Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

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

Tenth Session

Muscat, Oman
24–26 March 2015

UNESCO

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ICG/IOTWS-X/3
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[1] The Executive Summary is available in English, French, Spanish and Russian.

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Executive summary

The Tenth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-X) was held in Muscat, Oman, from 24 to 26 March 2015 under the Chairmanship of Mr Rick Bailey. The Session was attended by delegates from 20 Member States in the Indian Ocean region, 5 UN agencies and other organisations, and 17 observers. The meeting agenda is attached as ANNEX I.

The **ICG reviewed the progress** made during the intersessional period and considered the reports and recommendations from its Steering Group, Working Groups and Task Teams. It also considered the draft report of the Exercise Indian Ocean Wave 14 (IOWave14) prepared by the IOWave14 Task Team and Tsunami Service Provider (TSP) status reports from Australia, India and Indonesia.

The **ICG received, considered and noted** reports of the Sixth and Seventh meetings of the Working Group on Tsunami and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG); a report from the Indian Ocean Tsunami Information Centre (IOTIC); and national progress reports from Australia, Bangladesh, France, India, Indonesia, Iran, Kenya, Malaysia, Maldives, Madagascar, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Sri Lanka, Tanzania and Thailand.

The **ICG noted and considered** the outcomes and summary statement of the International Conference to commemorate the Tenth anniversary of the Indian Ocean Tsunami "The Indian Ocean Tsunami Warning and Mitigation System 10 years after the Indian Ocean Tsunami: Achievements, Challenges, Remaining Gaps and Policy Perspectives" (24–25 November 2014, Jakarta, Indonesia).

The **ICG noted** the outcomes of the Third UN World Conference on Disaster Risk Reduction (13–18 March, Sendai, Japan) as reported in the Sendai Framework for Disaster Risk Reduction 2015–2030.

The **ICG noted** the outcomes of the regional conference on Reducing Tsunami Risk in the Western Indian Ocean hosted by Oman, the 22 and 23 March 2015 and **congratulated** the Sultanate of Oman on the inauguration of its National Multi-Hazard Early Warning System (NMHEWS) on 23 March 2015.

The **ICG endorsed** the Terms of Reference for the Indian Ocean Tsunami Information Center (IOTIC) and **welcomed** with gratitude the offer of Indonesia to host IOTIC and support it with office space, staff support and other essential support for a period of 5 years commencing 2016.

The **ICG decided** to place greater emphasis on community awareness and preparedness to help ensure more appropriate responses to tsunami warning information.

The **ICG decided** to dissolve Working Group 1 on Tsunami Risk Assessment and Reduction and Working Group 3 on Tsunami Awareness and Response and establish a new Working Group 1 on Tsunami Risk, Community Awareness and Preparedness with Chair Dr Harkunti Pertiwi Rahayu (Indonesia) and Vice-Chairs Dr Majid Naderi Beni (Iran) and Dr Sultan Al-Yahyai (Oman).

The **ICG decided** to continue Working Group 2 on Tsunami Detection, Warning and Dissemination with Chair Mr Peter Coburn (Australia) and Vice-Chairs Dr Mohammad Mokhtari (Iran) and Dr Mochammad Riyadi (Indonesia).

The **ICG decided** to establish a new Sub-Regional Working Group for the North West Indian Ocean with Chair Dr Juma Al Maskari (Oman) and Vice-Chair Dr Nasser Hadjizadeh Zaker (Iran).

The **ICG adopted** the IOTWS Tsunami Service Provider (TSP) Service Definition Document and requested the TSPs to conform to it.

The **ICG decided** to conduct an Exercise Indian Ocean Wave 16 (IOWave 16) in August 2016 and established a Task Team to plan and organize it, reporting to the Steering Group.

The **ICG decided** to conduct a joint training workshop on Standard Operating Procedures in the intersessional period involving the TSPs, National Tsunami Warning Centres (NTWCs), DMOs and Media, and a post-IOWave 14 workshop, both subject to the availability of funding. The **ICG accepted** the kind offer of India to host the workshops, preferably in late 2015.

The **ICG decided** to conduct a workshop on coastal hazards and risk assessment in 2016, subject to the availability of funding, and accepted the kind offer of Seychelles to host it.

The **ICG elected** its officers for the next interesessional term commencing at the end of the Session. Dr Srinivasa Kumar Tummala (India) was elected as Chair, and Dr Juma Al Maskari (Oman) and Prof Samantha Hettiarachchi (Sri Lanka) were elected as Vice-Chairs.

The **ICG decided** to hold its Eleventh Session in early 2017 and **accepted** with appreciation the offer from Malaysia to host it. The **ICG expressed** its gratitude to the Sultanate of Oman for the excellent host arrangements for its Tenth Session.

The **ICG adopted** Decisions and Recommendations ICG/IOTWS-X.1 as attached in ANNEX **II**.

Résumé exécutif

La dixième session du Groupe intergouvernemental de coordination du Système d'alerte aux tsunamis et de mitigation dans l'océan Indien (GIC/IOTWS-X) s'est tenue à Mascate (Oman) du 24 au 26 mars 2015, sous la présidence de M. Rick Bailey. Ont participé à cette session 20 délégués d'États membres de la région de l'océan Indien, cinq institutions du système des Nations Unies et autres organisations, ainsi que 17 observateurs. L'ordre du jour de la réunion figure à l'Annexe I.

Le GIC a passé en revue les progrès accomplis pendant la période intersessions et **examiné** les rapports et recommandations de son groupe directeur, de ses groupes de travail et de ses équipes spéciales. Il a également **examiné** le projet de rapport de l'exercice IOWave 14, établi par l'équipe spéciale chargée de cet exercice, ainsi que les rapports d'étape des Prestataires de services relatifs aux tsunamis (TSP) d'Australie, d'Inde et d'Indonésie.

Le GIC a reçu et examiné plusieurs rapports, dont il **a pris note** : rapports des sixième et septième réunions du Groupe de travail sur les systèmes d'alerte aux tsunamis et autres aléas liés au niveau de la mer, et de mitigation (TOWS-WG) ; rapport du Centre d'information sur les tsunamis dans l'océan Indien (IOTIC) ; rapports d'étape nationaux de l'Australie, du Bangladesh, de la France, de l'Inde, de l'Indonésie, du Kenya, de Madagascar, de la Malaisie, des Maldives, de Maurice, du Mozambique, du Myanmar, d'Oman, du Pakistan, de la République islamique d'Iran, de la République-Unie de Tanzanie, de Sri Lanka et de la Thaïlande.

Le GIC a examiné et pris note des conclusions et du compte rendu de la Conférence destinée à commémorer le 10e anniversaire du tsunami qui a frappé l'océan Indien et intitulée « Le Système d'alerte aux tsunamis et de mitigation dans l'océan Indien 10 ans après: réalisations, enjeux, lacunes à combler et perspectives politiques » (24–25 novembre 2014, Jakarta, Indonésie).

Le GIC a pris note des conclusions de la troisième Conférence mondiale des Nations Unies sur la réduction des risques de catastrophe (13–18 mars, Sendai, Japon) qui figurent dans le Cadre de Sendai pour la réduction des risques de catastrophe (2015–2030).

Le GIC a pris note des conclusions de la conférence régionale sur la réduction des risques liés aux tsunamis dans l'océan Indien occidental, tenue à Oman les 22 et 23 mars 2015 et **a félicité** le Sultanat d'Oman pour l'inauguration de son système national d'alerte rapide multi-aléa (NMHEWS) le 23 mars 2015.

Le GIC a approuvé le mandat du Centre d'information sur les tsunamis dans l'océan Indien (IOTIC) et **a accepté avec gratitude** la proposition faite par l'Indonésie d'accueillir l'IOTIC et de lui apporter son soutien en mettant à sa disposition des espaces de bureau, du personnel d'appui et d'autres contributions essentielles pour une période de cinq ans à compter de 2016.

Le GIC a décidé de mettre davantage l'accent sur la sensibilisation et la préparation des communautés afin que celles-ci puissent réagir de manière adéquate en cas d'alerte au tsunami.

Le GIC a décidé de dissoudre le Groupe de travail 1 sur l'évaluation et la réduction des risques de tsunami, ainsi que le Groupe de travail 3 sur la sensibilisation et la réponse aux tsunamis, afin d'établir un nouveau Groupe de travail 1 sur les risques de tsunami et la sensibilisation et la préparation des communautés, sous la présidence de Mme Harkunti

Pertiwi Rahayu (Indonésie) et la vice-présidence de MM. Majid Naderi Beni (République islamique d'Iran) et Sultan Al-Yahyai (Oman).

Le GIC a décidé de reconduire le Groupe de travail 2 sur la détection des tsunamis, l'alerte et la diffusion, sous la présidence de M. Peter Coburn (Australie) et la vice-présidence de MM. Mohammad Mokhtari (République islamique d'Iran) et Mochammad Riyadi (Indonésie).

Le GIC a décidé d'établir un nouveau Groupe de travail sous-régional pour l'océan Indien nord-occidental sous la présidence de M. Juma Al Maskari (Oman) et la vice-présidence de M. Nasser Hadjizadeh Zaker (République islamique d'Iran).

Le GIC a adopté le document de définition des services pour les Prestataires de services relatifs aux tsunamis (TSP) de l'IOTWS et **a prié** ces derniers de s'y conformer.

Le GIC a décidé de réaliser un exercice IOWave 16 en août 2016 et **a mis en place** une équipe spéciale chargée de planifier et d'organiser cet exercice, sous la supervision du Groupe directeur.

Le GIC a décidé d'organiser, pendant la période intersessions, un atelier de formation conjoint sur les procédures opérationnelles normalisées, avec la participation des Prestataires de services relatifs aux tsunamis (TSP), des Centres nationaux d'alerte aux tsunamis (NTWC), des Bureaux de gestion des catastrophes (DMO) et des médias, ainsi qu'un atelier post-IOWave 14, tous deux sous réserve de fonds disponibles. Le GIC **a accepté** l'offre généreuse de l'Inde qui a proposé d'accueillir ces deux ateliers, de préférence à la fin de l'année 2015.

Le GIC a décidé d'organiser en 2016 un atelier sur les aléas côtiers et l'évaluation des risques, sous réserve de fonds disponibles, et **a accepté** l'offre généreuse des Seychelles, qui ont proposé d'accueillir cet atelier.

Le GIC a élu son bureau pour la prochaine période intersessions, à compter de la fin de la session. M. Srinivasa Kumar Tummala (Inde) a été élu Président et MM. Juma Al Maskari (Oman) et Samantha Hettiarachchi (Sri Lanka) ont été élus Vice-Présidents.

Le GIC a décidé de tenir sa onzième session au début de l'année 2017 et **a accepté** avec gratitude la proposition faite par la Malaisie d'accueillir cette session. Le GIC **a remercié** le Sultanat d'Oman de son excellent accueil pour sa dixième session.

Le GIC a adopté les décisions et recommandations ICG/IOTWS-X.1 qui figurent à l'Annexe II.

Informe resumido

La 10ª reunión del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Océano Índico (ICG/IOTWS-X) se celebró en Mascate (Omán) del 24 al 26 de marzo de 2015, bajo la presidencia del Sr. Rick Bailey. A la reunión asistieron delegados de 20 Estados Miembros de la cuenca del océano Índico, 5 organismos de las Naciones Unidas y otras organizaciones, y 17 observadores. El orden del día de la reunión figura en el Anexo I.

El ICG examinó los progresos realizados durante el periodo entre reuniones, así como los informes y recomendaciones de su Grupo de Dirección, sus grupos de trabajo y sus equipos de trabajo. Examinó asimismo el proyecto de informe del ejercicio de simulación en el océano Índico "Wave 14" preparado por el equipo de trabajo del ejercicio, y los informes de situación de los proveedores de avisos sobre tsunamis de Australia, la India e Indonesia.

El ICG recibió y examinó los informes de las reuniones sexta y séptima del Grupo de Trabajo sobre sistemas de alerta contra tsunamis y otros peligros relacionados con el nivel del mar y atenuación de sus efectos (TOWS-WG), un informe del Centro de Información sobre los Tsunamis del Océano Índico (IOTIC), e informes nacionales presentados por Australia, Bangladesh, Francia, India, Indonesia, Irán, Kenya, Madagascar, Malasia, Maldivas, Mauricio, Mozambique, Myanmar, Omán, Pakistán, Sri Lanka, Tailandia y Tanzania, **y tomó nota** de todos ellos.

El ICG examinó el documento final y la declaración resumida de la Conferencia Internacional de conmemoración del 10º aniversario del tsunami del océano Índico, titulada "El Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el océano Índico 10 años después del tsunami del océano Índico: logros alcanzados, dificultades encontradas, problemas pendientes y perspectivas en materia de políticas" (24 y 25 de noviembre de 2014, Yakarta (Indonesia)), **y tomó nota** de ellos.

El ICG tomó nota de los resultados de la Tercera Conferencia Mundial de las Naciones Unidas sobre la Reducción del Riesgo de Desastres (13 a 18 de marzo, Sendai (Japón)), de los que se informó en el Marco de Sendai para la Reducción del Riesgo de Desastres 2015–2030.

El ICG tomó nota de los resultados de la conferencia regional titulada "Reducción del riesgo de tsunamis en el océano Índico occidental", celebrada en Omán los días 22 y 23 de marzo de 2015, y **felicitó** al Sultanato de Omán por la inauguración, el 23 de marzo de 2015, de su Sistema nacional de alerta temprana de peligros múltiples (NMHEWS).

El ICG suscribió el mandato del Centro de Información sobre los Tsunamis del Océano Índico (IOTIC) y **recibió con gratitud** el ofrecimiento de Indonesia de acoger el IOTIC y brindarle espacio de oficina, personal y otro tipo de apoyo fundamental durante un periodo de cinco años a partir de 2016.

El ICG decidió prestar más atención a la sensibilización y la preparación de las comunidades a fin de lograr respuestas más adecuadas a la información de alerta contra tsunamis.

El ICG decidió disolver el Grupo de Trabajo 1 sobre Evaluación y reducción de los riesgos de tsunami y el Grupo de Trabajo 3 sobre Sensibilización y respuesta a los tsunamis, y establecer un nuevo Grupo de Trabajo 1 sobre Riesgo de tsunamis, sensibilización y preparación de las comunidades, bajo la presidencia de la Dra. Harkunti Pertiwi Rahayu (Indonesia) y la vicepresidencia del Dr. Majid Naderi Beni (Irán) y del Dr. Sultan Al-Yahyai (Omán).

El ICG decidió proseguir las actividades del Grupo de Trabajo 2 sobre Detección de tsunamis, alerta y difusión, bajo la presidencia del Sr. Peter Coburn (Australia) y la vicepresidencia del Dr. Mohammad Mokhtari (Irán) y del Dr. Mochammad Riyadi (Indonesia).

El ICG decidió establecer un nuevo Grupo de Trabajo Subregional para el océano Índico noroccidental, bajo la presidencia del Dr. Juma Al Maskari (Omán) y la vicepresidencia del Dr. Nasser Hadjizadeh Zaker (Irán).

El ICG aprobó el documento de definición de los servicios de los proveedores de avisos sobre tsunamis del IOTWS y pidió a los proveedores de avisos que se ciñeran a él.

El ICG decidió realizar un ejercicio de simulación en el océano Índico "IOWave 16" en agosto de 2016 y estableció un equipo de trabajo encargado de su planificación y organización, dependiente del Grupo de Dirección.

El ICG decidió llevar a cabo un taller de formación conjunto sobre los procedimientos normalizados de operaciones durante el periodo entre reuniones en el que participarían proveedores de avisos sobre tsunamis, centros nacionales de alerta contra los tsunamis, oficinas nacionales de gestión de desastres y medios de comunicación, así como un taller posterior al ejercicio "IOWave 14", a reserva en ambos casos de la disponibilidad de fondos. El **ICG aceptó** la amable oferta de la India de acoger los talleres, preferiblemente a finales de 2015.

El ICG decidió llevar a cabo un taller sobre peligros costeros y evaluación de riesgos en 2016, a reserva de la disponibilidad de fondos, y aceptó la amable oferta de Seychelles de acogerlo.

El ICG eligió sus directivos para el próximo periodo entre reuniones que comienza al final de la reunión. El Dr. Srinivasa Kumar Tummala (India) fue elegido Presidente y el Dr. Juma Al Maskari (Omán) y el profesor Samantha Hettiarachchi (Sri Lanka) fueron elegidos Vicepresidentes.

El ICG decidió celebrar su 11ª reunión a comienzos de 2017 y aceptó con reconocimiento la oferta de Malasia de acogerla. El ICG expresó su profundo agradecimiento al Sultanato de Omán por las excelentes disposiciones adoptadas para acoger su 10ª reunión.

El ICG adoptó las decisiones y recomendaciones ICG/IOTWS-X.1 que figuran en el Anexo II.

Краткий доклад

Десятая сессия Межправительственной координационной группы по Системе предупреждения о цунами и смягчения их последствий в Индийском океане (МКГ/СПЦИО-X) состоялась в Маскате, Оман, с 24 по 26 марта 2015 г. под председательством г-на Рика Бэйли. В сессии приняли участие представители из 20 государств – членов МОК из региона Индийского океана, 5 учреждений системы ООН и других организаций и 17 наблюдателей. Повестка дня сессии содержится в Приложении I.

МКГ провела обзор достигнутого в межсессионный период прогресса и рассмотрела доклады и рекомендации ее руководящей группы, рабочих и целевых групп. Она также рассмотрела подготовленный целевой группой «Волна 14» проект доклада об учениях в Индийском океане «Волна 14» и подготовленные Австралией, Индией и Индонезией доклады о положении дел провайдеров услуг по цунами (ПУЦ).

МКГ получила, рассмотрела и приняла к сведению доклады шестого и седьмого совещания Рабочей группы по системам предупреждения и смягчения последствий цунами и других опасных явлений, связанных с изменением уровня моря (РГ-СПЦО), доклад Центра информации о цунами МОК в Индийском океане (ЦИЦИО) и национальные доклады о проделанной работе, представленные Австралией, Бангладеш, Индией, Индонезией, Ираном, Кенией, Маврикием, Мавританией, Мадагаскаром, Малайзией, Мальдивскими Островами, Мозамбиком, Мьянмой, Оманом, Пакистаном, Таиландом, Танзанией, Францией и Шри-Ланкой.

МКГ приняла к сведению и рассмотрела выводы и краткие заявления международной конференции в память о 10-й годовщине цунами в Индийском океане «Система предупреждения о цунами и смягчения их последствий в Индийском океане 10 лет спустя цунами в Индийском океане: достижения, задачи, сохраняющиеся проблемы и политические перспективы» (24-25 ноября 2014 г., Джакарта, Индонезия).

МКГ приняла к сведению выводы 3-й Всемирной конференции ООН по уменьшению опасности бедствий (13-18 марта, Сендай, Япония), изложенные в Сендайской рамочной программе по уменьшению опасности бедствий на 2015-2030 гг.

МКГ приняла к сведению выводы региональной конференции по уменьшению риска цунами в западной части Индийского океана, прошедшей в Омане 22-23 марта 2015 г., и поблагодарила Султанат Оман за инаугурацию 23 марта 2015 г. его национальной системы раннего предупреждения о многих опасных явлениях (NMHEWS).

МКГ одобрила круг ведения Центра информации о цунами МОК в Индийском океане (ЦИЦИО) и с признательностью **приветствовала** предложение Индонезии разместить у себя данный центр и оказать ему поддержку путем выделения офисных помещений и предоставления персонала, а также оказывать другую необходимую поддержку в течение пяти лет, начиная с 2016 г.

МКГ постановила уделять больше внимания информированности и готовности общин для обеспечения более надлежащего реагирования на предупреждения о цунами.

МКГ приняла решение распустить рабочую группу 1 по оценке и уменьшению риска цунами и рабочую группу 3 по информированию общественности и мерам реагирования и учредить новую рабочую группу 1 по оценке риска цунами, информированности и готовности общин под председательством д-ра Харкунти Пертиви Рахаю (Индонезия) и с заместителями председателя д-ром Маджидом Надери Бени (Иран) и д-ром Султаном Аль-Яхьяи (Оман).

МКГ постановила продолжить деятельность рабочей группы 2 по обнаружению, оповещению и распространению информации о цунами под председательством г-на Питера Кобурна (Австралия) и с заместителями председателя д-ром Мохаммедом Мохтари (Иран) и д-ром Мохаммедом Рияди (Индонезия).

МКГ постановила учредить новую субрегиональную рабочую группу для северо-западной части Индийского океана под председательством д-ра Джума Аль Маскари (Оман) и с заместителем председателя д-ром Нассером Хаджизаде Закером (Иран).

МКГ утвердила документ об определении услуг провайдера услуг по цунами СПЦИО (СПЦИО-ПУЦ) и предложила ПУЦ выполнять его положения.

МКГ постановила провести учения в Индийском океане «Волна 16» в августе 2016 г. и учредила целевую группу для их планирования и организации, подотчетную руководящей группе.

МКГ постановила провести в межсессионный период при наличии необходимого финансирования совместный учебный семинар по стандартным процедурам деятельности с участием ПУЦ, НЦПЦ, ББББ и СМИ и семинар после учения «Волна 14». МКГ приняла любезное предложение Индии принять у себя семинары, предпочтительно в конце 2015 г.

МКГ постановила провести в 2016 г. при наличии необходимого финансирования семинар по оценке опасностей в прибрежной зоне и приняла любезное предложение Сейшельских Островов принять его у себя.

МКГ избрала своих должностных лиц на следующий межсессионный период, начинающийся после окончания сессии. Д-р Шриниваса Кумар Туммала (Индия) был избран председателем и д-р Джума Аль Маскари (Оман) и проф. Саманта Хеттиараччи (Шри-Ланка) заместителями председателя.

МКГ постановила провести свою одиннадцатую сессию в начале 2017 г. и с признательностью приняла предложение Малайзии принять ее у себя. МКГ выразила свою благодарность Султанату Оман за прекрасную организацию ее десятой сессии.

МКГ приняла решения и рекомендации МКГ/СПЦИО-X.1, содержащиеся в Приложении II.

1. WELCOME AND OPENING

1 The opening ceremony was conducted under the auspices of H.E. Dr Mohammed bin Nasser Al-Zaabi, the CEO of the Public Authority for Civil Aviation. Opening remarks were provided by Dr Juma Said Al-Maskari, Director General of Meteorology, and Dr Vladimir Ryabinin, Assistant Director General of UNESCO and Executive Secretary of the Intergovernmental Oceanographic Commission (IOC). An opening statement was also provided by Mr Rick Bailey, Chair of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS).

2 Dr Juma Said Al-Maskari welcomed the participants and guests to the Tenth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-X). He noted that this meeting follows the inauguration of the Oman National Multi Hazard Early Warning System and the scientific conference on "Reducing Tsunami Risk in the Western Indian Ocean" held in Muscat, Oman, 22 - 23 March 2015 as well as the "Third UN World Conference on Disaster Risk Reduction" held 14 - 18 March 2015 in Sendai, Japan. Dr Al-Maskari recommended that outcomes from the Sendai and Muscat conferences should be incorporated into this meeting. He encouraged that matters related to data exchange, awareness and education, and response coordination are discussed during the ICG meeting. Dr Al-Maskari concluded by wishing participants a successful meeting and enjoyable stay in Muscat.

3 Dr Vladimir Ryabinin spoke about the 10th anniversary of the Indian Ocean Tsunami and its commemorative event in Jakarta, where the achievements over the last decade and required further work to improve regional tsunami capacity were discussed. He mentioned the "Third UN World Conference on Disaster Risk Reduction" held in Sendai and its action priorities. Both the Jakarta and Sendai conferences have identified that international cooperation is essential to develop knowledge, capacities and motivation for disaster risk reduction at all levels, particularly for developing countries. Mr Ryabinin reaffirmed IOC's commitment to continue to facilitate, coordinate and provide governance for the Indian Ocean tsunami Warning and Mitigation System going forward.

4 Mr Rick Bailey provided an opening statement on the development of the ICG/IOTWS over the last decade. He commented that increased focus on the last mile is needed and integration of tsunami into multi-hazard warning education is desirable.

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF AGENDA

5 The Chair of the ICG/IOTWS, Mr Rick Bailey, introduced the provisional agenda and provisional annotated agenda. He informed the meeting that the agenda was prepared by the Secretariat and ICG/IOTWS Officers taking into account the recommendations of ICG/IOTWS-IX as well as the IOC Rules of Procedures (IOC/INF/1166). He then opened the floor for comments from delegates.

6 Mr Ahmed Al-Harthi (Oman) requested that the ICG/IOTWS takes proposals from the scientific conference on Reducing Tsunami Risk in the Western Indian Ocean held in Muscat, Oman, 22-23 March 2015 to its Working Groups. The Chair replied that there would be an additional agenda item (3.10) to report on this conference.

7 The ICG/IOTWS proposed to hold a sessional meeting of the northwestern countries of the Indian Ocean to discuss sub-regional cooperation. Member States participating in this meeting would include India, Iran, Oman, Pakistan and Yemen. The outcomes of the meeting

will be discussed under agenda item 6.3, “Sub-Regional Cooperation in the Northwest Indian Ocean Region”.

8 The amended agenda of the ICG/IOTWS-X was approved by the delegates and is available as ANNEX I.

2.2 DESIGNATION OF RAPPORTEUR

9 The Chair requested the group to consider the need to nominate a Rapporteur for the session. He clarified that the role of the Rapporteur is to review and certify the report prepared by the Secretariat. As per established practices for subsidiary bodies there will not be a line-by-line approval of the report but only for Decisions and Recommendations. As the meeting will be conducted in English, the Rapporteur should have a good command of the language.

10 The Chair asked if there were any nominations for the Rapporteur. **Oman** nominated Mr Nassir Al-Ismaeili and the nomination was seconded by **Australia**.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

11 The Chair informed the Session that, in order to facilitate the proceedings of the meeting the timetable has been prepared by the Secretariat in coordination with the ICG/IOTWS Officers and the Steering Group. The list of documents is available in Annex IX. The Provisional Timetable is available as ICG/IOTWS-X/1 Prov.Add. All the documents have been or will be made available through the ICG/IOTWS-X meeting website and printed copies are also available on request.

12 The Chair invited the delegates to adopt the timetable and it was adopted as presented. In order to organise the meeting as well as to facilitate and promote the exchange of points of views and advance agreements that might prove time consuming in plenary, delegates were requested by the Chair to establish the following sessional committees.

- The Elections Committee was established to oversee the election of officers and report back to the Plenary under Agenda Item 10. The Chair asked for nominations for the Elections Committee. Australia, India and Oman were nominated as committee members and Dr Mark Leonard (Australia) was nominated as the Committee Chair.

- The Recommendations Committee was established to certify that draft recommendations submitted by Member States are consistent in language and fulfil requirements established in the IOC Manual (Document IOC/INF 785) for presentation under agenda item 13. The Chair asked for nominations for the Recommendations Committee. Australia India, Indonesia, Iran were nominated as committee members and Dr Srinvasa Kumar (India) was nominated as the Committee Chair.

- The Programme and Budget Committee was established to produce an estimate of the amount of resources Member States are investing in tsunami warning systems and to estimate needs for 2015-2016, both from UNESCO/IOC regular budget and from other sources, and report back to plenary under agenda item 9. The Chair asked for nominations for the Programme and Budget Committee. Australia, India and Indonesia were nominated as committee members and Mr Daniel Jaksa (Australia) was nominated as the Committee Chair.

13 The Chair informed the meeting of the forthcoming election of officers and reminded the ICG of the deadline for nominations by Member States (16:00hrs local time, 24th March 2015). Nomination forms were available on the ICG/IOTWS-X website and printed copies were available from the Secretariat on request.

3. REPORT OF INTERSESSIONAL ACTIVITIES

3.1 ICG CHAIRMAN'S REPORT

14 The Chair of the ICG/IOTWS, Mr Rick Bailey, reported on the activities of the ICG during the intersessional period (Annex IV). He also reported on the Steering Group meetings held in Perth, Australia, 10 and 11 December 2013 and in Jakarta, Indonesia, 26 November 2014. He discussed the state of the tsunami landscape in 2004 compared with today and the history of the IOTWS during this period including its governance, contributions and membership.

15 Mr Bailey reviewed the progress of the ICG/IOTWS and its Working Groups: 1) Tsunami Risk Assessment and Reduction, 2) Tsunami Detection, Warning and Dissemination, and 3) Tsunami Awareness and Response. Mr Bailey commented on the achievements of the ICG/IOTWS during the last decade with reference to its tools, workshops, exercises and monitoring networks as well as the Interim Advisory Service and the Tsunami Service Providers (TSPs).

16 Referring to the Third UN World Conference on Disaster Risk Reduction (Sendai, Japan, 14-18 March 2015), Mr Bailey noted that it focused on how further implementation should be achieved. The key message for effective community response is: for an early warning system to be effective, the public must know what to do. He commented that we are certainly “safer” against the tsunami threat than we were in 2004, but we need more focus on the ‘last mile’. Tsunami awareness and public education should be integrated into a multi-hazard early warning framework for sustainability.

