
TAMPOLO	1.07	0.47	27	07 Jun 1342Z	07 Jun 1500Z	07 Jun 1816Z	08 Jun 0538Z	Threat
SAMPONA	1.11	0.48	29	07 Jun 1444Z	07 Jun 1612Z	08 Jun 0518Z	08 Jun 0534Z	Threat
MANANTENINA	0.86	0.26	122	07 Jun 1406Z	07 Jun 1414Z	07 Jun 1508Z	07 Jun 1746Z	Threat
ANDROKA	0.32	0.1	101	07 Jun 1502Z		07 Jun 1548Z		No Threat
MANJA	0.26	0.1	49	07 Jun 1610Z		07 Jun 1758Z		No Threat

# Textual Exchange Bulletin Information from TSPs

## AUSTRALIA

07Jun2023	1.32m
07Jun2023	1.15m
07Jun2023	1.18m
07Jun2023	0.88m
07Jun2023	0.85m
07Jun2023	0.71m
07Jun2023	0.63m
07Jun2023	0.51m
07Jun2023	0.62m
07Jun2023	0.74m
07Jun2023	1.62m
07Jun2023	0.93m

## BANGLADESH

07Jun2023	1.67m
07Jun2023	1.62m
07Jun2023	1.88m
07Jun2023	1.49m

## COMOROS

07Jun2023	0.66m
07Jun2023	0.86m
07Jun2023	1.17m
07Jun2023	0.79m

## FRANCE

07Jun2023	0.65m
07Jun2023	1.04m
07Jun2023	0.98m
07Jun2023	1.12m
07Jun2023	0.93m
07Jun2023	0.76m
07Jun2023	0.65m

## INDIA

07Jun2023	12.84m
07Jun2023	15.19m
07Jun2023	12.76m
07Jun2023	6.84m
07Jun2023	4.44m

## MADAGASCAR

07Jun2023	1.29m
07Jun2023	0.78m
07Jun2023	0.87m
07Jun2023	0.81m
07Jun2023	1.35m
07Jun2023	0.87m
07Jun2023	0.89m
07Jun2023	0.65m
07Jun2023	0.67m

## MALAYSIA

07Jun2023	2.49m
07Jun2023	1.63m
07Jun2023	1.67m
07Jun2023	2.61m
07Jun2023	2.22m
07Jun2023	1.93m
07Jun2023	1.94m
07Jun2023	1.43m
07Jun2023	1.90m
07Jun2023	1.33m
07Jun2023	1.04m
07Jun2023	0.73m

## MALDIVES

07Jun2023	7.77m
07Jun2023	4.52m
07Jun2023	7.44m
07Jun2023	9.54m
07Jun2023	4.63m
07Jun2023	5.24m
07Jun2023	2.63m
07Jun2023	5.05m
07Jun2023	3.33m

## MAURITIUS

07Jun2023	1.51m
07Jun2023	1.72m
07Jun2023	0.85m
07Jun2023	1.36m
07Jun2023	0.70m

TSUNAMI BULLETIN NUMBER 2 (TYPE-II THREAT ASSESSMENT BULLETIN)  
IOTWMS TSUNAMI SERVICE PROVIDER INDONESIA (InaTEWS-BMKG)  
issued at 0615 UTC, Jun 07, 2023

... 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 (updated)

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

Magnitude : 9.0 Mwp (REVISED)  
Depth : 10km  
Date : 07 Jun 2023  
Origin Time: 06:00:00 UTC  
Latitude : 7.20N  
Longitude : 92.90E  
Location : Nicobar Islands, India Region

