INTERSESSIONAL MEETING OF ICG/IOTWMS WORKING GROUP 2
TSUNAMI DETECTION, WARNING AND DISSEMINATION

Online Meeting, 10 December 2020

Members Attending:

Dr. Yuelong Miao, Chair (Australia)
Mr. Patanjali Kumar Chodavarapu, Vice-Chair (India)
Dr. Karyono, Vice-Chair (Indonesia)
Dr. Robert Greenwood (Australia)
Ms. Adrienne Moseley (Australia)
Mr. Jijjavarapu Padmanabham (India)
Mr. Afiq Zhofri Abdul Razak (Malaysia)
Dr. Zaty Aktar Mokhtar (Malaysia)
Mr. Krisna Bucha (Mauritius)
Mr. Ameer Hyder (Pakistan)

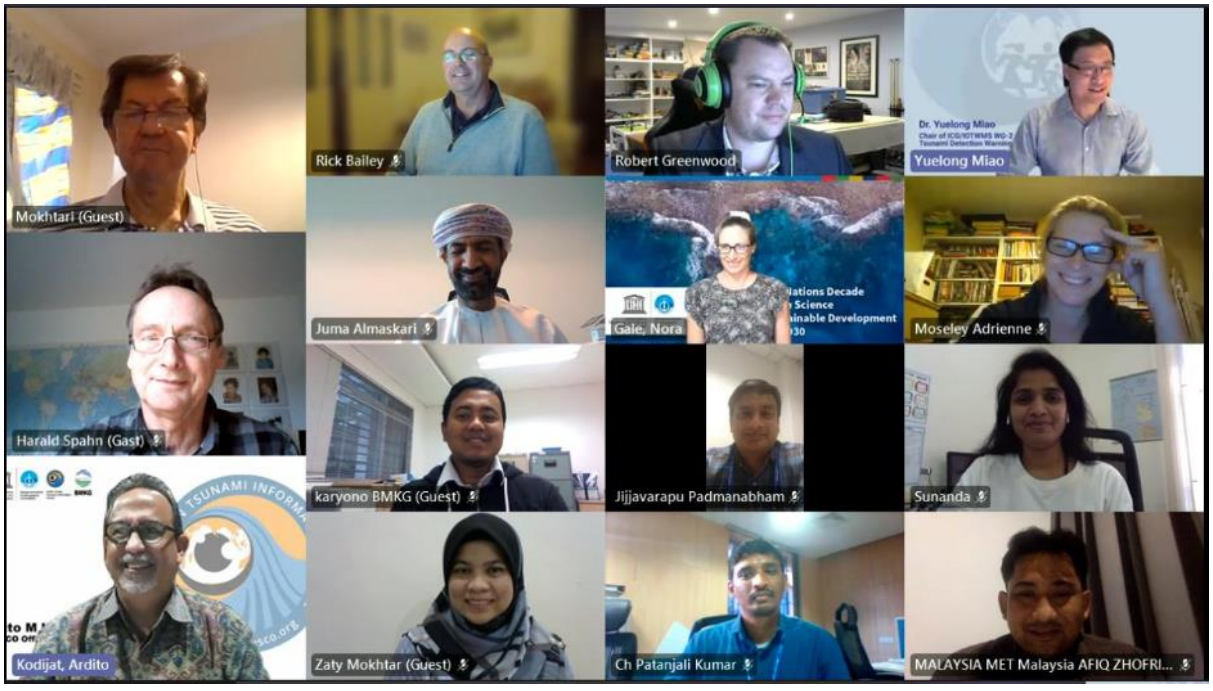
Invited Experts

Mr. Rick Bailey, Tsunami Consultant to UNESCO-IOC, Australia
Mr. Harald Spahn, DRR Consultant to UNESCO-IOC, Germany
Mr. Pattabhi Rama Rao Eluri, ICG/IOTWMS Vice-Chair India
Ms. V. Sunanda Manneela, WG-NWIO Vice-Chair India
Dr. Mohammad Mokhtari, WG-NWIO Chair Iran
Dr. Juma Said Al-Maskari, TT-MSZ Chair, Oman

UN Representatives

Ms. Nora Gale, ICG/IOTWMS Secretariat, UNESCO-IOC
Mr. Ardito Kodijat, IOTIC, UNESCO Jakarta

Participants at the Intersessional Meeting of Working Group 2 on Tsunami Detection, Warning and Dissemination, Online Meeting, 10 December 2020



1. OPENING

1.1 Opening Remarks

Opening remarks were provided by Mr. Pattabhi Rama Rao Eluri, Vice-Chair of the ICG/IOTWMS. He welcomed the distinguished delegates, member and invited experts to the intersessional meeting of ICG/IOTWMS Working Group 2 (WG-2) on Tsunami Detection, Warning and Dissemination. The recent Palu and Sunda Straight events were noted as examples of atypical source tsunamis that present significant challenges in the system. Since the last WG-2 meeting in September 2019 much progress has been made, including publications in response to the Covid-19 pandemic, two communication tests, and Exercise IOWave20. The exercise involved three scenarios held during 6-20 October 2020, as well as pre- and post-Exercise webinars. Furthermore, significant progress has been made in the UNESCAP-funded project on *Strengthening tsunami early warning in the North West Indian Ocean region through regional cooperation*. Mr. Eluri congratulated the Chair of WG-2 Dr. Yuelong Miao, the Working Group vice-chairs and members on their progress. He thanked the ICG/IOTWMS Secretariat and IOTIC for organising this meeting.