3.2 REPORT FROM THE IOC EXECUTIVE SECRETARY

17 Mr Tony Elliott, Head of the ICG/IOTWS Secretariat, presented a report from the IOC Secretariat, focusing mainly on the activities of the ICG/IOTWS Secretariat since the last session of the ICG (Annex V). He referred to the Terms of Reference that the ICG/IOTWS operates under. The responsibilities of the Secretariat are to support meetings of the ICG; to facilitate liaison between national contact points and National Tsunami Warning Centres (NTWCs); to maintain a list of operational national contact points; to organise liaison between the ICG/IOTWS and other regional warning systems; and to inititiate and support training activities and to enhance and enrich tsunami warning in the Indian Ocean.

18 Mr Elliott presented the key activities of the last intersessional period and elaborated on a few of these including: the Coastal Hazard Risk Assessment Workshop held in Colombo, Sri Lanka in March 2013; Standard Operating Procedure (SOP) Workshops held in Jakarta, Indonesia in September 2013 and Hyderabad, India in June 2014; Exercise Indian Ocean Wave 14 (IOWave14) held in September 2014; and the International Conference to commemorate the 10th Anniversary of the Indian Ocean Tsunami held in Jakarta, Indonesia in November 2014. He mentioned the two United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) projects: “Communicating the effects of the 1945 Makran Tsunami to increase awareness and preparedness of tsunami hazards in the Makran region” and “Enhancing Tsunami Risk Assessment and Management, Strengthening Policy Support and Developing Guidelines for Tsunami Exercises in Indian Ocean Countries”.

19 Mr Elliott commented that the Secretariat was primarily funded by Australia, which currently sustains the IOTWS programme, with additional funding from the IOC Regular Programme. Additional resources are mobilised to support further programme activities (e.g. UNESCAP). In conclusion, he reiterated that the IOTWS depends on the commitment of its Member States for its long-term sustainability and urged the Member States to maintain their support and commitment for IOTWS programmes and activities.

3.3 REVIEW OF ICG/IOTWS DECISIONS, RECOMMENDATIONS AND ACTIONS

20 Mr Elliott reported on the implementation of ICG/IOTWS decisions, recommendations and actions. He provided an update on the implementation of actions arising from ICG/IOTWS-VIII and ICG/IOTWS-IX.

3.4 REPORT FROM EIGHTH MEETING OF THE TOWS-WG

21 The Chair reported on the progress made by the Working Group on Tsunamis and Other Hazards related to Sea Level Warning and Mitigation Systems (TOWS-WG). In particular, he informed the Session of the outcomes of the Eighth meeting of the TOWS-WG (IOC/TOWS-WG-VIII), held in Morioka, Japan, 12 - 13 March 2015.

22 The Chair reported that the TOWS-WG is primarily tasked with advising the IOC Governing Bodies on coordinated development and implementation activities on warning and mitigation systems for tsunamis and other hazards related to sea level of common priority to all Intergovernmental Coordination Groups for Tsunami Warning and Mitigation Systems (ICG/TWSs). It currently has three Task Teams on Tsunami Watch Operations; Disaster Management and Preparedness; and Hazard Assessment Related to Highest Potential Tsunami Source Areas. The Tsunami Watch Operations Task Team is chaired by Dr Srinivasa Kumar Tummala (India) and has two representatives from each ICG.

23 A key output is the Global Service Definition Document, which includes areas of service, earthquake source zones, reporting water levels, threat level definition, Key Performance Indicators (KPIs), bulletin structure and event nomenclature.

3.5 REPORT OF THE INTERNATIONAL CONFERENCE TO COMMEMORATE THE 10TH ANNIVERSARY OF THE INDIAN OCEAN TSUNAMI

24 Mr Elliott introduced this agenda item. He reported on the key highlights and recommendations arising from the International Conference to Commemorate the 10th Anniversary of the Indian Ocean Tsunami, organised by IOC of UNESCO and the Indonesia Agency for Meteorology, Climatology and Geophysics (BMKG), and hosted by BMKG in Jakarta, Indonesia, 24 - 25 November 2014.

25 Mr Elliott informed the session that the Summary Statement from the conference has been distributed to all participants. In total, 160 participants from 28 countries attended the conference. The conference's objectives were: to report on and document the achievements of the last 10 years; to highlight gaps in the system and work that still needs to be done; to seek re-commitment of Member States and other partners to continue investing in the IOTWS to ensure its long-term sustainability; to launch the Indian Ocean Tsunami Information Centre (IOTIC); and to provide input to the Third UN World Conference on Disaster Risk Reduction (WCDRR).

26 The sessions of the conference included: development of the IOTWS since 2004; outstanding needs and future developments; donor perspectives; sustainability of the IOTWS; and strengthening international cooperation. Political commitment including mandated budgets and tsunami programmes codified in law with the key functions institutionalised should be implemented. To ensure long term sustainability, tsunami should form part of a multi-hazard warning system and stronger integration of tsunami early warning into national and local disaster management and other public and private sectors. Intergovernmental coordination is essential and should continue to be led by UNESCO/IOC.

27 Dr Mohammad Mokhtari (Iran) asked if there was a list of recommendations of gaps out of the conference and Mr Elliott referred him to the Summary Statement. Dr Mokhtari then asked if there were recommendations on building codes and other tangible recommendations for the public. The Chair commented that the conference statement is only a guide and that future work will be addressed into the IOTWS work plan.

28 Dr Harkunti Rahayu (Indonesia) reported on the Sendai WCDRR priorities for action for disaster risk reduction, which are: understanding disaster risk; strengthening disaster risk governance to manage for disaster risk; investing in disaster risk reduction for resilience; enhancing disaster preparedness for effective response; and to "Build Back Better" in recovery, rehabilitation and reconstruction. She emphasized that the ICG/IOTWS needs to incorporate these priorities into its work plan and its recommendations. Mr Bailey re-emphasised that we must capture this in the meeting summary and recommendations.

29 Mr Samwel Mbuya (Tanzania) commented that Tanzania has benefited from the training provided by IOTWS. In the past ten years they have focused on near-field tsunami hazards and seen tremendous improvements. The challenge remains to take the drill exercise to the community. Multi-hazard early warning systems need to incorporate tsunami as these events are rare, so it is hard to get governments to independently comment. A scaled-down model of Oman's undertakings can be adopted. Mr Bailey reiterated that we want to do more drills and exercises down to community level, document our improvements and undertakings, demonstrate where we are effective, note where we are not effective and develop work plans accordingly.

30 Mr Ahmed Al-Harthi (Oman) suggested retaining 'last mile' and adding words 'beyond the last mile' as this is widely adopted. Ms Irina Rafliana (Indonesia) reminded delegates that the main focus needs to be on the 'last mile' or 'first mile' paradigm.

3.6 REPORT OF THE INDIAN OCEAN TSUNAMI INFORMATION CENTRE (IOTIC)

31 Mr Ardito Kodijat, Head of Disaster Risk Reduction and Tsunami Information Unit at UNESCO Jakarta, introduced this agenda item. He reported on the activities of the Indian Ocean Tsunami Information Centre (IOTIC) since the last session of the ICG and noted that IOTIC was inaugurated at the International Conference to Commemorate the Indian Ocean Tsunami in Jakarta, Indonesia, on 24 November 2014.

32 Mr Kodijat outlined the proposed work plan for IOTIC for the next intersessional period and reviewed the development of IOTIC in support of the ICG/IOTWS Secretariat. The Terms of Reference were presented to the Steering Group for endorsement. Prior to the launch of IOTIC, a post in Jakarta was supported by UNESCO/IOC. IOTIC is hosted in the UNESCO Jakarta Office under the Science Sector with close involvement with the tsunami unit. Staff are supported by UNESCO/IOC, UNESCAP and Indonesian Funds in Trust (IFiT). Internships are welcomed from Member States (MS) of the IOTWS.

33 During the period 2012-2015, several activities have been undertaken including development of IOTIC Terms of Reference and website, which were presented at the Eighth Steering Group Meeting held in Perth, Australia, 10 - 11 December 2013; attendance at the 7th and 8th TOWS-WG meeting; support for the implementation of two of ICG/IOTWS projects funded by UNESCAP, implementation of a project funded by the Indonesian Fund in Trust; and support for the international conference to commemorate the 10th anniversary of the Indian Ocean Tsunami in November 2014 at which the IOTIC website was launched.

34 Mr Kodijat reported on the progress of the UNESCAP projects 'Enhancing Tsunami Risk Assessment and Management, Strengthening Policy Support and Developing Guidelines for Tsunami Exercises in the Indian Ocean Countries' and 'Communicating the effects of the 1945 Makran Tsunami to increase awareness and preparedness of tsunami hazards in the Makran Region'.

35 Mr Daniel Jaksa (Australia) asked if it is possible for the IOTIC website to have links to Member States' in-country resources. Mr Kodijat replied that this is indeed possible and the mechanism for this is to email details to IOTIC.

3.7 NATIONAL PROGRESS REPORTS

36 The following Member States submitted national reports to the Secretariat (available on the ICG/IOTWS-X website): Australia, Bangladesh, France (La Reunion), India, Indonesia, Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Myanmar, Pakistan, Singapore, Thailand, Sri Lanka and Yemen. Delegates from Australia, Indonesia, India, Iran, Kenya, Oman, Sri Lanka, Tanzania, and Thailand made short presentations on the actions and status of their national tsunami and other coastal hazards warning systems.

Report from Australia

37 Mr Daniel Jaksa presented Australia's National Report. The Joint Australian Tsunami Warning Centre (JATWC), operated by the Australian Bureau of Meteorology (BoM) and Geoscience Australia (GA), has responsibility as a National Tsunami Warning Centre (NTWC) as well as a Tsunami Service Provider (TSP). Australia has an extensive network of national seismic and sea level gauges and receives real-time seismic data from global stations. Initiatives include hazard and risk assessments, community awareness and preparedness activities, and tsunami exercises. A w-phase calculator is being developed to analyse events with magnitude 7 and over for real-time tsunami modelling.

Report from Indonesia

38 Dr Mochammad Riyadi presented Indonesia's National Report. The Agency for Meteorology, Climatology, and Geophysics (BMKG) operates the Earthquake Information and Tsunami Warning Centre, which is responsible for tsunami assessments in Indonesia. BMKG has responsibility as an NTWC as well as a TSP. Dr Riyadi discussed the Indonesian NTWC SOPs, national monitoring networks, dissemination system, and threat levels. In conclusion, he highlighted plans for future tsunami warning and mitigation system improvements.

Report from India

39 Dr Srinivasa Kumar Tummala presented India's National Report. The Indian Tsunami Early Warning Center, operated by the Indian National Centre for Ocean Information Services (INCOIS), has responsibility as an NTWC as well as a TSP. Dr Tummala discussed the components of India's end-to-end tsunami warning system including observation networks, modelling, national Standard Operating Procedures (SOPs), and product formats. He reported on performance since ICG/IOTWS-IX as well as on training and workshops, communications tests, and mock drills. He concluded by outlining future plans.

Report from Iran

40 Dr Nasser Hadjizadeh Zaker presented Iran's National Report. The regional tectonic setting was presented with specific reference to the Makran subduction zone. The Iranian National Center for Ocean Hazards (INCOH) was established in February 2012. Dr Zaker presented the national monitoring networks as well as tsunami modelling and public education initiatives in Iran.

Report from Kenya

41 Mr Paul Oloo presented Kenya's National Report. He shared details of the existing and planned seismic and sea level monitoring networks. Future planned activities in Kenya include the establishment of real-time seismic monitoring stations, more tide gauges, tsunami sirens at the coast, and public education initiatives.

Report from Oman

42 Dr Juma Al-Maskari presented Oman's National Report. He reviewed the work packages of the Oman Tsunami Early Warning System with emphasis on the seismic, coastal sea level, Global Positioning System(GPS) monitoring, and wave radar networks as well as software and modelling. He also presented the tsunami warning chain and timeline. The Oman Multi-Hazard Early Warning Center was inaugurated on 23 March 2015. Future activities include national and internal SOP completion, the downstream dissemination system, public awareness, risk assessment, international data exchange, and international collaboration on Makran subduction zone research.

Report from Sri Lanka

43 Rear Admiral Nimal Sarathsena presented Sri Lanka's National Report. In 2015, the Disaster Management Act came into place in Sri Lanka. The Disaster Management Centre (DMC) is responsible for disasters and activates the Emergency Management Centre during events. All of the scientific information is from other countries and then disseminated within Sri Lanka. Methods of dissemination are similar to other countries. There are 77 early warning towers that are operated remotely. Military and police are used for warning and evacuation. Real time information is posted on the DMC website three times per day. The way forward is telecommunication warning rings (telephone) to coast populations.

Report from Tanzania

44 Mr Samwel Mbuya presented Tanzania's National Report. Tanzania has revised its SOPs for preparing and issuing warning and warning cancellation. The SOP enhancements resulted from capacity building training and workshops (organized by IOC/UNESCO). Tanzania does not have any seismic or sea level monitoring equipment. Going forward Tanzania plans to focus on evacuation planning and publications in the local language.

Report from Thailand

45 Captain Song Ekmahachai presented Thailand's National Report. He reviewed Thailand's sea level stations and commented that most are available online. However, the data is not disclosed internationally as it is mostly collected by the navy. Thailand has 22 sea level stations and 77 seismic stations. A selection of seismic data is shared internationally via the Incorporated Research Institutions for Seismology (IRIS) and the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO). Tsunameter buoy 23401 was lost at sea and a replacement buoy was deployed in January 2014.

3.8 REPORTS FROM UN AGENCIES

46 Mr Alf Blikberg, Programme Officer, UN Economic and Social Commission for Asia and the Pacific (UNESCAP), provided a summary of the progress of the UNESCAP Multi-Donor Voluntary Trust Fund for Tsunami, Disaster and Climate Preparedness including collaborative activities with IOC. UNESCAP is supported by its Inter-Agency Task Force, Advisory Council, Grants Committee and Secretariat.

47 As of March 2015, donations total US $15.2 million with Thailand contributing US $10 million over the ten years since the establishment of the fund. Roughly half of the funds have been used to support the Asian Disaster Preparedness Center (ADPC) and the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES).

48 Phase 2 began in 2013 and has three strategic pillars: regional mechanisms, specific country needs, and civil society innovations and business sector initiatives with the priority being the 'last mile' in high risk countries. There are currently nine projects and two are managed by UNESCO. The Trust Fund encourages engagement by Member States and partners and welcomes new project proposals.

49 The Chair asked Mr Blikberg if he was getting enough information about the remaining gaps at this meeting to which Mr Blikberg replied that the national reports, Working Group reports and IOWave14 report are useful.

50 The Chair commented that a capacity stock-take over the region would be useful for donors.

51 Dr Mohammad Mokhtari (Iran) enquired if the Trust Fund supports science projects. Mr Blikberg responded that UNESCAP has supported a number of risk assessments, but very few science projects to date that are pure research. One of the research projects that is currently being supported is the "Communicating the effects of the 1945 Makran tsunami to increase awareness and preparedness of tsunami hazards in the Makran region".

52 Dr Joern Lauterjung, German Research Centre for Geosciences (GFZ) enquired about the role of RIMES. Mr Blikberg stated that the RIMES activities that the Trust Fund has supported include capacity support at the local level such as setting up seismic and sea level stations.

53 Dr Muzli (Indonesia) asked if UNESCAP might support a project on the integration of rapid moment magnitude estimation into the Indonesia system. Mr Blikberg responded that this type of project would be eligible for support. He expanded that many projects involve a region, multi-country component, for example, the replication of a pilot study into other countries.

54 Mr Arif Mahmood Rana provided a report from the ESCAP/WMO Panel on Tropical Cyclones (PTC) for the Bay of Bengal and Arabian Sea. The PTC is a regional

intergovernmental body jointly established by WMO and ESCAP in 1973. Panel Member countries include Bangladesh, India, Maldives, Myanmar, Oman, Pakistan, Sri Lanka and Thailand. The 42nd session convened in February 2015 in Bangkok, Thailand.

55 The vision of the Panel is to promote and coordinate the planning and implementation of the measures required to minimise damage caused by tropical cyclones and associated floods and storm surges in the Bay of Bengal and the Arabian Sea. The mission of the Panel is to review regularly the progress made in the various fields; to recommend measures to improve the multi-hazard warning systems in the Bay of Bengal and the Arabian Sea, including necessary training and research with regard to meteorological, hydrological and other ocean hazards such as storm surges and tsunamis; to recommend measures to improve telecommunication system to ensure timely provision of warnings for community preparedness and disaster risk management; to advise on possible sources of financial and technical support for such measures; and to coordinate the activities among the Panel Members, including all other activities carried out as part of or in conjunction with the WMO and regional tropical cyclone programmes.

56 The PTC cooperates with other regional bodies of the ESCAP/WMO Typhoon Committee (TC). The PTC is supported by the Regional Specialised Meteorological Centre and Indian Institute of Technology (IITD) in New Delhi, India.

57 The Chair commented that the TOWS-WG for tsunami and other sea level hazards will look for synergies in tsunami warning systems and those of tropical cyclones.

58 Mr Edgard Cabrera, Chief, Marine Meteorology and Ocean Affairs Division of the World Meteorological Organization (WMO), reported on recent activities initiated by WMO of particular interest to the ICG/IOTWS.

59 Mr Cabrera noted that the WMO Warning System operations involve taking observations, data processing, and delivering forecasts. Projects are currently underway in Africa and the Caribbean. Historically, WMO has focused on mariner forecasts and there are four Maritime Safety Information areas in the Indian Ocean. The Global Telecommunication System is fundamental to WMO data exchange. WMO information aims to be distributed between WMO Information System centres within 2 minutes.

60 Dr Mohammad Mokhtari (Iran) requested that Mr Cabrera elaborate on WMO planning to develop a multi-hazard early warning system. Mr Cabrera responded that is the aim in the next coming years, but he was uncertain of the implementation process.

61 Mr Elliott commented that 20% of Indian Ocean sea level data is transmitted via the geostationary satellite MeteoSat7, which is due to be retired in 2016, and enquired if this satellite would be replaced. Mr Cabrera replied that he did not have an answer, but would bring forward this information.

62 Mr Ahmed Al-Harthi (Oman) enquired about the mechanism for the integrated multi-hazard early warning centre and commented that the future of MeteoSat7 is an important issue for those directly under its footprint and it is important to know the future plans and recommended raising the issue at a satellite operators meeting in two weeks' time. Mr Cabrera clarified that the network of multi-hazard early warning system is to utilise the existing national networks and agencies to contribute towards the international initiative.

3.9 REPORTS FROM OTHER ORGANIZATIONS

63 Dr Joern Lauterjung, GeoForschungsZentrum (GFZ) and Mr Harald Spahn, Gesellschaft fuer Internationale Zusammenarbeit (GIZ), provided an update on the future German contributions to the IOTWS.

64 Dr Lauterjung discussed research and development in regards to tsunami early warning. He commented that a better knowledge of the regional subduction zones is needed as well as fast and reliable source inversions. He recommended that the Indian Ocean utilise GPS-based tsunami detection for early warning (i.e. within 3-5 minutes) and demonstrated how co-seismic displacement can be rapidly determined with real-time GPS data.

65 Mr Spahn reviewed community awareness noting that self-response is encouraged for near-field sources. To enable local communities to respond appropriately, local disaster management agencies should be engaged for public education. He noted that there is large gap in local level capacity and a step-by-step approach is needed in order to build this capacity.

66 Mr Spahn summarised areas of downstream initiatives that Germany has offered to support through the Global Initiative on Disaster Risk Management, which focuses on early warning and aims to link institutions to share experiences in the Indian Ocean and beyond. He spoke about the 'Tsunami kit', which is available online at www.gitews.org/tsunami-kit.

67 Dr Srinivasa Kumar Tummala (India) commented that the next level of forecasting improvement should come from utilising GPS/Global Navigation Satellite System (GNSS) data for 3D modelling. The Chair encouraged WG2 and the TOWS-WG Task Team on Tsunami Watch Operations to continue to monitor current developments in this field.

68 Mr Ali Shareef, Secretariat of the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES), provided an update on activities of relevance to the ICG/IOTWS.

69 Mr Shareef noted that the objectives of RIMES are: enhanced near-shore bathymetry, topography and exposure data sets for undertaking tsunami risk assessment as per IOTWS Service Level 3 requirements; capacity building for application of customized ocean/marine forecast information to meet different user needs; and capacity building for tsunami risk assessment, preparedness, and emergency response. The first phase target countries are Comoros, Maldives, Mozambique, Seychelles, and Sri Lanka.

70 The RIMES Council at its sixth meeting held the 30 May 2014 in Bangkok, Thailand, resolved to collaborate with INCOIS on provision of customized tsunami services on request from RIMES Member and Collaborating States. Under this arrangement, INCOIS provides regional tsunami watch services to RIMES Member States in the Indian Ocean. On request by RIMES Member States, RIMES provides tsunami information services. Cooperation between INCOIS and RIMES are independent and in no way affect the existing cooperation among Indian Ocean Member States and INCOIS under the ICG/IOTWS.

71 In addition, RIMES provides capacity-building services to its Member States on tsunami hazard and risk assessment through provision of tools and training. During the intersessional period, RIMES managed the UNESCAP-supported project on "Enhancing coastal hazard early warning and response: tools and institutional strengthening".

72 Dr Lauterjung enquired how RIMES fits into the IOTWS framework. Dr Satheesh Shenoi (India) stated that RIMES is not duplicating the TSP services but enhancing the value of TSP services. The Chair elaborated that TSP India products underpinning Service Level 3

have been utilised. Mr Elliott reminded the meeting that ICG/IOTWS-IX noted that RIMES is providing an independent tsunami warning service to many Indian Ocean Member States. RIMES has indicated that they do not want to pursue becoming an IOTWS Tsunami Service Provider (TSP) and will concentrate on the Service Level 3 outputs. The Chair noted that a number of countries are accepting Service Level 3 information from RIMES under bilateral agreements and that RIMES are utilising TSP India Service Level 2 products.

73 Dr Thorkild Aarup (UNESCO/IOC) commented that RIMES is a service for its member countries, however, he often receives messages from RIMES and wanted to clarify the Area of Service (AoS). Mr Shareef replied that RIMES has 13 member countries in the Indian Ocean and other coordinating countries that have requested information.

74 Dr Lauterjung asked if there is any integration work with the TSPs products and messages. It was noted that RIMES was requested to exchange products with the TSPs to avoid potential confusion and for better harmonisation of formats. However, sharing of products from RIMES has not taken place yet. Mr Peter Coburn (Australia) requested that RIMES products be available for comparison with TSP products for both real events and tests.

3.10 INTERNATIONAL CONFERENCE ON REDUCING TSUNAMI RISK IN THE WESTERN INDIAN OCEAN, DISCUSSION SUMMARY

75 Dr Sultan Al-Yahyai (Oman) presented on the International Conference on Reducing Tsunami Risk in the Western Indian Ocean, held in Muscat, Oman, 22-23 March 2015. The conference brought together many different disciplines including tsunami modellers, earth scientists, meteorologists, social scientists, construction and infrastructure planning specialists, warning-system developers, and emergency responders. The conference objectives were to bring the scientists and operational centres together to promote collaboration; to better understand tsunami in the western Indian Ocean; and to improve efficiencies of tsunami warning systems. The sessions included hazard assessment, hazard scenarios, vulnerability, and detection and warning. Points of discussion included high-resolution data, coordination between Multi-Hazard Early Warning Systems and academia, understanding people behaviour, and regional cooperation in research and funding.

76 Dr Thorkild Aarup (UNESCO/IOC) enquired if a summary statement for policy makers in local languages would be produced. Dr Fauzi (UNESCO/IOC) explained that papers from the conference are being evaluated for publication in the journal Natural Hazards. Dr Brian Atwater (USA) commented that a conference summary would fit well into this and Dr Al-Yahyai volunteered to oversee the summary.

77 Dr Mohammad Mokhtari (Iran) asked if there would also be a summary statement for land use policy makers. The Chair commented that this is part of the Working Group 1 Terms of Reference. Dr Sam Hettiarachchi (Sri Lanka, Working Group 1 Chair) strongly recommended producing a summary statement including the list of associated publications.

78 The Chair encouraged a 2-3 page general statement to be published on the IOC website, so that broader stakeholders can pick up the value. Dr Atwater asked if the summary should be based on the reviewed publications. The Chair replied that capturing the discussion and general outcomes is best to be done sooner without reference to scientific outcomes that are undergoing review for publication. Dr Al-Yahyai suggested that the summary statement and publication be done in parallel. Mr Al-Harthi elaborated that the summary statement should be available soon and the publications will follow peer review procedures, which will take longer.

4. IOTWS TSUNAMI SERVICE PROVIDER (IOTWS-TSP) REPORTS

79 Representatives from the IOTWS Tsunami Service Providers (TSPs) of Australia, India and Indonesia reported on their operational status, development and progress since the Ninth Session of the ICG/IOTWS. They also reported on their performance since 1 November 2012 against the Performance Indicators established by the ICG/IOTWS.

4.1 TSP AUSTRALIA

80 Mr Peter Coburn reported on TSP Australia. Since ICG/IOTWS-IX, the Joint Australian Tsunami Warning Centre (JATWC) has continued the full Service Level 2 TSP operations. They have 521 pre-run scenarios for 5 event magnitudes (7.0-9.0). Between November 2012 and February 2015, 134 earthquake bulletins, 12 (12 events) no threat bulletins, and 3 (1 event) threat bulletins have been issued.

81 Mr Coburn reported that the KPIs (Service level 1 and Service level 2) met target or were near target for all but one KPI during the first year of service (October 2011 to October 2012). Tsunami height accuracy missed target as the 11 April 2012 event was modelled as pure-thrust (all pre-calculated models are based on the worst case scenario), but was predominantly strike-slip. Between November 2012 and February 2015, all KPIs have improved with respect to the previous year except for first earthquake bulletin elapsed time (over 10 minute targets). However, during the last couple of years the time for all 3 TSPs to issue earthquake information has trended to less time (approaching 10 min target).

82 Major developments since ICG/IOTWS-IX include participation in and organization of 5 IOTWS communications tests; contribution to 2 NTWC training workshops; leadership of planning and participation in Exercise IOWave14; participation in the Exercise Pacific Wave 15 (PacWave15; improvement of TSP password protected webpage, addition of magnitude 7.0 scenarios to the scenario database; extension of the maximum-allowable earthquake magnitude from 9.2 to 9.5; intensive training and assessment programme for JATWC staff; and contribution to the development of draft “IOTWS TSP Service Definition” document.

83 TSP Australia’s future plans include to: organise and participate in upcoming communications tests; implement the extended IOTWS Area of Service; activate public webpage and public bulletins; implement W-phase seismic calculations; enhance threat-assessment method for Indian Ocean coastal zones; contribute to setting up a system for the logging and reporting of TSP performance; and real-time running of MOST tsunami model with sea level data assimilation and ensemble modelling. In the longer term, TSP Australia plans to implement Service Level 3 inundation modelling for Indian Ocean coastal zones.

84 Dr Harkunti Rahayu (Indonesia) asked if there are plans for Service Level 3 inundation information. Mr Coburn replied that inundation mapping for a few pilot sites with detailed bathymetry have been conducted within Australia; however, it will be some time before inundation can extend to other urbanised areas. The current focus is more to do with real-time tsunami modelling; the inundation modelling is a side-focus.

4.2 TSP INDIA

85 Dr Srinivasa Kumar Tummala reported on TSP India. He reviewed the history of the Indian Tsunami Early Warning Centre (ITEWS) as a TSP, product types and formats, monitoring networks, data exchange, tsunami modelling, and performance in relation to the IOTWS Key Performance Indicators.

86 During the intersessional period, TSP India participated as a TSP (and NTWC) in IOTWS communication tests; participated in IOWave14; hosted the IOTWS Regional Workshop on SOPs for Tsunami Warning and Emergency Response for Northern and Western Indian Ocean Countries held in Hyderabad, India, 23-26 June 2014; and participated in SOP regional workshop for Tsunami Warning and Emergency Response for Northern and Eastern Indian Ocean Countries held in Jakarta, Indonesia, 23-27 September 2013. Additionally, TSP India contributed to development of coastal forecast zone spatial layers, TSP Service Definition and Users Guides, and worked on global harmonization through the TOWS-WG Task Team on Tsunami Watch Operations.

87 TSP India's future plans include: deployment of more seismic, sea level and GNSS monitoring equipment; enhancements in earthquake parameter, tsunami modelling and sea level inversion; utilisation of real-time GNSS data for rupture characterization of the tsunamigenic earthquakes; undertaking technical enhancements as part of the new IOTWS Service Definition; contribute to training and capacity building activities; and contribute to the planning and conduct of IOTWS communications tests.