### 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.

# Spatial Data From TSPs



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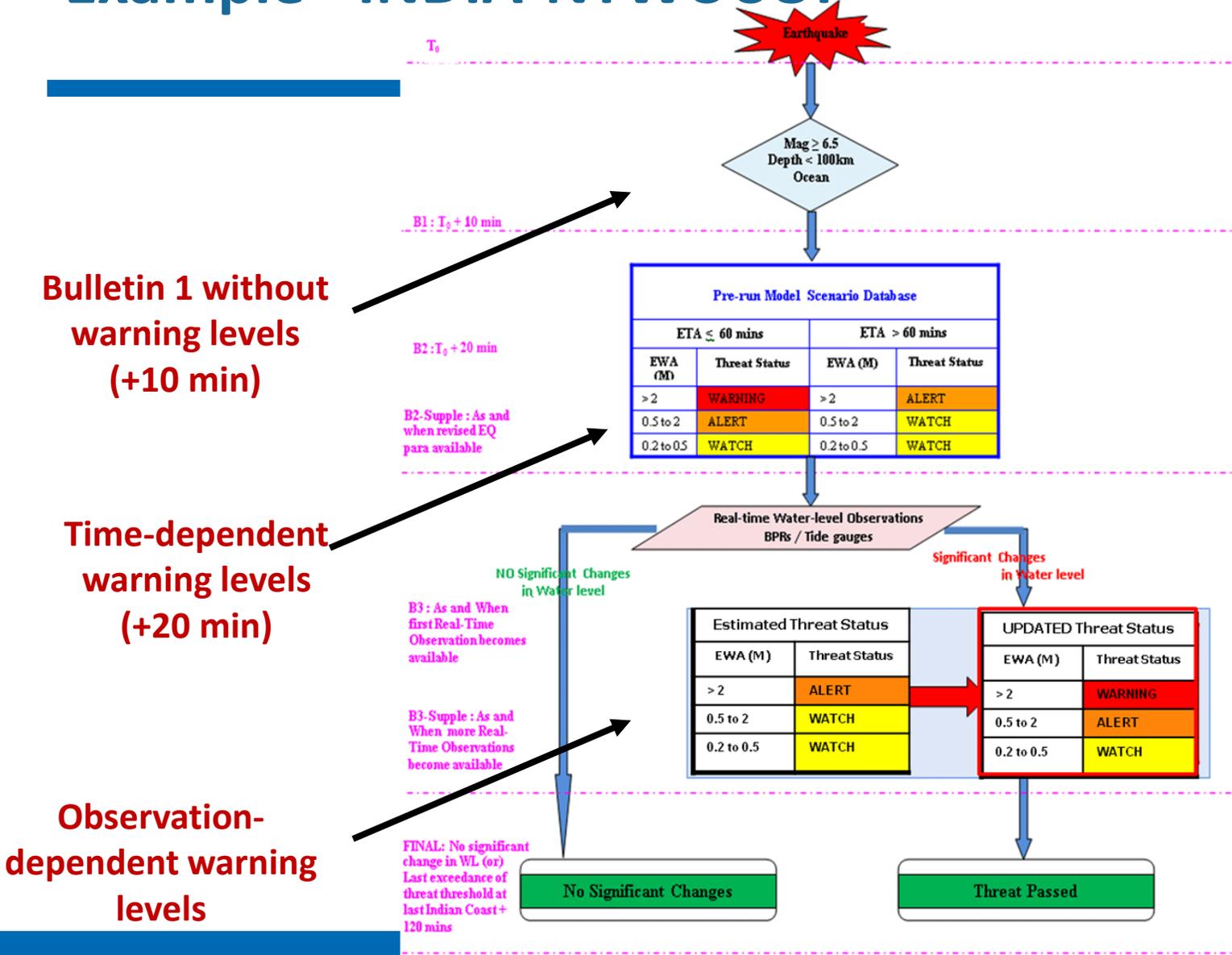
Spatial data files containing

- Threat Category
- wave forecast data
- T1, T2, T3 & T4 Tsunami Arrival times in minutes

These spatial data can be overlaid on GIS software to display in mapping applications

