Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS)

Report of the 13th Steering Group Meeting
Jakarta, Indonesia
19-21 November 2018
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1. OPENING

Dr Andi Eka Sakya, Chair of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS), welcomed distinguished delegates and participants to the 13th meeting of the ICG/IOTWMS Steering Group. He noted the activities following the devastating 28 September 2018 Palu earthquake and tsunami with emphasis on the National and International Tsunami Survey Teams deployed to the field to assess the tsunami impacts. The Post-IOWave18 Regional Workshop on lessons learnt from community participation and evaluation of Indian Ocean Tsunami Ready indicators in pilot communities during Exercise Indian Ocean Wave 2018 was held immediately prior to the Steering Group meeting on 15-17 November 2018 in Jakarta. Dr. Sakya wished the Steering Group a successful meeting and all participants a pleasant stay in Jakarta.

Mr. Ardito Kodijat, Head of the Indian Ocean Tsunami Information Centre (IOTIC), briefed the Steering Group on meeting logistics. He extended thanks to the Indonesia Agency for Meteorology, Climatology and Geophysics (BMKG) for their generosity in hosting the Steering Group meeting and back-to-back post-IOWave18 and Tsunami Evacuation Maps, Plans and Procedures (TEMPP) workshops.

Dr. MuhamadSadly, Deputy Director General for Geophysics at BMKG, welcomed the distinguished delegates including Mr. Kodijat, Dr. Srinivasa Kumar Tummala (Head of the ICG/IOTWMS Secretariat) and Dr. Sakya as well as all international and national participants to the 13th meeting of the ICG/IOTWMS Steering Group. He thanked BMKG for hosting this event and the ICG/IOTMWS Secretariat and IOTIC for planning and supporting the Steering Group meeting and other back-to-back events. The successful collaboration between the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organisation (IOC-UNESCO) and BMKG is reflected in the collaborative organisation of joint meetings and workshops. The Palu earthquake and tsunami on 28 September has reinforced the dangerous and destructive impacts of tsunami. Tsunami risk in the Indian Ocean is high and requires preparedness, especially for local [near-field] events where tsunamis can arrive in minutes. Community education and readiness to respond to such threats are critical for minimising loss of life and injuries. In September 2018, the ICG/IOTWMS conducted a successful IOWave18 exercise. Dr. Sadly encouraged communities to increase capacity building activities related to tsunami preparedness. In conclusion, Dr. Sadly expressed his sincere thanks to the organisers including BMKG, IOTIC and ICG/IOTWMS Secretariat.

Dr. Sakya reviewed the provisional agenda of the Steering Group Meeting and requested the Steering Group members to propose any additions and/or modifications to the agenda. Dr. Tummala noted that the Geoscience Australia proposal to leverage the Probabilistic Tsunami Hazard Assessment (PTHA) for the Indian Ocean should be discussed following the Working Group 1 report to the Steering Group.
Dr. Mohammad Mokhtari’s [Iran] draft proposal on tsunami hazard assessment and seismicity in Makran should be discussed following the Subregional Working Group for the North West Indian Ocean (WG-NWIO) report to the Steering Group. Dr. Tummala noted the positive news on the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) proposal and this should also be discussed after the WG-NWIO report to the Steering Group. The revised agenda was approved by the Steering Group. The final agenda is contained within Annex I.

The Steering Group Meeting was attended by sixteen participants from six countries including Australia, India, Indonesia, I.R. of Iran, Oman and Timor Leste as well as three representatives from UNESCO-IOC. Participant details are contained within Annex II.

2. SECRETARIAT REPORT

Dr. Srinivasa Kumar Tummala, Head of ICG/IOTWMS Secretariat reported on the activities of the Secretariat since ICG/IOTWMS-XI held in Putrajaya, Malaysia, 18-20 April 2017. The Secretariat updated the seismic and sea level databases, created a database of trainees, supported meetings and workshops, completed the biennial reporting to the Australia Bureau of Meteorology, oversaw the biannual communications tests, supported Exercise IOWave18, organised meetings of the Steering Group, Working Groups and Task Teams, and prepared associated meeting reports. Dr. Tummala presented the schedule of upcoming events including ICG/IOTWMS-XII to be held in Kish Island, Iran 9-12 March 2019.

Dr. Tummala reviewed the open action items from the previous Steering Group meetings. Progress against each action item was reported on with further comments provided by the Steering Group members. The updates against the actions that remain open are provided in Table 1 below:

<table>
<thead>
<tr>
<th>#</th>
<th>Action</th>
<th>Update from SG-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG 8.23</td>
<td>RTSPs to display maps of the utilised real-time seismic and sea level stations on their websites.</td>
<td>Outstanding. TSP-Australia has both; TSP-India has sea level.</td>
</tr>
<tr>
<td>SG 10.17</td>
<td>IOTIC to issue regular monthly news bulletins related to website updates and to work with officers and the Secretariat on regular 6 monthly ICG/IOTWMS newsletters.</td>
<td>Outstanding</td>
</tr>
<tr>
<td>SG 10.22</td>
<td>IOTIC and the Chair of IOTWMS to work together on an information sheet (1-2 pages) on TSP and NTWC contacts for the media and public.</td>
<td>In Progress. Website details updated and used on TSP-Australia public webpage. Will now incorporate in IOTWMS Fact Sheet with draft for ICG.</td>
</tr>
<tr>
<td>SG 11.03</td>
<td>WG-2 to engage with WG-NWIO to assist with assessment of seismicity for the Makran following the next meeting of the NWIO (project/proposal/ESCAP)</td>
<td>A team of WG-2 led by Mohammad Mokhtari with Members from 3 TSPs, Oman, Pakistan, Iran, Germany, Other Experts to undertake this task. Possible meeting back-to-back with the ICG-XII.</td>
</tr>
<tr>
<td>SG 11.06</td>
<td>Develop integrated event database and key performance indicators reporting system (WG2)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>#</td>
<td>Action</td>
<td>Update from SG-13</td>
</tr>
<tr>
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<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>SG 11.16</td>
<td>WG2 to initiate a project to recommend the optimal sea-level and seismic monitoring network for the Indian Ocean.</td>
<td>Outstanding</td>
</tr>
<tr>
<td>SG 11.17</td>
<td>WG2 to initiate a study of Green’s Law applicability/exceptions in the Indian Ocean, especially relating to islands, bays and coastlines with coral reefs.</td>
<td>Outstanding</td>
</tr>
<tr>
<td>SG 12.01</td>
<td>Status Report: The IOTWMS Status Report be developed based on the structure of the Status Report finalized in the SG-11 meeting (January 2017, Perth), further adding a section on the IOTIC. Inputs are to be drawn from (i) the national reports submitted by the IOTWMS Member States to the ICG/IOTWMS-XI session and (ii) the capacity assessment survey that is planned to be conducted by the TT-CATP during May-June 2018 in the new questionnaire format.</td>
<td>Ongoing. Capacity Assessment Survey sent to TNC in early November. Results will be analysed and presented in the form of IOTWMS Status Report to the ICG-XII Session.</td>
</tr>
<tr>
<td>SG 12.02</td>
<td>Medium Term Strategy: The MTS be prepared for the period 2019 - 2024, for approval by the ICG/IOTWMS-XII session in 2019</td>
<td>SG-13: Draft Prepared. After approval by the Steering Group in the present meeting, will be put up for approval by ICG-XII Session.</td>
</tr>
<tr>
<td>SG 12.04</td>
<td>Training of Operators: Requests WG-2 to explore the option of exchange of operators amongst the TSPs</td>
<td>Outstanding</td>
</tr>
</tbody>
</table>

**Table 1** Open actions and updates of the Steering Group

The complete list of outstanding from previous Steering Group Meetings, including actions that were closed in this meeting and past updates, are provided in Annex III.

### 3. SULAWESI EARTHQUAKE AND TSUNAMI

National and International Tsunami Survey Teams who conducted field visits to Palu, Sulawesi to study the impacts of the M7.4 28 September 2018 Palu earthquake and tsunami provided preliminary reports.

#### 3.1 M7.4 DONGGALA-PALU EARTHQUAKE: BMKG UPSTREAM WARNING AND FIELD SURVEY

Mrs. Weniza reported on the upstream response to the Palu earthquake from the perspective of the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG), the national warning centre for tsunami. The Donggala-Palu earthquake of 28 September 2018 generated a tsunami and liquefaction that lead to deaths of at least 2,100 people. It was preceded by a M5.9 foreshock and nearly 700 aftershocks have been recorded to date.

Mrs. Weniza presented the timeline of events associated with the M7.4 mainshock at 17:02 local time. BMKG issued a tsunami warning for this event, which was initially assessed at M7.7. However, due to the 6 cm recorded tsunami height on the Mamuju tide gauge, strike-slip fault plane solution, and arrival time of tsunami estimated model has passed, the Tsunami Warning was terminated and the final bulletin was issued at 17:36 local time.
3.2 BMKG FIELD SURVEY FOLLOWING THE 2018 PALU-DONGGALA TSUNAMI

Mr. Sugeng Pribadi and Mr. Indra Gunawan reported on the field survey in Palu-Donggala 2018. Survey locations included Palu and both the western and eastern sides of Teluk Palu Bay. The eastern and western transects showed variable tsunami heights along the coasts. The highest measurement of 10m was located close to Palu city, which is comparable with the estimate of 10m at Pantoloan Harbour. Lesser tsunami wave heights were observed to the north. Additional field measurements included run-up and inundation distance. The Batik Air Flight video showed tsunami in Palu Bay including what appeared to be three landslide-generated tsunamis. Eyewitness interviews were conducted to gain more information on the timing of events including tsunami arrival times.

3.3 PRELIMINARY LESSONS FROM THE DOWNSTREAM RESPONSE TO THE PALU TSUNAMI

Mrs. Irina Rafliana presented a preliminary overview of downstream community preparedness and response to the Palu tsunami. Communities in Indonesia, even after 2004, rely heavily on a traditional way of perceiving risk. Unfortunately, the local knowledge of tsunami does not include best practice steps immediately following a local event. Many communities perceive that they will have enough time to evacuate following tsunami generation. There is also no community knowledge of underwater landslide causing tsunami. The Palu City Contingency Planning 2012 has estimated the number of deaths and people effected by an equivalent event.