88 Malaysia asked why strong motion accelerometers, and not seismometers, were utilised. Dr Tummala replied that this is to avoid saturation at high-frequencies near the source. Indonesia elaborated that strong motion accelerometers are very good for near source earthquakes without clipped amplitude. The strong motion data can be used to derive the static surface deformation, which can be used to infer moment magnitude or slip distribution.

89 Pakistan enquired about India's seismic networks. Dr Tummala replied that INCOIS is responsible for locating and responding to earthquakes that can generate tsunami. Land-based earthquakes are the responsibility of the Indian Meteorological Department.

90 Mr Ahmed Al-Harthi (Oman) commented that earthquake information bulletins do not distinguish if events are within or outside the Indian Ocean and suggested that this information be available for users. Dr Tummala replied that the region name is provided and below that it states if the event is within or outside of the Indian Ocean region and also states if the event is on-land or below the sea. Dr Tummala suggested that they could investigate options for including this information in the text bulletin. Indonesia suggested that this information is included in the header of the text bulletin.

91 Mr Peter Coburn (Australia) commented that impact is more important than location of origin. Earthquakes outside the Indian Ocean with magnitude 8 or greater in the Pacific and South Atlantic are also reported in IOTWS TSP bulletins. Within the Indian Ocean, earthquake bulletins are issued for events of magnitude 6.5 or greater.

4.3 TSP INDONESIA

92 Mr Mohamad Taufik Gunawan reported on TSP Indonesia. Points of discussion included the TSP Indonesia system, services, performance between November 2012 and February 2015, and activities since the last ICG meeting, and development plans.

93 The Indonesian Tsunami Early Warning System (InaTEWS) was officially launched in 2008 and has been providing full IOTWS Service Level 2 since 12 October 2012 (along with TSP India and TSP Australia).

94 During the intersessional period, TSP Indonesia participated as a TSP (and NTWC) in IOTWS Communication Tests; contributed to NTWC SOP training workshop in Jakarta (September 2013) and Hyderabad (June 2014); participated in IOWave14 and in

PacWave15; and hosted the International Conference to commemorate the 10th Anniversary of the Indian Ocean Tsunami.

95 TSP Indonesia development plans include improving the capability of SMS dissemination system, developing the application features to calculate performance indicators automatically on TSP Indonesia password protected webpage, and continuing to contribute in the IOTWS Communication Tests as well as IOWave exercises.

96 Mr Peter Coburn (Australia) commented that the TSPs should work together to develop a single automated system for assessing performance against KPIs.

97 Mr Ahmed Al-Harthi (Oman) reported that faxes are seldom received from TSP Indonesia. Dr Mochammad Riyadi (Indonesia) responded that this is a telecommunications issue that needs to be resolved with the operator.

98 Mr Harald Spahn (GIZ) asked what information is on the public website. Mr Riyadi replied that the information is limited and Mr Yedi Dermadi (Indonesia) expanded that the information on public website includes 'Type 1' bulletins (earthquake information) and epicentre maps. The Chair stated that information on bulletins is noted in the TSP Service Definition Document.

4.4 REPORT FROM TASK TEAM ON EXERCISE INDIAN OCEAN WAVE 14 (IOWAVE14)

99 The Chair of the IOWave14 Task Team, Mr Peter Coburn, reported on the planning, conduct and outcomes of the IOWave14 exercise, which took place on 9 and 10 September 2014. He presented the results of the exercise based on the feedback forms received from TSPs, NTWCs and National Disaster Management Organizations (NDMOs) that participated in the exercise. He noted that the report of the exercise (working document ICG/IOTWS-X/15) has been drafted and invited Member States to review the draft and provide comments to the Secretariat by 30 April 2015.

100 Two earthquake scenarios, South of Java and the Makran Trench, were exercised on the 9 and 10 September, respectively. All twenty-four IOTWS Member States with a designated TWFP participated with eight Member States exercising during both scenarios. Twenty-three of the twenty-four Member States reported that the exercise was well organized. When compared to the previous Communication Tests, NTWC message reception was in-line with the general trends; email was the most widely received followed by GTS, SMS and fax. NTWC access to TSP websites and NTWC status reporting were higher than in all previous Communications Tests.

101 Exercise benefits reported by Member States included: testing and validating internal and inter-agency SOPs; strengthening operational collaboration between NTWCs, DMOs and the media; testing the robustness of communication systems; testing in-country model simulations by comparison with TSP results; enhancing NTWC capacity to use the TSP products; and raising overall levels of tsunami awareness. Improvements for future exercises suggested by Member States include: creating/updating Member State tsunami SOPs; more training to Member State staff members performing tsunami operations; better inter-agency communication within countries; making the TSP products more consistent in format to allow easier comparisons; conducting the exercise until evacuation; continued improvement in communication technologies; and having in-country independent IOC observers during exercises.

102 The IOWave14 Task Team recommended that a post-IOWave14 workshop should be conducted with representatives from TSPs and Member States. The Task Team further

recommended that observers from the TSPs and WGs should attend in-country during IOWave exercises, in order to help identify and resolve Member State Standard Operating Procedure gaps.

103 Ms Irina Rafliana (Indonesia) enquired if the report would be made widely available. Mr Elliott replied that the report is now available in draft format and will be circulated to TNCs when finalised. It is open for comment until 30 April 2015.

104 Ms Rafliana asked if future exercises could be fine-tuned to the national guidelines of tsunami exercises. Mr Coburn (Australia) replied that the survey questions were mostly taken from the previous evaluations with limited modification. It would be beneficial to fine tune the survey questions so that they are in-line with the national guidelines of tsunami exercises. Mr Elliott commented that the TOWS-WG Task Teams on Tsunami Watch Operations and on Disaster Management and Preparedness had thoroughly revised the tsunami post analysis questionnaire and this could form a basis for future IOWave Exercises. Mr Elliott noted that this was the first time that the evaluation had been conducted online.

105 Mr Rafliana asked if this survey will guide the response to real events. Mr Coburn (Australia) suggested that the evaluation of real events be discussed in the Working Group 2 forum.

106 Dr Harkunti Rahayu (Indonesia) commented that social media procedures, such as Facebook and Twitter, are challenging to evaluate. Mr Coburn suggested that the quantity of hits at particular times could give an indication of their usage.

107 Mr Samwel Mbuya (Tanzania) enquired if it is possible to build capacity for NTWCs to do a similar test. Mr Coburn replied that this is in-line with the recommendations of the Task Team and Member States are encouraged to run national exercises.

108 The Chair noted that the TOWS-WG has produced guidelines on how to conduct exercises (How to Plan, Conduct and Evaluate UNESCO/IOC Tsunami Wave Exercises, IOC/2012/MG/58 REV.), and the implications towards conducting exercises at the national level should be considered.

109 Mr Paul Oloo (Kenya) and Mr Badar Al-Rumhi (Oman) noted that there is a problem with reporting back via the national status warning form. Specifically, there is an issue with it redirecting to a Microsoft Outlook page. Mr Coburn responded that the message is reliant on email and if the machine in use does not have email enabled it will not work. He suggested that a more robust mechanism may need to be investigated.

110 Captain Song Ekmahachai (Thailand) suggested that for every regional exercise Member States also conduct a national exercise with the same scenario. Furthermore, Captain Ekmahachai suggested conducting a daily or weekly communications test for in-country agencies.

111 Dr Srinivasa Kumar Tummala (India) thanked the NTWCs for sharing issues with website access. He emphasised that reporting during events is important because it informs the core of public bulletins produced by the TSPs. Moreover, Mr Coburn noted that the warning status of IOTWS Member States will be reported on the public TSP webpages.

112 The Chair noted that IOTWS exercises will be held every two years. The next exercise date scheduled for 2016 should be confirmed and an exercise Task Team should be formed.

113 The IOWave14 Task Team recommended that a post-IOWave14 Workshop should be conducted, with representatives from TSPs and Member States. The Task Team recommended that observers from TSPs and Working Groups should attend in-country during IOWave exercises, in order to help identify and resolve Member State SOP gaps.

5. WORKING GROUP PROGRESS REPORTS

5.1 WORKING GROUP 1 PROGRESS REPORT: TSUNAMI RISK ASSESSMENT AND REDUCTION

114 The Chair of Working Group 1, Prof Sam Hettiarachchi, presented an update on the Group's activities in the intersessional period (Annex VI). He reminded the session that the mission of Working Group 1 is to strengthen the IOTWS by providing advice, developing guidelines and supporting Member States in the Indian Ocean to undertake tsunami risk assessment and management including hazard mitigation. The vision of the Working Group 1 is to bring together all stakeholders in tsunami prone ocean basins, including members of civil society, to make disaster risk reduction everyone's business and to ensure human security and protection of the built and natural environment.

115 Prof Hettiarachchi reported that the Working Group had a very successful intersessional period with a high activity profile. The principal activities relate to the 'Enhancing Tsunami Risk Assessment and Management, Strengthening Policy Support and Developing Guidelines for Tsunami Exercises in Indian Ocean Countries" ("TRATE") project through which the Revision of the guidelines on "Tsunami Risk Assessment and Mitigation for the Indian Ocean: knowing your tsunami risk and what to do about it" (IOC/2009/MG/52) was undertaken. In addition, several specific studies leading to research publications for use in risk assessment and management were undertaken. Currently, planning is underway for the Indian Ocean Tsunami Risk Assessment and Management Workshop to be conducted adopting the 'Training the Trainer' approach.

116 Prof Hettiarachchi was involved with a major project undertaken on Tsunami Risk Assessment and Management in Oman and with the assistance of relevant authorities the outcome of these studies will be shared for the benefit of Member States. This benchmark study has strengthened the Risk Assessment capacity within IOTWS. The Working Group continued to participate where possible at important international events to showcase their activities and is collaborating on important publications. The Working Group is keen to establish coordinating links with Tsunami Warning Systems of other ocean basins in order to share experience and documents as well as to produce global guidelines and perhaps joint training programmes.

117 Over the last decade the Working Group has initiated a number of activities leading to publications and guidelines and has conducted several training workshops. Two areas have been identified for future activity.

118 The first is the establishment of a sustainable mechanism for training in Coastal Hazards and Tsunami Risk Assessment and Management and training modules for tsunami exercises. This will enable the successful work carried out to be institutionalized and to be continued for the benefit of Member States. This aspect will be looked at via the TRATE Project. It may be worthwhile to look at the possibility of establishing a consortium of affiliated research/academic institutions having an effective geographical spread together with IOTIC to assist Member States in achieving this objective.

119 The second is the establishment of coordinated links with Tsunami Warning Systems of other ocean basins in order to share experience and documents as well as to produce global guidelines and perhaps joint Training Programmes. All efforts will be made to convene

a meeting with the assistance of UNESCO and relevant agencies. The only such previous gathering was held at the First Global Meeting of the Intergovernmental Coordination Groups for Tsunami Warning Systems hosted by UNESCO/IOC in Paris, France, from 24 to 27 March 2009.

120 Prof Hettiarachchi also pointed out that the Terms of References of TOWS-WG do not have dedicated areas focusing on Tsunami Risk Assessment. It is recommended to rectify this situation and the WG Chair has raised this issue at Steering Group meetings. The Terms of Reference of the Working Group support investigations of tsunami hazard sources; preparation of integrated regional tsunami hazard maps and risk models; development of a uniform guideline for tsunami risk assessment; the provision of guidance on tsunami risk management including hazard mitigation; and strengthening the capabilities of Indian Ocean Member States.

121 During the next intersessional period, the Working Group plans to complete all activities under the TRATE project, including the finalization of documents and guidelines, conduct of Regional Workshop adopting the Training of Trainer Approach and preparing a strategy paper on establishing a sustainable mechanism to continue with training activities. All activities will be followed up to ensure that if and when necessary Member States can embark on training and implementing Risk Assessment and Mitigation measures. The Working Group will also pursue actions identified under Gaps and Deficiencies.

122 Mr Ahmed Al-Harthi (Oman) thanked Prof Hettiarachchi and WG1 for an excellent job in assisting during the implementation phase of the early warning centre in Oman.

5.2 WORKING GROUP 2 PROGRESS REPORT: TSUNAMI DETECTION, WARNING AND DISSEMINATION

123 The Chair of Working Group 2 on Tsunami Detection, Warning and Dissemination, Dr Satheesh Shenoi, presented an update on the Group's intersessional activities (Annex VII). He referred to the IOWave14 Exercise conducted on 9 and 10 September 2014, the intersessional meeting of WG2 held in Hyderabad, India, on 27 June 2014, IOTWS 6-monthly communications tests, monitoring and evaluation of TSPs' performance, and contributions to NTWC/NDMO/Media SOP Training Workshops in Jakarta, Indonesia, 23-27 September 2013 and Hyderabad, India, 23-26 June 2014.

124 Working Group 2 **recommended** conducting a joint TSP/NTWC/DMO/Media training workshop on Standard Operating Procedures in the next intersessional period, subject to the availability of funding.

125 Evaluation of the TSPs' performance was reviewed in terms of the six Key Performance Indicators (KPIs). It was noted that between 1 November 2012 and 27 February 2015, earthquake bulletins for 164 earthquakes of magnitude greater or equal to 6.5 were issued by at least one TSP.

126 It was questioned if delivery via fax is still necessary given the high success rate of GTS, email, and SMS. Also, it was noted that access to TSP websites and warning status reporting has declined across the 5 tests.

127 The Working Group 2 action plan for the next intersessional period includes: monitoring TSP performance against agreed performance targets; continuing to review and further develop TSP performance targets; conducting 6-monthly Communication Tests; contributing to TSP/NTWC/DMO/Media training activities including the conduct of one SOP training workshop; and addressing gaps and deficiencies in communication mechanisms.

128 Mr Daniel Jaksa (Australia) thanked the Secretariat for its excellent work on collating a database of seismic stations in Indian Ocean. He noted that there are many stations that are not available in real-time and urged all countries to share their seismic data to enhance the performance of the TSPs. In the Makran region there is a scarcity of seismic data for research.

129 Dr Joern Lauterjung (GFZ) suggested that Working Group 2 investigates new advances in equipment and science developments in the future. Dr Shenoi commented that GPS and strong motion data is useful for tsunami threat evaluation. The Chair commented that this initiative is part of the group's existing Terms of Reference.

130 The Chair commented that the Working Group should demonstrate the value of the IOTWS seismic and sea level networks in terms of the optimal network for tsunami warning.

131 Mr Elliott urged all Member States to share their sea level data on the GTS. The Chair further commented that the TOWS-WG had requested IOC/UNESCO to make all sea level stations on the IOC Sea Level Monitoring website available on the GTS.

132 Iran suggested that the 24 September 2013 Pakistan earthquake be investigated by the Working Group. Australia commented that the Pakistan earthquake had been very well studied in the literature. The Chair commented that the Working Group should consider the 2013 Pakistan event in terms of warning output procedures. Dr Mark Leonard (Australia) suggested that more bathymetry data could be collected to better understand this area.

133 The Chair commented that performance monitoring of TSPs should be made available to the NTWCs and continuously updated and maintained.

5.3 WORKING GROUP 3 PROGRESS REPORT: TSUNAMI AWARENESS AND RESPONSE

134 The Chair of Working Group 3 on Tsunami Awareness and Response, Dr Harkunti Rahayu, reported on the activities of Working Group 3 in the intersessional period (Annex VIII). She referred to the interim document “Tsunami Early Warning and Community Preparedness – Experiences from the IOTWS”, and invited feedback and comments.

135 The objective of Working Group 3 is to provide advice, develop guidelines, and promote good practice in capacity building for community resilience through preparedness and response activities for Member States in the Indian Ocean.

136 Two WG3 intersessional meetings were conducted, supported by the Final Round-up Session German-Indonesian Tsunami Early Warning System (GITEWS) in 2013 and the IOTWS SOP Training Workshop for Northern and Western Indian Ocean Member States held in Hyderabad, India, 23-26 June 2014.

137 Dr Harkunti commented that there are issues with low and non-consistent Working Group 3 membership as well as the need for a Vice-Chair. Gaps and deficiencies were commented on and the need to focus on the ‘last mile’ was highlighted.

138 Proposed activities of the Working Group 3 action plan for the next intersessional period include: to update the preparedness baseline data of Member States conducted in 2005 via in-depth preparedness survey; to adapt and pilot test best practices from other basins to Indian Ocean Member States (e.g. Tsunami Ready from Caribbean TEWS); replicate the outcome of Tsunami Exercise Guide and Policy under the project: "Enhancing Tsunami Risk Assessment and Management, Strengthening Policy Support and Developing Guidelines for Tsunami Exercises in Indian Ocean Countries" (TRATE) funded by UNESCAP

to other Member States (Western Indian Ocean); setting up communication media among Working Group 3 members, approval and commitment of the Member States for Working Group 3 membership, finalising the interim document "Tsunami Early Warning and Community Preparedness - Experiences from the IOTWS; intersessional meeting and field trip.

139 Prof Din Mohammad Kakar, University of Balochistan, Pakistan, provided a summary of the outcomes of the project "Communicating the effects of the 1945 Makran tsunami to increase awareness and preparedness of tsunami hazards in the Makran region" funded by the UNESCAP Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness and managed by UNESCO/IOC through the ICG/IOTWS Secretariat and IOTIC. An educational booklet, *Remembering the 1945 Makran tsunami: Interviews with survivors beside the Arabian Sea* (IOC/BRO/2015/1), has been produced. All information collected is accessible via the IOTIC website (http://iotic.ioc-unesco.org).

140 Iran suggested drawing conclusions and quantitative information from the interviews. Prof Kakar (Pakistan) responded that they are in the process of analysing this information with the aim to publish it in scientific journals. Ms Ghazala Naeem (Pakistan) commented that Oxfam has recently funded a project focusing on enhancing resilience along coastal communities of Pakistan. As part of this project, hazard mapping will be developed that will take into account inundation measurements.

6. POLICY MATTERS

6.1 ADOPTION OF TERMS OF REFERENCE FOR INDIAN OCEAN TSUNAMI INFORMATION CENTRE (IOTIC)

141 Mr Ardito Kodijat, Head of Disaster Risk Reduction and the Indian Ocean Tsunami Information Centre (IOTIC) at UNESCO Jakarta, introduced this agenda item. He reminded the ICG that at the 9th Session of the ICG/IOTWS, the ICG supported the establishment of an Indian Ocean Tsunami Information Centre (IOTIC) to provide tsunami information services to the Indian Ocean region, subject to consultation and agreement on its Terms of Reference and governance mechanism with the Steering Group. Since then, the Terms of Reference and governance mechanism had been reviewed and approved by the IOTWS Steering Group, and after inviting comments from the delegates, the Chair would recommend to the ICG that it endorses the IOTIC Terms of Reference.

142 Mr Kodijat reviewed the definition of Tsunami Information Centres and their objectives noting that Tsunami Information Centres have been established in each of the regional tsunami warning systems within the ICG framework. He presented the draft IOTIC governance, function, and role as contained in the IOTIC Terms of Reference, which are subject for approval by the ICG at this session.

143 The IOTIC Terms of Reference were accepted without modification.

144 Dr Mochammad Riyadi (Indonesia) stated that to ensure the sustainability of IOTIC Indonesia is prepared to host IOTIC at their warning centre for the next five years starting 2016.

145 Ms Irina Rafliana (Indonesia) informed the ICG that the interim document *Tsunami Early Warning & Community Preparedness: Experiences from the IOTWS* (*ICG/IOTWS-X/39)* had been published in draft format. The document is a collaboration between Working Group 1 and Working Group 3 to compile examples of good practices in IOTWS Member States. Ms Rafliana welcomed comments and noted that the document will be finalised soon.

6.2 DESIGNATION OF NATIONAL TSUNAMI WARNING CENTRES (NTWC), TSUNAMI WARNING FOCAL POINTS (TWFP) AND TSUNAMI NATIONAL CONTACTS (TNC)

146 Mr Elliott introduced this agenda item. He recalled that the IOC Executive Council through Decision EC-XLVII/Dec.3.2.1 (IV) decided to update the definition of National Tsunami Warning Centre (NTWC) and Tsunami Warning Focal Point (TWFP), and instructed the Secretariat to update the ICG reference documents with these new definitions, as follows:

- National Tsunami Warning Centre (NTWC): A centre officially designated by the government to monitor and issue tsunami warnings and other related statements within their country according to established National Standard Operating Procedures.

- Tsunami Warning Focal Point (TWFP): A 24x7 point of contact (office, operational unit or position, not a person) officially designated by the NTWC or the government to receive and disseminate tsunami information from an ICG Tsunami Service Provider according to established National SOPs. The TWFP may or not be the NTWC.

147 Through IOC Circular Letter (CL) No. 2562, the IOC Executive Secretary requested ICG/IOTWS Member States to update their TWFP and NTWC contact information according to the above definitions. Mr Elliott provided details to those Member States that have responded to this request and encouraged those yet to respond to do so as soon as possible.

148 Mr Elliott also elaborated on the important role of Tsunami National Contacts (TNC) in the IOTWS. The TNC is the person designated by a Member State to represent his/her country in the coordination of international tsunami warning and mitigation activities.

149 Updating TNC and TWFP information must be done through an official channel if the institution/organisation has changed. Changes to contact details within an institution can be notified to the Secretariat via the TNC or TWFP. Seventeen out of twenty-four TNCs have been officially nominated. Mr Elliott encouraged the ICG to review the TNC contacts again and request re-nominations via a Circular Letter from the IOC Executive Secretary.

150 The Chair reiterated Mr Elliott's request for up-to-date contact information through official nomination channels. He requested Member States to review and revise their TNC, TWFP and NTWC information and provide updates to the Secretariat through official channels.

151 Mr Peter Coburn (Australia) requested the ICG to note that the acronym 'RTSP' had been replaced by 'TSP'. Mr Elliott commented that this change in acronym had been decided at TOWS-WG level and the revised acronyms are now PTWS-TSPs, IOTWS-TSPs etc. It has been included in the *Tsunami Glossary* (IOC/2008/TS/85 REV*)* and should also be included in the NTWC User Guide. The Chair explained that the word 'regional' was removed as it created issues in the Mediterranean. Dr Srinivasa Kumar Tummala noted that this change had been captured in the TSP Service Definition Document.

6.3 SUB-REGIONAL COOPERATION IN THE NORTHWEST INDIAN OCEAN REGION

152 The Chair introduced this topic and explained that it had been included in the agenda mainly because this is the first session of the ICG/IOTWS to be held in the Northwest Indian Ocean region, and at previous ICG meetings the concept of sub-regional cooperation in this region had been raised and discussed several times. The Chair invited representatives from the Member States of the Northwest Indian Ocean region to express their opinion, interest

and willingness to develop a sub-regional Working Group within the framework of the ICG/IOTWS.

153 Dr Juma Al-Maskari (Oman) reported that two side meetings on sub-regional cooperation in the Northwest Indian Ocean region had been held during this ICG session with attendance from India, Iran, Oman, Pakistan and Yemen. It was proposed to establish a Working Group for the North Western Indian Ocean region. Dr Al-Maskari (Oman) reported that Terms of Reference have been drafted and asked delegates for feedback. The final Terms of Reference for the Subregional Working Group for the North West Indian Ocean are contained in the Annex to Recommendation ICG/IOTWS-X.1.

154 Delegates from India, Iran and Yemen took the floor to support the establishment of the Working Group for the North West Indian Ocean.

155 Dr Satheesh Shenoi (India) asked if the Terms of Reference could be expanded to include 'multi-hazards'. The Chair responded that 'multi-hazard' is beyond the Terms of Reference of this ICG. Mr Elliott suggested that the focus of the Working Group should be on tsunami with recognition that it is within a 'multi-hazard' framework.

6.4 ADOPTION OF DEFINITION OF SERVICES PROVIDED BY THE IOTWS TSUNAMI SERVICE PROVIDERS

156 Dr Srinivasa Kumar Tummala, Vice-Chair of the ICG/IOTWS, introduced this agenda item. He referred the delegates to the draft IOTWS-TSP Service Definition Document, which had been prepared by the Tsunami Service Providers of Australia, India and Indonesia at the request of Working Group 2. He explained the need to have such a document and noted that the document will be reviewed by Working Group 2 and updated as necessary prior to each subsequent session of the ICG/IOTWS.

157 The Service Definition Document defines the services to be provided by the TSPs of the ICG/IOTWS. A forerunner is the Regional Tsunami Warning Provider (RTWP) Implementation Plan (adopted by the Fifth Session of the ICG/IOTWS held in Putrajaya, Malaysia, 8–10 April 2008). The document's structure and contents were presented and it was noted that the draft was available on the IOC website.

158 The TSP Services were reviewed with reference to the Service Levels. Maps of the IOTWS area of coverage and earthquake source zone (ESZ) were presented and were pending approval by the 28th session of the IOC Assembly (IOC-XXVIII) that will be held in Paris, France, 18-25 June 2015. The Area of Service extends 200 km inland from the coast. There is no longer an area of joint responsibility with the PTWS in the Banda and Java Seas. This area is the responsibility of the PTWS as Indonesia has withdrawn its request for back-up service in this area from the IOTWS. The exchange products for NTWC and public products were discussed. During an event, NTWCs should provide current warning status summaries to a TSP using the web-based feedback form, and the summary will be reflected in the TSP public pages. Finalisation of services, communication and interoperability between TSPs, and Key Performance Indicators were also discussed.

159 The Chair invited comments from the delegates and asked the ICG to endorse the IOTWS-TSP Service Definition Document following which it will be finalised and published by the Secretariat.

160 Prof Hettiarachchi (Sri Lanka) commented that Member States should be aware that amplification or de-amplification can occur along coastlines and that the predicted wave height is for a wide area. A study in Galle, Sri Lanka had found that local effects could

amplify the wave heights at the coast by a factor of up to 2.5. Dr Jorn Lauterjung (GFZ) stated that the NTWCs should interpret the TSP coastal forecasts within the local context.

161 Mr Martinho Fatima (Timor-Leste) requested information on earthquakes that are less than magnitude 6.5. Dr Tummala explained that this threshold corresponds with earthquakes that could be tsunamigenic. Mr Daniel Jaksa (Australia) elaborated that Timor-Leste seems to be concerned about felt earthquakes that are not tsunamigenic and advised Mr Fatima to consult a TSP to discuss receiving the appropriate earthquake bulletins. Indonesia agreed with Australia on this approach.

162 Mr Daniel Jaksa (Australia) commented that Australia would not be able to meet its KPIs for Makran trench events because of the limited seismic stations available from this region. He elaborated that it would take ~8 minutes before P-wave data arrived and a further ~4-5 minutes to calculate a magnitude. He stressed that Member States in the Makran region should share their seismic data in real-time.

163 The Chair pointed out that the KPIs are for detecting earthquakes greater than magnitude 7 (rather than 6.5) and requested that this is captured in the Service Definition Document.

164 The **ICG adopted** the IOTWS Tsunami Service Provider Service Definition Document with the changes detailed by Dr Tummala.

7. IOTWS DOCUMENTATION

7.1 IOTWS IMPLEMENTATION PLAN

165 The agenda item was introduced by Mr Daniel Jaksa on behalf of the IOTWS Steering Group. He recalled the request made by the ICG at its last session (ICG/IOTWS-IX.1) and reported on the discussion held by the Steering Group at its meeting in Jakarta, 26 November 2014. The Steering Group concluded that the Implementation Plan should be re-cast as a high level document that addresses the gaps and needs of the Member States.

166 Mr Jaksa presented the proposed outline structure of the Implementation Plan and the Chair opened the floor for discussion, comments and questions from the delegates.

167 The Chair commented that the Implementation Plan had not been updated since 2011. He noted that there have not been any issues with not having a current plan as the information is covered by other reporting mechanisms. He asked the ICG to consider if it requires the plan to be continued or if it is satisfied with the reporting in other forums.

168 Mr Jaksa proposed that the Implementation Plan be completely revised to provide the status, performance and plans of the IOTWS. Oman seconded this proposal. Dr Thorkild Aarup (UNESCO/IOC) commented that most basins prefer to have an implementation plan to allow outsiders to be informed of future work. He noted that the IOTWS does have a Medium Term Strategy plan, which other basins do not. He felt that either of these documents would be important for sharing with donors and decision makers. The Chair commented that the ICG/PTWS has the same issues regarding updating its Implementation Plan. Australia recommended that the reports from the Working Groups and Steering Group be formatted in such a way that the performance information can be easily extracted. Tanzania supported Australia's proposition.

7.2 IOTWS MEDIUM TERM STRATEGY

169 The Chair introduced this agenda item. He referred to the Medium Term Strategy 2011-2015 for the IOTWS, presented at the 8th Session of the ICG held in Melbourne, Australia, from 3 to 6 May 2011. He explained that the purpose of the Medium Term Strategy is to describe the basic directions toward continuously improving the IOTWS to meet stakeholder requirements during the period 2011-2015. It focuses on describing general, common but essential, strategic objectives to ensure an effective and efficient, tsunami warning and mitigation system that is interoperable wherever possible with other regional tsunami warning systems. The Chair noted that the Medium Term Strategy was now ready for review and opened the floor for discussion and invited comments and questions from the delegates. The ICG discussed the review process for its Medium Term Strategy.