COUNTRY	CNTRY_CODE	CENT_LON	CENT_LAT	T1	T2	T3	T4	MAX_BEACH	MAX_DEEP	DEPTH	THREAT_CAT	AOM
SINGAPORE	158.000000000000	103.85124677100	1.33881427142	840.000000000000	-99.000000000000	1004.000000000000	-99.000000000000	0.29538846016	0.109999999940	52.000000000000	No Threat	AOS
AUSTRALIA	0.000000000000	73.26342044540	-53.29986985450	594.000000000000	668.000000000000	734.000000000000	1216.000000000000	2.01416110992	0.90999996662	24.000000000000	Threat	AOS
FRANCE	0.000000000000	68.86434073000	-49.95065712740	548.000000000000	562.000000000000	762.000000000000	1432.000000000000	1.03955352306	0.47999998927	22.000000000000	Threat	AOS
FRANCE	0.000000000000	51.84936029750	-46.69022650880	552.000000000000	560.000000000000	596.000000000000	666.000000000000	1.08699142933	0.25999999046	305.000000000000	Threat	AOS
FRANCE	0.000000000000	50.01169595120	-46.15794402920	562.000000000000	570.000000000000	608.000000000000	896.000000000000	0.87969326973	0.22999998927	214.000000000000	Threat	AOS
FRANCE	0.000000000000	77.30990071540	-37.83452541810	400.000000000000	408.000000000000	408.000000000000	560.000000000000	0.64558058977	0.109999999940	1186.000000000000	Threat	AOS
MADAGASCAR	0.000000000000	40.60656972800	-22.36277740410	588.000000000000	-99.000000000000	638.000000000000	-99.000000000000	0.18298400939	0.029999999933	1384.000000000000	No Threat	AOS
MADAGASCAR	0.000000000000	42.96214118790	-17.05909700690	550.000000000000	-99.000000000000	556.000000000000	-99.000000000000	0.17605258524	0.029999999933	1186.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	19.96789765520	-35.04806520970	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	22.51863354250	-34.25372965890	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	23.99238476010	-34.26563686740	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	25.67552384520	-34.26099157890	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	27.02885157870	-33.78575233050	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	29.18659626930	-32.27909658450	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	29.61889648440	-31.87977634490	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	0.000000000000	29.99125031150	-31.59009250280	650.000000000000	-99.000000000000	716.000000000000	-99.000000000000	0.27714878321	0.09999999404	59.000000000000	No Threat	AOS
SOUTH AFRICA	246.000000000000	30.58339917880	-30.97505927820	648.000000000000	1000.000000000000	1002.000000000000	1006.000000000000	0.55538940430	0.22999998927	34.000000000000	Threat	AOS
SOUTH AFRICA	246.000000000000	31.18374150590	-30.05259366170	648.000000000000	-99.000000000000	686.000000000000	-99.000000000000	0.35043060780	0.109999999940	103.000000000000	No Threat	AOS
SOUTH AFRICA	246.000000000000	32.00834019800	-29.12181438410	636.000000000000	-99.000000000000	694.000000000000	-99.000000000000	0.49542510509	0.14999999106	119.000000000000	No Threat	AOS
MOZAMBIQUE	0.000000000000	33.02951049800	-25.72757920700	656.000000000000	-99.000000000000	1418.000000000000	-99.000000000000	0.36706930399	0.109999999940	124.000000000000	No Threat	AOS