Mrs. Rafliana presented an infographic that was released to public to explain the chain of events at the National Tsunami Warning Centre (BMKG). She also presented the community timeline where many people evacuated during the foreshock earthquake two hours earlier. Residents who underwent tsunami training in 2012 felt that this was very different from the tsunami characteristics they were taught and it must be a hoax. Mrs. Rafliana concluded by summarising preliminary findings including the need to preserve the memories of the 28 September 2018 tsunami for future generations.

3.4 INTERNATIONAL TSUNAMI SURVEY TEAM PRELIMINARY RESULTS

Dr. Gegar Prasetya of the Tsunami Research Center Indonesia presented a summary of preliminary post-tsunami survey results, tsunami impact and characteristics based on the International Tsunami Survey Teams (ITSTs). Team members were from Indonesia, Italy, New Zealand, Portugal, Russia, Turkey and the United States. Dr. Prasetya noted that Palu Bay is very narrow, which resulted in relatively high run-ups during the 28 September 2018 tsunami. Major damage was observed in Wani while only minor damage was observed in Donggala at the tip of the bay. Consequently, it has been inferred that the tsunami was generated within Palu Bay. The Indonesian navy has undertaken a multi-beam survey that has imaged a submarine landslide on the east coast of Palu Bay near Wani. The western side of Palu Bay shows evidence of subsidence while the eastern side shows evidence of uplift. The International Tsunami Survey Teams, which filled in the gaps in the BMKG national survey, agree that the source of the tsunami could have been due to coastal collapse on the eastern side of the bay.

Recommendations for future work included high-resolution bathymetry surveying [due to be undertaken next week]; more funding for research on tsunami and marine related hazards (Tadulako University), a Joint Research Centre proposal on the Last Mile Project (European Union), and land use planning for re-construction in Palu [do not rebuild in areas of liquefaction].

Following these talks there were discussions on landslide generated tsunami caused by strike-slip earthquakes, community response, and long-term and ongoing cultural change.

4. WORKING GROUP REPORTS

The Steering Group heard reports from its three Working Groups. Additionally, information was provided on leveraging the 2018 Australian Probabilistic Tsunami Hazard Assessment for the Indian Ocean, UNESCAP proposal, and concept note for the Makran Project.
4.1 REPORT OF WORKING GROUP 1 ON TSUNAMI RISK, COMMUNITY AWARENESS AND PREPAREDNESS

Dr. Harkunti Rahayu, Chair of ICG/IOTWMS Working Group 1 on tsunami risk, community awareness and preparedness (WG-1), reported on progress since the last meeting with reference to the working group’s 2017-19 workplan. The survey on Capacity Assessment of Tsunami Preparedness was circulated to Tsunami National Contacts this month. Dr. Tummala noted that the survey being conducted online via Survey Monkey and has also been distributed as a fillable pdf for ease of sharing with stakeholders. Dr. Rahayu reported on capacity building activities in 2017-2019 including the Interface Study. A special session on the ICG/IOTWMS has been proposed back-to-back with the International Conference on Building Resilience Cities, Bali, 4-7 November 2018. She suggested that the IOWave manual be updated to include a section addressing Local Disaster Management Organisations through to community level, which can be drafted by the Task Team on Capacity Assessment of Tsunami Preparedness (TT-CATP, or equivalent).

Progress against each work plan item is provided in Table 2 below:

<table>
<thead>
<tr>
<th>#</th>
<th>WG-1 Work Plan Item</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set up inter-sessional Task Team for updating the questionnaires for baseline assessments, future IOWave exercises and ICG Member-State national reports.</td>
<td>The Task Team on Capacity Assessment of Tsunami Preparedness (TT-CAPT) was established at ICG-XI. They have published a new questionnaire for baselines assessments / national report (see work plan item 2 below).</td>
</tr>
<tr>
<td>2</td>
<td>Conduct a baseline assessment survey on each Member State's tsunami risk assessment initiatives and preparedness;</td>
<td>The National Report on Capacity Assessment of Tsunami Preparedness was distributed to TNCs in November 2018 (reference: IOC CL-2742)</td>
</tr>
<tr>
<td>3</td>
<td>Conduct integrated capacity development training workshops</td>
<td>The Jakarta (September 2017) and Hyderabad (June-July 2018) Integrated meetings addressed this.</td>
</tr>
<tr>
<td>4</td>
<td>Support piloting Indian Ocean Tsunami Ready Programme and National Recognition in the IOTWMS Member States</td>
<td>India and Oman piloted IOTR during IOWave18 in 7 communities.</td>
</tr>
<tr>
<td>5</td>
<td>Enhance community participation in future IOWave exercises</td>
<td>At least 10 Member States conducted community evacuations in IOWave18 with 116,000 people evacuating.</td>
</tr>
<tr>
<td>6</td>
<td>Align working group activities with World Tsunami Awareness Day to increase community awareness and preparedness</td>
<td>The post-IOWave18 regional workshop (November 2018) preceding this SG meeting was organised as part of WTAD 2018.</td>
</tr>
</tbody>
</table>
7. Review the tsunami warning chains of the Member States and recommend improvements

Tsunami Warning Chains have been drafted by Member States at SOP workshops (Jakarta, September 2017; Hyderabad, July 2018)

8. Include discussions on tsunami warning chain in the TSP/NTWC/DMO/Media training workshops on Standard Operating Procedures

Tsunami Warning Chains have been discussed at SOP workshops (Jakarta, September 2017; Hyderabad, July 2018)

9. To define Key Performance Indicators on awareness and preparedness that are linked into Capacity Assessment of Tsunami Preparedness and Tsunami Ready guidelines

Performance Monitoring Framework being developed by a PTWS Task Team to be discussed at TOWS-WG, Paris, February 2019 and presented to the ICG-12 Session

10. Contribute to Medium Term Strategy

A draft of the Medium Term Strategy has been prepared

Table 2 WG-1 Work plan items and status

There was a discussion about key performance indicators aligned with WG-1, which will be decided on at the 12th session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) to be held in Paris, February 2019.

The proposed WG-1 action plan for 2019 – 2021 included consideration of Paris Symposium in finalising 2019-2021 workplan; review and use result of CATP survey for reviewing 2017-2019 WG-1 workplan and develop 2019-2021 WG-1 workplan; and publication of a special issue under IJDRB index on Scopus.

4.2 LEVERAGING THE 2018 AUSTRALIAN PROBABILISTIC TSUNAMI HAZARD ASSESSMENT FOR THE INDIAN OCEAN NATIONS

Dr. Jonathan Bathgate of Geoscience Australia presented an overview of the 2018 Probabilistic Tsunami Hazard Assessment (PTHA) for the Indian Ocean Nations. There are three proposed options for engagement with IOTWMS, which include:

1. Develop an updated version of the 2009 report “A Probabilistic Tsunami Hazard Assessment of the Indian Ocean Nations”, based on the PTHA18 results
2. Workshop on “Using the PTHA18 results to support scenario design for tsunami hazard assessment”, with a focus on the Indian Ocean
3. Collaborative development of a new “Probabilistic Tsunami Hazard Assessment for the Indian Ocean”

The Steering Group broadly agreed that this is important work and should be built into the work plan of Working Group 1. Overall, preference was given to option 2 though this requires further discussion amongst Working Group 1.

4.3 REPORT OF WORKING GROUP 2 ON TSUNAMI DETECTION, WARNING AND DISSEMINATION

Mr. Peter Coburn, Chair of the ICG/IOTWMS Working Group 2 on tsunami detection, warning and dissemination, presented the terms of reference, membership criteria, and current membership for WG-2. There have been two virtual meetings of the TSPs held in January and March 2018 and the WG-2
meeting during the Integrated meetings in Hyderabad held during July 2018. Mr. Coburn presented the work plan and status against each item as noted in Table 3 below.