Dr. Yuelong Miao, Chair of WG-2, noted the extraordinary times and expressed his gratitude that we can meet together online to discuss activities of the Working Group. He declared the meeting officially open.

1.2 Review and Adoption of Agenda

Dr. Miao presented the agenda, which was adopted without modification (refer to Annex 1). The list of participants is provided above, with more details provided in Annex 2.

1.3 Terms of Reference and Membership

Dr. Miao reviewed the terms of reference and membership of Working Group 2.

The terms of reference are to liaise with other working groups and task teams within the ICG/IOTWMS and with working groups from the other ocean basins through the TOWS-WG to:

1. Coordinate and strengthen the operational implementation of a "System-of-Systems" providing interoperable tsunami threat information products and services for Member States.
2. Monitor the performance of key observational, warning and communication system components.
3. Identify areas of priority for action following assessments, communications tests, exercises and real tsunami events
4. Provide advice to the Indian Ocean Tsunami Information Centre (IOTIC) on educational materials about the warning systems and services.
5. Help strengthen the capacity and capability of Member States in relation to tsunami detection, warning and dissemination.

2. BRIEF REPORTS AND UPDATES ON ACTIVITIES

2.1 Review of Recommendations and Actions

Ms. Nora Gale of the ICG/IOTWMS Secretariat reviewed the open WG-2 actions that arose between 2015 and 2019.

The status of recommendations and actions from previous meetings and this meeting is tabled in Annex 3.

2.2 TOWS TTTWO Report – February 2020

Mr. Pattabhi Rama Rao Eluri reported on the TOWS-WG Inter-ICG Task Team on Tsunami Watch Operations (TTTWO) meeting held on 18-19 February 2020 in Paris, France. Highlights of the meeting included development of key performance indicators in relation to Sendai Framework for Disaster Risk Reduction, local source tsunami standard operating procedures, NTWC competency framework, products for the maritime community, and handling tsunamis from non-seismic sources and non-subduction zone earthquakes. There were 6 recommendations arising in the meeting:

1. ICGs to discuss procedures and best practices for local source tsunami SOPs drawing upon the guidelines provided by PTWS and subsequent inputs by the IOTWMS.
2. To use the draft PTWS National Tsunami Warning Centre Competency Framework in designing online and onsite training courses planned under the Ocean Teacher Global Academy (OTGA).
3. Broader sharing of seismic, sea level, and other data types that support tsunami warning and analysis capabilities per the ICG/IOTWMS communique on the need for enhanced data sharing.
4. The following changes to the Area of Service (AoS) Map:
    - PTWS: Include AoS of South China Sea Tsunami Advisory Centre (SCSTAC) in line with recommendations of the ICG/PTWS XXVIII, noting that NWPTAC no longer provides service for this area.
    - NEAMTWS: Status of IPMA to be modified from Candidate TSP to Accredited TSP.
5. In order to record tsunamis from non-subduction earthquake sources as well as non-seismic sources a sample rate of 1 sample/sec or higher be implemented on sea level gauges.
6. To extend the tenure of the Task Team on Tsunami Watch Operations for a further term with the same Terms of Reference.

There were 6 Action from the meeting:

1. Team comprising Sarah-Jayne McCurrach (PTWS), Yuelong Miao and Harkunti Rahayu (IOTWMS), Elizabeth Vanacore and Mary Regifo (CARIBE-EWS), and Ocal Necmioglu (NEAMTWS) to complete work on harmonised performance monitoring framework including data collection tools/questionnaire and reporting formats for presentation to the next TOWS meeting.
2. Noting the importance of Common Alerting Protocol (CAP) for provision of harmonised tsunami warnings, requests IOTWMS to make a presentation to the next meeting of the Task Team on use of CAP.
3. IOC Secretariat to explore the possibility of providing links to TSP websites on the IOC TSU Webpage.
4. IOC Secretariat to provide links to important tsunami related documents and technical manuals in a readily accessible web page on the IOC TSU programme.
5. Francois Schindele and IOC Secretariat to finalize changes to the Global Service Definition Document for consideration at the next meeting.
6. Appreciating the presentations on non-megathrust and aseismic source tsunamis, requests the ad-hoc team comprising Yuji Nishimae, Francois Schindele, Weniza, Jacopo Selva, David Coetze, Valerie Clouard, Elizabeth Vanacore, and Ivica Vilibic to prepare a document on best practices for hazard assessment, monitoring and responding to tsunamis from those sources for the next TOWS meeting.

