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***WG2 Tsunami Detection
Warning and Dissemination
Progress Report***

Chair

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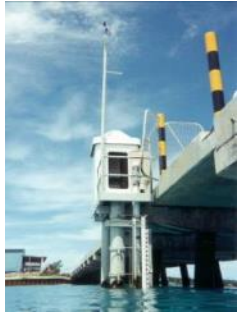
07 August 2024

Detection, Warning and Dissemination – Current Status / Highlights



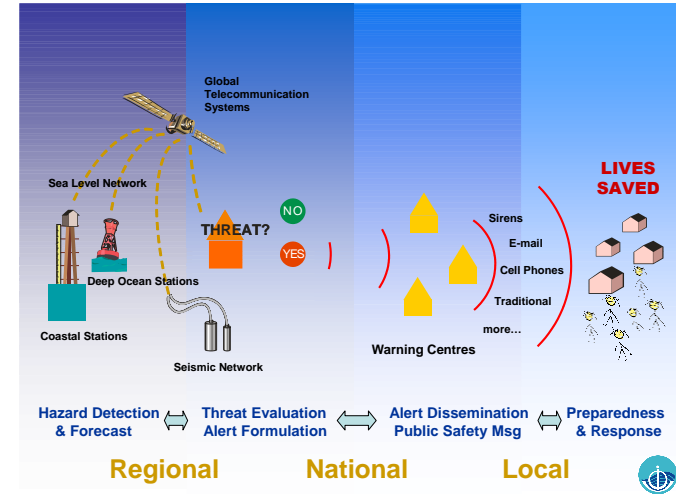
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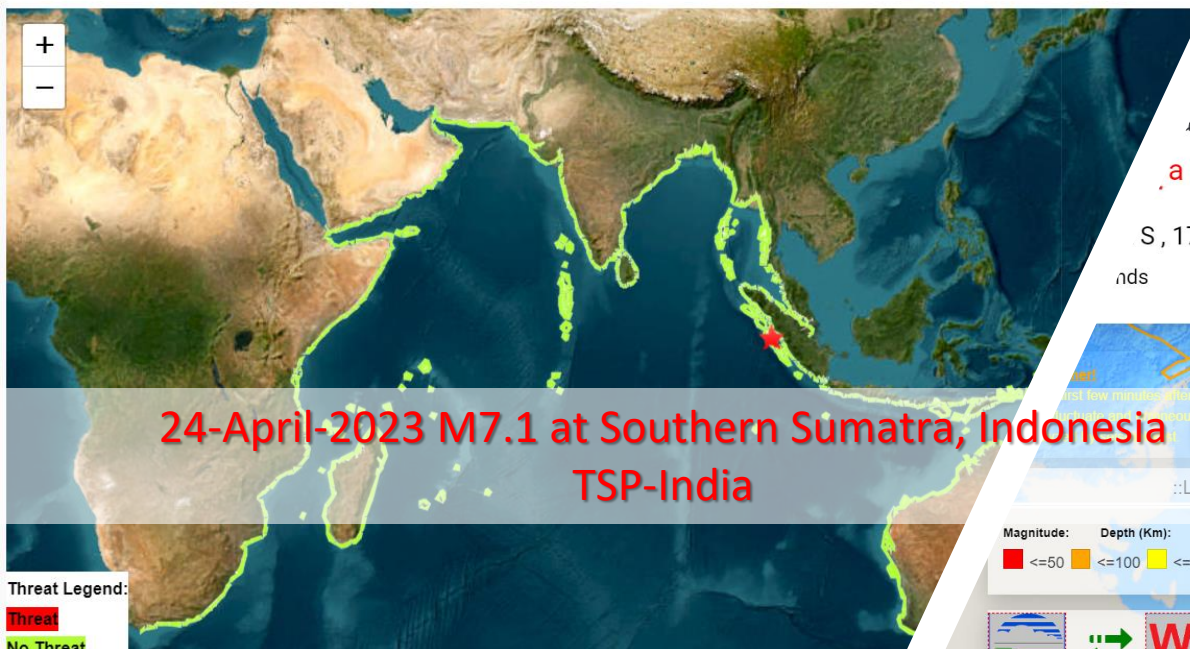