<table>
<thead>
<tr>
<th>#</th>
<th>WG-2 Work Plan Item</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maintain the TSP Service Definition Document and assist TSPs to implement the requirements of the TSP Service Definition Document</td>
<td>In progress: SDD update to be presented for adoption at ICG-12.</td>
</tr>
<tr>
<td>2</td>
<td>Review and harmonise TSP products and websites for NTWC users</td>
<td>Done</td>
</tr>
<tr>
<td>3</td>
<td>Review and improve the mechanism provided for NTWCs to report their national warning status</td>
<td>In progress: INCOIS developing mechanism for more secure feedback page.</td>
</tr>
<tr>
<td>4</td>
<td>Maintain the IOTWMS User Guide</td>
<td>In progress: User Guide update to be presented for adoption at ICG-12.</td>
</tr>
<tr>
<td>5</td>
<td>Contribute to the WG2 aspects of the new IOTWMS Status Report and the Medium Term Strategy</td>
<td>Done: IOTWMS Status Report &amp; Medium Term Strategy Meeting on 8 July 2018 reviewed preliminary draft.</td>
</tr>
<tr>
<td>6</td>
<td>Conduct 6-monthly IOTWMS Communication Tests and prepare reports of each test in conjunction with the Secretariat. Also assist the Secretariat in maintaining a log of issues arising from the tests, and in following up the issues with Member States.</td>
<td>Ongoing: Tests held on 13 December 2017 and 13 June 2018. Next test 12 December 2018.</td>
</tr>
<tr>
<td>7</td>
<td>Contribute to the planning and running of SOP Training workshops for Indian Ocean NTWCs, DMOs and Media, the IOWave18 Exercise and the Post IOWave18 Workshop. Follow up the Working Group 2 related recommendations in the IOWave16 Report.</td>
<td>Ongoing: Contributed to the conduct of 2 SOP workshops (Jakarta, September 2017; Hyderabad, July 2018) in the intersessional period</td>
</tr>
<tr>
<td>8</td>
<td>Assist the TSPs in the planning and development of a system for recording the details of Indian Ocean tsunami events and automatically generating IOTWMS Key Performance Indicators.</td>
<td>In progress: Online TSP meet discussed this aspect with TSP-India making some progress</td>
</tr>
<tr>
<td>9</td>
<td>Contribute to the assessment of seismicity and tsunami-genesis in the North West Indian Ocean region in collaboration with the North West Indian Ocean Working Group, with particular reference to the September 2013 Pakistan event.</td>
<td>In progress: Dr. Mokhtari (Iran) is leading an expert sub-group, with 7 nominees: Patanjali (India), Issa, Ahmed Deif, Adel Mohammed (Oman), Adrienne Moseley, Jonathan Bathgate, Robert Greenwood (Australia)</td>
</tr>
<tr>
<td>10</td>
<td>Assist the Secretariat in maintaining the database of seismic and sea-level reporting stations for the IOTWMS.</td>
<td>Done: Revised database released in December 2017. MS requested to review and provide feedback.</td>
</tr>
<tr>
<td>11</td>
<td>Undertake a study of the optimal sea-level and seismic networks in the Indian Ocean.</td>
<td>In progress: Specialist sub-group (Patanjali -India, Miao and Moseley -Australia) reviewing PTWS activities on this topic.</td>
</tr>
<tr>
<td>12</td>
<td>Assist the TSPs in their planning for the later introduction of Service Level 3 coastal inundation services, in collaboration with Working Group 1 and the NTWCs.</td>
<td>Not started</td>
</tr>
<tr>
<td></td>
<td>Item</td>
<td>Status</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>13</td>
<td>Contribute to the capacity re-assessment of the IOTWMS along with the Task Team on Capacity Assessment of Tsunami Preparedness and WG-1.</td>
<td>In progress: WG2 chair contributed to review of proposed online CATP survey.</td>
</tr>
<tr>
<td>14</td>
<td>Examine the potential use of social media applications, including WhatsApp, for dissemination of tsunami information, and follow up with application providers as necessary</td>
<td>In progress: Indonesia have implemented Twitter (automatic) and WhatsApp (manual).</td>
</tr>
<tr>
<td>15</td>
<td>Review the status of research into earthquake pre-cursors (maintaining a watching brief in this field), and the modelling of secondary non-seismic effects in Makran for potential use in the IOTWMS</td>
<td>In progress: Indonesia (Dadang Permana) leading this review. Status update needed.</td>
</tr>
<tr>
<td>16</td>
<td>Study the possibility of tsunami threat for coastlines of Persian Gulf and Red Sea and review the Coastal Forecast Zones for Timor Leste with a view to revising the IOTWMS Area of Responsibility map</td>
<td>Done: Timor Leste CFZs have been updated. In progress: Persian Gulf and Red Sea threats to be assessed by Makran Seismicity sub-group.</td>
</tr>
<tr>
<td>17</td>
<td>Update the TSP Service Definition Document and the TSP User Guide with guidance on the triggers NTWCs should use for reporting their national warning status to TSPs during events</td>
<td>Done: Included in SDD update to be presented to ICG-12.</td>
</tr>
<tr>
<td>18</td>
<td>Review the IOTWMS Area of Responsibility map in relation to the coastlines of South Africa and Banda Sea, and provide updates to the TOWS-WG for revisions to the global map</td>
<td>Done: TOWS-WG included these updates in February 2018.</td>
</tr>
<tr>
<td>19</td>
<td>Review the 200 km inland limit for tsunamigenic earthquakes</td>
<td>In progress: Ms Moseley (Australia) has commenced review.</td>
</tr>
<tr>
<td>20</td>
<td>Coordinate the re-initiation of public bulletins over the IOC Public List server and GTS</td>
<td>In progress: India's halted; Indonesia's and Australia's to be tested.</td>
</tr>
</tbody>
</table>

**Table 3** WG-2 Work plan items and status

Mr. Coburn ran through planned updates to the TSP Service Definition Document (SDD) and the Steering Group agreed to implement these changes in the document.

There are planned changes to the IOTWMS Users Guide, however, as they are all editorial they were not covered here.

Mr. Coburn noted the additional WG2 actions and recommendations from other meetings including:

- WMO alerting registry: Encourages Member States to review the WMO alerting registry and register their NTWCs/TSPs.
- Common Alerting Protocol: An expert sub-group (India -Padmanabham, Indonesia -Karyono, Australia -Yuelong Miao, Oman -Malik Al Ghafri) is drafting a policy document including a suitable CAP schema for tsunami warning messages.
- Use of Green's Law: WG2 to initiate a study of Green’s Law applicability/exceptions in the Indian Ocean, especially relating to islands, bays and coastlines with coral reefs.
- Exchange of TSP Staff: WG-2 to explore the option of exchange of operators amongst the TSPs.
- Bulletins to Ports, Harbours and Maritime authorities: Requests Member States to consider disseminating tsunami bulletins to ports, harbours and other maritime authorities, conforming with the roles and responsibilities of different warning agencies within their countries.
• Seismic data sharing: An expert sub-group (Australia - Adrienne Moseley, India - Patanjali, Indonesia - Bambang Setiyo,) has drafted a proposed document for sharing seismic data between all MS. Also Oman and Iran have recently signed an agreement to exchange data from two of each other's seismic stations.

• IOC / ICG Common Text: India and Indonesia to add text specified by the TOWS-WG to their TSP Public Webpages, describing the IOC Tsunami Programme, Framework, Area of Service, TSPs and a disclaimer.

Mr. Coburn reported on the communications tests to date including the most recent test on 13 June 2018. Email is the most successful medium followed by GTS, SMS and lastly fax. Both web access and web reporting were relatively high. The TSP key performance indicators for 2015 to 2018 (to 10 November) were presented (see Table 5 below).

<table>
<thead>
<tr>
<th>Table 4</th>
<th>TSP KPIs (to November)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TSP KPIs 2018 (to 10 November)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Service Level 1</strong></td>
<td><strong>Service Level 2</strong></td>
</tr>
<tr>
<td><strong>TSP</strong></td>
<td><strong>EQ Bulletins</strong></td>
</tr>
<tr>
<td><strong>KPI 1</strong></td>
<td><strong>KPI 2</strong></td>
</tr>
<tr>
<td>ET First EQ Bull</td>
<td>POD IO EQs GE M6.8</td>
</tr>
<tr>
<td>Target: 10 mins (% met)</td>
<td>Target: 30 km (% met)</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td>14.1 min (6.9%)</td>
</tr>
<tr>
<td><strong>India</strong></td>
<td>10.9 min (32.2%)</td>
</tr>
<tr>
<td><strong>Indonesia</strong></td>
<td>11.5 min (70.0%)</td>
</tr>
</tbody>
</table>

* No events meet the criteria  
** No events caused threat level tsunami waves  
*** For KPI 6, Australia issued 2 Potential Threat Bulletins (13 mins and 31 mins), India issued 1 No Threat Bulletin (25 mins) and Indonesia issued 1 No Threat Bulletin (38 mins)  

<table>
<thead>
<tr>
<th>Notes</th>
<th>Meets Target</th>
<th>Near Target</th>
<th>Misses Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPI 1</td>
<td><strong>KPI 2</strong></td>
<td><strong>KPI 3</strong></td>
<td><strong>KPI 4</strong></td>
</tr>
<tr>
<td>ET First EQ Bull</td>
<td>POD IO EQs GE M6.8</td>
<td>EQ Mag</td>
<td>EQ Depth</td>
</tr>
<tr>
<td>Target: 10 mins (% met)</td>
<td>Target: 30 km (% met)</td>
<td>Target: 100%</td>
<td></td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td>14.1 min (6.9%)</td>
<td>n/a*</td>
<td>0.13 (93.8%)</td>
</tr>
<tr>
<td><strong>India</strong></td>
<td>10.9 min (32.2%)</td>
<td>n/a*</td>
<td>0.10 (84.0%)</td>
</tr>
<tr>
<td><strong>Indonesia</strong></td>
<td>11.5 min (70.0%)</td>
<td>n/a*</td>
<td>0.27 (67.0%)</td>
</tr>
</tbody>
</table>

4.4 REPORT ON SUBREGIONAL WORKING GROUP FOR THE NORTH WEST INDIAN OCEAN

Dr. Juma Al-Maskari, Chair of the Subregional Working Group for the North West Indian Ocean (WG-NWIO), noted the 3rd meeting of the working group was in Hyderabad, July 2018, where participants from 4 Member States met. He noted the work of TT-IOWave18 was valuable to the WG-NWIO and he hopes that the IOWave exercises will continue. The working group encourages UNESCO to write letters of recognition to the communities that participated in evacuation drills. Dr. Al-Maskari has updated the recommendations from previous meetings and added new ones. He reported on progress and activities of the WG. Refer to Table 4 below for the WG-NWIO work plan items and status:
<table>
<thead>
<tr>
<th>#</th>
<th>WG-NWIO Work Plan Item</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coordinate with WG-1 on implementing the improvements recommended by WG-1 on the warning chains of the Member States and work with member states to incorporate the recommendations to reduce the warning chains in their SOPs</td>
<td>Ongoing. All 5 MS need to work on reducing the number of steps in their warning chains. It can be embedded in UNESCAP project</td>
</tr>
<tr>
<td>2</td>
<td>Coordinate efforts so that member states can participate in IOWave18 and prepare for implementing real evacuation plans on pilot areas (villages)</td>
<td>Ongoing and updated: Add IOWave18 and any upcoming IOWave exercises. It would be of great encouragement if a letter from UNESCO is addressed to the Governments of all member countries in the IOTWMS that participated in real evacuations in IOWave 18</td>
</tr>
<tr>
<td>3</td>
<td>Encourage all Member States of the WG-NWIO to exchange data from seismic and GNSS stations</td>
<td>Ongoing. Progress is being made. Continue until all data is exchanged freely between MS.</td>
</tr>
<tr>
<td>4</td>
<td>Coordinate efforts to organise a sub-regional SOP workshop involving NTWCs, NDMOs and LDMOs and a sub-regional Tsunami Drill among the Member States of the WG-NWIO with specific aim to inter-compare SOPs, inter-compare results of model simulations and to enhance tsunami warning chain</td>
<td>Completed but should be ongoing. It can be embedded in UNESCAP project</td>
</tr>
<tr>
<td>5</td>
<td>Implement WG-NWIO UNESCAP funded project</td>
<td>Stalled, pending funds availability from UNESCAP. Funding approved for phase 1</td>
</tr>
<tr>
<td>6</td>
<td>Organise on-the-job training for operators of tsunami warning centres and seismic networks in the region with special emphasis on warning centre operations, seismic instruments/data calibration, metadata management and quality control</td>
<td>This was incorporated in the recent SOP workshop (Hyderabad, July 2018) and should be an ongoing activity. Dr. Al-Maskari proposed that during the next ICG a one-day workshop for the region should be held.</td>
</tr>
<tr>
<td>7</td>
<td>Use information acquired through National Reports of the WG-NWIO Member States to ICG/IOTWMS-XI to take stock of the current status of (i) Risk Assessment and Reduction, (ii) Detection, Warning and Dissemination,</td>
<td>Completed and should be ongoing as part of the Status Report (to replace National Report). This action should be aligned with WG-1 and CATP-TT actions. Use information acquired by the regular Capacity Assessment Survey to identify gaps.</td>
</tr>
</tbody>
</table>