Dr. Robert Greenwood expressed interest in contributing to Action 6 on aseismic source tsunamis. Mr. Kodijat will put him in touch with Mrs. Weniza who is a team member.

2.3 TSP Reports on Service Updates

Dr. Robert Greenwood presented on behalf of TSP Australia, which is comprised of Geoscience Australia and the Australian Bureau of Meteorology. In July 2020, the Bureau's tsunami warning service was internationally accredited as an ISO 9001 compliant quality managed system. Australia participated in Exercise IOWave20 as a TSP as well as at national level. Future developments include the planned rollout of the upgraded tsunami decision support tool (planned for the first quarter of 2021); upgrade to the TSP services to align with the recent TSP Standard Service Definition (version 4, 2019); duty staff skills accreditation, and implementation of monthly functional testing between Geoscience Australia and the Bureau of Meteorology. The Covid-19 pandemic was reported to have had minimal impact on the TSP Australia service delivery.

Dr. Karyono presented on TSP Indonesia's performance, development and future plans. The Performance indicators were shown such that KP1s 1 and 6 were near target and KPIs 3, 4, and 5 met the target. Developments since last ICG include dissemination through social media (e.g. Twitter); upgrade to the SeisComp3 and decision support system, deployment of 39 new seismic stations and implementation of unique user password feature for each country on the TSP website. Indonesia participated in Exercise IOWave20 as a TSP as well as at national level. There are plans to develop a system to handle warning for atypical events, generate KPIs automatically, and provide a CAP data feed.

There was a discussion around use of Tsunami Observation and Simulation Terminal (TOAST). Ms. Sunanda Manneela explained that TOAST is a wrapper and GUI tool for back running tsunami models. Furthermore, it does not come with models, which must be input by the user.

Dr. Miao asked about plans for coastal sirens. Dr. Karyono noted that BMKG plans to pilot new sirens next year. Once they are functional, they will be handed over to the local government.

Mr. Patanjali Kumar Chodavarapu presented on TSP India. Developments since the last WG-2 meeting include a technology refreshment to the tsunami warning centre, real-time tsunami modelling using ADCRIC, upgrading the decision support system, proof of concept for Service Level 3, implementation of CAP for national and TSP services, and an event database and KPI generator. India participated in Exercise IOWave20 as a TSP as well as at national level. The communities as Venkatraipur and Noliasahi of Odisha State were recognised as Tsunami Ready by UNESCO-IOC. Future plans include to operationalize the KPI system, work on operational procedures for atypical tsunami sources, and ultise real-time GNSS and strong motion accelerometer data for earthquake rupture characterisation.

Dr. Miao enquired about the event database and KPI system. Patanjali replied that the system is online and the link will be shared with other TSPs soon.

Dr. Mokhtari suggested that a database for the Indian Ocean on real-time data could be considered with contributions from CTBTO. Dr. Moseley explained the process of NTWCs accessing CTBTO data.

2.4 TSP Performance against Key Performance Indicators

Mr. Patanjali Kumar Chodavarapu presented the TSP Key Performance Indicators (KPIs) for the January to November 2020 reporting period.

TSP KPIs 2020 (Jan – Nov)

	Service Level 1 EQ Bulletins					Service Level 2 Threat / No Threat Bulletins		
TSP	**KPI 1** **ET First EQ Bull** **Target: 10 mins (% met)**	**KPI 2** **POD IO EQs GE 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**
Australia	**13.8 min (10.5%)**	**n/a**	**0.09 (100%)**	**14.4 (100%)**	**21.9 (68.4%)**	**21.7 (66.7)**	**n/a**	**n/a**
India	**10.4min (55.6%)**	**n/a**	**0.19 (93.7%)**	**34.7 (81.25%)**	**20.7 (83.3%)**	**25 min (0.0%)**	**n/a**	**n/a**
Indonesia	**13.9min (45.0%)**	**n/a**	**0.26 (69.2%)**	**13.24 (90.0%)**	**26.5 (64.1%)**	**38 min (0.0%)**	**n/a**	**n/a**

NOTES
KPI 2: No IO events >= M6.8

KPI 6:
Australia issued 3 No Threat Bulletins
India issued 1 No Threat Bulletin
Indonesia issued

KPI 7,8: No events caused threat-level tsunami waves

Meets Target	Near Target	Misses Target

The TSP Earthquake Bulletins (SL1) and Threat Bulletins (SL2) were presented for all years.