# Example - INDIA-NTWC SOP



## Indian Tsunami Early Warning Centre User Guide

Version-2

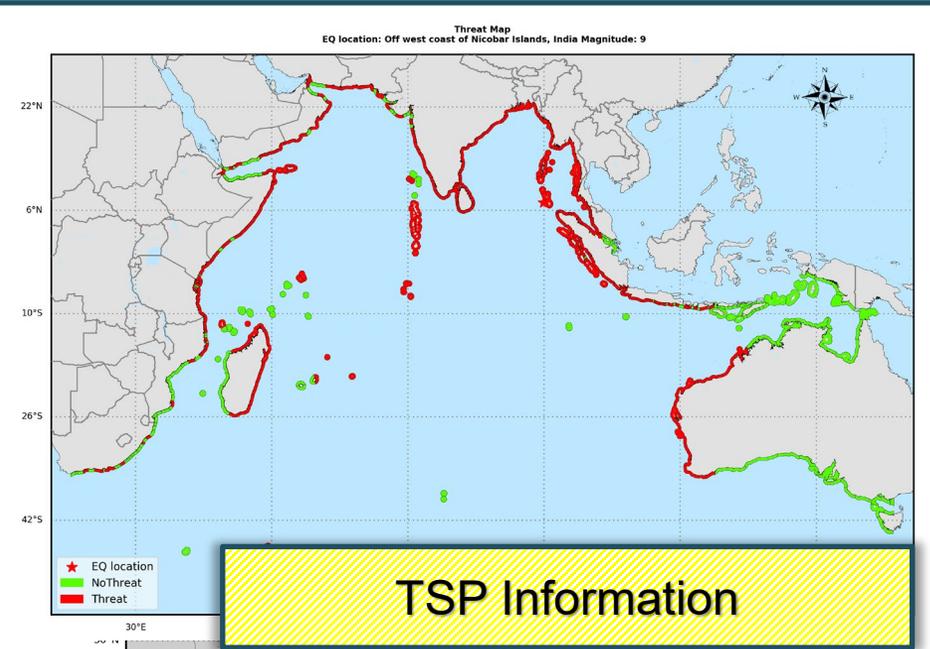


Indian National Centre for Ocean Information Services  
Ocean Valley, Pragathi Nagar (B.O), Nizampet (S.O)  
Hyderabad- 500090

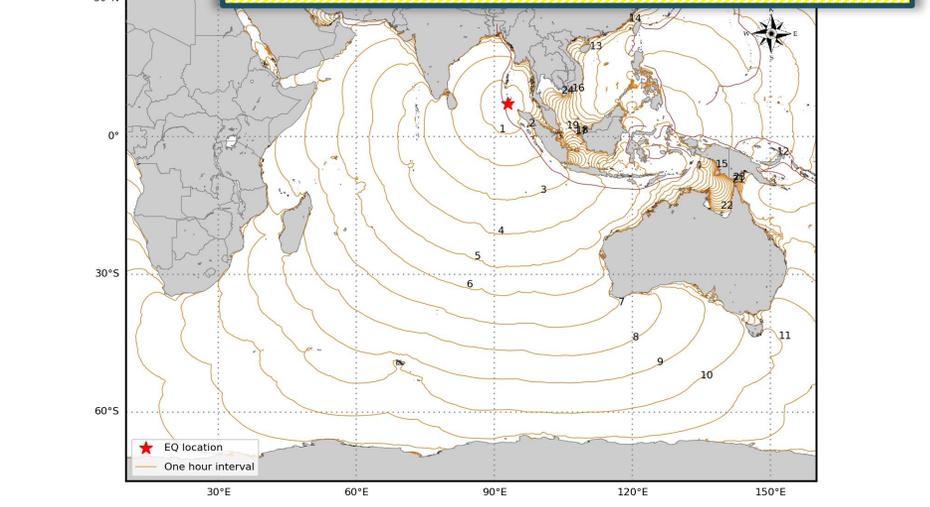
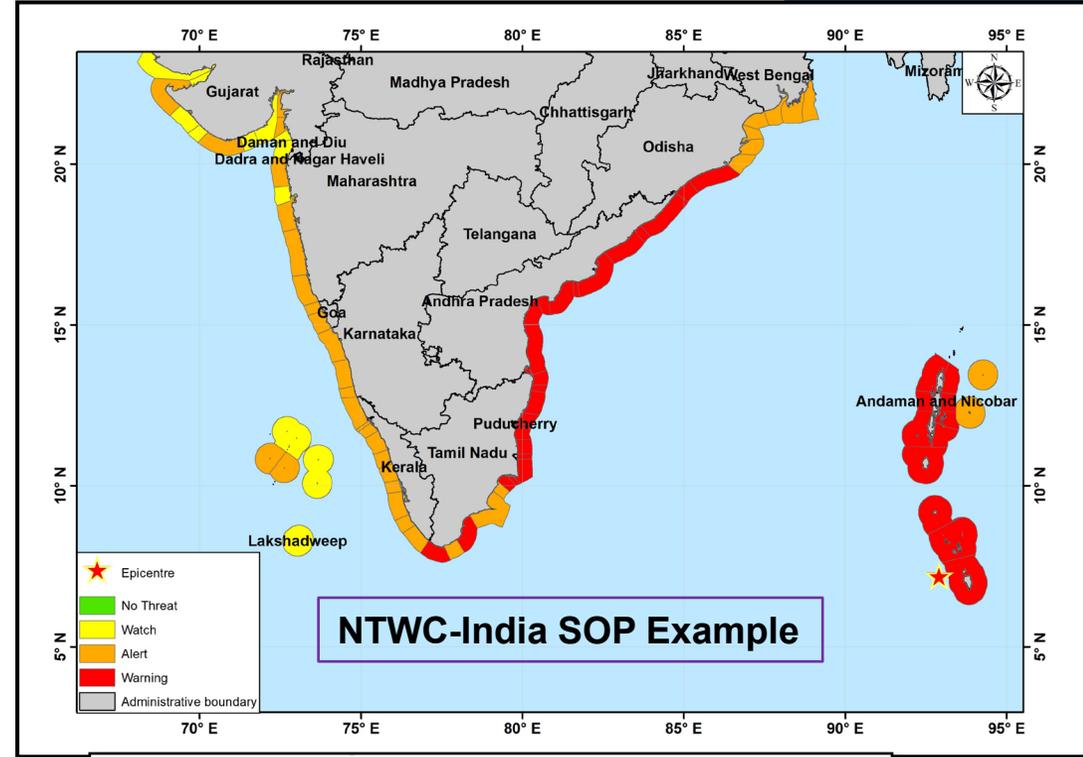
# Example – NTWC Bulletin Types & Timelines (INDIA)