170 The Chair stated that the Steering Group should review and recommend to the ICG the forward strategy for the next five years. Dr Joern Lauterjung (GFZ) suggested that the Medium Term Strategy should include the outcomes of the Third World Conference on Disaster Risk Reduction (WCDRR held in Sendai, Japan, and the technical developments in instrumentation. The Chair commented that the focus should be on sustainability and the 'last mile'. Dr Mark Leonard (Australia) stated that the current strategic objectives within the three pillars remain relevant. Dr Harkunti Rahayu (Indonesia) suggested that the three pillars be reviewed and revised to reflect sustainable development and resilience within each Member State. The ICG noted the offer of assistance with this endeavour from GFZ. The Chair requested the Steering Group to revise the Medium Term Strategy for the next 5 years taking into account the outcomes of the Sendai WCDRR, and including a renewed focus on 'the last mile', a review and investigation of technical developments, sustainability of the system, and in-country capabilities.

7.3 IOTWS USERS GUIDE

171 This agenda item was introduced by Mr Peter Coburn (Australia). He referred to the Draft IOTWS NTWC User Guide as prepared by the ICG/IOTWS Working Group 2, and explained that it is a priority document for the IOTWS. He noted that once approved by the ICG, it will be maintained by Working Group 2 with the support of the Secretariat. The Users Guide is a document to provide NTWCs with information on the IOTWS TSP services and the operation of the IOTWS. This document is much broader than the Implementation Plan.

172 Mr Coburn noted that each TSP has its own specific user guide (available via the TSPs' websites). The Secretariat commented that the TOWS-WG Tsunami Glossary has a 'life of its own' including updates, so synchronization with this document would be difficult. The Users Guide's glossary of terms is more general than the TOWS-WG glossary.

173 The Chair suggested adopting the Users Guide with the provision that Member States have the opportunity to provide feedback.

174 Mr Coburn reported on the IOTWS Users Guide for NTWCs (draft).

175 Iran commented that country contributions could provide detailed information on networks etc. The Chair responded that this information will be picked up in other documents (e.g. National Reports to the ICG). Mr Coburn stated that operational details will make the document become out-of-date quickly.

176 The Chair noted that the document is not yet available on the meeting website, so feedback should be provided by end of April for subsequent adoption by the ICG. The document will be placed on the meeting website and made available via email once it is finalised (i.e. within the next few days). The Chair suggested placing on IOTWS website so

that it reaches a wider audience [once finalised]. He recommended an area on the IOTWS website for key documents such as the Users Guide.

8. REPORTS FROM SESSIONAL COMMITTEE MEETINGS

177 The Chair provided an introduction to this item and noted that an outcome of the sessional meeting of the Steering Group was a proposal to combine the current Working Group 1 and Working Group 3 to harmonise and streamline their Terms of Reference and membership. He noted that the new Working Group would be cross-cutting and would be an enabler of activities rather than an implementer. He introduced the proposed Terms of Reference for the new Working Group 1, which focus on developing capacity in tsunami risk assessment and mitigation and community awareness and preparedness at the national level (Annex to Recommendation ICG/IOTWS-X.1). The Chair also highlighted the important role of IOTIC in interfacing with and supporting the proposed new Working Group 1.

178 The Chair introduced the revised Terms of Reference for Working Group 2 (Annex to Recommendation ICG/IOTWS-X.1) and stressed the importance of providing advice to IOTIC on educational material about the warning system and its services.

179 The Chair next introduced the revised Terms of Reference for the Steering Group (Annex to Recommendation ICG/IOTWS-X.1), noting that the group's role was to coordinate and integrate the work of the ICG/IOTWS in the intersessional periods, as implemented by the Working Groups and Task Team. The Steering Group also has an important role to play in integrating with the TOWS-WG and in identifying and seeking resources to support the implementation of the IOTWS.

180 Oman expressed reservations in combining Working Groups 1 and 3. It noted that risk assessment is lacking and Oman's preference was to retain Working Group 1 for at least one or two further intersessional periods. The Chair responded that risk assessment will remain a key activity of the proposed new combined Working Group.

181 Mr Elliott suggested including 'Risk Assessment' in the combined Working Group title. Sri Lanka commented that it would be appropriate to have the word 'risk' in the new Working Group title and this was supported by Australia, Indonesia and India. Australia recommended that the words tsunami and community are included in the title. The ICG decided to name the new Working Group 1 on *Tsunami Risk, Community Awareness and Preparedness*.

182 Iran recommended changing the IOTWS acronym to IOTWMS to fully reflect the actual name of the system and the importance of mitigation in the work of the ICG. Australia supported Iran's proposal.

183 Mr Peter Koltermann noted that there is an inconsistency in UN governance with including the past Chair of the ICG in the Steering Group. It was recommended that the past Chair of the Steering Group should be limited to one term. India (Dr Shenoi) commented that IOTIC should be included in the Steering Group as an observer. Mr Elliott suggested ensuring an IOTIC representative is included. Australia supported the membership of IOTIC and suggested the representative should be the Head of IOTIC.

9. PROGRAMME AND BUDGET

184 Mr Daniel Jaksa (Australia), Chair of the intra-sessional Programme and Budget Committee, introduced this item. He presented a list of activities that the Secretariat and Working Groups had proposed during the ICG with their corresponding budgets. These activities require further consideration in light of the available resources.

185 Delegates were invited to comment on the programme and budget. Iran noted that a public education component is missing. India noted that an annual SOP workshop for NTWCs, DMO and Media should be included. Mr Peter Coburn (Australia) noted that a post – IOWave14 workshop should also be included.

186 The Chair invited the ICG to consider the important issue of funding for the long term sustainability of the IOTWS and requested Member States to consider making contributions to the IOC Special Account set up for this purpose.

10. ELECTION OF OFFICERS

187 The Chair handed over this part of the session to the Chair of the Elections Committee, Dr Mark Leonard (Australia).

188 Dr Leonard reminded the delegates of the Rules and Procedures for the Election of Officers. The Election of Officers of the ICG/IOTWS was announced with the Invitation in Circular Letter 2567 (CL-2567) providing the required forms. Open for nominations were the positions of one Chair and two Vice-Chairs. The deadline for nominations was set in CL-2567 and confirmed in the adopted Annotated Agenda as Tuesday, 24 March 2015, at 16h00 Local Time Muscat.

189 Nominations were received by the Secretariat before the deadline for all open Officer positions. Each nomination was duly dated, timed and signed by the Secretariat.

190 After the deadline for nominations, the Secretariat received a request from a Member State to re-open the nomination window to allow for a late nomination. The Chair of the ICG/IOTWS and the Chair of the Elections Committee deliberated and decided to recommend to the ICG/IOTWS plenary session that nominations should be re-opened for a limited time window from 12h30 to 14h00 on Wednesday, 25 March 2015. The ICG/IOTWS agreed to this recommendation.

191 The Elections Committee composed of Australia, India, and Oman, chaired by Dr Mark Leonard, met on Wednesday, 25 March 2015 at 16h00. It duly scrutinized the nomination papers received by the Secretariat. At this point, the Election Committee was informed by the Secretariat that two nominations for the position of vice-chair had been withdrawn. The remaining nominations were considered complete, correct and in the required form and format.

192 The nominations received were one nomination for Chair and two nominations for Vice-Chair:

- Chair: Dr Srinivasa Kumar Tummala (India), seconded by Australia and Indonesia
- Vice-Chair: Dr Juma Said Al-Maskari (Oman), seconded by India and Malaysia
- Vice-Chair: Prof S.S.L. Hettiarachchi (Sri Lanka), seconded by Australia and Indonesia

193 The Elections Committee recommended that the ICG/IOTWS elect these Officers for the intersessional period commencing at the closing of this 10th Session of the ICG/IOTWS.

194 The ICG elected the Officers by acclamation and welcomed the elected Chair who will take office after the closure of this session.

195 The Chair of the Elections Committee invited the Chair of the ICG/IOTWS to take over the chairmanship of the session.

11. OTHER BUSINESS

196 The Chair asked the delegates to raise any issues not already covered during the meeting.

197 The Chair shared a congratulatory message to the ICG/IOTWS on the occasion of the 10th year of its establishment from the Chair of ICG/CARIBE-EWS (available in Annex III).

198 Mr Elliott shared a cable of gratitude to the Sultan of Oman from the ICG/IOTWS-X (available in Annex III).

12. NEXT MEETING

12.1 CONFIRMATION OF DATE AND VENUE FOR ICG/IOTWS-XI

199 Malaysia confirmed its offer to host the 11th Session of the ICG/IOTWS during the first half of 2017.

200 The Chair thanked Malaysia for its generous offer and the ICG accepted it.

12.2 TARGET DATE AND VENUE FOR ICG/IOTWS-XII

201 Iran expressed its interest in hosting the 12th Session of the ICG/IOTWS between April and June 2019.

13. ADOPTION OF DECISIONS AND RECOMMENDATIONS

202 Dr Srinivasa Kumar Tummala presented the Draft Recommendations submitted to the sessional Recommendation Committee established to prepare the recommendations for approval by the ICG.

203 The Chair requested the delegates to adopt the recommendations of the 10th Session of the ICG/IOTWS. The recommendations were reviewed by the ICG and adopted with minor changes. The adopted recommendation ICG/IOTWS-X.1 is available as ANNEX III.

204 Dr Tummala presented the new Terms of Reference for the ICG/IOTWS Working Groups and Steering Group and gave the floor the opportunity to provide feedback. The Terms of Reference were reviewed by the ICG and adopted with minor changes. The Terms of Reference are available in the Annex to Recommendation ICG/IOTWS-X.1.

205 The Chair invited expressions of interest from the floor to join Working Group 1 on Tsunami Risk, Community Awareness and Preparedness. India, Indonesia, Iran, Kenya, Oman, Pakistan, Sri Lanka, Tanzania and Yemen expressed interest in WG1 membership and GFZ expressed interest in being an invited observer. The Secretariat commented that a Circular Letter will be sent to all Member States inviting nomination. The Tsunami National Contacts will nominate a person to participate in the group. The Chair requested that the Member States that have expressed interest in becoming member of WG1 to ensure that their Tsunami National Contacts are aware that they would like to contribute.

206 The ICG appointed a Chair and two Vice-Chairs for Working Group 1 for the next intersessional period:

- WG1 Chair: Dr Harkunti Pertiwi Rahayu (Indonesia), nominated by Indonesia
- WG1 Vice-Chairs: Dr Majid Naderi Beni (Iran), nominated by Iran

Dr Sultan Al-Yahyai (Oman), nominated by Oman

207 The Chair invited expressions of interest from the floor to join Working Group 2 on Tsunami Detection, Warning and Dissemination. Australia, India, Indonesia, Iran, Kenya, Madagascar, Oman, Pakistan and Tanzania expressed interest in WG2 membership.

208 The ICG appointed a Chair and two Vice-Chairs for Working Group 2 for the next intersessional period:

- WG2 Chair: Mr Peter Coburn (Australia), nominated by India
- WG2 Vice-Chairs: Dr Mohammad Mokhtari (Iran), nominated by India and Pakistan
  Dr Mochammad Riyadi (Indonesia), nominated by Indonesia

209 Dr Srinivasa Kumar Tummala presented the Terms of Reference for the North West Indian Ocean Working Group (WG-NWIO). He then opened the floor for comments from delegates. The Terms of Reference were accepted and adopted by the ICG (refer to Annex to Recommendation ICG/IOTWS-X.1). Membership of the North West Indian Ocean Working Group includes India, Iran, Pakistan, Oman and Yemen.

210 The ICG appointed a Chair and Vice-Chair for the Working Group for the North West Indian Ocean for the next intersessional period:

- WG-NWIO Chair: Dr Juma Al Maskari (Oman), nominated by Oman
- WG-NWIO Vice-Chair: Dr Nasser Hadjizadeh Zaker (Iran), nominated by Iran

211 The Chair asked for nominations from Member States with NTWCs to participate in the Steering Group. Seychelles nominated a representative from their NTWC (to be announced) to participate in the Steering Group.

212 The Chair presented the Terms of Reference for the IOWave16 Exercise Task Team, which were reviewed and adopted with minor modification (refer to Annex to Recommendation ICG/IOTWS-X.1). The IOWave16 Exercise is scheduled for August 2016.

213 The Chair called for Member States to nominate participants for the IOWave16 Task Team. Membership includes Australia, India, Seychelles and Indonesia. Australia offered to chair the Task Team and India offered to act as vice-chair, and the ICG accepted these offers. The names of the Chair and Vice-Chairs will be informed by Australia and India after further consultation.

14. CLOSE OF MEETING

214 Australia expressed a vote of thanks to the outgoing Chairs and Vice-Chairs of all Working Groups, Task Teams, and the Steering Group. India followed Australia in thanking the past Chairs and Vice-Chairs and the Task Team for IOWave14. The Indonesian delegation extended thanks to Mr Bailey for all his hard work for the IOTWS and welcomed Dr Srinivasa Kumar Tummala as the new Chair of ICG/IOTWS. The Iranian delegation expressed appreciation to the ICG/IOTWS Secretariat and the Chair, and to the Sultanate of Oman for its excellent hospitality. Seychelles thanked everyone and extended an invitation to Seychelles to attend a Coastal Hazard Assessment workshop in 2016. Pakistan thanked the Sultanate of Oman for its wonderful hospitality. The WMO/ESCAP Panel on Tropical Cyclones members thanked the Sultanate of Oman for its hospitality and thanked the ICG Chair and the Secretariat.

215 The outgoing chair, Mr Rick Bailey thanked the Sultanate of Oman, Dr Juma Al-Maskari and his team including the Rapporteur. Mr Bailey thanked everyone for the

achievements that have been made as a team. He especially thanked all members of the Steering Group in recent years and the Secretariat.

216 Mr Tony Elliott, on behalf of IOC/UNESCO, expressed deep appreciation to the Sultanate of Oman and the Directorate General of Meteorology and Air Navigation for organising this event and for their hospitality. Mr Elliott congratulated Oman on the inauguration of the Tsunami Early Warning System and his colleagues Ms Nora Gale and Dr Fauzi. Mr Elliott said it had been a great pleasure to work with Mr Bailey over the last four years and thanked him for all the effort he had put into the ICG/IOTWS.

217 The incoming Chair Dr Srinivasa Kumar Tummala thanked Mr Bailey and the Vice-Chairs, the Working Group Chairs and Vice-Chairs, and the Member States. He committed himself to the improvement of the ICG/ITOWS and expected the same support going forward. He expressed his thanks to the Sultanate of Oman for hosting this wonderful meeting.

218 In Dr Al-Maskari's closing remarks, he thanked all of the participants for travelling to this meeting and attending the inauguration of the Tsunami Early Warning Centre and the conference. He thanked IOC/UNESCO for its support. As an incoming Vice-Chair for the ICG, he assured the ICG that he would give all his efforts to make the years to come successful.

219 The meeting was closed at 17:02 on 26 March 2015.

ANNEX I

AGENDA

1. WELCOME AND OPENING OF 10TH SESSION

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF AGENDA

2.2 DESIGNATION OF RAPPORTEUR

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

3. REPORT OF INTERSESSIONAL ACTIVITIES

3.1 ICG CHAIRMAN'S REPORT

3.2 REPORT FROM THE IOC SECRETARIAT

3.3 REVIEW OF ICG/IOTWS DECISIONS, RECOMMENDATIONS AND ACTIONS

3.4 REPORT FROM 8TH MEETING OF THE TOWS WORKING GROUP

3.5 REPORT OF THE INTERNATIONAL CONFERENCE TO COMMEMORATE THE 10TH ANNIVERSARY OF THE INDIAN OCEAN TSUNAMI

3.6 REPORT OF THE INDIAN OCEAN TSUNAMI INFORMATION CENTRE (IOTIC)

3.7 NATIONAL PROGRESS REPORTS

3.8 REPORTS FROM UN AGENCIES

3.9 REPORTS FROM OTHER ORGANISATIONS

3.10 SUMMARY OF THE REGIONAL CONFERENCE ON REDUCING TSUNAMI RISK IN THE WESTERN INDIAN OCEAN

4. IOTWS TSUNAMI SERVICE PROVIDER (IOTWS-TSP) REPORTS

4.1 TSP AUSTRALIA

4.2 TSP INDIA

4.3 TSP INDONESIA

4.4 REPORT FROM INDIAN OCEAN WAVE 14 (IOWAVE14) TASK TEAM

5. WORKING GROUP PROGRESS REPORTS

5.1 WORKING GROUP 1 PROGRESS REPORT: TSUNAMI RISK ASSESSMENT AND REDUCTION

5.2 WORKING GROUP 2 PROGRESS REPORT: TSUNAMI DETECTION, WARNING AND DISSEMINATION

5.3 WORKING GROUP 3 PROGRESS REPORT: TSUNAMI AWARENESS AND RESPONSE

6. POLICY MATTERS

6.1 ADOPTION OF TERMS OF REFERENCE FOR INDIAN OCEAN TSUNAMI INFORMATION CENTRE (IOTIC)

6.2 DESIGNATION OF NATIONAL TSUNAMI WARNING CENTRES (NTWC), TSUNAMI WARNING FOCAL POINTS (TWFP) AND TSUNAMI NATIONAL CONTACTS (TNC)

6.3 SUB-REGIONAL COOPERATION IN THE NORTHWEST INDIAN OCEAN REGION

6.4 ADOPTION OF DEFINITION OF SERVICES PROVIDED BY THE IOTWS TSUNAMI SERVICE PROVIDERS

7. IOTWS DOCUMENTATION

7.1 IOTWS IMPLEMENTATION PLAN

7.2 IOTWS MEDIUM TERM STRATEGY

7.3 IOTWS USERS GUIDE

8. REPORTS FROM SESSIONAL COMMITTEE MEETINGS

9. PROGRAMME AND BUDGET

10. ELECTION OF OFFICERS

11. OTHER BUSINESS

12. NEXT MEETING

12.1 CONFIRMATION OF DATE AND VENUE FOR ICG/IOTWS-XI

12.2 TARGET DATE AND VENUE FOR ICG/IOTWS-XII

13. ADOPTION OF DECISIONS AND RECOMMENDATIONS

14. CLOSE OF MEETING

ANNEX II

ADOPTED DECISIONS AND RECOMMENDATIONS

Recommendation ICG/IOTWS-X.1

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

Having met for its Tenth Session from 24 to 26 March 2015 in Muscat, Oman,

Recalling Resolution XXIII–12 that established the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System,

Recognizing the progress towards establishing National Tsunami Warning Centres (NTWCs) in all countries around the Indian Ocean since the Indian Ocean Tsunami of 26 December 2004,

Reaffirming that the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) is a coordinated network of national systems and capacities, and is part of a global network of early-warning systems for all ocean-related hazards,

Reaffirming further that each Member State has the responsibility to issue warnings within its respective territories,

Recalling the Mauritius Declaration adopted at the intergovernmental coordination meeting held at Grand Baie from 14 to 16 April 2005 to openly share and exchange tsunami-relevant real-time observational data in accordance with the UNESCO/IOC Oceanographic Data Exchange Policy,

Noting that the WMO/UNESCAP Panel on Tropical Cyclone's activities, particularly its programme of development of integrated multi hazard early warning system for the coastal areas of the Bay of Bengal and Arabian Sea countries, is complementary to ICG/IOTWS objectives,

Noting the outcomes of the Third UN World Conference on Disaster Risk Reduction (13–18, March 2015, Sendai, Japan), the Sendai Framework for Disaster Risk Reduction 2015–2030,

Noting the WMO International Network for Multi Hazard Early Warning Systems (IN-MHEWS) initiative.

Noting the Summary Statement of the International Conference to commemorate the Tenth anniversary of the Indian Ocean Tsunami "The Indian Ocean Tsunami Warning and Mitigation System 10 years after the Indian Ocean Tsunami: Achievements, Challenges, Remaining Gaps and Policy Perspectives" (IOC/BRO/2015/2),

Noting the outcomes of the final roundup session of the German-Indonesia cooperation on Tsunami Early Warning System 2005–2014 (24–27 March 2014, Jakarta, Indonesia) and **welcoming** the offer of GFZ to continue to support the IOTWS beyond GITEWS/PROTECTS initiatives,

Noting that 2015 marks the 70th anniversary year of the 1945 Makran Earthquake and Tsunami,

Noting the outcomes of the Regional Conference on Reducing Tsunami Risk in the Western Indian Ocean (22–23 March 2015, Muscat, Oman),

Congratulates the Sultanate of Oman on the inauguration of the National Multi Hazard Early Warning System (NMHEWS) on 23 March 2015,

Noting with concern that the EUMETSAT Meteosat-7 will be decommissioned in 2016, **urges** WMO to address the issue of its replacement to ensure availability of real-time sea level data for tsunami warnings,

Noting the opportunity to further explore the seismicity and geology of the Indian Ocean basin during the IIOE-2 programme of the IOC during 2016–2020,

Recalling the IOC Resolution XXVI-7 on Global Coordination of Early Warning and Mitigation Systems for Tsunamis and Other Sea-Level Related Hazards, and IOC Resolution XXVI-6 on Data Buoy Vandalism: Impact and Responses,

Acknowledges with appreciation the contribution and support of UNESCAP and other donor agencies,

Acknowledges the contributions of seismic data through the CTBTO,

Having reviewed the progress made in the implementation of the IOTWS since the Ninth Session of the ICG/IOTWS,

Having considered the reports of:

- ICG/IOTWS Chair,
- IOC Secretariat,
- IOTIC,
- Eighth and Ninth Meetings of the ICG/IOTWS Steering Group,
- Sixth and Seventh Meetings of the TOWS-WG,
- IOWave 14 Exercise Task Team (Draft),
- TSP Australia,
- TSP India,
- TSP Indonesia,
- Working Group 1 on Tsunami Risk Assessment and Reduction,
- Working Group 2 on Tsunami Detection, Warning and Dissemination,
- Working Group 3 on Tsunami Awareness and Response,
- Working Group 2 IOTWS TSP Service Definition Document (Draft),
- Working Group 2 IOTWS NTWC User Guide (Draft),

Reaffirms that participation in ICG activities should be funded by the Member States,

Encourages voluntary contributions to the IOC Special Account set up for the IOTWS to support activities identified in the Budget and Programme,

Encourages Member States to continually update the list of Tsunami National Contacts (TNCs), National Tsunami Warning Centres (NTWCs), Tsunami Warning Focal Points (TWFPs) and **inform** the Secretariat of all changes through official channels,

Encourages Member States to retain trained staff at the NTWCs,

Encourages continued involvement of national and international media in training workshops and exercises, as well as warning dissemination,

Urges Member State NTWCs to ensure national tsunami warning status is reported back to the TSPs in a timely manner via the agreed web reporting protocols during tsunami events, tests and exercises,

Requests Member States to review the IOWave14 exercise draft report and provide corrections, if any, to the Secretariat by 30 April 2015,

Requests NTWCs to continue to develop and routinely review Standard Operating Procedures (SOPs) and provide copies to the Secretariat,

Noting that Regional Integrated Multi-hazard Early Warning System (RIMES) is no longer proposing to operate as an IOTWS-TSP and further noting that RIMES is developing SL-3 services for its Member States in cooperation with TSP-India, decides to no longer request RIMES to exchange its products with the IOTWS-TSPs,

Noting the diminishing engagement by some Member States in the activities of the ICG/IOTWS, **urges** Member States to participate more actively,

Noting the value of basin-wide tsunami exercises and drills, **encourages** Member States to conduct further exercises and drills at the national level,

Noting the importance of seismic data for timely and accurate determination of tsunami threats by TSPs, encourages Member States, especially in the north-west Indian Ocean, to provide all relevant real-time seismic data,

Noting the importance of clarifying the earthquake and tsunami potential of the Makran subduction zone, **encourages** Member States to acquire new datasets such as the GNSS, Seismic and other geological data,

Appreciates the outcomes of the TOWS-WG in guiding the activities of the ICG and its Working Groups and Task Teams, and **requests** the TOWS-WG to complete the Global Service Definition Document,

Having considered the Terms of Reference (ToRs) of the Indian Ocean Tsunami Information Centre (IOTIC), decides to endorse them and

Welcomes with gratitude, the offer of Indonesia to support IOTIC, by hosting the centre and supporting IOTIC with office space, staff support and other essential support for a period of 5 years commencing 2016,

Requests the Executive Secretary:

1. To prepare the Executive Summary Report of the Tenth Session of the ICG/IOTWS within 30 days,
2. To carry forward the outstanding actions from previous ICGs for review at each session,

3. To invite nominations for membership of the Working Groups to ensure continuity and functioning of the Working Groups in the intersessional period,

4. To maintain and update the IOTWS website to meet the specific needs of the ICG/IOTWS in consultation with the ICG/IOTWS Steering Group,

5. To invite IOTWS Member States to renew nomination of Tsunami National Contacts (TNCs),

Recognising the present financial concerns of the IOC Regular Programme, **requests** that the Executive Secretary allocates extra budgetary funds provided for the ICG/IOTWS for use in supporting ICG/IOTWS programme and activities,

Requests GLOSS to provide 6-monthly reports on the status of tide gauge station availability in the Indian Ocean region,

Requests the IOWave14 Exercise Task Team to prepare its final report by the end of May 2015 and submit to the Steering Group,

Decides:

1. To place greater focus on community awareness and preparedness to help ensure more appropriate responses to tsunami warning information,

2. To develop performance indicators for all aspects of the IOTWS in consultation with the TOWS-WG,

3. To dissolve Working Group 1 and Working Group 3,

4. To continue existing Working Group 2 with modified Terms of Reference as attached in Annex to Recommendation ICG/IOTWS-X.1. Chair, Mr Peter Coburn (Australia) and Vice-Chairs Dr Mohammad Mokhtari (Iran), Dr Mochammad Riyadi (Indonesia),

5. To continue the Steering Group with modified Terms-of-Reference as attached in Annex to Recommendation ICG/IOTWS-X.1,

6. To establish a new Working Group 1 on Tsunami Risk, Community Awareness and Preparedness with Terms-of-Reference as attached in Annex to Recommendation ICG/IOTWS-X.1. Chair, Dr Harkunti Pertiwi Rahayu (Indonesia) and Vice-Chairs, Dr Majid Naderi Beni (Iran), Dr Sultan Al-Yahyai (Oman),

7. To establish a new Sub-Regional Working Group for the North West Indian Ocean with Terms-of-Reference as attached in Annex to Recommendation ICG/IOTWS-X.1. Chair, Dr Juma Al-Maskari (Oman) and Vice-Chair, Dr Nasser Hadjizadeh Zaker (Iran)

8. To adopt the IOTWS TSP Service Definition Document,

9. To adopt the IOTWS NTWC User Guide subject to consideration of comments from the Member States to the WG-2 before 30 April 2015 for approval by the Steering Group,

10. To dissolve the IOWave 14 Exercise Task Team after completion of the IOWave 14 report by end of May 2015,

11. To establish a new IOWave 16 Exercise Task Team reporting to the Steering Group to plan and conduct an exercise in the August 2016 utilizing the IOC Tsunami

Exercise Guidelines, with Terms of Reference as attached in Annex to Recommendation ICG/IOTWS-X.1,

12. To refer the recommendations contained in the IOWave 14 exercise report to the relevant Working Groups for review by the 31 December 2015 for follow-up actions,

13. To conduct a joint TSP/NTWC/DMO/Media training workshop on Standard Operating Procedures in the intersessional period, subject to the availability of funding,

14. To conduct a post-IOWave 14 workshop, subject to availability of funding,

15. To conduct a workshop on coastal hazards and risk assessments in 2016, subject to the availability of funding,

16. That TSPs should conform to the IOTWS TSP Service Definition Document ,

17. To replace the IOTWS Implementation Plan with an IOTWS Status Report to be completed by the Steering Group for review at the next ICG.

Requests the IOWave 16 Exercise Task Team to review and simplify the exercise evaluation form, taking into account the Post-event Assessment Questionnaire adopted in the IOTWS TSP Service Definition Document,

Requests Working Group 1 with the assistance of IOTWS Member States to make an inventory of historical earthquake events in the Pacific Ocean that may have impacted the Indian Ocean coasts with a view to assessing the associated risks,

Requests Working Group 2 to use the IOTWS Communications Tests and significant real events to identify and help rectify the causes of delivery problems, reporting of NTWC status and access to TSP websites,

Requests the Steering Group to review and revise the Medium Term Strategy and develop the Outreach and Communication Plan,

Requests the Steering Group to oversee the reassessment of the capacity and capability of Member States to respond to the tsunami threat by repeating the original assessment made in 2005 (IOC/INF-1219), subject to availability of funding,

Requests the IOC Assembly to change the IOTWS acronym to IOTWMS to fully reflect the actual name of the System and the importance of mitigation in the work of the ICG,

Expresses appreciation for the congratulatory note to IOTWS on the occasion of the Tenth year of establishment from Chair, ICG/CARIBE-EWS as per ANNEX III,

Expresses its gratitude to the Sultanate of Oman for kindly hosting the Tenth Session of the ICG/IOTWS in Muscat, as per cable in ANNEX III,

Accepts with appreciation the kind offer of India to host a post-IOWave 14 Workshop and TSP/NTWC/DMO/Media training workshop on Standard Operating Procedures, preferably in the second-half of 2015,

Accepts with appreciation the kind offer of Seychelles to host a Coastal Hazards and Risk Assessment Workshop in 2016,

Accepts with appreciation the offer of Malaysia to host the Eleventh Session of the ICG/IOTWS in the first half of 2017,

Accepts with appreciation the kind offer of Iran to host the Twelfth Session of the ICG/IOTWS in April–June 2019.