TSP Earthquake Bulletins (SL1) and Threat Bulletins (SL2) – All Years

	TSP Australia				TSP India				TSP Indonesia			
Year	Number Issued		Av. Time (mins)		Number Issued		Av. Time (mins)		Number Issued		Av. Time (mins)	
	SL1	SL2	SL1	SL2	SL1	SL2	SL1	SL2	SL1	SL2	SL1	SL2
2011 (Oct-Dec)	11	2	10.3 55.6%	17 100%	9	1	8.9 60.00%	23 0.0%	5	3	25 50.00%	45 33.3%
2012	49	10	13.8 40.8%	24 40.0%	53	5	8.6 87.20%	20 60.0%	29	1	19.7 33.30%	24 0.0%
2013	58	6	17 5.2%	18.5 66.7%	54	4	11.4 40.50%	22.5 0.0%	35	0	15.4 29.00%	n/a
2014	61	4	14.8 25.0%	19 50.0%	50	1	10.9 50.00%	15 0.0%	37	0	14.2 18.20%	n/a
2015	56	7	13.6 31.6%	20.5 50.0%	35	0	10.5 78.10%	n/a	32	0	14.1 34.60%	n/a
2016	51	13	13.3 13.7%	18.4 71.4%	35	5	9.2 74.30%	20.6 40.0%	36	1	13.7 42.40%	90 0.0%
2017	40	4	12.7 22.5%	15.5 75.0%	30	3	11.5 46.7%	27.3 0.0%	27	1	19.9 40.7%	190 0.0%
2018	32	2	13.7 12.5%	22.0 50.0%	30	1	11.3 40.9%	25.0 0.0%	39	1	11.6 64.1%	38 0.0%
2019	31	3	15.8 16.1%	23.0 33.3%	25	2	11.4 40.0%	25.5 0.0%	30	4	10.5 63.3%	27 62.5%
2020 (Jan - Nov)	19	3	13.8 10.5%	21.7 66.6%	17	1	10.4 55.6%	25.0 0.0%	21	2	13.9 45.0%	38.0 0.0%
Total	***389***	***51***			***338***	***23***			***291***	***13***		
Average	***42.4***	***5.6***	***15.0*** ***22.9%***	***21.3*** ***62.3%***	***33.8***	***2.3***	***10.4*** ***57.3%***	***22.7*** ***12.8%***	***29.1***	***1.3***	***15.8*** ***42.1%***	***45.2*** ***47.8%***

Dr. Greenwood noted the difficulty in meeting the KPI 1 (first earthquake bulletin issued within 10 minutes) and KPI 6 (first tsunami threat bulletin issued within 20 minutes) and asked if they are appropriate targets. The KPIs were discussed by the Working Group and it was decided to leave them as they are.

2.5 IOTWMS Communication Tests 2019/20

Mr. Patanjali Kumar Chodavarapu presented on the ICG/IOTWMS communications tests and key performance indicators. There have been 21 communications tests held to date. The 22nd test, originally scheduled for December 2020, was cancelled due to the member state participation during IOWave20 in October 2020. Overall, the communication tests show that participation rates have increased. Message dissemination rates, web access, and status reporting were also reported on. (access all reports here)

2.6 Impacts of Covid-19 on IOTWMS Monitoring Networks

Dr. Karyono presented on the potential impacts of the Covid-19 pandemic on operations, data procurement and risks against the monitoring networks (i.e. seismic, tide gauge and tsunameter) as well as the Tsunami Service Providers. The findings are provided in the WG-2 report on *Impacts of Covid-19 Pandemic on IOTWMS Monitoring Networks and Tsunami Service Providers*, which was published in June 2020 (see access here). Similar initiatives were conducted in the other ocean basins.

The Working Group discussed conducting another survey in the near future.

2.7 Capacity Assessment of Tsunami Preparedness Report

Ms. Nora Gale presented on the IOC technical series publication (IOC TS-143): Capacity Assessment of Tsunami Preparedness in the Indian Ocean: Status Report, 2018. This report provides a new baseline of the status of tsunami preparedness capacity in the region. Of relevance to Working Group 2 is section 4 on detection, warning and dissemination.

Recommendations for the way forward were presented. Support for increasing the capacity for real-time seismic and sea-level data for tsunami threat analysis is a key priority. Support is also needed to increase the capacity for tsunami modelling to support the generation of tsunami threat forecasts. A further study should be undertaken to examine whether there is a need for so many different software tools to be used to analyse data for tsunami threat determination or tsunami modelling. Lastly, increasing the frequency of tabletop or similar tsunami warning exercises to review and test Standard Operating Procedures (SOPs), and to reduce the potential for complacency among countries that have not experienced a recent tsunami event.

Mr. Bailey suggested that the Working Group should review the findings of the Capacity Assessment of Tsunami Preparedness Status Report relevant to Working Group 2 and provide feedback to the ICG.

3. DISCUSSION

3.1 IOTWMS Service Definition

Dr. Yuelong Miao noted the latest version V4.0 of the IOTWMS Service Definition Document was published in February 2019. This included three updates from the previous working group meeting (September 2019). New proposed updates in V5.0 were presented for discussion. The terms “revised” and “updated” were discussed. The 10 minute KPI was discussed and it was decided to keep it as is and continue to try to meet it. Dr. Miao also noted that maritime community TSP products need to be added to the Standard Service Definition Document.

It was noted that atypical and non-seismic tsunamis are not currently in the Standard Service Definition Document. Dr. Mokhtari asked about secondary effects. Dr. Greenwood replied that this is included in the Standard Operating Procedures for JATWC and there are procedures on what to do if waves are larger than expected.