**Table 5** WG-NWIO Work plan items and status
Dr. Al-Maskari reported on the other key activities carried out by WG-NWIO including IOWave, WMO/ESCAP panel of tropical cyclones and APDIM:

- IOWave 18 was accompanied by a very good media coverage in the whole of the IOTWMS member counties. In Oman the media coverage was followed very closely by neighbouring countries. UAE showed strong interest on becoming a member of the IOTWMS and was linked to the Secretariat and soon a new member will be joining the IOTWMS.

- WMO/ESCAP Panel of Tropical Cyclone (PTC) 45th session was held in Oman during 23 - 27 September 2018. Four new countries (Iran, Saudi Arabia, Qatar and UAE) were welcomed as new members. ESCAP is very much involved in PTC activities especially in DRR capacity building and training, Synergized SOP, and Impact based forecasting and Risk based warnings. The Steering Group is encouraged to look at possible ways of strengthening the cooperation between PTC/ESCAP/IOTWMS and come up with recommendations towards a multi-hazard approach.

- APDIM (Asia Pacific Disaster Information Management Centre) is a centre established in 2015 and based in Iran under the UN ESCAP. The Centre also looks into a multi-hazard cross-border approach including tsunami hazard. This meeting might also like to engage in cooperation with APDIM/ESCAP in this regards.

4.5 UNESCAP PROPOSAL

Dr. Tummala reported on the UNESCAP advisory board meeting on 14 November 2018. Phase 1 of the UNESCO-IOC Makran project has been approved. We are now awaiting the official notification. The phase one budget is USD 350K. Dr. Tummala reviewed the Phase-1 outcomes, performance indicators and outputs. The outcomes include:

1. Better understanding of the risk knowledge based on scientific research (8 months)
2. Improvements of warning services at NTWC level and the organisation of the national warning chains to assure timely warnings and rapid response with due emphasis on self-protection for near source events. (12 months)

Mr. Kodijat reminded that this project covers, UNESCAP countries only, which does not include Oman. Therefore, Oman is requested to prepare and in-kind budget to support their participation in the workshops.

4.6 CONCEPT NOTE FOR MAKRAN SCIENTIFIC TSUNAMI HAZARD ASSESSMENT OF THE MAKRAN SUBDUCTION ZONE

Dr. Mohammad Mokhtari presented his concept note for Scientific Tsunami Hazard Assessment of the Makran Subduction Zone, which is provided as Annex IV to this report. The purpose is to examine the seismicity of the Makran subduction zone as well as the potential impact of tsunamis in the Red Sea and Persian Gulf. The initial steps are:

1. To find the best configuration for monitoring earthquake and tsunami in the region of Makran zone
2. To find the best way to share the data in real time
3. To find alternative methodology for monitoring the seismic activity
4. To check the importance of onshore and offshore seismicity and monitor tsunamis caused by onshore earthquakes
5. To conduct more realistic tsunami modelling and the real distribution tsunami effect in the regional sense to include Persian Gulf and the Red sea

This group can meet for a workshop discussion immediately prior to the ICG/IOTMWS-XII with the detailed scope and duration to be determined. The Steering Group agreed that this should be a supported activity. The Steering Group recommends that the ICG form a Task Team for this initiative.
There was a discussion around the activities of this Task Team not duplicating but strengthening the activities within WG-NWIO and the appropriate Terms of Reference for such a Task Team.

5. TSUNAMI SERVICE PROVIDER (TSP) REPORTS

5.1 TSP AUSTRALIA

Mr. Peter Coburn of the Australian Bureau of Meteorology and Dr. Jonathan Bathgate of Geoscience Australia reported on TSP Australia operated by the Joint Australia Tsunami Warning Centre (JATWC). Mr. Bathgate commented on improvements and development at Geoscience Australia, which included migrating the earthquake monitoring system from Antelope to SeisComP3, focal mechanisms being published online and w-phase CMTs being published. Future work includes rapid finite fault inversions and ISO9000 accreditation. Mr. Peter Coburn reported that the tsunami decision support tool was updated with the latest CFZs, exchange bulletin formats are up-to-date, improvements to tsunami travel time calculation, separate TSP maps for deep-water wave amplitudes and travel time contours, capability for issuing TSP Australia Public Bulletins, and harmonised TSP threat maps. During the IOWave18 Exercise, the map of status of tsunami warnings in the Indian Ocean derived from Member States event status reports was hosted on the TSP-Australia public website. Developments at the Australian Bureau of Meteorology include improves in threat assessment [based on the earthquake CMT data from Geoscience Australia]; improvements in the handling of non-seismic tsunami events in the Decision Support Tool (DST); and harmonisation of DST system with the Geoscience Australia Earthquake Alerting system to reduce manual intervention and elapsed time for TSP earthquake bulletin issue. Furthermore, attaching seismometers to the Perth-Singapore telecommunications cable is being explored.

There was a discussion around the number of pre-calculated scenarios, particularly in the Makran region. Dr. Mokhtari noted that having fewer scenarios may enable a more rapid response.

5.2 TSP INDIA

Mr. Ajay Kumar Bandela reported on TSP India operated by the Indian National Centre for Ocean Information Services (INCOIS). The observation monitoring networks include seismic, tsunami buoy and tide gauge stations. Coastal forecast points and coastal forecast zones were updated on 14 March 2018. The operational tsunami forecast for the Indian Ocean utilised an open ocean propagation database. For global earthquakes, the real time model is launched for earthquakes of M>=8.0. Real-time inundation using ARCRIC is currently an experimental set-up with model run times of 1-2 minutes in the test DSS 2018 version. Product formats and issue timeframes align with those of the other TSPs (i.e. Type 1-4). TSP India Performance from 1 Sept – 8 November 2018 incudes 44 global earthquakes with 37 events resulting in bulletins issued by TSP India. The key performance indicators were reported on. The IOWave18 exercise on 4-5 September 2018 saw ~104,000 people evacuated in communities along the Indian coastline. A national board on Indian Ocean Tsunami Ready (IOTR) indicators and IOWave exercises has been formed. Six villages participated in IOTR during Exercise IOWave18. Other activities include the hosting of 2nd Integrated meetings of the ICG/IOTWMS; INCOIS-MEA-NDMA Training programme for Pacific Island Countries on Tsunamis; and the Mega-Mock Tsunami Exercise for the East Coast of India. For the 3rd World Tsunami Awareness day INCOIS organised an open day for school children and public where tsunami awareness movies, flyers, tsunami models exhibition, and lectures on seismology, tectonics and tsunami were organised. 3D GIS Mapping has been done around the Indian coastline and nine at-risk communities have been identified. Future plans include utilisation of real-time Global Navigation Satellite System (GNSS) and strong motion accelerometer data for calculating rupture characteristics of tsunamigenic earthquakes.

5.3 TSP INDONESIA

Dr. Karyono presented on behalf of TSP Indonesia operated by the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG). This included performance during 2018, developments since last ICG and development plans. The have 170 seismic stations in Indonesia complimented by 200 global stations. SeisComP3 is used for earthquake analysis and Tsunami Observation and Simulation
Terminal (TOAST) is used for tsunami warnings. The key performance indicators were shared for the period until November 2018 (see Table 5). Developments since the last ICG [ICG-XI, Putrajaya, April 2017] include upgrades to SeisComP3 and Decision Support Tool (DST); adapted new coastal forecast zones; implemented new dissemination standard operating procedures of TSP; extended the TSP notification mode (e.g. Twitter and WhatsApp); and participated in IOWave18. There is a new TSP Indonesia application available for notification to mobile phones, called the “4n1 notification application”) and information is contained in the password protected website.

There was a discussion about the use of social media for TSP notification messages.

6. TASK TEAM REPORTS

6.1 CAPACITY ASSESSMENT OF TSUNAMI PREPAREDNESS

Dr. Harkunti, Chair of the Task Team on Capacity Assessment of Tsunami Preparedness (TT-CATP), reported on the activities of the Task Team. She reviewed the terms of reference, membership, rules and conditions, and membership. The Task Team met at the 1st and 2nd integrated meetings (September 2017, July 2018) as well as in virtual meetings. A key activity is the Survey of Capacity Assessment of Tsunami Preparedness (CATP) of the IOTWMS Member States. Improvements of the CATP baseline survey were noted. The Survey of Capacity Assessment of tsunami Preparedness of the IOTWMS has been issued (IOC CL-2742). They propose to form a new task team to follow-up identified issues to back up WG1 actions: improving the IOWave Manual; and include a study pathway to MHEWS.