Sovereign national tsunami warning principle

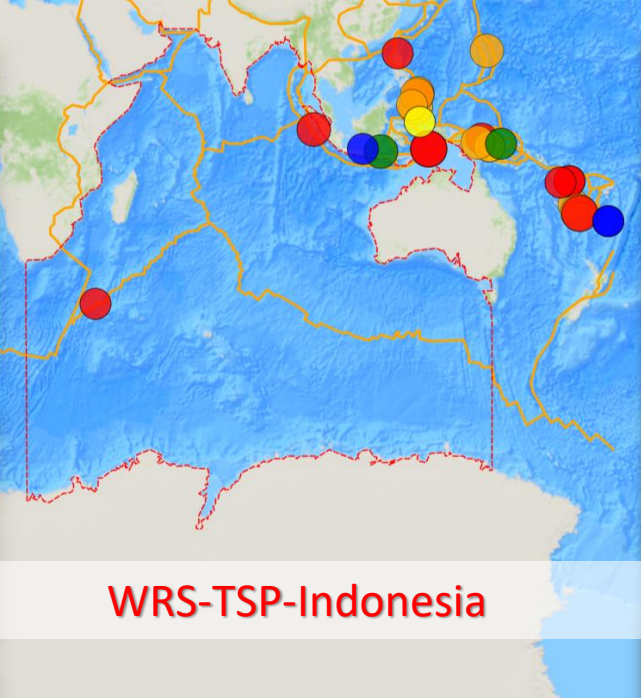
- Under ICG/IOTWMS there are 3 Tsunami Service Providers (TSPs) (Australia, India, Indonesia) to provide tsunami threat information to National Tsunami Warning Centres (NTWCs)
- During the reporting period Indian Ocean witnessed 2 events,
 - (i) 24-April-2023 M7.1 at Southern Sumatra, Indonesia
 - (ii) 21-May-2023 M6.8 at Prince Edward Islands region
 - (iii) 10 Jul 2024 M6.6 at South of Africa
- NTWCs issue sovereign warnings to their at-risk communities
- NTWCs operate within multi-hazard frameworks.
- Threat information now being provided for non-seismic source tsunami, eg volcanoes, landslides,... by TSP-Australia. other two TSPs planned to implement.
- Maritime products for NAVAREAs to be trialed and implemented in 2024 by TSPs – IHO contacts and mechanism of dissemination needs to be formulated with Secretariate.
- Competency training framework being developed for NTWCs
- TSP operations are ISO compliant: ISO 9001 (India & Australia), ISO 22328-3 (Indonesia)
- Phase 2c of the UNESCAP-funded project on "Strengthening Tsunami Warning in the Northwest Indian Ocean through Regional Cooperation" launched on 15th November.



The screenshot shows a 'Warning & Dissemination' interface. It includes a map of the Indian Ocean region, a data table with columns for 'Station', 'Depth', 'Type', 'Status', and 'Alert', and a globe showing the warning area. The interface is used for monitoring and disseminating tsunami warnings.



Earthquake:
Mag>6.5, Last 3 years
in 2024, 07:12:24
a month ago
S, 175.51 W || 227Km
nds