Bulletin	Information	Time of issue (Earthquake Origin time as $T_0$ ) minutes
Type-1 (Tsunami genesis)	Preliminary EQ Parameters and <b>LAND / NO THREAT</b> Information based on <b>EQ Location, Magnitude &amp; Depth</b> .	$T_0 + 10$
	Preliminary EQ Parameters and <b>Qualitative Tsunamigenic potential</b> based on EQ Location, Magnitude & Depth	
Type-2 (Potential Threat)	Preliminary EQ Parameters and NO THREAT Information from Model Scenarios	$T_0 + 20$
	Preliminary EQ Parameters and <b>Quantitative Tsunami Threat (WARNING / ALERT / WATCH)</b> Information from Model Scenarios	
Type-2- Updates	Revised EQ Parameters and Quantitative Tsunami Threat (WARNING / ALERT / WATCH) Information from Model Scenarios - <b>If revised EQ Parameters are available much before the real-time water level observations are reported.</b>	as and when revised earthquake parameters are available or after Earthquake Elapsed Time + 60 mins
Type-3 (Confirmed Threat)	Revised EQ Parameters and <b>Quantitative Tsunami Threat (WARNING / ALERT / WATCH)</b> Information from Model Scenarios and <b>Real-time water level observations</b> indicating Tsunami Generation.	<b>as and when the first real-time water level observation is available</b>
Type-3 Supplementary – xx	Revised EQ Parameters and Quantitative Tsunami Threat (WARNING / ALERT / WATCH) Information from Model Scenarios and Real-time water level observations indicating Tsunami Generation Threat PASSED information for individual Zones	<b>Hourly update / as and when the subsequent real-time water level observations are available</b>
Type-4 (Final)	Issued when water levels from multiple gauges confirm that no significant tsunami was generated.	
	120 minutes after a significant tsunami passes the last Indian threat zone; <b>Final bulletin and no further bulletins will be issued</b> unless additional information becomes available	<b>Issued 2 hours after last arrival time in the Indian coast of a wave over 0.5m</b>

# Apply NTWC SOP and Disseminate based on National SOP Arrangements



**Apply NTWC SOP**  
Generate the Bulletins based on NTWC SOP, TWS- Templates, and SOP Arrangements



Threat Status	Action to be taken	Dissemination to	Icon
<b>WARNING</b>	Public should be advised to move inland towards higher grounds. Vessels should move into deep Ocean	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Public, Media	
<b>ALERT</b>	Public should be advised to avoid beaches and low-lying coastal areas. Vessels should move into deep Ocean	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Public, Media	
<b>WATCH</b>	No immediate action is required	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Media	
<b>THREAT PASSED</b>	All clear determination to be made by the local authorities	MoES, MHA, NDMA, NCMC, NDRF Battalions, SEOC, DEOC, Public, Media	



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**THANK YOU**