6.2 EXERCISE INDIAN OCEAN WAVE 2018 (IOWAVE18)

Mr. Ajay Kumar Bandela, Vice-Chair of the Task Team for IOWave18, and Ms. Nora Gale of the ICG/IOTWMS Secretariat provided a review and preliminary report of Exercise Indian Ocean Wave (IOWave18).

The presentation covered Task Team membership, past IOWave exercises, feedback from the post-IOWave18 workshop [held in Jakarta, Indonesia, November 2018], the IOWave18 timeline, checklist of activities for Member States, community involvement, scenarios, and participation at all levels including evacuations and piloting of Indian Ocean Tsunami Ready (IOTR). The estimated number of evacuations is 116,000 with 104,000 people evacuating in India. Furthermore, IOTR was piloted in six communities in Odisha State (Jayadevkasaba Pahi, Podhuan, Tantiapal Sasan, Noliasahi, Keutajanga and Venkatraipur), India and the community of AlSawadi AlSahil in Oman.

7. OUTCOMES OF THE WORKSHOP ON POST-IOWAVE18 AND IOTR PILOTING

Mr. Kodijat reported on the outcomes of the regional post-IOWave workshop. 30 participants from 13 countries attended the workshop. The objectives of the workshop included lessons learned from community activity during IOWave18, how to improve future IOWave exercises, lessons learned from piloting IOTR in India and Oman, and encouragement of Indian Ocean Member States to pilot IOTR. Mr. Kodijat presented the workshop agenda and recommendations.

Member States have been requested to provide one-page IOWave18 summary, video, photographs, news articles, and media coverage. The IOTR pilot programme in Odisha, India [six communities] and AlSawadi, Oman was reported on. The lessons learned for the IOTR pilots were reported as well as the level of difficulty of implementation.

The recognition of IOTR and Member State involvement in exercises and IOTR was discussed.

8. INDIAN OCEAN TSUNAMI INFORMATION CENTRE (IOTIC)

Mr. Ardito Kodijat gave an update on IOTIC-BMKG 2018 activities and work plan for 2019. The work plan for 2017 – 2022 includes Indian Ocean regional workshops (2); IO capacity building (3 TEMPP trainings); preserving past tsunami information for future preparedness (1950 Ambon, 1992 Flores,
1968 Majen; 1996 Palu; 1994 Banyuwangi; 1996 Biak) documenting and communicating IOWave Exercises (IOWave18 and previous exercises; www.iowave.org); tsunami education awareness and preparedness materials. The next TEMPP activities should focus on in-country development with support for countries piloting IOTR. IOTIC also supported the international tsunami survey teams (6) for Palu. In 2019 IOTIC will report on ITST-Palu to the Government of Indonesia, discuss with GOI on survey applications, and organise a conference on the findings of the Palu surveys. For the current Palu event, the reports are being compiled through the ITST including interviews.

9. IOTWMS DOCUMENTATION

Dr. Andi Eka Sakya, Chair of ICG/IOTWMS, presented the draft ICG/IOTWMS Medium Term Strategy 2019-2024. Dr. Sakya also reported on the IOTWMS Status Report which will based on the Capacity Assessment of Tsunami Preparedness survey. Dr. Tummala reviewed the structure of the ICG/IOTWMS Status Report.

Dr. Sakya noted the plans by the IOC tsunami unit to update the 2015 Fact Sheet for all ICGs. Dr. Tummala shared the Fact Sheet from 2015. While the format of the updated Fact Sheet will be the same across the ICGs, the content and structure can be decided by each ICG. The funding section will be removed and replaced with partner information. The national tsunami warning centre section will be expanded to include organisations and website details for public warnings. The earthquake source zone remains up-to-date and the area of service map will be added. The communications test table will be replaced with a test summary (i.e. twice a year). Other points noted were to retain IOWave exercises; update seismic and sea level stations and make the 2004 seismic and sea level maps smaller; remove summary of IOTWS-TSPs and replace with a yearly summary for earthquake and threat level bulletins. There were suggestions to additions including an IOTIC section, graph of communications tests results, key performance indicator table, IOTR section, and list of people trained.

10. TOWS WORKING GROUP AND TASK TEAM

Dr. Tummala presented the terms of reference of the Task Team on Tsunami Watch Operations (TTTWO). In this Task Team there are two representatives from each ICG (representing the TSPs) and the Technical Secretary is Dr. Tummala. He shared the recommendations from the last meeting in February 2018 including symposiums should be repeated every 3-4 years; explore using ‘travel time’ instead of ‘distance from epicentre’ (not relevant to Indian Ocean who is already doing this); TSPs to review their regional and domestic products to avoid any conflicting information in their products; encourage CARIBE-EWS to continue work on handling tsunamis from volcanos; Member States to assess risk and develop possible warning and mitigation strategy for tsunami from landslides; encourage Member States to share their best practice for meteo-tsunami threats. The Task Team also recommend to change the AoS map, approve standardised text to be used on TSP webpages and request TSPs to have the statement on their websites.

Dr. Harkunti presented on the Task Team on Disaster Management and Preparedness (TTDMP) including membership and terms of reference. Recommendations of the Task Team are to consider refining standard operating procedures in alignment with those of the Pacific Tsunami Warning System (PTWS), which have been tailored to the Sendai Target G indicators, Secretariat to inform Member States of the World Tsunami Awareness Day theme, and the IOTR pilot programme be continued.

11. OTHER ISSUES

Ms Nora Gale, ICG/IOTWMS Secretariat, reported on databases managed by the ICG/IOTWMS Secretariat. These include the seismic, sea level, training participants, and TNC/NTWC/TWFP. There was a conversation to clarify nomination of TNCs. It was also noted that some participants keep repeating training and this may not be desirable for broader information sharing within a Member State.
Dr. Tummala noted that a circular letter has been issued by IOC UNESCO for World Tsunami Awareness Day (WTAD) on 5 November. Member States have informed of their activities over WTAD. It was also noted that the post-IOWave18 workshop aligned with WTAD. In 2019, the ICG will organise activity(ies) with UNESCO-IOC and IOTWMS. Enhancing preparedness for response will be the focus of 2019. Dr. Harkunti noted that WTAD will be challenge in years where it coincides with IOWave exercise and suggested that IOWave be synergised with WTAD.

12. PLANNING FOR ICG/IOTWMS-XII

Dr. Mahmood Reza Akbarpour Jannat from the Iranian National Institute for Oceanography and Atmospheric Science (INIOAS) reported on planning for the 12th Session of the ICG/IOTMWS (ICG-XII), Kish Island 9–12 March 2018. Accommodation and meeting rooms will be at the Kish Island Convention Centre. If transiting through Tehran visas need to be applied for, otherwise Kish Island is a visa-free zone.

Dr. Tummala noted that he met with Dr. Behrouz Abtabi in Tehran. A logistics note is being drafted with inputs from the local organisers at INIOAS. The CL will be issued in the next few weeks.

Dr. Tummala reviewed the ICG-XII draft provisional agenda, time table and list of documents.

Dr. Tummala noted the TOWS-WG meeting scheduled for February 2019 which will be followed by the ICG-XII. The IOC-UNESCO Assembly will be held in June 2019 at which the ICG/IOTWMS Chair will make a presentation.

13. PROGRAMME AND BUDGET

Dr. Tummala reviewed the programme and budget for this intersessional period (April 2017 – March 2019). This included funds from IOC-UNESCO, Government of Australia via the Bureau of Meteorology, Government of Indonesia via BMKG, and UNESCAP (did not receive as project approved later than anticipated). It was noted that there was also unplanned in-kind support from INCOIS toward the 2nd Integrated Meetings. Dr. Tummala noted that the 3 TEMMPs were not included in the original budget and conducted with the support of BMKG (2) and INCOIS (1). In summary we did more activities than planned within the available budget. Dr. Tummala reviewed planned activities and reported on achievements.

14. REVIEW OF RECOMMENDATIONS AND ACTIONS

Dr. Tummala reviewed the draft recommendation and actions from the meeting for feedback and additions to ensure that the list is complete and accurate. The Steering Group approved the actions and recommendations pending minor editorial revisions from the Secretariat. The final Recommendations and Actions are listed below.

14.1 RECOMMENDATIONS

- Consider appointing an additional Vice-Chair to the WG-1 with specific expertise on Hazard Assessments, in addition to the Vice-Chair with expertise on Tsunami Awareness and Preparedness.
- Consider updating the Probabilistic Tsunami Hazard Assessment (PTHA) for Indian Ocean based on recent work by Geoscience Australia.
- Consider approving a 1-day Special technical session on the Palu earthquake and tsunami back to back with the Centennial Conference of the Institute Technology Bandung (ITB) schedules during 4-7 November 2019 in Bali, Indonesia.
- Reiterate the importance of real-time exchange of seismic and sea-level data, especially in the backdrop of Palu Tsunami and the threat of such near-field tsunamis in countries bordering the Makran Subduction Zone.
• Continue to include an additional one-day session on TWC and Seismic Network Operations as part of all future SOP trainings
• Consider mechanisms to strengthen cooperation between UNESCAP, PTC, APDIM and IOTWMS, especially in the context of integrating tsunami warning systems into a multi-hazard framework
• Consider approving International Recognition of Communities that meet the Indian Ocean Tsunami Ready (IOTR) indicators, considering the requests by several Member States
• Consider organising an IOWave exercise in 2020 taking on-board suggestions from the post-IOWave18 lessons learnt workshop, including an increased focus on participation of LDMO down to community level and implementation of IOTR
• Consider establishing a mechanism for participation of international observers in countries conducting community evacuations and IOTR piloting during future IOWave exercises
• Encourage Member States to implement TEMPP trainings at the national/local level leveraging the experience of the past TEMPP Trainings, as well as taking advantage of the offer from IOTIC-BMKG Programme to support experts.
• Request TNCs to consider nominating new participants to the Trainings and Workshops to ensure that more country experts are trained and available to handle tsunami warning operations within their country.
• Consider setting up 3 inter-sessional task teams for the period 2019-21 to focus on (i) Tsunami Preparedness for a near-field tsunami hazard, (ii) Scientific Tsunami Hazard Assessment of the Makran Subduction Zone and (iii) IOWave20, with Terms of Reference and Membership as detailed in Annex V.