6.5 IOTWMS TSP INDONESIA
BULLETIN-1 (REAL EVENT)
Issued: 2024-01-23T14:43:00UTC

Origin Time: 23-Jan-2024 14:33:45 UTC
Location: 17.95S, 168.07E
Depth: 22 Km

EARTHQUAKE BULLETIN

TSP INDONESIA BULL-1 ISSUED EQ
Mag 6.5 14:33:45UTC 23-Jan-2024

IOTWMS-TSP
INDONESIA

14:33 UTC 23 January 2024 Mag 6.5	Vanuatu Islands
22:12 UTC 18 January 2024 Mag 6.5	Tonga Islands
20:48 UTC 08 January 2024 Mag 6.8	Talau Islands, Indonesia
07:10 UTC 01 January 2024 Mag 7.5	Near West Coast of Honshu, Japan
09:15 UTC 28 December 2023 Mag 6.5	Kuril Islands
12:56 UTC 07 December 2023 Mag 6.9	Vanuatu Islands
19:49 UTC 03 December 2023 Mag 6.8	Mindanao, Philippines
10:35 UTC 03 December 2023 Mag 6.6	Mindanao, Philippines
16:03 UTC 02 December 2023 Mag 6.6	Mindanao, Philippines
14:37 UTC 02 December 2023 Mag 7.5	Mindanao, Philippines
21:46 UTC 27 November 2023 Mag 6.5	Near North Coast of Papua New Guinea
09:05 UTC 24 November 2023 Mag 6.8	Mariana Islands
04:47 UTC 22 November 2023 Mag 6.6	Vanuatu Islands
08:14 UTC 17 November 2023 Mag 6.9	Mindanao, Philippines
13:02 UTC 08 November 2023 Mag 6.7	Banda Sea
04:54 UTC 08 November 2023 Mag 7.4	

EARTHQUAKE: Prince Edward Islands Region 14:56 UTC 21 May 2023 Mag 6.8

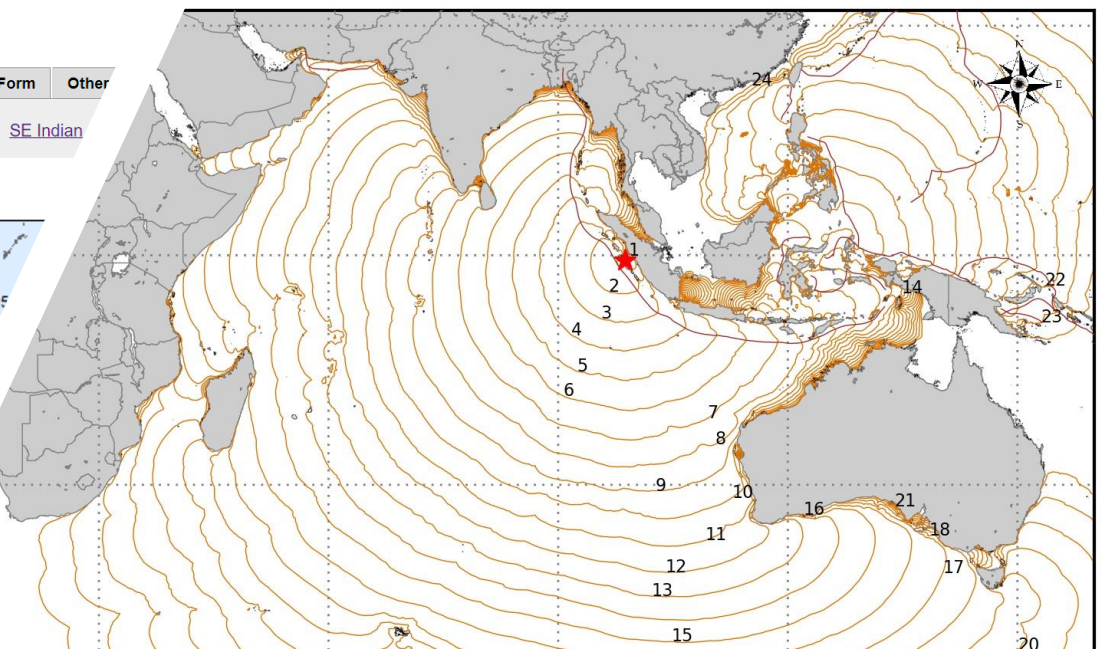
INFORMATION FOR BULLETIN 6. Potential Threat Bulletin 1923UTC 21 May 2023

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

• [Indian Ocean](#) • [SW Indian Ocean](#) • [NW Indian Ocean](#) • [NE Indian Ocean](#) • [SE Indian Ocean](#)



Tsunami Travel Time map
Earthquake location: Southern Sumatra, Indonesia Magnitude: 6.8