3.2 Common Alerting Protocol, Mobile Applications and Social Media

Mr. Jijjavarapu Padmanabham presented on Common Alerting Protocol (CAP) developments. CAP is a standard message format designed for all media, hazards, and communications that can assist in early public hazard notification, and consequently reduce damage and loss of life. The implementation status of CAP varies among the three TSPs. The Australian Bureau of Meteorology issues national tsunami products in CAP format, which conforms to Australian CAP standards. The Indonesian Agency for Meteorology, Climatology and Geophysics also generates national warnings in CAP to various stakeholders. TSP-India is producing notification messages in CAP (IOTWMS) on a test basis and the Indian Tsunami Early Warning Center is also generating real-time CAP files for their national service.

A draft document on ICG/IOTWMS CAP (Version 1.0) is under preparation. IOTWMS-TSPs will continue to work on CAP messages for use at both the regional and national levels.

There was a discussion on using CAP in the Indian Ocean. It was noted that there is a trend to use CAP for all hazards, not only tsunami.

Dr. Karyono presented on mobile applications and social media. TSP Indonesia has implemented a mobile application for notifications, however, this application was removed from Google play due to minimal subscribers. The Warning Receiver System (WRS) of TSP Indonesia can be used to complement or replace

conventional TSP dissemination tools (i.e. SMS, email, fax, GTS). The system uses the most advanced technology to distribute information. A video on the WRS – TSP Indonesia was shown.

Dr. Greenwood asked if the other TSPs should also use the mobile application for notification. Dr. Karyono replied that it would be good if all TSPs could provide similar CAP formatted data for the application. This will be discussed more offline between the TSPs and be reported on at the next ICG meeting.

There was a discussion about the types of dissemination that are most useful and preferable from the NTWC perspective. It was suggested a short survey could be included in either the next communications test or national report.

3.3 Maritime Community TSP Products

Dr. Miao presented on TSP products for the Maritime community known as TSP NAVAREA bulletins, which would assist NAVAREA coordinators in producing their NAVWARNINGS during tsunami events. The requirements and specifications are listed in the 2019 TOWS-WG TTTWO proposal and recommended to IOTWMS at ICG-XII (Kish, March 2019). The template example of a potential threat was shown. Considerations include auto-generation of NAVAREA TSP product, implementation by all TSPs, and logistics.

The members of Working Group 2 agreed that the TSPs should test and implement NAVAREA bulletins.

Mr. Chodavarapu asked if NAV areas are under deep ocean or only coastal. Dr. Miao explained that if a coastal forecast zone is under threat, then the country names should be mentioned in the NAVEREA bulletin.

3.4 Green's Law Modification

Dr. Miao reviewed Green's Law modification, a way of extrapolating the offshore wave amplitude to the coast. There are many environments where Green's Law results in overestimation (atolls, islands, steep slopes) and underestimation (harbours). A possible solution is a tailored formula depending on the coastal set-up. The formula could be applied in all three TSPs' coastal amplitude predictions.

Mr. Chodavarapu noted it was a good idea to have a case study or case studies, however, there are challenges in bathymetry data for many areas.

It was agreed that TSPs and interested NTWCs would conduct case studies to verify Cenalt's formula for modified Green's Law in localities where high-resolution bathymetry datasets and/or past event data are available, with the aim to develop a set of tailored formula suitable for different types of Indian Ocean coastlines.

3.5 WG-NWIO Relevant Findings to WG-2

Dr. Mohammad Mokhtari presented WG-NWIO relevant findings to WG-2. The major objectives of WG-NWIO are achieved through the UNESCAP project, which aligns with the WG-2 Terms of Reference. The main issue in the NWIO region is the lack of data sharing, particularly seismic. It is encouraging to see the initiatives of data sharing between Iran-Oman-Pakistan as well as India-Oman and India-Iran. Another ongoing task is the Makran Probabilistic Tsunami Hazard Assessment (PTHA). The Working Group suggested IOTIC to arrange webinars for the NWIO region for media. Harmonisation of the tsunami warnings in the regions is very important and requires input from WG-2.

Dr. Miao responded that WG-2 can provide advice based to the Makran project team on best practices in the Indian Ocean for tsunami products and bulletins.

3.6 NTWC Harmonization of Warnings and Products

Mr. Harald Spahn reported on results from the regional workshop on Harmonization of NTWC Tsunami Warning and Products in the North West Indian Ocean. Warning levels were discussed in terms of

thresholds, warning levels and colour codes. The NTWCs agreed on a 3-level harmonised approach with colour coding Warning (red), Alert (orange) and Watch (yellow). However, in terms of water level measurements the thresholds utilised differ among countries.

The logic of warning levels and their relationship to advice was discussed. The TOWS-WG TTTWO 2011 threat levels 0-3 and the more recent IOTWMS Users Guide (2019) threat levels were referred to. The advice messages of the countries mostly align with the exception of Oman who will look into harmonisation with the other Makran countries.