14.2 ACTIONS
• Working Group 1 to prepare a special edition journal series dedicated for IOTWMS as part of the IJDRBE (International Journal of Disaster Resilience in the Built Environment) focusing on all 3 pillars of the IOTWMS and report to the ICG-XII (Action: Dr. Harkunti P. Rahayu)
• Working Group 2 to work towards re-initiation of TSP public bulletins over GTS and IOC public list server after necessary testing, and report to the ICG-XII (Action: Mr. Peter Coburn)
• Working Group 2 to update the IOTWMS TSP Service Definition Document and User guide for approval by the ICG-XII (Action: Peter Coburn)
• Secretariat to provide the “text” recommended by the TOWS-WG to TSP-India and TSP-Indonesia for display on their TSP public websites (Action: Secretariat)
• Secretariat to invite United Arab Emirates (UAE) to join the WG-NWIO as soon as their TNC nomination is officially received by the IOC (Action: Secretariat)
• Secretariat to check with IOC-UNESCO, the status of publication of manuscripts presented at the 2015 conference in Muscat, Oman. (Action: Secretariat)
• Organise an Expert Consultation on “Scientific Tsunami Hazard Assessment of the Makran Subduction Zone” on 08 March 2019 back-to-back with ICG-XII and requests Dr. Mohammad Mokhtari to lead this activity in coordination with the Secretariat. The preliminary list of participants includes TSP representatives (Patanjali Kumar, Ajay Kumar, Karyono, Weniza, Adrienne Moseley, Jonathan Bathgate, Robert Greenwood), Issa El-Hussain, Ahmed Deif Gomaa Abdullah, Adel Mohamed and other noted experts to be identified from UAE, Iran, India, Pakistan, Germany, etc. (Action: Mohammad Mokhtari, Secretariat)
• TT-CATP to generate Country and Regional profiles based on the inputs received from Member States, and prepare a draft of the IOTWMS Status Report for presentation to the ICG-XII (Action: Dr. Harkunti P. Rahayu)
• Working Groups to prioritise future Capacity Development requirements of IOTWMS Member States based on results of the TT-CATP survey (Action: Working Group Chairs)
• IOC-UNESCO to send congratulatory message addressed to the Permanent Delegations and UNESCO National Commissions of the IOTWMS Member States that participated in community evacuations and IOTR piloting during IOWave18 (Action: Secretariat)
• IOTIC to continue to support the implementation of IOTR and communication and documentation of future IOWave exercises (Action: IOTIC)
• IOTIC to finalise the report on ITST-Palu for presentation at the ICG-XII, explore organising a scientific conference on lessons learnt from Palu event, archive data collected from the ITST initiatives and prepare a summary report on behalf of the IOC for submission to Government of Indonesia (Action: IOTIC)
• IOTIC to organise a regional workshop aligned with WTAD-2019 on the topic of enhancing community preparedness against tsunami threats in the Indian Ocean (Action: IOTIC)
• Approves the draft Medium Term Strategy 2019-2024 and requests the Secretariat to put up the document for approval by ICG-XII (Action: Secretariat)
• Secretariat to incorporate all changes suggested by the Steering Group in the IOTWMS factsheet for consideration by the ICG-XII (Action: Secretariat)
• Secretariat to continue updating the WG and TT facts sheets (Action: Secretariat)
• Secretariat to maintain a running list of actions/recommendations pertaining to all the Working Groups and Task Teams to ensure efficient monitoring (Action: Secretariat)
• IOTWMS representatives to the TOWS-WG Task Teams to report at the next TTTWO and TTDMP regarding (i) lessons learnt from Palu Tsunami, (ii) TT-CATP Questionnaire in relation to the key performance indicators being finalized by a PTWS Task Team, (iii) lessons learnt from pilot implementation of the IOTR programme and the request by several Member States for international recognition of communities by IOC-UNESCO. (Action: Harkunti Rahayu, Yuelong Miao)
• Chair of Working Group 1 to make a presentation of the PTWS key performance indicators for consideration by the ICG-XII (Action: Dr. Harkunti P. Rahayu)
• Approves the Provisional Agenda, Provisional Time Table and Provisional List of Documents for the ICG-XII prepared by the Secretariat and requests the Chairs of WGs, TTs, Secretariat and IOTIC to prepare the necessary documents to be made available to Member States 8 weeks in advance of the ICG (Action: Chairs of Working Groups and Task Teams, Secretariat)

14.3 NOTES WITH APPRECIATION
• Welcome message from Prof. Behrooz Abtahi, Director of INIOAS (provided in Annex VI), and sincerely thanks the IR of Iran for all arrangements being made for hosting the ICG-XII.
• Support of BMKG for hosting the post-IOWave18 Workshop, SG and TEMPP-3 meetings in Indonesia.
• Secretariat and IOTIC/BMKG/UNESCO-Jakarta for the excellent preparation and organisation of the workshop, meetings and trainings.
• Extra Budgetary support from Australia for IOTWMS Secretariat, support from Indonesia for IOTIC-BMKG activities including 1st integrated meetings, support from INCOIS, India for hosting the 2nd integrated meetings, as well as in-kind support from Global Disaster Resilience Centre (GDRC), UNESCAP, etc. during the inter-sessional period.
• Working Groups, Task Teams, IOTIC and Secretariat for the excellent work during the inter-sessional period.

15. CLOSE OF MEETING
The meeting was closed by Dr. Andi Eka Sakya at 12:35 pm on 21 November 2018.
## AGENDA

### Day -1: Monday 19 November

<table>
<thead>
<tr>
<th>No.</th>
<th>Time</th>
<th>Session</th>
<th>Lead</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>1230 to 1245</td>
<td>Welcome by BMKG</td>
<td>Muhamad Sadly / Andi Eka Sakya</td>
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<td></td>
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<td>Welcome by Chair</td>
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<td></td>
<td></td>
<td>- Introductions</td>
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<td>- Approval of Agenda</td>
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<td>2.</td>
<td>1245 to 1400</td>
<td>Secretariat Report</td>
<td>Srinivasa Kumar</td>
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<td>- Review of action items from the previous meetings</td>
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<tr>
<td>3.</td>
<td>1400 to 1530</td>
<td>Sulawesi Earthquake and Tsunami</td>
<td>Muhamad Sadly / Pak Triyono / Irina Raffliana / Gegar Prasetya</td>
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<td></td>
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<td>- Upstream Detection &amp; Warning and Preliminary Field Survey by BMKG</td>
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<td>- Downstream Community Preparedness &amp; Response</td>
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<td>- Preliminary findings of the International Tsunami Survey Teams (ITST)</td>
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<td>1530 to 1600</td>
<td>Tea Break</td>
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<td>4.</td>
<td>1600 to 1730</td>
<td>WG Reports</td>
<td>Harkunti Rahayu / Jonathan Bathgate / Peter Coburn / Juma Al-Maskari / Srinivasa Kumar / Mohammad Mokhtari</td>
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<td></td>
<td></td>
<td>- WG 1 - Tsunami Risk, Community Awareness and Preparedness</td>
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<td>- Probabilistic Tsunami Hazard Assessment for the Indian Ocean Nations</td>
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<td>- WG 2 - Tsunami Detection, Warning and Dissemination</td>
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<td></td>
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<td>- Sub-Regional Working Group for North West Indian Ocean</td>
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<td>- UNESCAP Proposal</td>
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<td>- Concept Note for Makran Project</td>
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### Day -2: Tuesday 20 November

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<tr>
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<th>Time</th>
<th>Session</th>
<th>Lead</th>
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<tbody>
<tr>
<td>6.</td>
<td>0900 to 1000</td>
<td>Task Team Reports</td>
<td>Harkunti Rahayu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Capacity Assessment of Tsunami Preparedness</td>
<td>Ajay Kumar</td>
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<tr>
<td></td>
<td></td>
<td>- IOWave18</td>
<td>Nora Gale</td>
</tr>
<tr>
<td>7.</td>
<td>1000 to 1030</td>
<td>Outcomes of the Workshop on post-IOWave18 and IOTR Piloting</td>
<td>Ardito Kodijat</td>
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<tr>
<td></td>
<td>1030 to 1100</td>
<td>Tea Break</td>
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<tr>
<td>8.</td>
<td>1100 to 1130</td>
<td>Indian Ocean Tsunami Information Centre (IOTIC)</td>
<td>Ardito Kodijat</td>
</tr>
<tr>
<td>9.</td>
<td>1130 to 1230</td>
<td>IOTWMS Documentation</td>
<td>Andi Eka Sakya</td>
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<td></td>
<td></td>
<td>- Medium Term Strategy (2019-2024)</td>
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<tr>
<td></td>
<td></td>
<td>- IOTWMS Status Report</td>
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<td></td>
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<td>- IOTWMS Factsheet / Leaflet</td>
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<td></td>
<td>1230 to 1400</td>
<td>Lunch Break</td>
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<td>10.</td>
<td>1400 to 1530</td>
<td>IOTWMS Documentation (Continued)</td>
<td>Andi Eka Sakya</td>
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<td>1530 to 1600</td>
<td>Tea Break</td>
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<tr>
<td>11.</td>
<td>1600 to 1630</td>
<td>TOWS Working Group and Task Teams</td>
<td>Harkunti Rahayu</td>
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<td>Srinivasa Kumar</td>
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<tr>
<td></td>
<td>1630 to 1730</td>
<td>Other Issues</td>
<td>Nora Gale</td>
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<tr>
<td></td>
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<td>- Updates to Seismic/Sea-level Database</td>
<td>Srinivasa Kumar</td>
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<tr>
<td></td>
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<td>- Updates to TNC/TWFP/NTWC Contact Database</td>
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<td>- WTAD</td>
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<td>End of Day – 2</td>
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Day -3: Wednesday 21 November