CURRENT STATUS

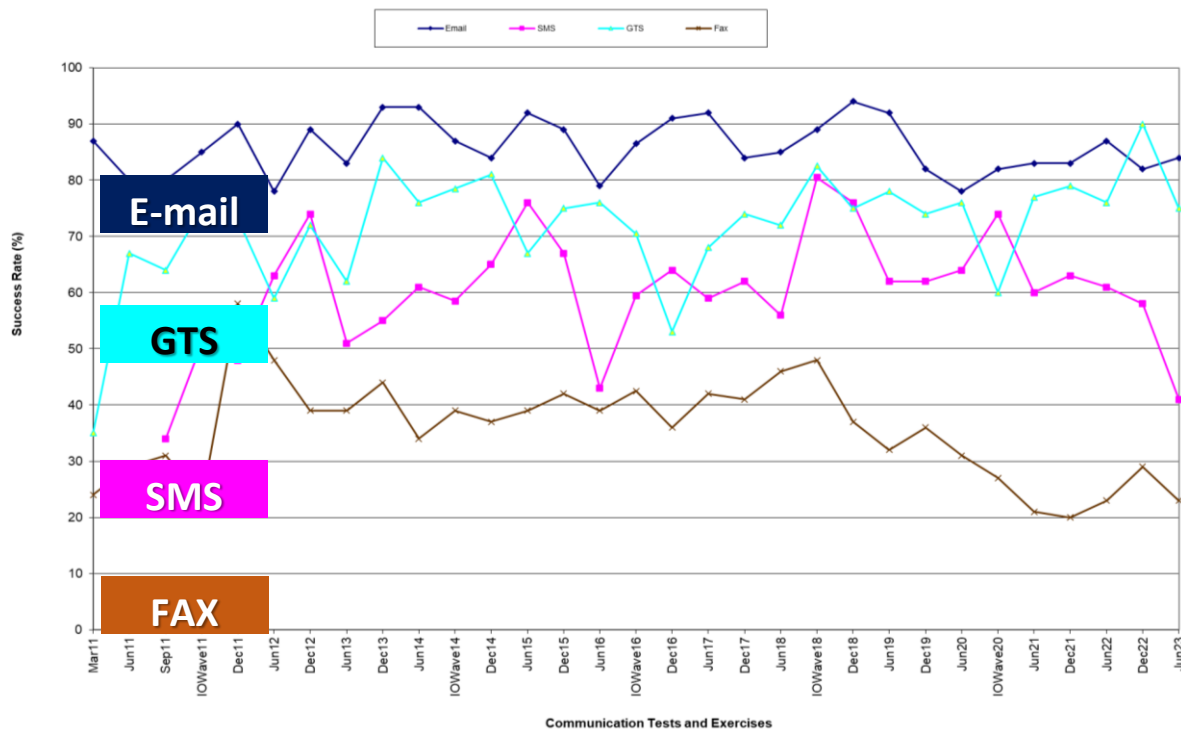


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- Communication Tests were conducted in June 2023 and June 2024.
- NTWCs Web Access and Reporting Rates