Financial Implications: Extrabudgetary only

Annex to Recommendation ICG/IOTWS-X.1

Terms of Reference
ICG/IOTWS Working Group 1:
Tsunami Risk, Community Awareness and Preparedness

Liaise with other working group(s) and task team(s) within the ICG/IOTWS and with working groups from the other ocean basins through the TOWS-WG to:

1. Assist, develop and strengthen the overall capacity and capability of Member States in tsunami risk assessment and mitigation, community awareness and preparedness

2. Encourage Member States to mainstream tsunami Disaster Risk Reduction into sustainable development to help achieve a resilient communities in the region

3. Identify areas of priority for action following assessments, exercises and real tsunami events.

4. Provide advice on user requirements and utility of tsunami warning products and services.

5. Provide advice to the Indian Ocean Tsunami Information Centre (IOTIC) on educational, awareness and preparedness materials.

6. Promote collaboration among academia, research institutions and disaster management offices to encourage multidisciplinary and multi sectoral interaction in ensuring tsunami risk knowledge are streamlined to risk reduction strategies

Activities may include:

1. Monitor, assess and routinely report to the Steering Group and ICG on the status of Tsunami Risk Assessments, Community Awareness and Preparedness in each Member State.

2. Seek resources and coordinate projects to build capacity in Member States.

3. Organize workshops and symposiums for training and capability development.

4. Contribute to the conduct of regular exercises of the IOTWS.

5. Encourage Member States to integrate tsunami risk assessment, community awareness and preparedness within national disaster risk reduction programmes for multi-hazards.

6. Stimulate and share information on best-practices between Member States.

7. Assist with development and application of guidelines on hazard, vulnerability and risk assessment and mitigation, exercises, and post-event surveys.

8. Work with Working Group 2 "Tsunami Detection, Warning and Dissemination" to develop effective warning products, services, Standing Operating Procedures and warning chains.

9. Under the direction of the Steering Group, assist with national assessments of the IOTWS performance after each exercise and real tsunami event.

The Working Group will be composed of members nominated by Member States, an invited IOTIC representative and other invited observers as required, with a chairperson and a vice-chairperson to be elected by the ICG.

Terms of Reference
ICG/IOTWS Working Group 2
Tsunami Detection, Warning and Dissemination

Liaise with other working group(s) and Task Team(s) within the ICG/IOTWS 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.

Activities may include:

1. Help coordinate and facilitate the development and operational implementation of tsunami detection, warning and dissemination systems and procedures within Multi-Hazard Early Warning System (MHEWS) frameworks and systems.

2. Monitor, assess and routinely report to the Steering Group and ICG on the performance of Tsunami Service Providers (TSPs), observational seismic and sea level monitoring networks, communication systems and procedures.

3. Consult with Working Group 1 Community Awareness and Preparedness on the requirements and suitability of threat information and warning products.

4. Monitor existing international and national arrangements and provision of real-time data required for tsunami monitoring and warning with regards to seismic, GNSS, sea level and other kinds of measurements and data exchange.

5. Undertake studies to determine warning requirements for seismic and sea level data.

6. Facilitate the ongoing development and benchmarking of tsunami modelling, forecast and verification systems.

7. Contribute to the conduct of regular exercises and communication tests of the IOTWS.

8. Develop, coordinate and help implement training and capacity building programmes for NTWCs, DMOs and Media in the Tsunami Warning Services.

9. Develop and maintain relevant documentation, such as the IOTWS Service Definition and IOTWS NTWC Users Guide.

The Working Group will be composed of members nominated by Member States, Member State representatives for each ICG-designated TSP and invited observers, with a chairperson and a vice-chairperson to be elected by the ICG.

Terms of Reference
Subregional Working Group
for the North Western Indian Ocean

1. To evaluate capabilities and ascertain requirements of countries in the Northwest Indian Ocean region for providing end-to-end tsunami warning and mitigation services within a multi-hazard framework and within the framework of the ICG/IOTWS,

2. To promote and facilitate tsunami hazard and risk studies and research in the region,

3. To facilitate cooperation in the establishment and upgrading of seismic, sea level and GNSS stations and networks and communication systems in the region,

4. To facilitate improvement of the education programs on tsunami mitigation in the region,

5. To facilitate capacity building and the sharing of tsunami-related data and information in the region.

The Group will be composed of members nominated by Member States India, Iran, Oman, Pakistan, Yemen, other Member States in the Northwest Indian Ocean region and invited observers, with a chairperson and vice-chairperson to be elected.

Terms of Reference
IOWave16 Task Team

The ICG/IOTWS undertakes a major basin-wide exercise every two years. A Task Team is required to:

1. Plan and coordinate the next IOWave16 Exercise for August 2016

2. 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

3. Prepare IOWave16 Exercise Report for ICG/IOTWS-XI.

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.

Terms of Reference
ICG/IOTWS Steering Group

Coordinate and integrate the work of ICG/IOTWS in the inter-sessional periods, as implemented through the various Working Groups and Task Teams to:

1. Oversee the execution of the Decisions and Recommendations of the ICG.

2. Monitor the overall performance of the IOTWS.

3. Identify areas of priority for action following assessments, communications tests, exercises and real tsunami events.

4. Ensure the IOTWS is implemented in line with the guidance of the TOWS-WG for the harmonisation of global tsunami warning and mitigation systems.

5. Identify and assess resource requirements to support implementation of the IOTWS.

<u>Activities may include:</u>

1. Promote and enhance the institutionalisation of tsunami early warning systems, their implementation, exercises and maintenance.

2. Develop and maintain the Medium Term Strategy and Outreach Plan.

3. Identify funding priorities for the ICG/IOTWS Work Plans, including development of Programme and Budget for subsequent inter-sessional period for review by the ICG.

4. Oversee the planning and implementation of ocean wide tsunami exercises and drills.

5. Oversee performance assessment of IOTWS for real tsunami events, with assistance of ICG/IOTWS Secretariat through post-event questionnaires to be completed by Member States, for finalisation and distribution within 2 months after the event.

6. Contribute to the work of the TOWS-WG to coordinate the most effective global implementation and harmonisation of tsunami warning and mitigation systems.

Membership of the Steering Group includes the ICG Chair and Vice Chairs, Chairs and Vice Chairs of the Working Groups, Member State representatives from each TSP and two other NTWCs. Invited observers include a representative from IOTIC, immediate past Chair of the ICG for one term, and other invited observers as required. The Chair of ICG/IOTWS is the Chair of the Steering Group. The Steering Group will primarily work offline by correspondence, but meet in person at least once a year.

ANNEX III

MESSAGES

Congratulatory Note to IOTWS
on the occasion of their 10th year of establishment

Christa G. von Hillebrandt-Andrade
Chair, ICG/CARIBE-EWS

As Chair of the UNESCO/IOC CARIBE-EWS, I would like to extend a warm greeting to IOTWS, all its Member States, Observer Organizations, UNESCO/IOC leadership and supporting organizations on the occasion of the 10th year of your establishment.

A little over ten years ago the world witnessed the tragedy caused by the Indian Ocean tsunami, we still remember with sadness the 230,000 lives that were lost and the hundreds of thousands more that were left without homes or livelihoods. Unfortunately it took your loss, your pain, to show the world the power of a tsunami, its transboundary nature and that most importantly; the infrequent nature of these events does not protect lives or livelihoods but can disarm governments and people.

In the Caribbean, where we also share a similar low frequency of tsunamis coupled with year round warm waters and attractive climate, as well as vulnerable coast based economies and lifelines and vibrant tourism, the 2004 tsunami was defining. What for years had been the "Peligro Olvidado" (the "Forgotten Danger") also became a priority of our governments, disaster risk reduction community stakeholders and our people.

Based on the lessons learned in 2004, and the models of tsunami services like the IOTWS, the CARIBE-EWS has also been constructing its regional tsunami early warning system. We thank the IOTWS for your leadership in the region and globally and look forward to continuing to work with you, as well as NEAMTWS and PTWS as we strengthen and consolidate our tsunami and other coastal hazards warning system within the UNESCO/IOC framework. In doing so, we honor the lives and livelihoods and the hopes and dreams that were washed away on in December 2004.

On behalf of CARIBE-EWS, its 48 countries and territories, congratulations for a job well done and best wishes for a successful meeting and sustainment of your most important efforts.

A Cable of Sincere Appreciation and Gratitude

Sultan of Oman to the ICG/IOTWS-X

The Participants of "the First International Scientific Conference on Reducing Tsunami Risk in the Western Indian Ocean" and the delegates of "the Tenth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System" which were organized and hosted by the Public Authority for Civil Aviation, coinciding with the inauguration of the Multi Hazard Early Warning Center, with the Coordination of the United Nations Educational, Scientific and Cultural Organization(UNESCO) during 22–26 March 2015, would like to deliver a cable of sincere appreciation and gratitude to His Majesty Sultan Qaboos Bin Said may Allah Protect him, on the occasion of the closing of the Meeting. The participants expressed their thanks to God for His Majesty's health and safe return. They were pleased to offer their noble thanks and gratitude to His Majesty Sultan Qaboos Bin Said may Allah protect him for the generous gesture and warm hospitality they received during their stay in Oman.

The participants assure that the scientific recommendations which resulted from this conference and the decisions that have been taken in this session represent a vital addition to the scientific studies and research in the realm of tsunami warning and mitigation systems in order to mitigate its hazards.

The participants would like to congratulate the Sultanate of Oman for the inauguration of the Multi Hazard Early Warning Center.

ANNEX IV

CHAIR REPORT

Rick Bailey
Chair, UNESCO/IOC Intergovernmental Coordination Group
Indian Ocean Tsunami Warning & Mitigation System
(ICG/IOTWS)

24-26 March 2015
Muscat, OMAN

EXECUTIVE SUMMARY

Over the last ten years, since the devastating Indian Ocean tsunami of 2004 and the establishment of the UNESCO/IOC Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning & Mitigation System (ICG/IOTWS), there have been considerable achievements. There are now seismic and sea level monitoring networks providing data in real-time to detect the tsunami threat. Australia, India and Indonesia have developed the capability and have been designated as Tsunami Service Providers (TSPs) for the IOTWS, providing detailed tsunami threat information based on the expanded seismic and sea level data using sophisticated tsunami forecast models to provide interoperable products and services for the National Tsunami Warning Centres (NTWCs) and Tsunami Warning Focal Points (TWFPs) for each Member State in the Indian Ocean. Considerable effort has gone into developing guidelines, tools and training to enable Member States to undertake risk assessments and plan mitigation efforts for their countries. Best practices have been developed and shared, capacity building programs undertaken to help Member States educate their communities of the risk and be prepared to respond.

There are several challenges over the next 10 years to sustain the efforts and achievements of the previous 10 years. Whilst we are fortunate tsunami events don't occur as frequently in the Indian Ocean as in the Pacific Ocean, the infrequency will make it easy for our communities to disarm. The challenge will be to maintain and further develop community awareness and preparedness, and to ensure our warning systems and procedures are tested and ready. It has been shown that proactive actions, such as implementation of Early Warning System (EWS), save lives and countless more savings than dependence on recovery alone. But we need commitments to sustain current achievements and further contributions to enable the programs required to prepare our communities. An even greater focus is required in the next 10 years and beyond to better educate and prepare our communities against the tsunami threat, when and not if it next happens.

Given the above challenges and opportunities, it is essential that the 10th Meeting of the ICG/IOTWS in Oman, 24-26 March 2015, reviews recent progress and develop a 7 Point Action Plan supported by additional commitment to sustain and build on the achievements of the ICG/IOTWS, in order to reduce the risk of the tsunami threat to coastal communities around the Indian Ocean.

My sincere thanks for their support and dedication during my term as Chair must go in particular to the Vice-Chairs Srinivas Kumar and Prih Harjadi, Working Group Chairs Sam Hettiarachchi, Satheesh Shenoi, Irina Rafliana and Harkunti Rahayu, Task Team Chair Peter Coburn, and Tony Elliot in his role as the ICG/IOTWS Secretariat.

Looking Back: 10 Years since Indian Ocean Tsunami of 2004

Ten years ago the risk of a tsunami in the Indian Ocean was considered low by many, resulting in almost no real-time seismic and sea level monitoring systems being in place to detect tsunamis. There were no regional and very limited national tsunami warning systems to alert communities. There was almost no community awareness and preparedness to be able to respond to the threat. The devastation and loss of over 200,000 lives caused by the Indian Ocean Tsunami of 26 December 2004 changed the landscape. Cooperation began in earnest to protect coastal communities from any future threat of tsunamis.

Tsunami Warning & Mitigation System Development

In early 2005 the international communities rallied and responded quickly, giving the mandate to UNESCO's Intergovernmental Oceanographic Commission (IOC) to develop the Indian Ocean Tsunami Warning and Mitigation System (IOTWS). An Interim Advisory Service (IAS) for the Indian Ocean was quickly established by the USA Pacific Tsunami Warning Centre (PTWC) and the Japan Meteorological Agency (JMA). In August 2005 the UNESCO/IOC Intergovernmental Coordination Group for the IOTWS (ICG/IOTWS) held its first meeting. Australia provided funding for a Secretariat Office for the ICG/IOTWS to be hosted by the Australia Bureau of Meteorology in its Perth offices in Australia. Government from around the Indian Ocean rim nominate Tsunami Warning Focal Points (TWFPs) to be the national authorities to receive tsunami threat information and be responsible for issuing tsunami warnings to their coastal communities. Member States of the Indian Ocean region begin their task of developing and implementing the IOTWS, with help from countries such as the USA, Japan, Germany, and Canada Australia, as well as donor agencies such as UNESCAP, UNDP, USAID, and AusAID. The ICG structures itself into Working Groups to address the three multi-disciplinary "pillars" required to address: a) risk assessment and mitigation; b) tsunami detection, warning and dissemination; and c) community awareness and preparedness

In order to guide the building task ahead, the capacity for countries to be aware of, detect, warn and respond to any tsunami threat was assessed by teams travelling throughout the region. National risk assessments were then supported by the development and publication of risk assessment guidelines, training workshops and provision of on-line tools, such as the Community Model Interface for Tsunami (ComMIT). Core networks for seismic and sea level monitoring were quickly established. Communications systems and procedures were put in place to ensure information could be exchanged in a timely manner. A "System-of-Systems" approach was adopted to establish in October 2011 a system of three Tsunami Service Providers (TSPs) operated by Australia, India and Indonesia providing tsunami threat information to National Tsunami Warning Centres (NTWCs) and Tsunami Warning Focal Points (TWFPs) in each country. NTWCs as the national authorities now utilise this information from the TSPs to decide the level of tsunami threat and issue national tsunami warnings, as part of their recognised sovereign responsibility and to avoid wherever possible conflicting information from different sources. After a successful overlap period with the TSPs, the IAS ceases operation in April 2013. Communications tests between all the TSPs and NTWCs are now conducted on a regular 6-monthly basis.

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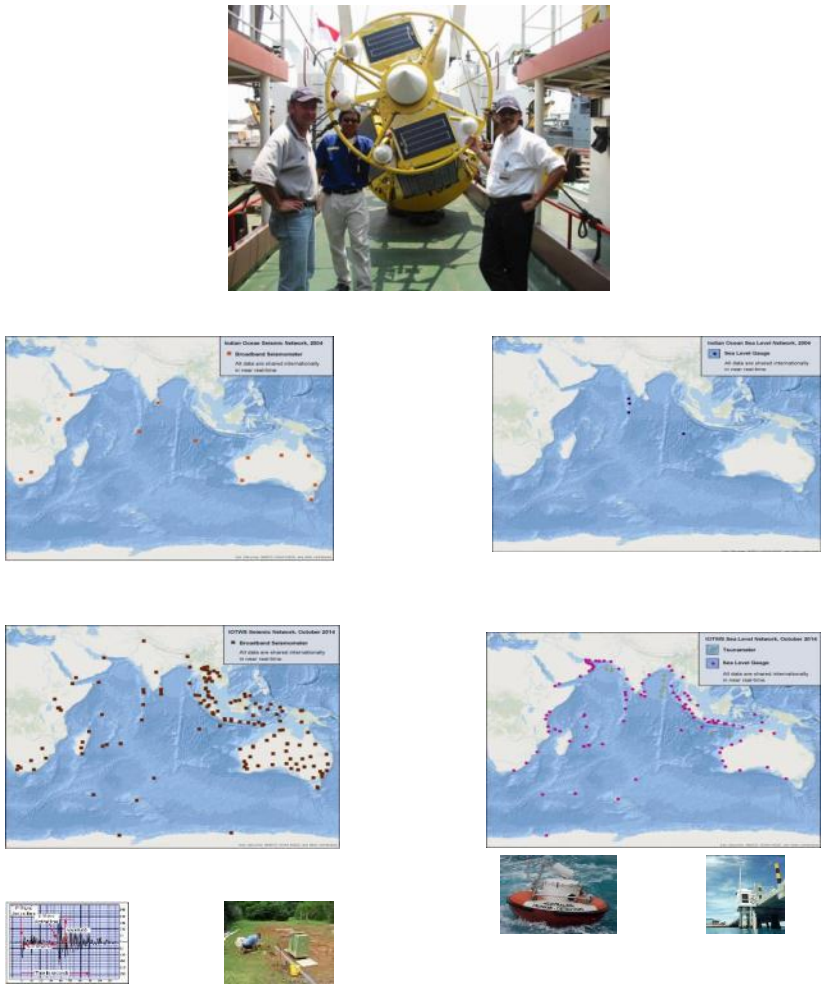


Image IV-1. Core seismic and sea level networks disseminating data in real-time have been implemented across the Indian Ocean

Community Education and Preparedness

Community awareness and response programs have been conducted in many countries, through the support of national programs and donor agencies. With the support of UNESCO the Indian Ocean Tsunami Information (IOTIC) is established in November 2012 and formally launched in November 2014 to help provide materials and training programs to support community education and preparedness. IOTIC builds on and utilises the experience of the International Tsunami information Centre (ITIC) operated by the US in Hawaii and the former Jakarta Tsunami Information Centre (JTIC) established with support from Canada for Indonesia.

Preparedness of the IOTWS and countries around the region is tested approximately every two years through implementation of region tsunami drills called "IOWAVE" exercises. There have been three IOWAVE exercises to date (2009, 2011 and 2014). There have been several, relatively small tsunami, but nevertheless deadly events since 2004, including events such as the tsunami that impacted the Mentawi Islands in Indonesia in October 2010. This tsunami took more than 400 lives.

The performance of the IOTWS is evaluated by the ICG after every exercise, communications test and real event to ensure continuous improvement and implementation of lessons learned. Key Performance Indicators (KPIs) have been developed for the Tsunami Service Providers to measure and monitor performance. By in-large the IOTWS has performed well in most exercises and real events, but the threat and loss of lives from locally generated tsunamis, such as in the Mentawi Islands, continues to demonstrate the absolute necessity for community education in areas close to the earthquake source. In those cases the tsunami may arrive in minutes and before the earthquake can be analysed and warnings disseminated. Communities must also be prepared to take self-action and respond to the natural warning signs if near the coast and feel the earthquake.

Reviews of the Extensive Progress since 2004

As Chair of the ICG/IOTWS, I attended and presented on the status of the IOTWS at the "Closing Ceremony of the German - Indonesia cooperation on Tsunami Early Warning System", which was held in Jakarta, 24-25 March 2014. The German - Indonesia Cooperation for Tsunami Early Warning System (GITEWS) operated from 2005 – 2011. It was extended with another cooperation through the Project for Training, Education and Consulting for Tsunami Early Warning System (PROTECTS) from 2011 to 2014, which formerly finished at the end of March 2014. The conference highlighted the considerable capacity and capability development implemented through these projects with the aid of the German Government, spanning the areas of detection, warning and dissemination to community awareness and preparedness. Straight afterwards I joined a small study group of representatives from around the Indian Ocean ICG Member States, which was taken to Bali, Indonesia to witness firsthand the magnificent outcomes in community education, evacuation planning, warning chain development, and preparedness for an at risk coastal community.

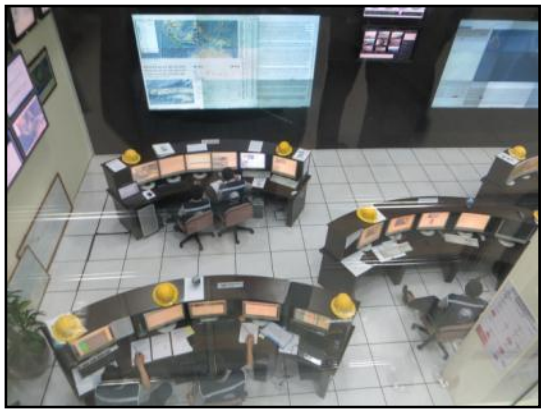


Image IV-2. Tsunami Warning Centre at BMKG, Indonesia

Image IV-3. Hotel preparedness in Bali, Indonesia

Image IV-4. Evacuation signs on the beach in Bali, Indonesia

During 24-25 November 2014 as Chair of the ICG/IOTWS I attended, helped moderate, and represented the ICG at a conference on "The Indian Ocean Tsunami Warning and Mitigation System 10 years after the Indian Ocean Tsunami: Achievements, Challenges, Remaining Gaps and Policy Perspectives" in Jakarta, Indonesia. The conference was attended by 160 participants from 28 countries, 10 UN agencies, 10 media organisations and many NGOs, research institutions, universities and private organisations. The participants came from a variety of backgrounds, including physical and social scientists, warning system operators, emergency and response managers, planners, journalists, policy and decision makers. The conference was organised by the Intergovernmental Oceanographic Commission (IOC) of UNESCO and the Indonesian Agency for Meteorology for Climatology and Geophysics (BMKG) with support from the UNESCO Jakarta office and the Indian Ocean Tsunami Information Centre (IOTIC). The primary objectives were to recognise the achievements of the last 10 years, to highlight work that still needs to be done, and to seek re-commitment to investment in the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) to secure its long term sustainability. The Conference Statement will guide the future work of the ICG/IOTWS in sustaining and further developing the IOTWS to help protect the coastal communities at risk to the tsunami threat in the Indian Ocean. The full statement can be found at:

http://www.ioc-unesco.org/index.php?option=com_oe&task=viewDocumentRecord&docID=14662.

Commemoration of 24 December 2004

On 26 December 2014 countries around the region commemorate the Indian Ocean of Tsunami of 2004. Many remember lost loved ones and the horrific images of the devastation, images at the time in the media never captured so graphically and comprehensively before

The Present: A Fully Operational "System-of-Systems"
Tsunami Service Providers (TSPs)

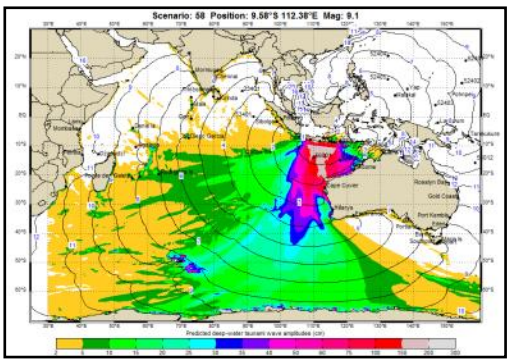
Today the three TSPs operated by Australia, India and Indonesia continue to maintain vigilance over the Indian and surrounding oceans, for signs of any tsunami impacting the Indian Ocean again. A total of twenty-three (23) earthquakes of magnitude 7.0 and greater have occurred in the Indian Ocean since 2005. Four (4) of these earthquakes generated tsunamis resulted in a large number of casualties and property loss.

Since the last ICG in November 2012, there have been a total of 119 earthquakes with final USGS final magnitudes of 6.5 or above and which were located in the IOTWS Earthquake Source Zone (Indian Ocean, Pacific Ocean, and South Atlantic). These are events for which Service Level 1 Earthquake Bulletins were required to be issued by the TSPs. Twelve of those earthquakes with final USGS magnitudes of 6.5 or above in the Indian Ocean (or 8.0 and above in the Pacific or South Atlantic Oceans) were events requiring Service Level 2 Threat Assessment Bulletins to be issued. All three TSPs are in general meeting their KPIs









Two TSP/NTWC/DMO/Media Training Workshops (were held during the inter-sessional period (Jakarta, September 2013, Hyderabad June 2014), providing training in use of IOTWS TSP services and development of Standard Operating Procedures (SOPs) involving representatives from Indian Ocean NTWCs, Disaster Management Organisations and Media Organisations.

Five IOTWS Communications Tests between all TSPs and NTWCs were conducted since the last ICG (Dec 2012, June and Dec 2013, June and Dec 2014). These tests are vital for ensuring regional TSPs and NTWCs are prepared for any tsunami event, highlighting any communication issues that requiring addressing urgently.

Exercises and Drills

Exercise Indian Ocean Wave 14 (IOWave14, IOC/2014/TS/113Vol.1) was conducted on 9 and 10 September 2014 to evaluate and improve the effectiveness of IOTWS and its operational TSPs, NTWCs, and Disaster Management Organisations (DMOs). It also provided an opportunity for Indian Ocean countries to test their communication methods and review their SOPs, tsunami emergency response plans and tsunami emergency preparedness.

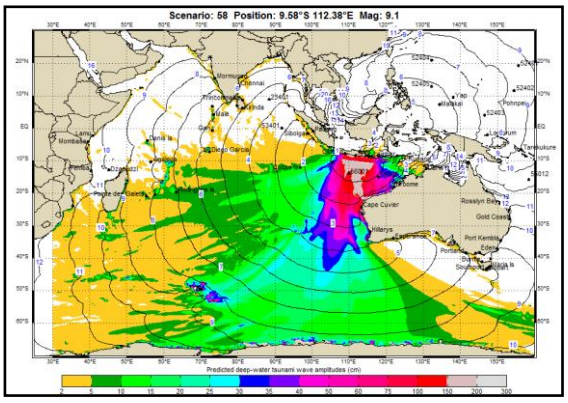


Image IV-5. South of Java, Indonesia exercise scenario with focus eastern Indian Ocean

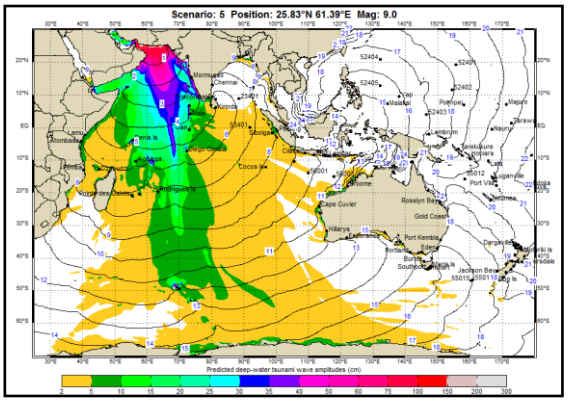


Image IV-6. Makran Trench exercise scenario with focus western Indian Ocean

The exercise highlighted both the strengths and weaknesses of the IOTWS, identified areas requiring further attention, and provided a benchmark of the present status of the system. The three (3) designated TSPs and all twenty-four (24) Member States with nominated Tsunami Warning Focal Points (TWFPs) participated, with two (2) countries taking the exercise down to the community level, and all countries providing feedback via a post-exercise survey questionnaire

Risk Assessment, Awareness and Preparedness

Underpinning the work of the TSPs and NTWCs has been the continuing work on revised guidelines on Tsunami Risk Assessment for Indian Ocean States (UNESCO Guide No 52. (Draft Final)), including a focus on risks to life, infrastructure and economies associated with smaller scale tsunami events. Whilst this lower level of threat doesn't necessarily lead to extensive land inundation and need for evacuations, nevertheless they manifest as dangerous currents and surges impacting mainly the marine environment.

Training in risk assessment continues through workshops, such as "Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation (CHARM)", organised by UNESCO/IOC and the University of Moratuwa, Sri Lanka and held on 19/20/21/22 March 2013. Representatives from twelve countries, Bangladesh, India, Indonesia, Kenya, Madagascar, Maldives, Pakistan, Mozambique, Myanmar, Sri Lanka, Tanzania and Timor Leste attended the workshop.

Community education and preparedness in Member States continues to be facilitated through the Indian Ocean Tsunami Information Centre (IOTIC) in Jakarta, national programs (such as development of the award winning "Tsunami: The Ultimate Guide" in Australia), and donor funded projects (such as ESCAP supported project helping countries such Bangladesh, Timor Leste and Myanmar develop Standard Operating Procedures (SOPs) for

warning and emergency response and training in implementing national tsunami warning exercises).