Dr. Miao explained the service definition standards in the Indian Ocean. He shared the standard tsunami bulletins noting that tsunami wave observations are reported in maximum positive wave amplitudes measured relative to normal sea level (and not the crest to trough wave height). Furthermore, in the TSP Standard Service Definition Document, it is noted that the agreed wave-height threshold for considering a country under threat shall be a predicted positive wave amplitude of great or equal to 0.5 metre. The amplitude shall be occurring on the shoreline, which is taken to be at 1 metre depth.

Mr. Bailey noted the issue of harmonising warning colour coding with other national warning systems, not only tsunamis, to provide consistency and help with community awareness. It is also important to recognise the different responses for near and far field.

Dr. Al-Maskari noted that some locations in Oman are on clifftops. Also, in terms of local-source tsunamis many people are not aware of them. Shake-maps would be helpful to educate people.

3.7 Atypical Tsunami

Dr. Robert Greenwood reported on TSP Australia's proposal for dealing with atypical tsunamis. This included atypical event types, threat assessment technique, source identification, TSP product examples and future development. The warning threshold is given using an isochrone depending on the severity of threat with the water level measurement one of the key considerations. If the source location is not known, the advisory is based on the location of measurement. Examples of TSP tsunami bulletins were shown with updated source information and inclusion of a notification stating that areas within a travel time are considered under threat. On the TSP page a default amplitude of 0.51 m is listed to make coastal forecast zones appear under threat. Future developments include improved modelling, near real-time sea level alerting, and improved detection and/or identification of source. A common way of updating TSP threat bulletins is needed for atypical sources and Dr. Greenwood proposes to use the draft TSP Australia bulletins.

Mr. Bailey suggested that an adhoc team be established to progress this. In this regard, Dr. Greenwood will forward information to Mr. Chodavarapu and Dr. Karyono for further collaboration.

3.8 Near-field Tsunami

Dr. Miao presented on near-field tsunami. He referred to the best practice guidelines on local-source tsunami response prepared by the ICG/PTWS, with input from ICG/IOTWMS (see this link http://www.ioc-tsunami.org/components/com_oe/oe.php?task=download&id=44899&version=1.0&lang=1&format=1)). The guidelines include local-source tsunami priorities, warning types, public awareness and education, and detection and characterisation. Subsequent consideration will be given to identification of the minimum viable capability required of a NTWC, work on atypical tsunamis, refinement natural warning definitions for various sources, and defining relevant key performance indicators.

Dr. Miao suggested a focus of the Ocean Decade could be on responding to near-field tsunami events. The associate scientific objective could be to improve forecast times and accuracy based on more data.

ICG/IOTWMS Working Group 2 new recommendations and actions arising during all agenda items in this intersessional meeting are included in Annex 3.

4. SUMMARY AND CLOSING

In summary Dr. Miao reviewed the 2019-2021 work plan noting that this meeting has discussed progress on many of these activities.

Dr. Miao thanked all participants for their inputs to the intersessional meeting of ICG/IOTWMS Working Group 2 on Tsunami Detection, Warning and Dissemination. He declared the meeting officially closed.

ANNEX 1: AGENDA

ICG/IOTWMS Working Group 2
on Tsunami Detection, Warning and Dissemination
Agenda

Thursday, 10 December 2020

Chair: Dr. Yuelong Miao

Time: 5:00 – 10:00 UTC; *10:30 – 15:30 Hyderabad; Jakarta: 12:00 – 17:00; 16:00 – 21:00 Melbourne*

5:00 – 5:30 UTC Moderator: Nora Gale	**1. Opening** • **Welcome** *Dr. Yuelong Miao (WG-2 Chair)* • **Opening Remarks** *Mr. Pattabhi Rama Rao (Vice-Chair ICG/IOTWMS)* • **Review and Adoption of Agenda** *Dr. Yuelong Miao (WG-2 Chair)* • **WG2 Terms of Reference and Membership** *Dr. Yuelong Miao (WG-2 Chair)*
5:30 – 6:30 UTC Moderator: Ardito Kodijat	**2. Brief Reports and Updates on Activities** • **Review of Recommendations and Actions** *(10 min)* *Ms. Nora Gale (ICG/IOTWMS Secretariat)* • **TOWS TTTWO Report - Feb 2020** *(5 min)* *Mr. Pattabhi Rama Rao (Vice-Chair ICG/IOTWMS)* • **TSP Reports on Service Updates** *(5 min per TSP)* *TSP Representative (tbc)* • **TSP Performance against KPIs for 2019/20** *(5 min)* *Mr. Patanjali Kumar Chodavarapu (WG-2 Vice-Chair)* • **IOTWMS Communication Tests 2019/20** *(5 min)* *Dr. Yuelong Miao (WG-2 Chair)* • **Impacts of COVID-19 on IOTWMS Monitoring Networks** *(5 min)* *Dr. Karyono (WG-2 Vice-Chair)* • **Capacity Assessment of Tsunami Preparedness Report** *(5 min)* *Ms. Nora Gale (ICG/IOTWMS Secretariat)*
6:30 – 6:40 UTC	*Break*
6:40 – 9:30 UTC Moderator: Yuelong Miao	**3. Discussion** • **IOTWMS Service Definition** *(30min)* • **CAP, mobile apps and social media** *(20min)* • **Maritime community TSP products** *(10min)* • **Green's Law modification** *(10min)* • **NTWC harmonization of warnings and products** *(20min)* *Representative from UNESCAP Makran project*