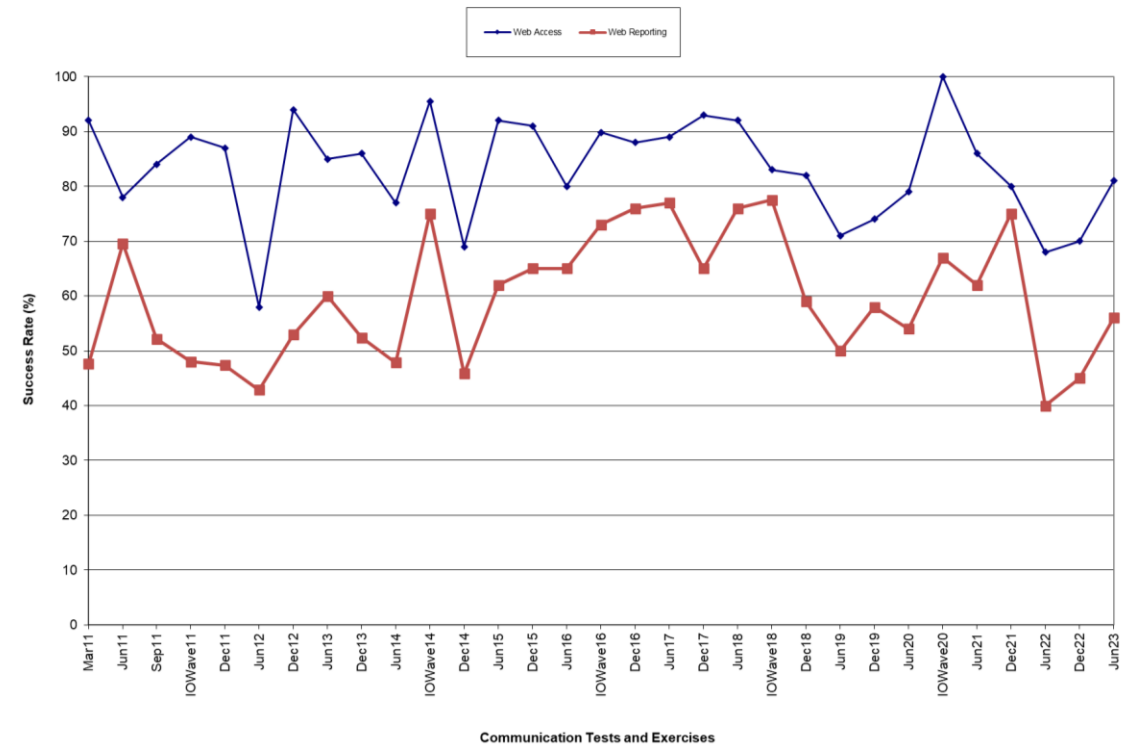
TSP TO NTWC SUCCESSFUL DELIVERY RATE OF NOTIFICATION MESSAGES

TSP to NTWC Message Delivery Success Rates



NTWCs Web Access and Reporting Rates

NTWC Web Access and Reporting Rates



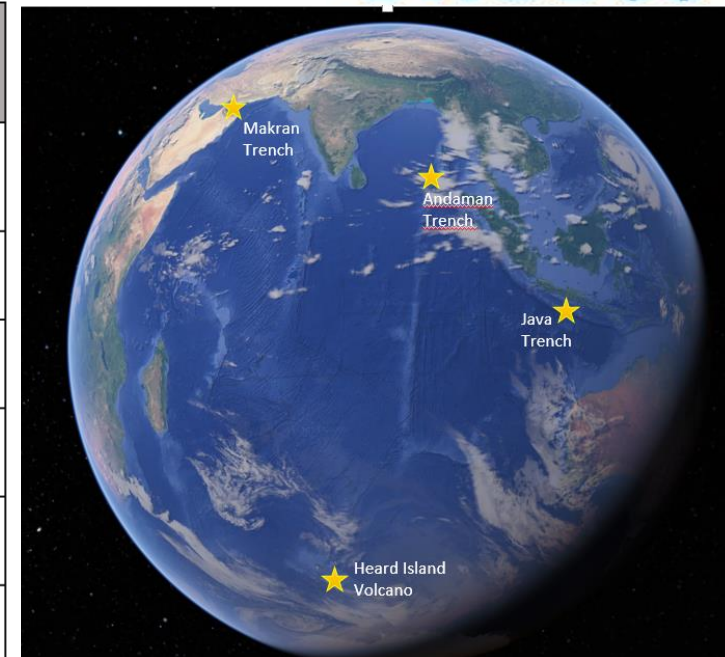
(i.e., accessing the password-protected TSP Webpages for threat information and products; and then reporting back what each country's warning status is)

IOWave23 Scenarios



Scenario	1. Andaman Trench	2. Makran Trench	3. Heard Island Volcano	4. Java Trench
Date	4 October 2023 (Wednesday)	11 October 2023 (Wednesday)	18 October 2023 (Wednesday)	25 October 2023 (Wednesday)
Time	04:00 UTC	06:00 UTC	06:00 UTC	02:00 UTC
Magnitude	~M9	~M9	n/a	~M9
Depth	10 km	10 km	n/a	10 km
Latitude	7.20N	24.80N	53.10S	10.40S
Longitude	92.90E	58.20E	73.52E	112.80E
Location	Off west coast of Nicobar Islands, India	North-West Indian Ocean	Kerguelen Islands Region, Southern Ocean	South of Java, Indonesia