Coordination

Coordination and oversight of IOTWS implementation and related activities is being successfully carried out by the ICG/IOTWS Steering Group during the Inter-sessional period. The Steering Group is chaired by the Chair of the ICG/IOTWS, with members including the two ICG/IOTWS vice-chairs, chairs and vice-chairs of the ICG/IOTWs Working Groups, and representatives from each of the three TSPs. The Steering Group met twice during the inter-sessional period (December 2013 and November 2014).

Global Coordination continues to be most effectively carried out through the UNESCO/IOC Tsunami and Other seal level related Warning and Mitigation Systems Working Group (TOWS-WG). This working group reports to the IOC Assembly and IOC Executive Committee and, is chaired by the Vice-Chair of IOC. Its Members include the chairs from each ICG, representatives from the Joint IOC/WMO Commission for Oceanography and Marine Meteorology (JCOMM) and International Hydrographic Organisation (IHO). TOWS-WG has met three times since the ICG/IOTWS meeting (February 2013, February 2014 and March 2015). The TOWS-WG currently has three Task Teams (TT) supporting it: TT Tsunami Watch Operations; TT Disaster Management & Preparedness; Hazard Assessment Related to Highest Potential Tsunami Source Areas. These TTs often meet in conjunction with the TOWS-WG. They are an extremely effective way of getting the global expertise, often limited in the different ICGs and ocean basins by themselves, together to form highly effective teams of experts to coordinate and address the many important issues facing tsunami warning and mitigation system in general.
The main ongoing activities and outcomes of the TOWS-WG fundamental to the successful implementation of the IOTWS are:

— Standardised terminologies and definitions

— Requirements for sea level monitoring

— Global Service Definition for tsunami warning and mitigations systems

— Guidelines for post-tsunami event surveys

— Guidelines for undertaking tsunami exercises

— Best practices in tsunami education and preparedness

— Development of specialized tsunami bulletins by TSPs for vessels on the high seas

— Identification of potential source areas for mega-tsunami events

— Coordination with JCOMM activities related to seas level such as storm surge warnings.

Looking Forward: Challenges and Opportunities

Over the last ten years there have been significant achievements for the IOTWS. A warning system has been built from scratch and extensive efforts gone into identifying, educating and preparing many of the communities at risk (but not all due to the size of the effort required) to be able to respond to the tsunami threat.

I recently attended the 3rd UN World Conference on Risk Reduction (WCDRR), which was recently held in Sendai, Japan, 13-18 March 2015. I represented the international tsunami warning community under the UNESCO/IOC framework at a Panel Session on Early Warnings. The outcomes and **opportunities** from that conference included:

— Our new paradigm for the IOTWS, where specialist centres provide threat information to countries to develop and disseminate warnings to their communities as part of their sovereign responsibility, is recognised as the way ahead for all Early Warning System (EWS).

— In general there was a strong call for EWS, supported by science and technology, to proactively reduce the risk due to hazards.

— In parallel, however, there was a strong, recurrent theme throughout several sessions that echoed the philosophy that the best technical warning systems in the world will struggle to provide effective community responses to any threat, if the community is not aware and do not know how to respond to the warnings.

— A side Symposium at the WCDRR was organised by the WMO on an initiative to develop a framework for the implementation of Multi-Hazard Early Warning Systems (MHEWS). UNESCO/IOC is one of the partners in this initiative. The development and implementation of such a framework is essential for sustaining the IOTWS.

In contrast, recent reviews, including the recent conference in Jakarta to commemorate the 10th anniversary of the Indian Ocean Tsunami of 2004, have highlighted several **challenges** over the next ten years:

1. Need to focus on sustaining the achievements of last 10 years and continue to enhance the systems now in place, including detection and warning systems, community awareness and preparedness.

2. Need continue to exercise the IOTWS to ensure warning systems are not only ready for the next tsunami, but communities also remain aware and prepared to respond.

3. For locally generated tsunamis, where the tsunami may arrive in minutes, communities must be educated, aware and also ready to self-respond to natural warning signs.

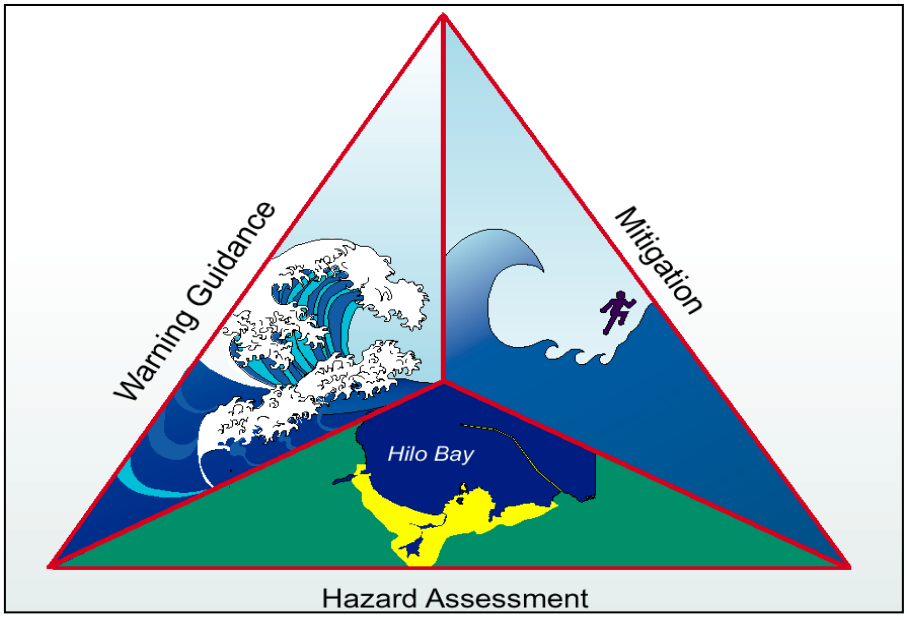
4. While thankfully the tsunami risk in the Indian Ocean is less than other regions such as the Pacific Ocean, the danger is communities will not remain aware and prepared for the threat. Community awareness and preparedness against the tsunami threat must be considered as part of a multi-hazard approach so as not to be forgotten.

5. Managing potentially conflicting information from growing number of alternative suppliers outside the coordinated intergovernmental framework of the ICG/IOTWS of tsunami threat and warning information available to NTWCs and the public.

Issues for the 10th Meeting of the ICG/IOTWS to Address:

Given the above challenges and opportunities, it is essential that this 10th Meeting of the ICG/IOTWS in Oman undertakes the following ***7 Point Action Plan***:

1. Consider pathways to sustain the achievements of the last 10 years, including greater integration within multi-hazard early warning systems.
2. Continue to share lessons learnt and best practices.
3. Review and provide feedback on the performance of the "System-of-Systems", including the TSPs
4. Provide a greater focus on improved community awareness and preparedness in its activities, to address areas identified requiring further and ongoing support and commitment.
5. Implement work plans and activities to ensure each Member State remains prepared for the next tsunami event.
6. Review the Medium Term Strategy (MTS), which expires this year, to ensure the ICG/IOTWS activities and strategy address the challenges and opportunities confronting the IOTWS, including a review of its working group and task team structures in light of opportunities provided by TOWS-WG and its TTs.
7. Seek additional commitments from Member States to underpin the Budget and Program of the ICG/IOTWS to meet its objective of reducing the risk of coastal communities around the Indian Ocean to the deadly tsunami hazard.



ANNEX V

REPORT OF THE ICG/IOTWS SECRETARIAT

1. INTRODUCTION

This report provides a summary of the activities of the ICG/IOTWS Secretariat for the period 1 November 2012 to 23 March 2015.

2. TERMS OF REFERENCE FOR ICG/IOTWS AND ITS SECRETARIAT

The Terms of Reference for the ICG/IOTWS, endorsed by the IOC Assembly under Resolution XXIII-12, are as follows:

1. To coordinate the activities of the IOTWS;

2. To organize and facilitate as appropriate the exchange of seismic, sea level and other data at or near real-time and information required for the interoperability of the IOTWS;

3. To promote the sharing of experience and expertise related to tsunami warning and mitigation for the Indian Ocean basin;

4. To promote tsunami research;

5. To promote the establishment and further development of national tsunami warning and mitigation capacities in accordance with standard protocols and methods;

6. To develop, adopt and monitor implementation of work plans of the IOTWS, and to identify required resources;

7. To promote implementation of relevant capacity-building;

8. To liaise and coordinate with other tsunami warning systems;

9. To liaise with other relevant organizations, programmes and projects;

10. To promote the implementation of the IOTWS within a multi-hazard framework;

11. To keep under constant scrutiny the status of the system and how it satisfies the needs.

The Terms of Reference for the ICG/IOTWS Secretariat are as follows:

The Secretariat shall:

1. Support meetings of the ICG;

2. Facilitate the liaison among the various national contact points and national tsunami warning centres;

3. Maintain a current list of operational national contact points and facilities and make it available on request to all member states;

4. Organize the liaison between ICG/IOTWS and the ICG/ITSU [now ICG/PTWS], with the PTWC and with other tsunami warning centres to facilitate best practices in tsunami warning;

5. Initiate and support training activities and enhance and enrich tsunami warning in the Indian Ocean.

3. IOTWS SECRETARIAT STAFF

The IOTWS Secretariat is currently staffed by 2 full time programme specialists. The Head of Secretariat is Mr Tony Elliott, who commenced his duties in July 2006. He is assisted by Ms Nora Gale, who joined the Secretariat in August 2013. Mr Elliott and Ms Gale are members of the IOC Tsunami Unit under the management of Dr Thorkild Aarup, and receive technical and administrative support from IOC headquarters in Paris.

4. OFFICE ACCOMMODATION

The Secretariat is hosted by the Bureau of Meteorology in Perth and shares office space with the Perth Programme Office in support of IOC UNESCO. All office furniture, phones, printing and photocopying facilities are provided by the Bureau. Utilities and internet connections are also provided by the Bureau.

5. ACTIVITIES

The activities of the Secretariat in the period 1st November 2012 – 23rd March 2015 with specific reference to its Terms of Reference were as follows:

1. Support meetings of the ICG:

ACTIVITY	DATES	DESCRIPTION
Informal meeting of the IOTWS Regional Tsunami Service Providers, Perth	9 December 2013	The Secretariat organised and facilitated the meeting of RTSPs, which was attended by representatives of all RTSPs and Steering Group members.
Steering Group Meeting, Perth	10-11 December 2013	The Secretariat organised and facilitated the meeting at the offices of the Bureau of Meteorology in Perth.
Informal meeting of WG3, Jakarta, Indonesia	24 March 2014	This opportunistic meeting was held back-to-back with the GITEWS seminar (see 5, below). The Secretariat identified experts in awareness and response and invited them to the meeting on behalf of BMKG and GFZ. Funding was provided by GFZ.

ACTIVITY	DATES	DESCRIPTION
Intersessional meetings of WG2, WG3 and IOWave14 Task Team, Hyderabad, India	27 June 2014	These meetings were organised back-to-back with the regional workshop on Standard Operating Procedures for tsunami warning and emergency response (see 5, below).
International conference to commemorate the 10th Anniversary of the Indian Ocean Tsunami, BMKG, Jakarta, Indonesia.	24-25 November 2014	The Secretariat in association with BMKG and with the support of IOTIC planned, organised and facilitated this conference, including preparing the conference programme, identifying speakers, preparing announcements, sending invitations, arranging travel and accommodation. The conference was attended by 160 participants representing 22 Indian Ocean countries, 6 other IOC member countries, 8 UN agencies, donor agencies and governmental, intergovernmental and non-governmental organisations
Steering Group Meeting, Jakarta, Indonesia	26 November 2014	The Secretariat organised the meeting at the offices of BMKG in Jakarta

Intergovernmental coordination has been enhanced by conducting intersessional meetings of the ICG/IOTWS Working Groups IOWave14 Task Team in Hyderabad (India), June 2014. The participants at the meetings reviewed progress towards workplan implementation and made commitments to participate more actively in Working Group activities. In particular, Working Group 3 on Tsunami Awareness and Response enhanced its membership during the intersessional meeting, which will lead to further improvements in intergovernmental coordination.

A highlight of the intersessional period was the international conference to commemorate the 10th anniversary of the Indian Ocean Tsunami held in Jakarta, Indonesia, 24-25 November 2014, which was attended by 160 participants from 28 countries, 10 UN agencies, 10 media organisations and many NGOs, research institutions, universities and private organisations. The participants came from a variety of backgrounds, including physical and social scientists, warning system operators, emergency and response managers, planners, journalists, policy and decision makers. The conference was organised by the IOC UNESCO and the Indonesian Agency for Meteorology for Climatology and Geophysics (BMKG) with support from the UNESCO Jakarta office and the Indian Ocean Tsunami Information Centre (IOTIC). The primary objectives were to recognise the achievements of the last 10 years, to highlight

work that still needs to be done, and to seek re-commitment to investment in the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) to secure its long term sustainability. The summary statement of the conference has been published as: "The Indian Ocean Tsunami Warning and Mitigation System 10 years after the Indian Ocean Tsunami: Achievements, Challenges, Remaining Gaps and Policy Perspectives" (IOC/BRO/2015/2)

2. Facilitate the liaison among the various national contact points and national tsunami warning centres:

ACTIVITY	DATES	DESCRIPTION
IOTWS communications tests	12 December 2012, 12 June 2013, 12 December 2013, 11 June 2014, 10 December 2014	The Secretariat organised the communications tests including announcing the tests, preparing and circulating the manuals, following up with the NTWCs to obtain their test results, analysing the results and preparing the test reports.
IOWave14 Exercise	9-10 September 2014	The Secretariat assisted the IOWave14 Task Team to organise the exercise including announcing the exercise, preparing and circulating the manuals, designing the online Survey Monkey Assessment forms, following up with the IOWave14 Focal Points to obtain their exercise results, analysing the results and preparing the exercise report.

The conduct of regular biannual communications tests is vital to ensure good communications links between the Regional Tsunami Service Providers and the National Tsunami Warning Centres and maintain the operational readiness of the IOTWS. Notably, the December 2014 communications test had the highest ever participation with all 24 of the active Member States' NTWCs returning communication test logs to the Secretariat indicating that the Member States understand and appreciate the value conducting these tests, thereby contributing to the reduction of risk from tsunami hazards.

The Secretariat has drafted the IOC-UNESCO technical series report "Exercise Indian Ocean Wave 14 - An Indian Ocean-wide Tsunami Warning and communications Exercise: 9 and 10 September 2014" (IOC/2015/TS/113 Vol.2) and invites feedback from the IOTWS Member States. For the first time, the exercise comprised two earthquake scenarios on successive days: South of Java and the Makran trench. Exercise Indian Ocean Wave 14 (IOWave14) tested the effectiveness of the IOTWS and its operational TSPS, NTWCs, and DMOs, in responding to potentially destructive tsunami. Additionally, IOWave14 provided an opportunity for Indian Ocean countries to test their communication methods and review their SOPs, tsunami emergency response plans and tsunami emergency preparedness. The three TSPs and 24 Member States participated, with two countries (India and Seychelles)

exercising community evacuations. The Secretariat conducted a post-exercise survey capturing Member States' feedback via an online questionnaire. Reported benefits of the exercise included testing of SOPs, collaboration between response agencies and the media, testing of communication systems, improving Member States' understanding of the TSP service, and raising overall levels of tsunami awareness. Member States have suggested improvement for future exercises including making products from TSPs more consistent in format, having independent IOC observers in Member States during exercises, improving communication linkages between in-country agencies that interact during a potential tsunami threat, revising and updating in-country SOPs, and more training for Member State agency staff.

3. Maintain a current list of operational national contact points and facilities and make it available on request to all member states:

ACTIVITY	DATES	DESCRIPTION
TWFP/NTWC contact database maintained and RTSPs updated at least twice per year prior to IOTWS Communications Tests	June 2013, December 2013, June 2014, December 2014	The Secretariat maintains this primary contact database and makes it available to the TSPs. Any changes in contact details notified by the NTWCs are followed up to ensure that they are official.
TNC/TWFP contact database maintained and available to Member States on request	Ongoing	The Secretariat maintains this contact database, which is continually changing. Any changes notified by the Member States are followed up to ensure that they are coming through official channels.
NTWC/TWFP new definitions	January 2015, ongoing	At the recommendation of the TOWS-WG, the IOC Executive Council in June 2015 approved revised definitions of NTWC and TWFP. The Secretariat requested new nominations from the Member States and is updating the contact database.
Seismic and sea level station database updated. made available to Member States in October 2014	2013-2014	At the request of the Steering Group, the Secretariat took the lead to develop an inventory of seismic and sea level stations in the Indian Ocean region. The Secretariat developed the inventory templates and corresponded with the Member States to populate them.

The Secretariat has created databases of seismic and sea level monitoring stations in the Indian Ocean in consultation with Working Group 2. IOTWS Member State and Global network operators were consulted regarding the stations details and contacts for each network. In total over 140 broadband seismometers and over 100 sea level stations with data that are available in real-time have been identified. The network details are available on the IOC-UNESCO Tsunami Programme website as excel spreadsheets, kml files, and images. Details of the administrative and technical contacts for each network are available on request from the Secretariat.

The development of seismic and sea level instrumental and contact databases will provide the Member States with a clearer understanding of the detection and monitoring networks of the IOTWS and will help to identify gaps and areas where network densification is required.

4. Organize the liaison between ICG/IOTWS and the ICG/ITSU [now ICG/PTWS], with the PTWC and with other tsunami warning centres to facilitate best practices in tsunami warning:

ACTIVITY	DATES	DESCRIPTION
TOWS-WG Inter ICG Task Team on Tsunami Watch Operations. Meeting in Paris.	19-20 February 2013	The Head of Secretariat organised and facilitated the meeting in Paris and provides ongoing secretariat support.
6th Meeting of TOWS-WG, Paris, France	20-21 February 2013	The Head of Secretariat attended and provided secretariat support at the meeting.
ICG/PTWS-XXV meeting, Vladivostok, Russian Federation	9-11 September 2013	The Head of Secretariat attended and provided secretariat support for the meeting.
TOWS-WG Inter ICG Task Team on Tsunami Watch Operations. Meeting in Paris.	10-11 February 2014	The Head of Secretariat organised and facilitated the meeting in Paris.
7th Meeting of TOWS-WG, Paris, France	12-13 February 2014	The Head of Secretariat attended and provided secretariat support at the meeting.
3rd Meeting of ICG/PTWS Regional Working Group for the South China, Hong Kong, China	7-9 April 2014	The Head of Secretariat attended and provided secretariat support. There are 4 Member States in common between the IOTWS and the PTWS SCS-WG and it has proved useful for the IOTWS Secretariat to provide guidance.
TOWS-WG Inter ICG Task Team on Tsunami Watch Operations. Meeting in Tokyo, Japan.	21-22 October 2014	The Head of Secretariat organised and facilitated the meeting in Toko
TOWS-WG Inter ICG Task	11 March 2015	The Head of Secretariat organised

ACTIVITY	DATES	DESCRIPTION
Team on Tsunami Watch Operations. Meeting in Morioka, Japan.		and facilitated the meeting in Morioka.
8th Meeting of TOWS-WG, Morioka, Japan	12-13 March 2015	The Head of Secretariat attended and provided secretariat support at the meeting.

5. Initiate and support training activities and enhance and enrich tsunami warning in the Indian Ocean:

ACTIVITY	DATES	DESCRIPTION
Regional Workshop on Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation, Colombo, Sri Lanka	19-22 March 2013	The Secretariat with support from UNESCO Jakarta organised and facilitated the workshop, including workshop announcements and follow-up, liaising with participants, trainers and host organisations, arranging travel and accommodation. The workshop was attended by 16 participants and 8 trainers from 14 countries.
Regional workshops on Standard Operating Procedures for tsunami warning and emergency response: 1) Jakarta, 2) Hyderabad	23-27 September 2013 23-26 June 2014	The Secretariat organised and facilitated both workshops, including workshop announcements and follow-up, liaising with participants, trainers and host organisations, arranging travel and accommodation, preparing agendas and workshop materials, and contributing to the workshops as trainers. The first workshop in Jakarta was attended by 44 participants and trainers and the 2nd workshop in Hyderabad was attended by 40 participants and trainers.
GLOSS-IOTWS training course for operators of sea level gauges, Bangkok	17-21 March 2014	The Secretariat assisted the GLOSS technical secretary to organise this training and participated as a trainer. 22 participants from 11 IOTWS countries attended.

ACTIVITY	DATES	DESCRIPTION
GITEWS international seminar and field trip on tsunami early warning and community preparedness, Jakarta and Bali.	24-27 March 2014	The Secretariat provided assistance to GFZ to organise this seminar by identifying and inviting participants from IOTWS Member States. The Head of Secretariat attended and gave a keynote address. Full funding was provided by GFZ.
ESCAP Makran project meetings, 1) Muscat (Oman), 2) Islamabad (Pakistan) and ongoing project management support	20-24 October 2013 26-29 June 2014	The Secretariat is providing project management for this project and attended coordination meetings in Muscat and Islamabad. The project is fully funded by ESCAP and will complete by the end of June 2015.
ESCAP tsunami risk assessment and tsunami exercises training course, Myanmar and ongoing project management support	11-14 March 2014	The Secretariat is providing project management for this project on behalf of WG1 and WG3, with support from UNESCO Jakarta. The Head of Secretariat also participated as a trainer in a tsunami exercise workshop in Myanmar. The project is fully funded by ESCAP and is scheduled to complete by the end of June 2015.
Oman Multi Hazard Early Warning System project: SOP and Risk Assessment training workshops, Muscat	1). January 2013 2) March 2013 3) October 2013 4).January 2014 5) June 2014 6) January 2015 7) March 2015	The Head of Secretariat has provided technical assistance to this project on risk assessment and standard operating procedures, and is a ensuring good coordination with the ICG/IOTWS. He has attended several coordination meetings and training workshops, all fully funded by the project.

The successful conduct of the regional workshops on SOPs in Jakarta and Hyderabad has enhanced and enriched end to end tsunami warning and emergency response in the Member States of the Indian Ocean region. The engagement of disaster management and media organisations proved to be very successful and will lead to improved stakeholder coordination at the national level.

The Secretariat coordinates the ESCAP project "Communicating the effects of the 1945 Makran Tsunami to Increase Awareness and Preparedness of Tsunami Hazards in the Makran Region", which commenced in July 2012. The projects aims to increase official and public awareness of Makran tsunami hazards by collecting government documents, newspaper reports, and eyewitness accounts of the 1945 tsunami, posting these materials on the Indian Ocean Tsunami Information Centre (IOTIC) website, and summarising the accounts of the tsunami in an educational booklet. Project meetings were held in Muscat, Oman in October 2013 with the support of the Directorate General of Meteorology and Air Navigation and in Islamabad, Pakistan in May 2014 with the support of UNESCO Islamabad. The collection of materials on the 1945 Makran tsunami, including over 80 interview transcripts with half available on video, are accessible on the IOTIC website at iotic.ioc-unesco.org/1945makran/tsunami/. The IOC-UNESCO booklet, "Remembering the 1945 Makran Tsunami: Interviews with Survivors Beside the Arabian Sea", has recently been publish in English and translations to Arabic, Farsi, and Urdu are planned for later in 2015

In addition to the above activities, the Secretariat actively liaises with other UN organisations to ensure that they are kept aware of the status, development and future workplans of the IOTWS. The Head of Secretariat is a member of the ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness Inter-Agency Task Force, which technically reviews and advises the Trust Fund Advisory Council on project proposals submitted for funding. He attends Trust Fund Advisory Council meetings regularly and provides briefings on the IOTWS. He also attends meetings of the WMO/ESCAP Panel on Tropical Cyclones and has assisted the ESCAP/WMO Typhoon Committee with training in Synergised Standard Operating Procedures (participation fully funded from ESCAP Trust Fund project funds).

6. OTHER ACTIVITIES

11.1 IOC-UNESCO TECHNICAL SERIES REPORT ON THE 11 APRIL 2012 WEST OF NORTH SUMATRA EARTHQUAKE AND TSUNAMI EVENT

The 11 April 2012 magnitude 8.6 earthquake triggered a small tsunami that was detected on tide gauges and tsunameters across the Indian Ocean. In response to this event, the Secretariat distributed a post-survey questionnaire to its Member States covering the Tsunami Service Providers (TSPs), national actions, national response, and monitoring and modelling. The survey responses from 22 Member States form the basis for the IOC UNESCO technical series report "11 April 2012 West of North Sumatra Earthquake and Tsunami Event: Post-event Assessment of IOTWS Performance" (IOC/2014/TS/112). The survey responses represent positive steps toward the implementation of the TSP service and the continued functioning of the IOTWS. When compared with the survey responses to the 12 September 2007 magnitude 8.4 earthquake off of Bengkulu, Sumatra it is apparent that the TSPs are functioning at an equivalent level to the Interim Advisory Service provided by the Pacific Tsunami Warning Center and the Japan Meteorological Agency. Furthermore, it is apparent that Member States have acknowledged the TSPs as the authoritative source of tsunami information in the Indian Ocean.

11.2 DOCUMENT REFERENCING SYSTEM

A new archiving system for ICG/IOTWS non-statutory documents has been implemented by the Secretariat. Non-statutory documents include reports and presentations from inter-sessional meetings of the ICG/IOTWS Working Groups, Task Teams, and Steering Group as well as from communication tests and workshops. The archiving system includes guidelines for document codes and titles, utilises document lists, and employs the *Paperclip* document storage system. As part of this process document lists have been created for the Steering Group, Working Group 1, Working Group 2, Working Group 2, training and workshops,

statutory documents, communication tests, and IOWave exercises. The IOC-UNESCO Tsunami Programme website contains links to these document lists.

7. PROBLEMS AND CHALLENGES

The main challenges affecting the IOTWS are limited resources to implement workplans and diminishing engagement by some Member States. To overcome these challenges and ensure that the ICG workplans can be implemented, it is necessary to call upon additional support from Member States either in terms of funding or in-kind support. Diminishing engagement of some Member States is a result of reduced national funding availability and complacency in some countries.

The core funding for the IOTWS Secretariat provided by the Government of Australia through the Bureau of Meteorology has been and continues to be vital for the stability of the Secretariat and the ICG as it allows the IOC to coordinate and facilitate the work of the ICG and implement its workplans. Nevertheless, a challenge for the future will be to develop project proposals and secure further extrabudgetary funding to develop and sustain the IOTWS and its capacity building programme.

ANNEX VI

REPORT OF WORKING GROUP 1 ON TSUNAMI RISK ASSESSMENT AND REDUCTION

Chair: Prof S.S.L Hettiarachchi

Department of Civil Engineering, University of Moratuwa, Sri Lanka)

Contents

Executive Summary

The WG 1 had a very successful intersessional period with a high activity profile. The principal activities relate to the TRATE Project, through which the Revision of the Guideline on Tsunami Risk Assessment and Management was undertaken. In addition several specific studies leading to research publications for the use in risk assessment and management were undertaken. Currently, planning is underway for the Indian Ocean Tsunami Risk Assessment and Management Workshop to be conducted adopting the Training the Trainer Workshop. This will enable member states to train personnel who in turn will be able initiate training in their countries. Attention is also focused in developing a sustainable mechanism to continue the activities which have received acceptance by the membership. The Chair was actively involved with the major project to undertaken on Tsunami Risk Assessment and Management in Oman and with the assistance of relevant authorities the outcome of these studies will be shared for the benefit of member states. This benchmark study has strengthened the Risk Assessment capacity within IOTWS. The WG continued to participate where possible at important international events to showcase their activities and collaborating on important publications. The WG is keen to establish coordinating links with Tsunami Warning Systems of other ocean basins in order to share experience and documents as well as to produce global guidelines and perhaps joint training programmes.

1. Introduction to Terms-of-Reference

The Terms of References of the Working Group (WG1) was revised at the ICG/IOTWS 9 held in Jakarta in November 2012. The ToR has 10 clearly defined activities named, A1 to A10.

A1. Develop guidelines for tsunami risk assessment in the marine and land environment as part of a global multi-hazard risk management framework.

A2. Encourage Member States to carry out assessments of tsunami hazard and risk.

A3. Facilitate the application and use of inundation model outputs for tsunami hazard and risk
assessment.

A4. Provide guidance to emergency response managers on the preparation of risk assessment
products.

A5. Facilitate data sharing where possible, including access to and development of databases,
incorporating exposure, tsunami hazard and vulnerability.

A6. Facilitate capacity building, including knowledge transfer, in the form of workshops, training programmes and case studies for risk assessment in all Indian Ocean countries.

A7. Provide advice and develop guidelines on hazard mitigation (physical interventions – artificial and natural methods).

A8. Liaise with other working groups within the ICG/IOTWS, and with working groups from the
other ocean basins through the TOWS WG to coordinate the implementation of tsunami risk assessment and reduction.