	• **WG-NWIO relevant findings to WG2** *(20min)* *Dr. Mohammad Mokhtari (Chair WG-NWIO)* • **Atypical tsunami** *(10min)* • **Near-field tsunami** *(20min)* • **Others**
9:30 – 10:00 UTC Moderator: Yuelong Miao	4. **Summary and Closing** *Dr. Yuelong Miao (WG-2 Chair)*

ANNEX 2: DETAILED LIST OF PARTICIPANTS

ICG/IOTWMS Working Group 2
on Tsunami Detection, Warning and Dissemination

Thursday, 10 December 2020

WG-2 Member State Participants

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ANNEX 3: RECOMMENDATIONS AND ACTIONS

The recommendations and actions from previous meetings reviewed and closed at this meeting:

#	Closed Recommendations & Actions	Update from WG2 2020
WG2 2015.06	Working Group 2 to further consider sending out the actual Bulletins to Tsunami Warning Focal Points by email and fax rather than the current practice of only distributing Bulletin Notification Messages.	Closed and superseded. See ***WG-2-2019.01R***:
WG2 2015.10	TSPs to harmonise their Wave Maps and other TSP products.	Closed.
WG2 2015.11	TSPs to enhance their websites to make them more user-friendly.	Closed.
WG2 2017.09	**Earthquake Precursors:** TSP Indonesia (Dr. Suaidi) to take the lead in assessing the state of research into earthquake precursors and reporting back to the WG-2	Closed.
WG2 2018.02R	In alignment with the TOWS-TTTWO recommendation, IOTWMS TSPs are requested to review regional and domestic products to avoid any conflicting information.	Closed and superseded. ***See WG-2-2019.03R***:
ICG 12.61	**Atypical Tsunamis:** Requests Working Group 2 to investigate methods of detection and threat assessment of atypical tsunami events, including volcanic and landslide events.	Closed and superseded. **See *WG-2-2019.07***:
ICG 12.62	**New detection Technologies:** Requests Working Group 2 to explore possible new tsunami-detection technologies such as tsunameters attached to undersea communications cables.	Closed. Will keep monitoring and report as appropriate.
ICG 12.63	Requests Working Group 2 to investigate replacing the current magnitude 8.0 or above threshold for issuing threat products for earthquakes outside the Indian Ocean ESZ with a threshold based on above-threat level waves predicted for any Indian Ocean Coastal Forecast Zone.	Closed and superseded. **See WG-2-2020.03**

ICG 12.64	**TSP Messages to Maritime Community**: Requests Working Group 2 to implement the TOWS-WG proposal on TSP messages for the Maritime Community.	Closed and superseded. **See *WG-2-2019.08***:
ICG 12.65	Requests Working Group 2 to facilitate coordination between WMO and Iran for receipt of tsunami bulletins over the GTS.	Closed and completed.
ICG 12.66	Requests Working Group 2 to investigate the possibility of replacing the word "REVISED" in TSP bulletins with "UPDATED".	Closed and superseded. **See WG-2-2020.03**

The recommendations and actions from previous meetings reviewed this meeting and to remain open:

#	Open Actions	Update from WG2 2020
WG-2-2019.01R:	ICG to discuss whether TSPs should send the actual bulletins directly to NTWCs (not just the notification messages).	Open. For ICG-13 to consider.
WG-2-2019.02R:	ICG to consider updating the next version of Service Definition Document by • adding a clarification at the end of point 9 that "This does not preclude TSPs from issuing SL-2 bulletins in situations that they have assessed as causing threat to the IOTWMS CFZs for earthquakes less than M8.0" • updating the word "Revised" with "Updated" in the IOTWMS TSP bulletins and templates • adding an additional KPI target nil for unnecessary bulletins	Ongoing. Consider additional products for maritime community as requested in TOWS-WG and endorsed at IOC assembly. Updated version of SSD to be tabled for ICG-13 to consider.
WG-2-2019.03R:	TSPs to continue to explore means to address any conflicting information in regional and national products.	Ongoing.
WG-2-2019.01:	TSPs to investigate reasons for the reduction of the TSP success delivery rate in the recent communication tests.	Ongoing. Summary of issues arising from communication tests are tabulated for follow-up.