Non-Seismic Event

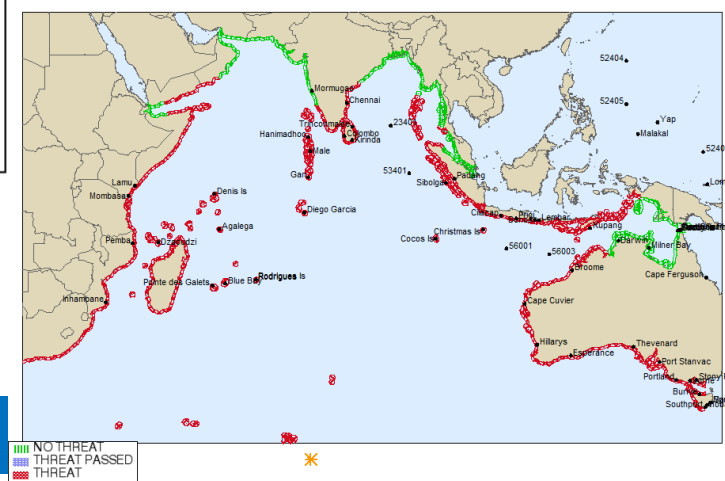


25 countries under threat

20 countries under threat

20 countries under threat

19 countries under threat



TT-TWO 19-20, February 2024

Working Group -2 : work plan 2023-25 & Progress



- 1. Publish, advertise, and implement the updated IOTWMS TSP Service Definition Document (Version 5) and request the TSPs to conform to it. (Secretariat, TSPs);** - Adopted the Version 5 during ICG/IOTWMS –XIII ; TSPs are implementing the updated SDD.

The updated Draft Version 5 of the SDD was presented to the ICG/IOTWMS during its 13th session. The ICG/IOTWMS then endorsed Version 5, recommending that Tsunami Service Providers (TSPs) implement this latest version. The following are the major changes in the SDD-V5

- Added an explicit statement that TSPs can issue a Level 2 bulletin if there is a threat to the Indian Ocean from earthquake outside the Indian Ocean source zone, even if the magnitude is less than M8.0. This addressed a request to WG2 from the ICG/IOTWMS XII.
 - Marked any earthquake magnitude change as "Updated", not "Revised" to minimise chance of mistaking 'revised' as 'arbitrary'. This addressed a request to WG2 from the ICG/IOTWMS XII.
 - Added a requirement to produce a new TSP product to NAVAREA Coordinators for their issuing navigational warnings to ships. Product templates and examples are also added.
 - Updated the KPI reporting threshold from M6.5 to M6.8 in USGS final solution. This is to improve reporting consistency without compromising reporting standards.
 - Defined explicitly those traffic light reporting thresholds of 'on target/near target/missing target' to improve clarity of the performance reporting.
 - Expanded the TSP services (not mandatory but on best effort and voluntary basis) to handle non-seismic and complex tsunami sources to meet increasing demands.
- 2. Update the NTWC User Guide in accordance with the updates to the TSP Service Definition Document (Secretariat, TSPs);**
- A draft NTWC User Guide is under preparation with updates on seismic and non-seismic templates and procedures.(Led by Robert). – JP, Nora
 - 3. Maintain the NTWC User Guide and TSP Service Definition Document (Secretariat, TSPs);** - on going
 - 4. Implement further the TOWS-WG request on TSP messages for the maritime community and Secretariat to obtain contacts for NAVAREA operators (TSPs, Secretariat);** - TSP-Australia & TSP-India are ready to produce such TSP maritime bulletins

-We lack subscribers and must establish a procedure for contacting NAVAREA coordinators and maintaining their details, which we propose adding to the NTWC/TWFP Contact Database. (Secretariat)