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<tr>
<td>12.</td>
<td>0900 to 1030</td>
<td>Planning for ICG/IOTWMS XII</td>
<td>Akbarpour Jannat</td>
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<td></td>
<td></td>
<td>- ICG/IOTWMS XII Meeting Logistics</td>
<td>Srinivasa Kumar</td>
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<td></td>
<td></td>
<td>- ICG/IOTWMS XII Draft Agenda, Session Organisation, Documentation, Programme Matters</td>
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<td>- Other planned Workshops/Events</td>
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<td></td>
<td>1030 to 1100</td>
<td>Tea Break</td>
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<tr>
<td>13.</td>
<td>1100 to 1130</td>
<td>Programme and Budget</td>
<td>Srinivasa Kumar</td>
</tr>
<tr>
<td>14.</td>
<td>1130 to 1200</td>
<td>Review of Actions and Recommendations</td>
<td>Srinivasa Kumar</td>
</tr>
<tr>
<td>15.</td>
<td>1200 to 1230</td>
<td>Close of Meeting</td>
<td>Andi Eka Sakya</td>
</tr>
</tbody>
</table>
ANNEX II

IOC-UNESCO
Intergovernmental Coordination Group for the
Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS)

13th Meeting of the ICG/IOTWMS Steering Group
19 – 21 November 2018
BMKG, Jakarta, Indonesia

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Email: serverino.d.c.oliveira@hotmail.com
## ACTIONS OUTSTANDING FROM PREVIOUS STEERING GROUP MEETINGS

<table>
<thead>
<tr>
<th>SG Meeting</th>
<th>Action Number</th>
<th>Status</th>
<th>Progress</th>
<th>Action</th>
<th>Updates</th>
<th>Assigned</th>
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</thead>
</table>
| SG-8 Perth Dec 2013 | SG 8.23       | Open   | In progress | RTSPs to display maps of the utilised real-time seismic and sea level stations on their websites. | **SG-13:** Outstanding. TSP-Australia has both; TSP-India has sea level.  
**SG-12:** Ongoing  
**SG-11:** Ongoing  
**SG-10:** Ongoing, All TSPs will set this up  
**SG-9:** INCOIS already do this for sea level, JATWC and InaRTSP will follow up on this. Display is for NTWC only. Stations available to the TSP updated in real time. May need a link to external website. | TSPs     |
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<tr>
<th>SG Meeting</th>
<th>Action Number</th>
<th>Status</th>
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<th>Action</th>
<th>Updates</th>
<th>Assigned</th>
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</thead>
<tbody>
<tr>
<td>SG-9 Jakarta</td>
<td>SG 9.03</td>
<td>Closed</td>
<td>Cancelled</td>
<td>Secretariat to write a letter to the TNCs introducing IOTIC and Ardito Kodijat as the primary contact for the collection of tsunami educational material.</td>
<td>SG-13: Closed &amp; cancelled. May include with a new fact sheet or flyer. SG-12: Outstanding</td>
<td>Secretariat.IOTIC</td>
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<tr>
<td>Nov 2014</td>
<td></td>
<td></td>
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<td></td>
<td>SG-11: To be sent after MoU is signed between IOC/UNESCO and BMKG SG-10: Outstanding</td>
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<tr>
<td>SG-10 Perth</td>
<td>SG 10.17</td>
<td>Open</td>
<td>In progress</td>
<td>IOTIC to issue regular monthly news bulletins related to website updates and to work with officers and the Secretariat on regular 6 monthly ICG/IOTWMS newsletters.</td>
<td>SG-13: Outstanding SG-12: Outstanding SG-11: Outstanding</td>
<td>IOTIC</td>
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<td>Aug 2015</td>
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<td>SG-10 Perth</td>
<td>SG 10.22</td>
<td>Open</td>
<td>In progress</td>
<td>IOTIC and the Chair of IOTWMS to work together on an information sheet (1-2 pages) on TSP and NTWC contacts for the media and public.</td>
<td>SG-13: In Progress. Website details updated and used on TSP-Australia public webpage. Will now incorporate in IOTWMS Fact Sheet with draft for ICG. SG12: Ongoing SG 11: Outstanding</td>
<td>IOTIC SG Chair</td>
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<td>Aug 2015</td>
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<tr>
<td>SG-11 Perth</td>
<td>SG 11.03</td>
<td>Open</td>
<td>In progress</td>
<td>WG-2 to engage with WG-NWIO to assist with assessment of seismicity for the Makran following the next meeting of the NWIO (project/proposal/ESCAP)</td>
<td>SG-13: A team of WG-2 led by Mohammad Mokhtari with Members from 3 TSPs, Oman, Pakistan, Iran, Germany, Other Experts to undertake this task. Possible meeting back-to-back with the ICG-XII. SG-12: Ongoing</td>
<td>WG-2</td>
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<tr>
<td>Jan 2017</td>
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<tr>
<td>SG-11 Perth</td>
<td>SG 11.06</td>
<td>Open</td>
<td>In progress</td>
<td>Develop integrated event database and KPI reporting system (WG-2)</td>
<td>SG-13: Ongoing SG-12: Ongoing</td>
<td>WG-2</td>
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<td>Jan 2017</td>
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<tr>
<td>SG-11 Perth</td>
<td>SG 11.08</td>
<td>Closed</td>
<td>In progress</td>
<td>Secretariat to obtain the Indian and Australian National IOWave16 Manuals and share with Member States in preparation of future IOWave exercises.</td>
<td>SG-13: Closed SG-12: Ongoing</td>
<td>Secretariat</td>
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<td>Jan 2017</td>
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<td>SG Meeting</td>
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| SG-11 Perth Jan 2017 | SG 11.16 | Open | In progress | WG2 to initiate a project to recommend the optimal sea-level and seismic monitoring network for the Indian Ocean. | SG-13: Outstanding  
SG-12: Ongoing | WG-2 |
| SG-11 Perth Jan 2017 | SG 11.17 | Open | In progress | WG2 to initiate a study of Green’s Law applicability/exceptions in the Indian Ocean, especially relating to islands, bays and coastlines with coral reefs. | SG-13: Outstanding  
SG-12: Ongoing | WG-2 |
<p>| SG-12 Jakarta Sep 2017 | SG 12.01 | Open | In progress | Status Report: The IOTWMS Status Report be developed based on the structure of the Status Report finalized in the SG-11 meeting (January 2017, Perth), further adding a section on the IOTIC. Inputs are to be drawn from (i) the national reports submitted by the IOTWMS Member States to the ICG/IOTWMS-XI session and (ii) the capacity assessment survey that is planned to be conducted by the TT-CATP during May-June 2018 in the new questionnaire format. | SG-13: Ongoing. Capacity Assessment Survey sent to TNC in early November. | Dr. Harkunti Rahayu, Mr. Peter Coburn, Dr. Juma Al-Maskari assisted by the IOTIC and Secretariat. |
| SG-12 Jakarta Sep 2017 | SG 12.02 | Open | In progress | Medium Term Strategy: The MTS be prepared for the period 2019 - 2024, for approval by the ICG/IOTWMS-XII session in 2019 | SG-13: Draft Prepared | Dr. Andi Eka Sakya, Mr. Peter Coburn, Dr Harkunti Rahayu, Dr. Juma Al-Maskari assisted by the IOTIC and Secretariat. |
| SG-12 Jakarta Sep 2017 | SG 12.03 | Closed | Completed | Indian Ocean Tsunami Ready (IOTR): Adopt the Indian Ocean' Tsunami Ready Guidelines and pilot implementation of IOTR. | SG-13: Closed | TT-CAPT |</p>
<table>
<thead>
<tr>
<th>SG Meeting</th>
<th>Action Number</th>
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<th>Action</th>
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<tr>
<td>SG-12 Jakarta Sep 2017</td>
<td>SG 12.04</td>
<td>Open</td>
<td>In progress</td>
<td>Training of Operators: Requests WG-2 to explore the option of exchange of operators amongst the TSPs</td>
<td>SG-13: Outstanding</td>
<td>WG-2</td>
</tr>
<tr>
<td>SG-12 Jakarta Sep 2017</td>
<td>SG 12.05</td>
<td>Closed</td>
<td>Completed</td>
<td>2nd Integrated Meetings: To be held in Hyderabad (~April 2018) with meetings of the Working Groups, Task Teams and Steering Group back-to-back with the SOP workshop.</td>
<td>SG-13: Closed</td>
<td>Steering Group, Secretariat, IOTIC</td>
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</table>
Background:
The Makran Subduction Zone is still poorly understood even though it poses a major tsunami risk in the North West Indian Ocean. Several decades after the 1945 tsunami that caused hundreds of confirmed fatalities, there are still open questions about whether the Makran is able to generate such large tsunamis in the future. In the worst case of such an event, tsunami waves generated at the Makran source would reach adjoining shores within few tens of minutes, posing enormous challenges for tsunami early warning systems.

There is urgent need for scientific tsunami hazard assessment of the Makran Subduction Zone based on existing knowledge as well as relevant projects being implemented in the region by international scientific groups. This information will enable Member States to assess their tsunami risk, strengthen warning systems including inter-agency SOPs, warning chains, develop evacuation plans, build emergency response capacity and raise community awareness, preparedness and resilience.

The ICG/IOTWMS sub-regional Working Group for the North West Indian Ocean, established at the 10th Session of the ICG/IOTWMS with India, Iran, Oman, Pakistan and Yemen as Members, is engaged in pursuing these important activities. As a follow up to actions arising from its working group meetings, the ICG/IOTWMS Steering Group recommended organising an Expert Consultation on “Scientific Tsunami Hazard Assessment of the Makran Subduction Zone” on 08 March 2019 back-to-back with ICG-XII.

Dr. Mohammad Mokhtari, Vice Chair of the ICG/IOTWMS Working Group 2 on Tsunami Detections, Warning and Dissemination was requested to lead this activity in coordination with the ICG/IOTWMS Secretariat.