WG-2-2019.02:	TSPs to continue to work on CAP messages for use at both the regional and national levels, tasked to the team comprising Mr. Padmanabham, Mr. Karyono and Dr. Miao.	Ongoing. Implementation status of CAP varies among the three TSPs. Draft document is under preparation.
WG-2-2019.03:	TSPs should continue to work on Mobile Apps. The team consisting of JP, Karyono and Yuelong to review Mobile Apps of TSP India and TSP Indonesia to ensure that products are consistent with the IOTWMS SDD. Provision is to be made for making notifications as well as detailed TSP bulletins from all 3 TSPs available on the TSP Apps with proper security authentication.	Ongoing. TSP-Indonesia has developed a Warning Receiver System (WRS) to distribute information.
WG-2-2019.04:	A team consisting of Mr. Padmanabham, Mr. Karyono, Dr. Greenwood, Mr. Jaifar Malik, Mr. Fatt to develop a document detailing the "password change implementation protocol for single entry access to all three TSP websites and the NTWC Status reporting website" that could be shared by the Secretariat to the TNCs/NTWCs.	Open. TSP to conduct case studies where high-resolution datasets are available.
WG-2-2019.05:	Initiate a study of Green's Law modification for Indian Ocean, particularly around the islands.	Open. TSP to conduct case studies where high-resolution datasets are available.
***WG-2-2019.06*:**	Congratulated TSP-India on the work done towards a comprehensive KPI archiving and reporting system for IOTWMS. TSP-India to provide access to all other TSPs to review and provide feedback to assist the system's eventual implementation.	Ongoing.
WG-2-2019.07:	A team consisting of Mr. Karyono, Mr. Patanjali Kumar, Dr. Greenwood, and other interested nominees to explore possibilities for TSPs to monitor and respond to atypical events as the extension of the TSP service, and to develop best practice procedures for TSPs.	Open. Dr. Greenwood will forward information to Mr. Chodavarapu and Dr. Karyono for further collaboration.

WG-2-2019.08:	Assist TSPs to plan and implement the IOC Assembly approved Tsunami Threat Messages developed by TOWS-WG for Navigation Warning Area Coordinators to disseminate through their channels as Navigation Warnings.	Open. NAVARA bulletins should be tested and implemented by TSP. , noting that TSP Australia has implemented such service as of Sep 2021. The Secretariat is to assist with informing the World-Wide Navigational Warning Service Sub-Committee (WWNWS-SC) whenever such a service is operational in a TSP, and inviting the email subscription of such service by the interested NAVAREA coordinators.

The new recommendations and actions from this meeting:

#	**Open Recommendations and Actions**	**Status from WG2 2020**
WG-2-2020.01R:	ICG considers conducting a follow-up survey to assess the potential impacts of prolonged COVID-19 on operations, data procurement and risks	Open.
WG-2-2020.02R:	ICG endorse the recommendations of the Capacity Assessment of Tsunami Preparedness [Status Report 2018] related to detection warning and dissemination for consideration in the WG-2 work plan	Open.
WG-2-2020.01:	A team comprising Mr. Padmanabham, Dr. Karyono and Dr. Miao to develop guideline of tsunami CAP standard for NTWCs, and to present the outcome to the next meeting of TOWS-WG TTTWO.	Open.
WG-2-2209.02:	Mr. Kodijat to put Dr Robert Greenwood in contact with Ms. Weniza from TOWS-WG TTTWO ad-hoc team on best practices for non-megathrust and non-seismic source tsunamis hazard assessment, monitoring and response.	Open.
WG-2-2020.03:	Update the IOTWMS Service Definition document (SDD) to include TSP products for the maritime community, in addition to adding a	Open.

	clarification at the end of point 9 that "This does not preclude TSPs from issuing SL-2 bulletins in situations that they have assessed as causing threat to the IOTWMS CFZs for earthquakes less than M8.0", and updating the word "Revised" with "Updated" in the IOTWMS TSP bulletins and templates. Table the updated SDD at the ICG-13 for endorsement.	
WG-2-2020.04:	TSP Indonesia to facilitate access to its WRS-TSP by interested NTWCs, to evaluate the customer feedback and report back to the next WG2 meeting. TSPs to look into the effectiveness of the WRS-TSP proposed by TSP Indonesia as one of the dissemination tools of Tsunami Early Warning	Open.
WG-2-2209.05:	TSPs to implement sending TSP NAVAREA bulletins to NAVAREA Coordinators via email subscription.	Open. See update in ***WG-2-2019.08***:
***WG-2-2020.06*:**	TSPs and interested NTWCs to conduct case studies to verify Cenalt's formula for modified Green's Law in localities where high-resolution bathymetry datasets and/or past event data are available, with the aim to develop a set of tailored formula suitable for different types of Indian Ocean coastlines	Open. See ***WG-2-2019.05***
WG-2-2020.07:	WG-2 to advise the Makran project team on best practice regarding issues relating to harmonization of NTWC warnings and products in the Makran region.	Open
WG-2-2020.08:	ICG Consider conducting a small survey to find out what types of dissemination channels that NTWCs are finding useful and preferable, including but not limited to the current four – GTS, SMS, Email and Fax. This could be included as part of the next communications test survey or national report to ICG-XIII	Open.