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5. **Provide training subject to resources including: (Led by Dr. Karyono , Secretariat, TSPs) – TBD**
 - a) Awareness on tsunamis generated by non-seismic and complex sources
 - b) An additional one-day session on Tsunami Warning Centre and Seismic Network Operations as part of all future Standard Operating Procedure (SOP) training (Dr Karyono with support from TSPs, Secretariat);
 - c) Support to increase the capacity for analyzing real time seismic and sea level data for tsunami threat (TSPs, Secretariat);
 - d) On job trainings for the Indian Ocean Member States (Secretariat and IOTIC to assist the TSPs);
 - e) Capacity support for NTWCs in tsunami modeling to support generation of threat forecast (Secretariat, IOTIC, TSPs);
Provide training subject to resources including:
6. **Identify sea level observations that are not available on the IOC sea level station monitoring facility and update the IOC on the data feeds (NTWCs, TSPs); -TBD**
7. **The Secretariat to work with the IOC Sea Level Facility to identify reliable tide gauge stations with fast transmission rates (Secretariat); - !!**
8. **Assist the Secretariat in maintaining the database of seismic and sea-level reporting stations for the IOTWMS (Secretariat, WG-2 members); - On Going [The Secretariat proposes to reach out to each Member State yearly to check the TNC, NTWC, and contact details for receipt of TSP bulletins are up-to-date. Included in this we could also check the real-time seismic and sea-level stations operated in each Member State (if agreed in this meeting). The current seismic and sea level station database is many years old and needs updating to reflect the current configurations.] Through Capacity Assessment survey!!**
9. **Determine the work required for the optimal seismic and sea level network coverage and identify instrumentation gaps for more accurate and timely tsunami warnings in the Indian Ocean region noting the work of the PTWS (Secretariat, Karyono, Robert, JP) - Yet to initiate. The current TOWS-WG upcoming guidelines will be used to meet the requirements**

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10. **Contribute to the conduct of ocean-wide exercise (IOWave23) and 6 monthly IOTWMS Communication Tests and prepare reports of each test in conjunction with the Secretariat (TSPs, NTWCs; Secretariat);**
 - ✓ Supported the IOWave23 throughout the pre/during/post stages.
 - ✓ Conducted 2 comms tests (Dec 2022, Jun 2023, June 2024) with issues captured in each comms test report and followed up (where practically possible).
11. **Encourage the NTWCs of Member States to increase the frequency of tabletop or similar tsunami warning exercises to review and test SOPs and reduce the potential for complacency among countries that have not experienced a recent tsunami event (NTWCs); - On going**
12. **TSP Australia to share the outcomes of the Australian warning system currently in development with respect to the multi-hazard early warning approach or system for mutual benefits (to be led by Robert Greenwood) and take this up for wider consideration across all ICGs (TT TWO representatives from Indian Ocean);**
13. **Assist WG-3 with the SOP training workshops on IOC-UNESCO Tsunami Ready Recognition Programme (TSPs); WG2 has supported the Wg3 to conduct the below workshops & trainings.**
 - ✓ 01Jun -ICG/IOTWMS : Eastern Indian Ocean Member State Preparation Meeting for SOP Workshop
 - ✓ 01 Jun -ICG/IOTWMS : Western Indian Ocean Member State Preparation Meeting for SOP Workshop
 - ✓ 03-06 Jul -ICG/IOTWMS : Western IO Member States Training Workshop on SOPs for NTWCs and DMOs (Hybrid)
 - ✓ 10-13 Jul -ICG/IOTWMS : Eastern IO Member States Training Workshop on SOPs for NTWCs and DMOs(Hybrid)
 - ✓ 07-08 Aug - ICG/IOTWMS : North-West Indian Ocean SOP Hybrid Training Workshop

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14. **Establish a work mechanism between NTWCs and TSPs to solve communication issues (i.e. non-receipt of messages) and re-examine the need for fax (TSPs, Secretariat); - in progress**
15. **Consider having the TSPs send an SMS/email notification whenever there are tsunami product updates**
-The requirement was already met. 3 TSPs are sending the SMS/Email notifications for any new bulletins issued. Closed
16. **Encourage NTWCs to conduct a risk assessment of upstream tsunami warning including dissemination of tsunami warnings, reliable resources, etc. (for example, SWOT analysis: strengths, weaknesses, opportunities, threats) (TSP Australia, Secretariat);**
17. **In regard to tsunamis generated by non-seismic and complex sources (e.g. volcanoes, landslides, splay-faulting, meteotsunami, onshore earthquakes, mud volcanos):**
 - a) **Extend the TSP services to include tsunamis generated by non-seismic and complex sources (TSPs); -**
The SDD V5 revisions specify the bulletin formats for both seismic and non-seismic tsunami sources. During the SOP workshop, it was highlighted that TSP Australia employs a uniform approach for all sources, though it's noteworthy that only volcanic tsunamis have been empirically tested in a real-world scenario. TSPs are encouraged to innovate in threat assessment techniques, provided that their outputs comply with the standards set forth in SDD V5.
 - b) Investigate methods of detection and threat assessment of non-seismic and complex source tsunami events in coordination with TOWS-WG TTTWO,
 - c) Prepare an atlas of known sources, and – in progress (India)
 - d) Conduct an online workshop on non-seismic and complex source tsunami events (JP, Mohammad, Ameer, Robert, Secretariat); -TBD