Objectives of the Expert Consultation:
The tectonic situation of the MSZ, where the section to the west of the Sonne Fault has low seismicity compared to the east side is vital to be understood clearly. The question is whether the west side is locked? Further, secondary tsunami sources such as splay faulting and
landslides could be potential strengthening source for tsunamis. Real-time seismic networks are very sparse in the region, limiting our capability to effectively monitor seismic events and forewarn tsunamis. In this context it is very important that we work out ways for real-time exchange of seismic and sea-level data from the regional Member States, as well as develop other seismological methods such as seismic array to bridge gaps in monitoring seismicity. This will improve timely event detection and analysis, in addition to contributing to general understanding of the seismicity in the region. An international project to better understand the western Makran Subduction Zone, with cooperating institutions from Iran, Portugal, Oman, Norway, Germany and the Netherlands is currently underway which is expected to provide important inputs to seismic and tsunami hazard assessment. Paleo tsunami work also plays an important role in understanding the frequency of past tsunamis.

A recent report on “Tsunami Early Warning Systems in countries of the North West Indian Ocean Region” prepared by UNESCAP identified the immediate need to enhance our collective understanding of the Makran Tsunami Hazard, strengthen national warning systems including end-to-end warning chains & SOPs as well as enhance community preparedness with specific emphasis on near-field tsunami threat.

This Expert Consultation will bring together national and international experts working on Seismic and Tsunami Hazard in the MSZ and is intended to formulate a working mechanism for enhancing our collective understanding of the Makran Tsunami Hazard. The Expert Consultation will discuss the following important topics and present its recommendations to the 12th Session of the ICG/IOTWMS (09-12 March 2019) at Kish Island, I.R. of Iran:

- Optimal number and configuration of seismic/sea-level/GNSS and other observing networks needed for real-time tsunami warning in the MSZ
- Investigate and report on the credible maximum earthquake magnitude in the Makran Subduction Zone
- Investigate and report on the seismicity of the Makran subduction zone as well as the potential impact of tsunamis in the Red Sea and Persian Gulf with a view to including those zones in the IOTWMS Area of Service, if there is a threat
- Review and report on the status of research into the modelling of secondary non-seismic effects in Makran for potential use in the IOTWMS

**Preliminary list of Invitees for the Expert Consultation:**

Representatives of the 3 Tsunami Service Providers (Australia, India, Indonesia), WG-NWIO Member States (India, Iran, Oman, Pakistan, Yemen) and invited experts from international institutions involved in research of MSZ (IIEES, GFZ, GTM, UNESCAP, etc.) will be invited to the expert consultation. A preliminary list of invitees is as follows:

**Experts:**
- Mohammad Mokhtari, Lead - mokhtari@iiees.ac.ir; m7mokhtari@gmail.com
- Adrienne Moseley, TSP – Australia: adrienne.moseley@ga.gov.au
- Jonathan Bathgate, TSP – Australia: Jonathan.Bathgate@ga.gov.au
- Robert Greenwood, TSP – Australia: robert.greenwood@bom.gov.au
- Patanjali Kumar, TSP – India: Patanjali@incois.gov.in
- Ajay Kumar, TSP – India: Ajay@incois.gov.in
- Karyono, TSP – Indonesia: karyonosu@gmail.com
- Weniza, TSP – Indonesia: weniza@bmkg.go.id
- Issa El-Hussain, Oman: elhussain@squ.edu.om
- Ahmed Deif Gomaa Abdullah, Oman: adeif@squ.edu.om
- Adel Mohamed, Oman: geotec_04@yahoo.com
- Joern Lauterjung, GFZ: lau@gfz-potsdam.de
- Andrey Babeyko, GFZ: babeyko@gfz-potsdam.de
- Christian Haberland, GFZ: haber@gfz-potsdam.de
- Hamid Zafarani, IIEES: h.zafarani@iiees.ac.ir
- To be confirmed, GITU:
- To be confirmed, INIO:
- Seismic Expert from Pakistan
- Seismic Expert from Yemen
- Seismic Expert from United Arab Emirates
- Representative from GEM/GTM
- Finn Lovholt, NGI, Norway, GTM: finn.lovholt@gmail.com
- John F. Schneider, GEM Secretary General: john.schneider@globalquakemodel.org
- Other Experts (Japan, etc. to be confirmed)

Meeting Host:
- Prof. Behrooz Abtahi, Iran: abtahi.b@gmail.com

ICG Officers:
- Andi Eka Sakya, Chair, ICG/IOTWMS: andi.eka.sakya@gmail.com
- Juma Al-Maskari, Chair, WG-NWIO - j.almaskari@met.gov.om
- Harkunti Rahayu, Chair WG-1: harkunti_rahayu@yahoo.com
- Peter Coburn, Chair WG-2: p.coburn@bom.gov.au

UN Agencies:
- Sanjay Srivastava, UNESCAP: srivastavas@un.org
- Mostafa Mohaghegh, UNESCAP: mostafa.mohaghegh@un.org
- Srinivasa Kumar Tummala, ICG/IOTWMS Secretariat: sk.tummala@unesco.org
- Nora Gale, ICG/IOTWMS Secretariat: n.gale@unesco.org
- Ardito Kodijat, IOTIC : a.kodijat@unesco.org
NEW INTER-SESSIONAL TASK TEAMS FOR 2019-2021

**Recommends ICG set up a Task Team on “Tsunami Preparedness for a near-field tsunami hazard” with the following Terms of reference**

- Provide technical assistance to Member States threatened by near-field tsunami threat to adapt and integrate their national warning chains and SOPs into a multi-hazard approach
- Guide the implementation of Indian Ocean Tsunami ready recognition programme in the IOTWMS Member States with a near-field tsunami threat

The Task Team will work towards enhancing Tsunami preparedness for near-field tsunami hazard in a Multi Hazard framework including improving end-to-end national warning chains, learning from the recent tsunami events. The Task Team will be composed of representatives from WG-1, WG-2, WG-NWIO, IOTIC, interested Member States and invited experts (GDRC, UNESCAP) with a chair and Vice-Chair to be elected.

**Recommends the ICG to set up an inter-sessional Task Team on “Scientific Tsunami Hazard Assessment of the Makran Subduction Zone” reporting to the Steering Group with the following Terms of Reference:**

- Draft an agreement document for real-time exchange between Member States of seismic/sea-level/GNSS data in the MSZ
- Specify optimal number and configuration of seismic/sea-level/GNSS and other observing networks needed for real-time tsunami warning in the MSZ
- Investigate and report on the credible maximum earthquake magnitude in the Makran Subduction Zone
- Investigate and report on the seismicity of the Makran subduction zone as well as the potential impact of tsunamis in the Red Sea and Persian Gulf with a view to including those zones in the IOTWMS AoS if there is a threat
- Review and report on the status of research into the modelling of secondary non-seismic effects in Makran for potential use in the IOTWMS

Members of the Task Team will include representatives of the 3 TSPs (Australia, India, Indonesia), WG-NWIO Member States (India, Iran, Oman, Pakistan, Yemen) and invited experts from international institutions involved in research of MSZ (IIIES, GFZ, GTM, UNESCAP, etc.)
Recommends the ICG consider conducting IOWave exercise in 2020 and establish a Task Team with the following Terms of Reference:

- Plan and coordinate the next IOWave Exercise, taking on-board suggestions from the post-IOWave18 lessons learnt workshop including an increased focus on LDMO down to community level and implementation of IOTR.
- Prepare the Exercise Manual in accordance with the Guideline on "How to Plan. Conduct and Evaluate Tsunami Exercises" (IOC Manuals and Guides No. 58) at least 6 months in advance of the exercise,
- Prepare the Exercise Report for ICG/IOTWMS-XIII.

The Task Team will report to the Steering Group and be composed of members nominated by Member States and representatives from TSPs, with a chairperson and vice-chairperson to be elected.
The tragic tsunami in 2004, in which over 230,000 lives were lost around the Indian Ocean region, identified the importance of coastal hazards, vulnerability, risk assessment and management and generated global interest for disaster risk reduction in coastal areas. Over the following years, the member states through regional and international collaboration, planned, designed and commenced operations of the Indian Ocean Tsunami Warning and Mitigation System (IOTWMS) as a highly successful end to end warning system under UNESCO/Intergovernmental Oceanographic Commission (IOC).

As an active IOC Member State, Islamic Republic of Iran through the Iranian National Institute for Oceanography and Atmospheric Science (INIOAS) is active on ocean hazards researches. Having long coastal lines, IR of Iran is affected by different hazards including Tsunami, rip currents, storm surges, high waves, water level change, oil stick movement and red tide. Coastal lines of the Persian Gulf, Gulf of Oman and Caspian Sea and even of the lakes are strategically important for Islamic Republic of Iran. In this regard, the INIOAS, as the main oceanographic institute in Iran, has established the "Iranian National Center for Ocean Hazards (INCOH)", which is a high qualified national research center that strives to fulfill the educational and social needs of the country in respect to the mitigation of marine hazards.
Considering the international collaborations for mitigation of the Tsunami impacts and being an active member of ICG/IOTWMS, Islamic Republic of Iran expressed its interest in hosting the 12th Session of the ICG/IOTWMS in 2019 at the 10th session of the ICG/IOTWMS held in Muscat, Oman, March 2015. At the IOTWMS 11th session held in Putrajaya, Malaysia, April 2017, ICG accept the offer of IR. Of Iran. Therefore, the INIOAS has the honor of hosting the 12th Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS), 9-12 March 2019 in Kish Island.

Dear steering committee members, Ladies and gentlemen, it gives us great pleasure to welcome each and every one of you to Iran and to the 12th Session of the ICG/IOTWMS. With these words, I want to welcome all of you to Kish Island and Iran. I think you have some interesting days with a lot of fruitful discussions before you, but I also hope that you will take the time to enjoy Iran and your stay here in Kish Island.

Welcome, and good luck.

Behrooz Abtahi
Director Office, INIOAS