A9. Carry out routine survey/stock taking on the status of Risk Assessments in each Member State.

A10. Under the direction of the Steering Group, carry out assessments of the IOTWS performance after each exercise and real tsunami event. Encourage and assist national assessments following real events.

2. Progress against actions

The WG1 had a very productive intersessional period undertaking numerous actions and the relevant activities of the ToR covered by the actions are indicated in brackets.

2.1 TRATE Project

Enhancing **T**sunami **R**isk **A**ssessment and Management, Strengthening Policy Support and Developing Guidelines for **T**sunami **E**xercises in Indian Ocean Countries (TRATE) has a number of interrelated components. Three of the components refer to activities of Working Group 1 and are listed below.

1) Revision and Expansion of the Guideline on Tsunami Risk Assessment at regional level including sufficient guidance to implement activities at national level and Stock Taking of Country supporting Policies for Disaster Risk Reduction and Tsunami Exercises. **(A1, A2, A4)**

2) To enhance the capability in conducting Tsunami Risk Assessment within a tsunami forecasting and early warning framework and tsunami exercises guideline formulation.

The former to be achieved via conducting a case study to illustrate the use of scenario modelling for long term forecasting and strategic risk assessment, focusing on critical

issues relating to the interpretation of the technical warnings and their transformation to a public warning for the benefit of the coastal population**. (A2, A3, A5)**

3) Establishment of a sustainable mechanism for training in Coastal Hazards and Tsunami Risk Assessment and Management and training module for tsunami exercises.

To be achieved via development of training modules and by conducting regional workshop on Tsunami Risk Assessment and Management based on the 'Training the Trainer Approach' for long term sustainability of training and education. **(A2, A3, A4, A5, A6, A7, A9)**

2.2 Regional Training Workshop on Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation (CHARM)

To provide training to member states in Coastal Hazard Assessment and applications in Risk Assessment, Management and Mitigation **(A2, A3, A4, A5, A6, A7, A9)**

2.3 Contribution by the Chair towards Risk Assessment and Mitigation Studies and Training of Personnel by the Government of Oman.

The Chair assisted the Government of Oman in numerous activities as member of UNESCO Team. **(A2, A3, A6, A7)**

2.4 Attendance at International Conference

Presentation of papers on Risk Assessment Studies under IOTWS **(A5, A6)**

2.5 Contribution to relevant external publications

Contribution to publications relevant to Risk Assessment and Mitigation work **(A5, A6)**

3. Activities undertaken in the Intersessional Period

3.1 TRATE Project

Two Task Team Meetings were held in Colombo in February 2013 and September 2014 to plan and implement the components of TRATE Project (see Section 2.1) under WG1.

Arising from these meetings, preparation of following guidelines/research publications have been achieved.

1. Revised Guideline on Tsunami Risk Assessment for Indian Ocean States UNESCO Guideline No 52. (Draft Final)

2. IOTWS- Operations and Limitations

3. Preparation of Case Study on Tsunami Risk Assessment and Mitigation for the Port City of Galle (Draft Final)

4. Preparation of research document, Improved Tsunami Wave Height Forecasting- An Integrated Approach for the analysis of results from Early Warning Systems and Inundation Modelling for Risk Assessment (Draft Final)

Currently the Working Group is preparing for the Regional Workshop for Indian Ocean States to be held in May 2015

3.2 Regional Training Workshop on Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation (CHARM)

Training Workshop on Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation (CHARM) was organised by UNESCO/IOC and the University of Moratuwa, Sri Lanka and held on 19/20/21/22 March 2013, at Mount Lavinia Hotel, Sri Lanka.

Representatives from twelve countries, Bangladesh, India, Indonesia, Kenya, Madagascar, Maldives, Pakistan, Mozambique, Myanmar, Sri Lanka, Tanzania and Timor Leste attended the Training Workshop. The results of the evaluation of the workshop by the participants indicated that the workshop had been efficiently organized and information well disseminated. Relevant information which can be used for risk assessment studies were made available to all participants. They were also allowed to share experience from their respective countries by presenting Case Studies.

3.3 Contribution by the Chair towards Risk Assessment and Mitigation Studies and Training of Personnel by the Government of Oman.

The Chair of WG1 was actively involved with the above project from its inception. The Chair together with Oman authorities prepared the ToR for the Risk Assessment and Management Study, comprising a broad brush overall study for the entire country and detailed studies for nine cities for Storm surges and Tsunamis. The Chair had the privilege of serving on monitoring committees leading to its very successful completion.

The Chair also contributed as a resource person to several Training Progarmmes designed to train Omani personnel in Coastal hazards, Risk Assessment and Management. These programmes were held in December 2012, June 2103, May 2014. The Chair also delivered an invited presentation on the Tsunami Risk Assessment at an major workshop and seminar organized by UNESCO, Oman in October 2013.

In this context the Chair wishes to express his deepest appreciation to Omani Officials for the act of cooperation which has been very beneficial to the WG.

3.4 Attendance at International Conference

Research Papers on Risk Assessment and Mitigation were presented at several events including UNISDR- Global Platform 2013 in Geneva, IDRC- Davos Risk Forum 2014, UNSPIDER Workshop on Early Warning held in Bonn in June 2013. These opportunities provided the Chair to showcase activities of the WG 1. The Chair also had several rounds of discussion with UNISDR, Geneva, UNU, Bonn, UN-SPIDER, Bonn, DLR, Munich, Swiss RE, Zurich, ETH, Zurich and other agencies to establish/strengthen collaborative links.

The Chair was also invited to be the Guest Editor of UNISDR PreventionWeb (December 2014) on the subject of 'The importance of Tsunami Early Warning Systems for Human Security', which showcased the achievements of the IOTWS. (http://www.preventionweb.net/experts/guest/collection/41433)

3.5 Contribution to relevant external publications

1. The Role of Ecosystems in Disaster Risk Reduction (published by PEDRR, UNU, Bonn, IUCN, UNEP and CEM)

Since 2010, the Chair has contributed to the Vulnerability Specialist Group of UNU, Bonn. As an outcome of a Workshop held in September 2010 in Bonn, it was decided to prepare a book on *'The Role of Ecosystems in Disaster Risk Reduction'*, a subject which gained momentum after the Indian Ocean Tsunami. The Chair strongly supported the move and prepared a comprehensive Chapter on *'Investigating the performance of Coastal Ecosystems for hazard Mitigation'* which is the lead Chapter in Part II of the book titled, *'Ecosystems and coastal disaster risk reduction'*.

As a part of Coastal Hazard Mitigation, the Working Group strongly promotes natural methods, harnessing the full potential of coastal ecosystems and hence the Chapters in Part II under the heading serves as an effective guideline and supplements the previous publications of the Working Group.

2. Step by step community's Guide Reducing Coastal Hazard Risk (to be published by UNESCO/IOC)

Following the contribution of the Chair to UNESCO Guideline No 50, the Chair was invited to contribute to the revision of the same guideline to be published as above. The Chair contributed to this effort since December 2011. The document is in Draft Final Stage.

4. Current Status

4.1 TRATE Project

All activities are in progress and will be concluded in due course. The major documents have all been prepared and will be subject to peer review.

It is planned to have the Regional Workshop in May 2015 and planning is in progress.

4.2. Regional Training Workshop on Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation (CHARM)

Following the successful Regional Workshop in March 2013, the WG has informed UNESCO/IOTWS that they will be happy to host another event. The Head of Secretariat is looking at the possibility of having a combined event along with the Regional Workshop under the TRATE Project (See Sections 2.1, 3.1 and 4.1)

4.3 Contribution by the Chair towards Risk Assessment and Mitigation Studies and Training of Personnel by the Government of Oman.

This project will be concluded soon. The Chair will make arrangements to obtain summary on the Risk Assessment and Mitigation Studies to be shared by the WG. Lessons learnt from this project will be very useful to member states who wish to undertake both broad brush and detailed risk assessment studies.

4.4 Attendance at International Conference

Where possible the Chair will present the achievements of WG and Case Studies at international events. Members are encouraged to do so both at national and international level.

4.5 Contribution to relevant external publications

Where possible the Chair will initiate contribution and over the last decade several such contributions have been made. The Chair is promoting a detailed manual on Hazard Mitigation beneficial to member states.

5. Gaps and deficiencies

Over the last decade the Working Group has initiated a number of activities leading to publications/guidelines and conduct of several important training workshops. There are two important areas which have been identified.

5.1. Establishment of a sustainable mechanism for training in Coastal Hazards and Tsunami Risk Assessment and Management and training module for tsunami exercises. This will enable the successful work carried out to be institutionalized and to be continued for the benefit of member states. This aspect will be looked at via the TRATE Project (See Section 2.1 sub para 3). It may be worthwhile to look at the possibility of establishing a consortium of affiliated research/ academic institutions having an effective geographical spread together with IOTIC to assist member states in achieving this objective.

5.2. To establish coordinating links with Tsunami Warning Systems of other ocean basins in order to share experience and documents as well as to produce global guidelines and perhaps joint Training Programmes. All efforts will be made to convene a meeting with the assistance of UNESCO and relevant agencies. The only such previous gathering was held at the First Global Tsunami Warning Meeting hosted by UNESCO/ IOC in Paris in March 2009.

It is also pointed out that the Terms of References of TOWS WG do not have dedicated areas focusing on Tsunami Risk Assessment. It is recommended to rectify this situation and the WG Chair has raised this issue at Steering Group Meetings.

6. Action plan for the next intersessional period

Completion of all Activities under the TRATE Project, including the finalization of documents and guidelines, conduct of Regional Workshop adopting the Training the Trainer Approach and preparing a strategy paper on establishing a sustainable mechanism to continue with training activities. All activities will be followed up to ensure that if and when necessary member states can embark on training and implementing Risk Assessment and Mitigation measures.

The WG will also pursue actions identified under Gaps and Deficiencies 5.1 and 5.2.

ANNEX VII

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

Submitted by Dr. Satheesh Shenoi, Chairman of the Working Group

1. EXECUTIVE SUMMARY

The intersessional activities and progress of Working Group 2 are summarised herein, with focus on:

- The IOWave14 Exercise conducted on 09 & 10, September 2014
- An Inter sessional Meeting of WG2 on 27 June 2014
- IOTWS Communications Tests conducted 6-monthly (Dec 2012, June 2013, Dec 2013, June 2014, Dec 2014)
- Monitoring and evaluation of TSPs' performance for the period from November 2012 to February 2015
- Contributions to NTWC/NDMO/Media SOP Training Workshops in Jakarta in 2013 and Hyderabad in 2014

2. INTRODUCTION

Working Group 2 has a broad area of responsibility which covers the range of operational tsunami warning activities and procedures from earthquake and sea-level observation, through production of threat information and training for National Tsunami Warning Centres

(NTWCs), to dissemination issues such as formatting, addressing and communications channels. The Terms of Reference of WG2, as agreed by ICG/IOTWS-IX, are shown in Annexure 1.

3. PROGRESS

Significant progress has been made in the intersessional period, through the following activities which are discussed below:

- IOWave14 Exercise was conducted on 9th and 10th September, 2014
- An Intersessional Meeting of WG2 and IOWave14 Task Team Meeting on 27 June 2014
- Five Communications Tests, conducted 6-monthly (Dec 2012, June 2013, Dec 2013, June 2014, Dec 2014)
- Monitoring and evaluation of TSPs' performance for the period from November 2012 to February 2015
- Training of NTWC representatives at two IOTWS NTWC/NDMO/Media SOP Training Workshops: Jakarta in September 2013 and Hyderabad in June 2014

3.1. TSP PERFORMANCE IN IOWAVE14

The purpose of exercise IOWave14 was to evaluate and improve the effectiveness of the IOTWS, through its operational Tsunami Service Providers, National Tsunami Warning Centres and National Disaster Management Organisations, in responding to a potentially destructive tsunami. Exercise IOWAVE14 contained, for the first time in Indian Ocean exercises, two earthquake scenarios on successive days, 9 and 10 September, with each scenario run in real time. The scenario details were:

	SCENARIO 1 – JAVA	**SCENARIO 2 – MAKRAN TRENCH**
Date:	Tuesday, 9 September 2014	Wednesday, 10 September 2014
Time:	0000 UTC	0600 UTC
Magnitude:	9.1 Mw	9.0 Mw
Depth:	10 km	10 km
Latitude:	10.4 S	24.8 N
Longitude:	112.8 E	62.2 E
Location:	South of Java, Indonesia	Off Coast of Pakistan

Fourteen (14) IOTWS Member States participated in the Java scenario, eighteen (18) participated in the Makran scenario and eight (8) participated in both scenarios.

- Java scenario participants: Australia, Bangladesh, Comoros, France (Reunion), India, Indonesia, Madagascar, Malaysia, Maldives, Myanmar, Seychelles, Singapore, Thailand and Timor Leste.

- Makran scenario participants: Australia, Comoros, India, Indonesia, Iran, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Oman, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Tanzania and Yemen.

The exercise highlighted both the strengths and weaknesses of the IOTWS, identified areas requiring further attention, and provided a benchmark of the present status of the system. The three (3) designated TSPs and all twenty-four (24) Member States with nominated Tsunami Warning Focal Points (TWFPs) participated, with two (2) countries taking the exercise down to the community level.

The objectives of the exercise were to:

1. Validate the dissemination by TSPs of Tsunami Bulletin Notification Messages to NTWCs via the designated TWFPs of Indian Ocean countries.

2. Validate the reception by NTWCs of Tsunami Bulletin Notification Messages and access by NTWCs to the tsunami bulletins and other products on the TSP websites.

3. Validate the reporting by NTWCs to the TSPs of their National Tsunami Warning Status.

4. Validate the SOPs within countries for disseminating tsunami warnings and other threat information to their relevant disaster response agencies.

5. Validate the organisational decision-making process within countries for the issuing of public warnings and ordering evacuations.

6. Identify the methods used to notify and instruct the public.

7. Assess the elapsed time for public notification and instruction.

All twenty-four (24) countries exercised their tsunami warning and mitigation SOPs to varying degrees, with all countries also reporting that the TSP notification messages were received by their NTWCs. Disaster management and emergency response organisations also participated in seventeen (17) or 74% of countries, table-top or functional exercises were carried out in fifteen (15) or 65% of countries, the provincial or local level of government participated in ten (10) or 43% percent of countries, and public evacuation drills were conducted in two (2) or 8% of countries (India and Seychelles).

Reported Benefits and Suggested Enhancements for Future Exercises

Member States listed many benefits from the exercise including the testing of SOPs, collaboration between response agencies and the media, testing of communication systems, improving Member States' understanding of the TSP services, and raising overall levels of tsunami awareness.

Member States also suggested improvements for future exercises including revising and updating their SOPs, more training to Member State agency staff, making products from TSPs more consistent in format, and having independent IOC observers in Member States during exercises.

3.2. OUTCOMES OF THE INTERSESSIONAL MEETING OF WG2 HELD ON 27 JUNE 2014

An Intersessional Meeting of WG2 was held at Hyderabad, India on 27 June 2014. Summary report of WG2 Inter sessional meeting is available at http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewDocumentRecord&docID=14466

3.3. SUMMARY OF COMMUNICATIONS TEST RESULTS

Five communications have been conducted since the last reporting period. During these tests four tsunami notification messages were disseminated to the NTWCs via Email, Fax, GTS and SMS. A full report on the outcome of the tests is included at Annexure 3.

The most significant points of note from the report are:

- Email message delivery has been the most successful delivery medium, averaging a delivery rate of 89% across the 5 tests, and delivery times of generally only 1-2 minutes. The highest delivery rate was 93% in the 11 Dec 2013 test.

- GTS message delivery has generally been the second most successful delivery medium after email, with an average delivery rate of 75 % and a highest rate across the 5 tests of 84% in the 11 Dec 2013 test, which is also the highest rate among all 10 tests conducted since March 2011.

- Connection to the GTS should also be investigated for the NTWCs who are not yet connected.

- SMS message delivery continues to be one of the best delivery media along with email and GTS with an average delivery rate of 61% across the 5 tests, with most delivery times between 1-3 minutes. The highest rate was 74% in the 12 Dec 2012 test, which is also the highest rate across all 10 tests conducted so far.

- Some NTWCs have not received SMS messages in any tests (e.g. Myanmar), and one NTWC (France / La Reunion) does not have the capability to receive SMS messages. Further investigation is required into this by TSPs and the affected NTWCs.

- Fax has continued to be the least successful among all delivery media with an average rate of 39%. Fax maximum message delivery times have also been unacceptably high, but most are delivered within 10 - 20 minutes. In addition some NTWCs have not received any fax messages in particular tests, with one (Pakistan) not receiving fax messages in any of the tests.

- Further investigation is required from the TSPs and the NTWCs into fax – particularly to determine if this is still a required delivery mechanism, given the good success of email, GTS and SMS delivery

- NTWC access to TSP websites and reporting of their warning status via the websites has generally been declining across the 5 tests, to low values in the 10 Dec 2014 test of 69% for web access and 46% for web reporting. Urgent investigation is required, particularly into access to TSP websites which contain the key tsunami threat information needed by NTWCs. There is also a possibility that low web reporting rates are due to a lack of awareness of procedures to be followed in Comms Tests and in real events.

3.4. EVALUATION OF TSP PERFORMANCE

The Key Performance Indicators (KPIs) of the TSPs are as mentioned below:

1. Elapsed time of issuing first earthquake bulletin after earthquake - Target 10 minutes

2. Probability of Detection of Indian Ocean earthquakes with magnitude 6.5 or Above - Target 100%

3. Accuracy of Earthquake Parameters, in comparison with final estimates from USGS:

    a. Magnitude – Target 0.3

    b. Depth – Target 30km

    c. Location – Target 30km

4. Elapsed time of issuing first Tsunami Threat Assessment Bulletin after Earthquake - Target 20 minutes

5. Probability of detection of tsunamis above threat threshold (Target: 100%)

6. Accuracy of tsunami wave height predictions (Target: factor of 2)

Key Performance Indicator 1: Elapsed time of issuing first earthquake bulletin after Earthquake - Target 10 minutes

As per the IOTWS service definition, the TSPs have to issue the first bulletin (earthquake information) for all global earthquakes of magnitude ≥ 6.5 that are in the ocean or up to 200 km inland from the coast. Annexure-2 lists 164 events in the report period (1 November 2012 to 27 February 2015) for which at least one TSP issued an earthquake bulletin, and gives the elapsed time of the first earthquake bulletin issued by each TSP. The summary of the average elapsed times is given in the table below:

TSP	**No. Events Bulletins issued (out of 164)**	**Ave. Elapsed time of first bulletin (min)** ***(KPI 1)***
Australia (JATWC)	134	15.6
India (ITEWC)	116	11.1
Indonesia (InaTEWS)	82	14.5

The average elapsed time is calculated for those events only where TSP has issued an earthquake information bulletin

Key Performance Indicator 2: Probability of detection of Indian Ocean earthquakes of magnitude ≥ 6.5 - Target 100%

As per the final estimates of USGS there were 119 earthquakes of magnitude ≥ 6.5 in the reporting period (1 November 2012 to 27 February 2015). Out of these 119 earthquakes only 11 earthquakes occurred in the Indian Ocean region (6 - Ocean region, 3 - Near Coast, 2 - Land). The summary of the TSP's Probability of Detection of events of final USGS magnitude **≥** 6.5, i.e. for which the TSP issued an earthquake bulletin, is given below:

TSP	**Probability of Detecting IO events ≥ Mag 6.5** (USGS Final) ***(KPI 2)***	**Probability of Detecting ALL events ≥ Mag 6.5** (USGS Final)
Australia (JATWC)	82% (9 out of 11)	90% (107 out of 119)
India (ITEWC)	91% (10 out of 11)	84% (100 out of 119)
Indonesia (InaTEWS)	91% (10 out of 11)	63% (75 out of 119)

Note: Some events have not been reported by one or the other TSPs either because the magnitude was assessed to be less than 6.5 or the region was assessed to be outside the Indian Ocean

Key Performance Indicators 3a, b, c: Accuracy of earthquake magnitude (Target 0.3), Depth (Target 30 km), and Location (Target 30 km)

The final estimates of TSPs during each event were compared with the final estimates of USGS to calculate the performance indicators. The 119 earthquakes in Annexure-2 with magnitude **≥** 6.5 are considered and the results are summarised below:

TSP	Average difference in magnitude - Target 0.3 *(KPI 3a)*	Average difference in depth – Target 30 km *(KPI 3b)*	Average difference in location – Target 30 km *(KPI 3c)*
Australia (JATWC)	0.18	28	21
India (ITEWC)	0.17	22	14
Indonesia (InaTEWS)	0.16	18	16

Key Performance Indicator 4: Elapsed time of issuing first tsunami threat assessment bulletin after earthquake - Target 20 minutes

TSPs have to issue Tsunami Threat Assessment Bulletins for undersea earthquakes (or those within 200km of the coast) and of magnitude ≥ 6.5 in the Indian Ocean or magnitude ≥ 8.0 outside the Indian Ocean. Considering the USGS final earthquake estimates there were 12 (6 - Indian Ocean, 3 - Indian Ocean (Near Coast), 3 - Other than Indian Ocean) events of that type in the reporting period. Annexure-2 gives the elapsed times of the initial threat assessment bulletins issued by the TSPs for each event in which they issued Threat bulletins; the averages of those times are in the table below. (Note that the TSPs issued Threat Assessment Bulletins for some events that were later assessed by USGS as being less than magnitude 6.5, or were more than 200km inland from the coast.)

TSP	No. Events Threat Assessment Bulletin Issued	Ave elapsed time of first threat Assessment Bulletin – Target 20 mins *(KPI 4)*	Number of "No Threat" Bulletins Issued	Number of "Threat" Bulletins Issued
Australia (JATWC)	13	19.3	12	2 (for 1 event)
India (ITEWC)	7	22.1	6	1 (for 1 event)
Indonesia (InaTEWS)	1	13	Nil	4 (for 1 event)

Note: Some events have not been reported by one or the other TSPs because the magnitude was assessed to be less than the threshold for issuing the threat assessment bulletin.

4. CONTRIBUTION TO NTWC/NDMO/MEDIA SOP TRAINING WORKSHOPS:

Continuing the contributions made in two workshops during 2011, representatives from all 3 TSPs, Australia, India and Indonesia, made significant contributions to two IOTWS NTWC/NDMO/Media SOP Training Workshops in the intersessional period: Jakarta in September 2013 and Hyderabad in June 2014.

TSP representatives delivered lectures and conducted classroom sessions to representatives from both northern and eastern Indian Ocean Member States (Jakarta) and northern and western Indian Ocean Member States (Hyderabad), primarily focusing on the development of Member State SOPs encompassing the use of the detailed tsunami threat information available from the TSPs during events. In both workshops the knowledge passed on was exercised in tabletop event-simulation exercises conducted on the final day.

Recommendation to ICG/IOTWS:

To conduct one joint TSP/NTWC/DMO/Media training workshop on Standard Operating Procedures in the next intersessional period organised by WG2 and WG3, subject to the availability of funding.

5. GAPS AND DEFICIENCIES

- Regular Communications Tests have highlighted deficiencies in some communications media, especially relating to GTS links for a small number of countries, fax in general, lack of SMS access for some NTWCs, and poor reporting of warning status by NTWCs back to TSPs

6. ACTION PLAN FOR THE NEXT INTER SESSIONAL PERIOD

Depending on the decisions of the ICG/IOTWS-X, WG2 will continue to:

- Monitor TSP performance against agreed performance targets
- Continue to review and further develop TSP performance targets
- Conduct 6-monthly communications tests
- Contribute to further TSP/NTWC/DMO/Media training activities including the conduct of one SOP training workshop during the intersessional period.
- Address the gaps and deficiencies identified in this report

Appendix 1: Terms-of-Reference Working Group 2: Tsunami Detection, Warning and Dissemination

1. Monitor existing international and national arrangements with regards to seismic, GPS, sea level and other kinds of measurements, data collection and exchange.

2. Promote best practice to ensure that all events likely to cause tsunami can be reliably located and sized in a timely manner.

3. Review and make recommendations regarding upgrades and enhancements to the IOTWS seismic, GPS and sea level networks, communications, processing and analysis to minimise the time required for accurate source characterization and tsunami verification to meet desired warning responses.

4. Coordinate and monitor operational implementation and enhancement of warning systems in the Indian Ocean, including ongoing development and benchmarking of tsunami verification and forecast systems.

5. Coordinate the development of coastal inundation models for tsunamis within multi-hazard frameworks, including storm surges and tropical cyclones.

6. Coordinate, monitor and report on the performance of the IOTWS Tsunami Service Provider (TSP) Service.

7. Coordinate and conduct regular exercises and communication tests of the IOTWS.

8. Develop, coordinate and help implement training and capacity building programmes for NTWCs, NDMOs and Media to utilise the TSP Service.

9. Develop capability guidelines and performance indicators for NTWCs and TSPs.

10. Document performances of candidate TSPs and report to the ICG.

11. Develop and maintain IOTWS Users Guide.

12. Liaise with working groups within the ICG/IOTWS, and working groups from the other ocean basins through the TOWS WG, to coordinate tsunami detection, warning and dissemination.

13. Under the direction of the Steering Group, carry out assessments of the IOTWS performance after each exercise and real tsunami event. Encourage and assist national assessments following real events.

The Group will be composed of members nominated by Member States, representatives from TSPs and invited observers, with a chairperson and three vice-chairpersons to be elected.