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- 18. Share information on possible new tsunami-detection technologies such as pressure sensors attached to undersea communications cables (WG-2 members & NTWCs); -**
- 19. Assist NTWCs with their implementing Common Alerting Protocol (CAP), mobile applications and social media including WRS-TSP Indonesia for effective dissemination of national tsunami warning information (Australia, India, Indonesia, NTWC representative – to be confirmed);**
- 20. Request Member States to review TSP bulletin dissemination details annually and advise of updates (Secretariat).**
- 21. To support and contribute on the Capacity Assessment of Tsunami Preparedness in the Indian Ocean Report which is under way.**

Other WG2 Updates

- Held WG2 intersessional meetings 2022, online WG2 meetings in 2023.
- Global tsunami coordination
 - Supported the yearly global tsunami coordination meetings of TOWS-WG and its Task Team Tsunami Watch Operations
 - Supported the Ad Hoc Team on Tsunamis Generated by Volcanoes through surveys.
 - Contributed to the harmonised global performance framework and questionnaires

2. Challenges/Gaps in Tsunami Detection Warning and Dissemination



- Challenge to sustain the seismic and sea level networks/observing systems
- Major challenge to enable free and full data sharing of real-time observations .
- Challenge to sustain research and development efforts that
 - update or expand the pre-computed scenario database to real-time tsunami modelling capabilities, that
 - develop auto-alerting capability and improve use of real-time observations including new/emerging technologies such as GNSS and SMART cables, and that
 - provide scientific basis for impact-based forecasts and warnings.
- Insufficient inter-agency coordination and cooperation, which reduced wider reach of warnings, and the timely and appropriate emergency response.
- Integrated Multi-hazard approach remains largely a concept unless coordinated at each Members states.
- Major challenge to provide timely and accurate tsunami detection and warning to near-field tsunami, and non-seismic and complex tsunami.

3. Plans and timelines – 2024-25



- Initiating the trail run of TSP messages [At least one TSP] for the maritime community in co-ordination with Secretariat & NAVAREA operators – for the Upcoming Communication Tests . –Dec 2024.
- Contributing to WG-1 for the Capacity Assessment of Tsunami Preparedness in the Indian Ocean Report. – Dec 2024.
- Creating a Standard Operating Procedure (SOP) document for dealing with non-seismic sources of tsunamis, specifically focusing on Tsunami-Generating Volcanic Events (TGVVs), involves outlining clear, step-by-step procedures that TSPs can follow. – Dec 2024
- Prepare an atlas of known sources with possible tsunami travel times for ready reference to NTWCs.- TBD
- Contribute to the conduct of regular exercises and communication tests of the IOTWMS. – [As and When]
- WG2 to realign the action plans to meet the broader objectives of UN Ocean Decade Tsunami Program in addition to the ICG/IOTWMS WG2 roles and responsibilities/ Plans. – TBD
- Determine the work required for the optimal seismic and sea level network coverage and identify instrumentation gaps for more accurate and timely tsunami warnings in the Indian Ocean region noting the work of the PTWS - The report from TOWS-WG is now available, and we need to see the possible adoption to ICG/IOTWMS through a task team.



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Changes and Clarifications to Performance Reporting

	Service Level 1 EQ Bulletins (Change to report Mag 6.8 and above in all source zones)					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	10-15 min	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+



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Thanks!