Appendix 2: Earthquake Bulletins and Tsunami Threat Assessment Bulletins issued by TSPs

Period: 1 November 2012 - 27 February 2015

Total Number of Events in which TSP Bulletins Issued: 164

IO = Indian Ocean; OO = Other Ocean; NC = Near Coast; L = Land; EQ = earthquake; ET = elapsed time bulletin issued after earthquake; NT = No Threat; T = Threat

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
1	07-Nov-12	16:35:00	Near Coast of Chiapas, Mexico	OO	86	7.4	9		33	7.3	10						41.6	7.4
2	11-Nov-12	1:12:00	Myanmar	IO (L)	10	6.7	9						10	6.7	9		9.9	6.8
3	11-Nov-12	22:15:00	Near Coast of Chiapas, Mexico	OO					47	6.6	13						20	6.5
4	12-Nov-12	20:42:00	The Gulf of Alaska	OO					10	6.6	16						10	6.2
5	16-Nov-12	18:12:00	Kuril Islands	OO	73	6.7	8		22	6.8	14						29.1	6.4
6	07-Dec-12	8:18:21	off East Coast of Honshu, Japan	OO	10	7.9	11			7.3	11		10	7.6	11		36.1	7.3
7	07-Dec-12	08:31:00	Off East Coast of Honshu, Japan	OO									10	6.9	14		32	6.2
8	10-Dec-12	16:53:10	Banda Sea	IO	164	6.9	6	28 NT	100	7.1	32	39 NT	170	7.4	12		159.3	7.1
9	21-Dec-12	22:28:11	Vanuatu Islands	OO	209	6.7	10						222	6.6	16		207.9	6.8
10	05-Jan-	8:58:22	Southeastern Alaska	OO	30	7.5	8		10	7.8	11		10	7.4	29		10	7.5

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
	13																	
11	30-Jan-13	20:15:41	Central Chile	OO (NC)	10	6.9	10		57	6.7	14		10	6.9	23		45	6.8
12	31-Jan-13	03:33:00	Santa Cruz Islands	OO	21	6.5	10										9	6.1
13	01-Feb-13	22:16:00	Santa Cruz Islands	OO					1	6.6	13						10	6.3
14	02-Feb-13	14:17:00	Hokkaido, Japan region	OO (NC)	96	7.0	9		125	6.9	16						107	6.9
15	06-Feb-13	1:12:00	Santa Cruz islands	OO	10	7.8	12		0	7.9	16	17 NT	15	7.4	14		28.7	8.0
16	06-Feb-13	1:23:00	Santa Cruz islands	OO	10	6.5	17										10.1	7.1
17	07-Feb-13	18:59:00	Santa Cruz islands	OO	28	6.6	20		41	6.7	16		10	6.5	11		10	6.7
18	08-Feb-13	11:12:00	Santa Cruz islands	OO	10	7.0	15		25	7.0	13		10	6.8	9		15.9	6.8
19	08-Feb-13	15:26:00	Santa Cruz islands	OO	10	7.2	9		5	7.0	12		10	7	10		21	7.1
20	09-Feb-13	14:16:00	Colombia	OO (NC)	128	6.9	8		159	7.0	17		10	6.9	24		145	6.9
21	09-Feb-13	21:02:00	Santa Cruz islands	OO	43	6.6	9		36	6.5	13						15.6	6.6
22	14-Feb-13	13:13:00	Eastern Siberia, Russia	OO (L)	37	7.2	10										9.9	6.6
23	15-Feb-13	03:02:00	Tonga Islands	OO	110	6.6	12										74	5.7
24	28-Feb-13	14:05:00	Kuril Islands	OO	60	6.9	10		46	6.9	138		44	6.7	35		41	6.9

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
25	01-Mar-13	13:20:00	Kuril Islands	OO	64	6.8	10		33	6.5	17		28	6.8	15		29	6.5
26	10-Mar-13	22:51:00	New Britain Region, P.N.G.	OO					41	6.7	12						28.9	6.5
27	06-Apr-13	4:42:00	Irian Jaya, Indonesia	IO (NC)	83	7.3	7		55	7.0	15		66	7.3	8		66	7.0
28	14-Apr-13	1:32:00	Solomon Islands	OO					35	6.7	25						31	6.6
29	16-Apr-13	10:44:00	Southwestern Pakistan	IO (L)	73	7.9	8		0	7.7	16	31 NT	95	7.6	14		82	7.7
30	16-Apr-13	22:55:00	Near N. Coast of New Guinea	OO	42	6.6	9		20	6.8	15		19	6.6	13		13	6.6
31	19-Apr-13	3:05:00	Kuril Islands	OO	104	7.2	9		58	7.3	20		96	7.3	13		112.2	7.2
32	20-Apr-13	0:02:00	Sichuan, China	OO (L)	49	6.9	10										14	6.6
33	23-Apr-13	23:14:00	New Ireland Region, P.N.G.	OO	44	6.5	10		5	6.5	11						23.3	6.5
34	11-May-13	20:46:00	Tonga Islands	OO	214	6.5	11		185	6.5	19						212	6.4
35	14-May-13	0:32:00	Mariana Islands	OO	588	6.7	9		650	6.7	11		594	6.5	13		602.3	6.8
36	16-May-13	05:56:00	Southwestern Atlantic Ocean	OO	10	6.6	16										13	5.6
37	20-May-13	09:49:00	West Chile Rise	OO					-	6.8	21						10	6.4
38	23-May-13	17:19:00	South of Fiji Islands	OO	136	7.5	9		100	7.5	13		172	7.3	13		171.4	7.4
39	23-May-13	21:07:00	Tonga Islands	OO	118	7.0	11										149	6.3

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
40	24-May-13	5:44:00	Sea of Okhotsk Region	OO	604	8.1	10	30 NT	619	8.2	13	15 NT	529	8	14		608.9	8.3
41	24-May-13	14:56:00	Sea of Okhotsk Region	OO	10	6.8	11		-	6.5	20		663	7	17		623	6.7
41	02-Jun-13	05:43:00	Taiwan	OO	17	6.5	9		10	6.5	18						17	6.2
42	05-Jun-13	04:47:00	The Santa Cruz Islands	OO					51	6.6	12						39	6.1
44	13-Jun-13	16:47:00	South of Java, Indonesia	IO	10	6.8	11	18 NT	9	6.7	12	13 NT	57	6.5	8		8.6	6.7
45	15-Jun-13	17:34:00	Near Coast of Nicaragua	OO	56	6.6	12		-	6.6	12						35.8	6.5
46	24-Jun-13	22:04:00	N. Mid-Atlantic Ridge	OO					185	6.6	28						10	6.6
47	07-Jul-13	18:35:00	New Ireland Region, P.N.G.	OO	402	6.6	11		398	7.1	13		386	6.5	7		386.3	7.3
48	07-Jul-13	20:30:00	New Britain Region, P.N.G.	OO (NC)					103	6.5	14		90	6.6	10		62	6.6
49	15-Jul-13	14:03:00	South Sandwich Islands Region	OO	10	7.2	17		73	7.2	22						31	7.3
50	21-Jul-13	5:09:00	Cook Strait, New Zealand	OO	10	6.7	13		5	6.8	13						14	6.5
51	21-Jul-13	23:45:00	Gansu, China	OO									10	6.6	9		10	5.9
52	01-Aug-13	20:01:00	Tonga Islands	OO	10	6.5	17										17	5.8
53	12-Aug-13	00:53:00	Tanimbar Is Reg., Indonesia	IO									121	6.5	7		95	6.0
54	13-Aug-13	15:43:00	South of Panama	OO	11	6.7	11		10	6.7	11		10	6.6	32		12	6.7

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
55	16-Aug-13	2:31:00	Cook Strait, New Zealand	OO (NC)	25	6.8	13		7	7.0	9						8.2	6.5
56	30-Aug-13	16:25:00	Andreanof Island, Aleutian Is	OO	32	6.8	12		10	7.0	11		10	6.7	23		29	7.0
57	01-Sep-13	11:52:00	Banda Sea	IO					116	6.4	13		131	6.6	7		112	6.5
58	04-Sep-13	02:32:00	Andreanof Islands, Aleutian Is	OO	23	6.5	12										20	6.5
59	24-Sep-13	11:29:00	Pakistan	IO (NC)	10	7.6	11	16 NT					29	7.5	18		15	7.7
60	25-Sep-13	16:42:00	Near Coast of Peru	OO	10	6.8	10		50	7.2	10		10	7	25		40	7.1
61	28-Sep-13	7:34:00	Pakistan	IO (NC)	16	6.8	13	26 NT	33	7.0	13	15 NT	42	6.7	14		12	6.8
62	30-Sep-13	5:55:00	Kermadec Islands, New Zealand	OO	50	6.6	14		32	6.8	11						42.1	6.5
63	01-Oct-13	3:38:00	Sea of Okhotsk	OO	568	6.6	11						573	6.6	18		580.2	6.7
64	12-Oct-13	13:11:00	Crete, Greece	OO	26	6.6	10		32	6.5	15		34	6.7	19		40	6.6
65	15-Oct-13	0:12:00	Mindanao, Philippines	OO (NC)	41	7.4	12		60	7.3	10		31	7.2	12		22.8	7.1
66	16-Oct-13	10:31:00	Solomon islands	OO	80	7.1	12		50	7.2	13		52	6.9	8		35	6.8
67	19-Oct-13	17:55:00	Gulf of California Region	OO (NC)					10	6.8	13						9.4	6.6
68	24-Oct-13	19:25:00	E. of S. Sandwich islands	OO					10	6.5	17						22.9	6.7
69	25-Oct-13	17:10:19	Off Coast of Honshu, Japan	OO	10	7.4	14		55	7.6	13	14 NT	10	7.2	16		25.7	7.1

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
70	31-Oct-13	12:02:00	Taiwan	OO					10	6.7	12						10	6.3
71	31-Oct-13	23:04:00	Central Chile	OO					150	6.8	18						29	6.6
72	02-Nov-13	18:53:00	Tonga Islands Region	OO	10	6.5	12		0	6.5	16						10	6.2
73	12-Nov-13	7:03:53	Near East Coast of Kamchatka	OO	72	6.6	12		0	6.5	17		75	6.5	17		47.2	6.6
74	16-Nov-13	3:34:33	Scotia Sea	OO	10	6.8	14		10	6.9	23						10	6.8
75	17-Nov-13	9:04:57	Scotia Sea	OO	10	7.8	13		0	7.3	22		10	7.4	25		10	7.7
76	23-Nov-13	7:48:32	Fiji Region	OO					329	6.4	14						371	6.5
77	25-Nov-13	6:27:00	South Atlantic Ocean	OO	10	6.8	15		10	6.6	13						10	7.0
78	01-Dec-13	01:24:00	Banda Sea	IO	10	6.7	10		0	6.9	12	22 T	40	6.7	6		10	6.4
79	08-Dec-13	17:24:00	Kuril Islands	OO					33	6.6	15						28	6.0
80	17-Dec-13	23:38:06	Mariana Islands	OO					0	6.4	12						9	6.2
81	01-Jan-14	16:03:34	Vanuatu Islands	OO	220	6.6	11		227	6.7	12						187	6.5
82	21-Jan-14	01:29:00	Tonga Islands	OO	10	6.5	13										6	6.1
83	25-Jan-14	05:14:00	Java, Indonesia	IO									48	6.5	8		66	6.1
84	02-Feb-14	9:26:40	South of Kermadec Islands	OO					0	6.4	17						44.3	6.5

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
85	07-Feb-14	8:40:19	Vanuatu Islands	OO													122	6.5
86	12-Feb-14	9:19:48	Southern Xinjiang, China	OO (L)	10	6.7	8										10	6.9
87	18-Feb-14	9:27:13	Windward Islands	OO	5	6.8	11		105	6.8	15						16.9	6.5
88	02-Mar-14	20:11:24	Ryukyu Islands	OO	113	6.7	11		127	6.7	11						111.2	6.5
89	10-Mar-14	5:18:17	Near Coast of N. California	OO	16	6.7	9		10	7.2	10		10	6.5	19		16.6	6.8
90	11-Mar-14	02:44:00	East of South Sandwich Islands	OO	10	6.8	16		10	6.8	16						10	6.4
91	13-Mar-14	17:06:00	Kyushu, Japan	OO	84	6.5	12										79	6.3
92	15-Mar-14	23:51:00	Near Coast of Northern Peru	OO					11	6.5	13						29	6.3
93	16-Mar-14	21:16:29	Near Coast of Northern Chile	OO	10	6.9	12		10	7.0	11		15	6.6	20		20	6.7
94	21-Mar-14	13:41:09	Nicobar Islands, India	IO	10	6.5	9	15 NT	0	6.6	9	14 NT					10	6.5
95	01-Apr-14	23:46:45	Near Coast of Northern Chile	OO	10	7.8	12		10	8.0	16	17 NT	10	8	36		20.1	8.2
96	01-Apr-14	23:57:00	Near Coast of Northern Chile														28.4	6.9
97	03-Apr-14	1:58:32	Near Coast of Northern Chile	OO													24.1	6.5
98	03-Apr-14	2:43:18	Near Coast of Northern Chile	OO	10	7.4	15		10	7.4	11		10	7.6	19		31.1	7.7
99	03-Apr-14	03:11:00	Near Coast of Northern Chile	OO	10	6.9	16										10	5.5

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
100	11-Apr-14	7:07:26	Solomon Islands	OO	69	7.2	10		5	7.4	10		43	7	10		50	7.1
101	11-Apr-14	8:16:00	Solomon Islands	OO					100	6.9	13						39.4	6.5
102	11-Apr-14	20:29:15	Near Coast of Nicaragua	OO (NC)	185	6.6	10		241	6.6	16						135	6.6
103	12-Apr-14	20:14:44	Solomon Islands	OO	49	8.0	12		60	7.7	13		10	7.7	10		29.3	7.6
104	12-Apr-14	20:24:00	Solomon Islands	OO	107	6.7	18						28	7.2	15		32	5.8
105	13-Apr-14	12:36:18	Solomon Islands	OO	10	7.3	10		0	7.3	11		58	7.5	12		35	7.4
106	13-Apr-14	13:24:00	Solomon Islands														10	6.6
107	15-Apr-14	3:57:02	Southwest of Africa	OO	10	6.7	14		10	7.0	19		10	6.7	24		11.7	6.9
108	18-Apr-14	14:27:36	Guerrero	OO (NC)	90	7.3	12		60	7.4	15		10	7.2	16		24	7.2
109	19-Apr-14	1:04:10	Solomon Islands	OO	63	7.0	14		50	7.0	11						24.4	6.6
110	19-Apr-14	13:28:05	Solomon Islands	OO	53	7.7	12		60	7.8	10		60	7.5	8		30.9	7.5
111	24-Apr-14	3:10:16	Vancouver Island, Canada	OO	13	6.7	12		10	6.8	10		10	6.7	16		10	6.5
112	01-May-14	6:36:41	SE of Loyalty Islands	OO	151	6.7	12		130	6.7	13		123	6.7	11		106	6.6
113	04-May-14	9:15:51	South of Fiji Islands	OO	529	6.5	12		600	6.8	9						527	6.6
114	08-May-14	17:00:00	Guerrero, Mexico	OO	83	6.9	8		10	6.8	10		10	6.7	14		17	6.4

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
115	12-May-14	18:38:00	Southern East Pacific Rise														10.5	6.5
116	13-May-14	6:35:00	South of Panama	OO					33	7.0	9		10	6.5	21		10	6.5
117	14-May-14	20:56:00	E. Caroline Islands, Micronesia	OO	10	6.6	8		35	6.5	14						10	6.1
118	15-May-14	8:16:36	E. Caroline Islands, Micronesia	OO	10	7.0	9		0	6.5	14		10	6.5	11		10	6.6
119	24-May-14	9:25:02	Aegean Sea	OO													10	6.9
120	31-May-14	11:54:00	Off the Coast of Jalisco, Mexico	OO					10	6.6	20						5	6.2
121	14-Jun-14	11:11:05	South Indian Ocean	IO	10	6.5	8		0	6.6	21	21 NT	10	6.5	10		4	6.5
122	19-Jun-14	10:18:00	Vanuatu Islands	OO					84	6.8	9		50	6.6	18		36	6.2
123	23-Jun-14	19:19:15	Kermadec Islands region	OO	10	6.9	8		10	7.1	12		80	6.8	13		20	6.9
124	23-Jun-14	20:53:10	Rat Islands, Aleutian Islands	OO	106	7.9	10		50	8.0	23	23 NT	109	8.1	31		109	7.9
125	24-Jun-14	03:15:00	Rat Islands, Aleutian Islands	OO					33	6.6	16						4	6.3
126	29-Jun-14	05:56:00	Volcano Islands, Japan Region	OO					68	6.6	16						48	6.2
127	29-Jun-14	7:52:56	South Sandwich Islands Region	OO	10	7.2	12		15	6.9	111						8	6.9
128	29-Jun-14	15:52:00	Samoa Islands Region	OO					35	6.5	14						9	6.4
129	29-Jun-14	17:15:00	Tonga Islands (Samoa Region)	OO					0	6.5	16						18	6.7

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
130	03-Jul-14	19:50:00	Kermadec Islands Region	OO					33	6.6	10						35	6.3
131	04-Jul-14	15:00:31	New Britain Region, PNG	OO	20	6.7	16		20	6.6	11						20	6.5
132	07-Jul-14	11:23:59	Near Coast of Chiapas, Mexico	OO	97	7.2	8		33	7.1	8		82	7	13		53	6.9
133	11-Jul-14	19:22:00	off East Coast of Honshu, Japan	OO		6.6	10		10	6.8	7		10	6.8	13		20	6.5
134	21-Jul-14	14:54:40	Fiji Islands Regions	OO	615	6.6	8		607	6.7	13		621	6.5	11		615.4	6.9
135	03-Aug-14	0:22:05	Caroline Islands, Micronesia	OO	10	6.6	8		0	6.8	12		10	6.5	10		13	6.9
136	23-Aug-14	22:32:00	Near Coast of Central Chile	OO					10	6.6	26						32	6.4
137	24-Aug-14	23:21:43	Central Peru	OO (NC)	72	6.8	10		14	6.9	9		10	7	20		101	6.8
138	10-Sep-14	02:46:00	Southern Molucca Sea	OO					12	6.6	10						35	6.2
139	17-Sep-14	6:14:00	Mariana Islands	OO	164	6.7	12		100	7.0	16		213	6.5	13		130	6.7
140	09-Oct-14	2:14:34	Southern East Pacific Rise	OO	10	6.8	12		126	6.8	14		10	6.9	12		16.5	7.0
141	11-Oct-14	02:35:00	Off East Coast of Honshu, Japan	OO					2	6.5	15						22	6.1
142	14-Oct-14	3:51:34	Off Coast of Central America	OO	10	7.5	17		10	7.3	13		94	7.1	17		40	7.3
143	14-Oct-14	04:12:00	East of Northern Islands, N.Z.	OO					5	6.5	14						14	5.7
144	01-Nov-14	18:57:22	Fiji Islands Regions	OO	442	6.8	10		471	6.9	15						434	7.1

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
145	07-Nov-14	3:33:55	New Britain Region, P.N.G	OO	10	6.5	10		69	6.6	12		71	6.5	7		53.2	6.6
146	15-Nov-14	2:31:41	Northern Molucca sea	OO	10	7.4	8		35	7.3	15		48	7.3	8	13 T	45	7.1
147	16-Nov-14	22:33:17	Off E. Coast of N. Island, N.Z.	OO					0	6.8	11		44	6.6	17		22	6.7
148	21-Nov-14	10:10:20	Northern Molucca sea	OO	10	6.8	7		101	6.8	15		10	6.7	4		35	6.5
149	22-Nov-14	13:08:00	Eastern Honshu, Japan	OO	10	6.5	10		10	6.6	16						9	6.2
150	26-Nov-14	14:33:43	Northern Molucca sea	OO	10	6.7	9		32	6.7	12		10	6.8	1		39	6.8
151	02-Dec-14	5:11:31	Mindanao, Philippines	OO	621	6.5	7										614	6.6
152	07-Dec-14	1:22:03	Solomon Islands	OO	10	6.6	8		1	6.7	10		36	6.5	11		23	6.6
153	08-Dec-14	8:54:54	South of Panama	OO	10	6.7	9		64	6.7	14		10	6.5	16		20	6.6
154	21-Dec-14	11:34:00	Northern Molucca Sea	OO					60	6.6	11		60	6.6	11		41	6.3
155	07-Jan-15	5:07:09	South of Panama	OO	10	6.6	9		33	6.8	11						10	6.6
156	23-Jan-15	3:47:27	Vanuatu Islands	OO	212	6.6	10		201	6.5	13						219.3	6.8
157	11-Feb-15	18:57:18	Jujuy Province, Argentina	OO (L)	180	6.5	10		268	7.0	15						223	6.7
158	13-Feb-15	18:59:14	Northern Mid Atlantic Ridge	OO	10	6.7	31										16.4	7.1
159	16-Feb-15	22:00:00	South Sandwich Islands Region	OO					14	6.7	11						13	6.2

Sl. No	Earthquake Event				TSP India ITEWC (Final EQ Estimate)				TSP Australia JATWC (Final EQ Estimate)				TSP Indonesia InaTEWS (Final EQ Estimate)				USGS (Final EQ estimate)	
	Date	OT (UTC)	Region	IO/OO	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mwp	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw (mB)	ET First EQ Bull (min)	ET First Threat Bull (min)	Depth (Km)	Mag Mw
160	16-Feb-15	23:06:26	Off East Coast of Honshu, Japan	OO	10	6.7	9		50	6.9	14		10	6.7	12		23	6.7
161	19-Feb-15	13:18:00	Vanuatu Islands	OO					39	6.6	11		10	6.5	14		10	6.4
162	20-Feb-15	04:25:00	Off East Coast of Honshu, Japan	OO					17	6.5	13						14	6.3
163	22-Feb-15	14:23:00	Off Coast of Jalisco, Mexico	OO					10	6.6	8						10	6.2
164	27-Feb-15	13:45:05	Flores Sea	IO	581	6.8	6	22 T	554	6.6	9	10 NT	572	7.1	7		552.3	7.0

Appendix 3: IOTWS Communication Tests Report

1. Test Schedule

Five IOTWS communication tests have been conducted since the last reported period. During all these tests 4 notification messages were sent to the NTWC's via Email, Fax, GTS and SMS.

12 December 2012	IOTWS Communications Test Number 6
12 June 2013	IOTWS Communications Test Number 7
11 December 2013	IOTWS Communications Test Number 8
11 June 2014	IOTWS Communications Test Number 9
10 December 2014	IOTWS Communications Test Number 10

2. Test Comparison Table

The attached Test Comparison Table summarises the results of the tests according to:

- Reception of TSP messages by NTWCs (via GTS, fax, email and SMS)
- Access to TSP web sites by NTWCs
- Web reporting of NTWC warning status

3. Message Delivery – GTS

The WMO GTS network has been one of the most successful delivery media along with email and SMS, with an average delivery rate of 75% across the 5 tests. The GTS message delivery rate was 84% in the 11 Dec 2013 test, which is the highest rate among all the tests conducted since March 2011. Most delivery times for GTS messages were between 1 - 3 minutes.

4. Message Delivery – Fax

Fax has generally been the least successful of all delivery media in the tests with an average delivery rate of 39% across the 5 tests. In addition, in each test at least one NTWC has not received fax messages from any of the TSPs, with Pakistan not receiving fax messages during any of the 5 tests. Other NTWCs which have not received any fax messages in one or more of the tests are Bangladesh, Comoros, Iran, Kenya, Malaysia, Maldives, Madagascar, Myanmar, Seychelles, Timor-Leste, South Africa.

Iran reported that it has received 3 fax messages from TSP India with a longest delay of 5 hrs in 11 Dec 2013 and Tanzania also reported the same delay times in 11 June 2014. Sri Lanka reported 5 to 6 hour delays for fax messages from all TSPs in the Dec 2014 test. These extreme delays need to be investigated.

5. Message Delivery – Email

Email has been the most successful delivery medium, with an average delivery rate of 89% for the five tests (and a highest of 93% in the 11 Dec 2013 test), with most delivery times between 1-2 minutes. However, Madagascar did not receive any email messages in the 12 June 2013 test, and Timor-Leste reported a maximum delay of 40 minutes. In the 10 Dec 2014 test Sri Lanka did not receive any emails due a login problem.

6. Message Delivery – SMS

SMS messaging continues to improve as a delivery medium with an average delivery rate of 61% across the five tests and most delivery times between 1-3 minutes. The delivery rate dropped drastically to 51% in the 12 Jun 2013 test following its highest rate ever of 74% in the 12 December 2012 test, but the rate has increased steadily since then, up to 65% in the 10 Dec 2014 test.

However some NTWCs did not receive any SMS messages in the 5 tests (e.g. Myanmar), and one NTWC (France / La Reunion) does not have the capability to receive SMS messages. Further investigation is required into this by TSPs and the affected NTWCs.

7. Web Access

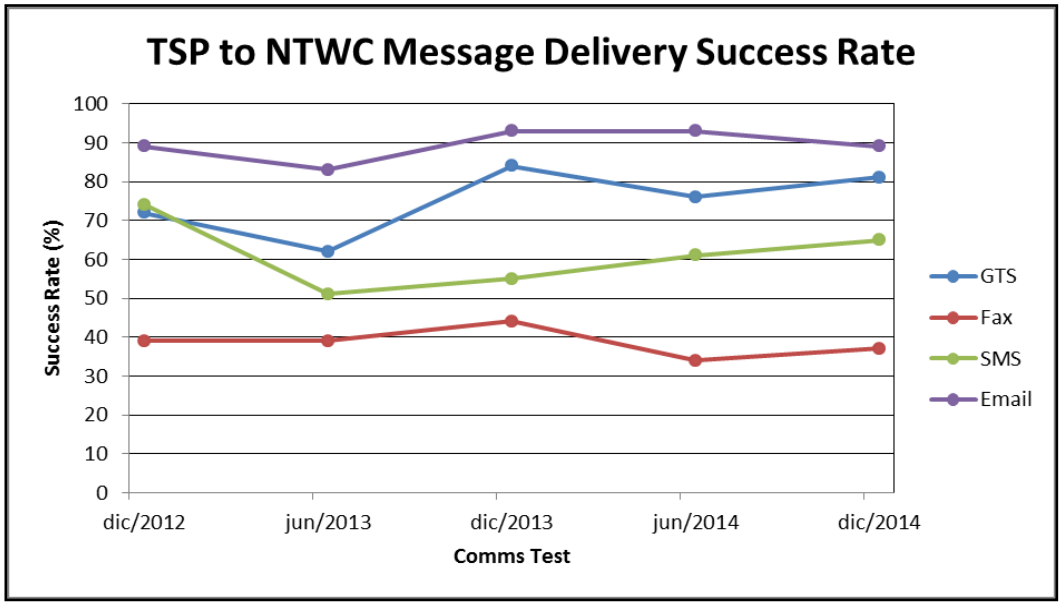
Access by NTWCs to TSP websites peaked at a highest-ever rate of 94% in the Dec 2012 test but has steadily declined since to a low of 69% in the 10 Dec 2014 test. TSPs and NTWCs need to urgently investigate this, noting that in the 10 Dec 2014 test 6 of the 24 participating NTWCs failed to report whether they accessed the TSP websites.

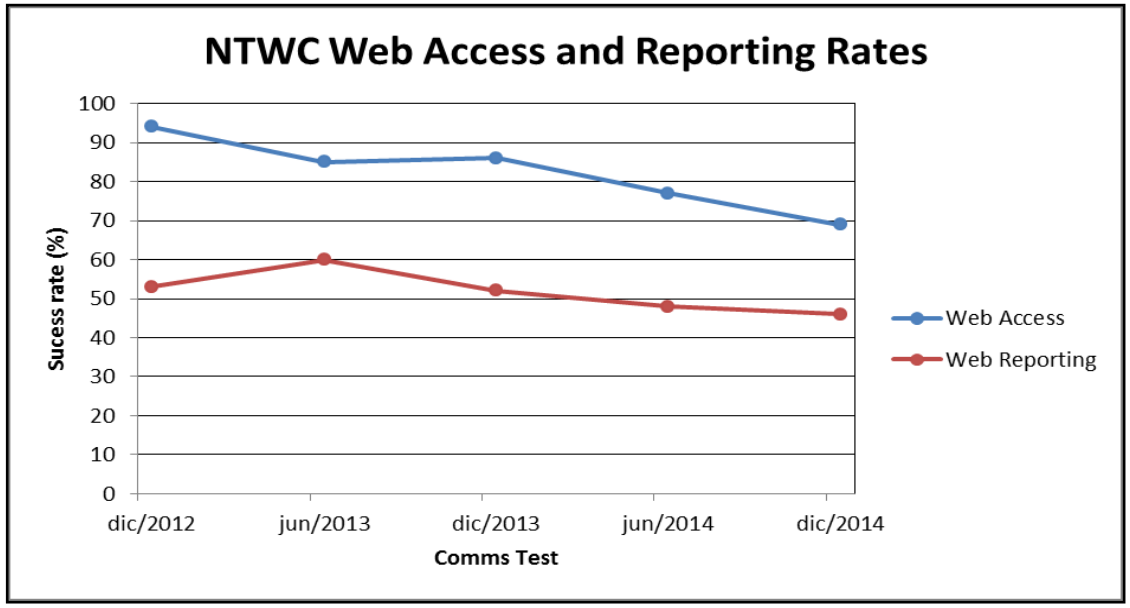
8. Web reporting

Reporting by NTWCs of their warning status via the TSP websites has generally been unsuccessful, with a reporting rate between 50% and 60% for the first 3 tests but dropping to under 50% for the last 2 tests. However it has recently been identified that there has been some confusion amongst NTWCs about when and how often to report their status, and the reporting instructions were clarified in the technical manuals for the Dec 2014 test and also for the IOWave14 exercise in Sep 2014. Interestingly, the reporting rate for IOWave14 was 75.5% - much higher than for recent Comms Tests. TSPs and NTWCs should investigate this variation in reporting rates.

TEST COMPARISON TABLE

	12 Dec 2012 (17 NTWCs)		12 Jun 2013 (20 NTWCs)		11 Dec 2013 (21 NTWCs)		11 June 2014 (23 NTWCs)		10 Dec 2014 (24 NTWCs)	
Originating TSP	**% of NTWCs**	**Max. Delay (mins)**	**% of NTWCs**	**Max. Delay (mins)**	**% of NTWCs**	**Max. Delay (mins)**	**% of NTWCs**	**Max. Delay (mins)**	**% of NTWCs**	**Max. Delay (mins)**
	Received GTS Messages									
Australia	72%	7	59%	30	87%	15	74%	15	81%	16
India	70%	14	65%	40	81%	4	79%	10	81%	15
Indonesia	73%	15	63%	35	86%	24	76%	17	80%	12
TSP Average	72%	12	62%	35	84%	14	76%	14	81%	14
	Received Fax Messages									
Australia	66%	26	55%	47	66%	38	50%	99	60%	355
India	32%	32	37%	184	49%	32	43%	20	41%	335
Indonesia	18%	12	26%	19	19%	23	8%	7	10%	337
TSP Average	39%	23	39%	83	44%	31	34%	42	37%	342
	Received Email Messages									
Australia	87%	6	75%	28	94%	16	98%	8	94%	32
India	87%	4	85%	5	93%	16	90%	28	86%	95
Indonesia	94%	17	88%	39	90%	8	90%	10	87%	5
TSP Average	89%	9	83%	24	93%	13	93%	15	89%	44
	Received SMS Messages									
Australia	82%	3	54%	13	61%	1	68%	52	67%	4
India	82%	3	59%	9	61%	2	60%	37	62%	397
Indonesia	59%	14	39%	3	43%	3	56%	19	67%	553
TSP Average	74%	7	51%	8	55%	2	61%	36	65%	318
	Accessed Web pages									
Australia	94%	n/a	79%	n/a	90%	n/a	77%	n/a	70%	n/a
India	94%	n/a	85%	n/a	90%	n/a	77%	n/a	69%	n/a
Indonesia	94%	n/a	90%	n/a	76%	n/a	77%	n/a	68%	n/a
TSP Average	94%		85%		86%		77%		69%	
	Lodged Web Status Reports									
With any TSP	53%	n/a	60%	n/a	52%	n/a	48%	n/a	46%	n/a


TSP to NTWC Message Delivery Success Rate
Success Rate (%)
100
90
80
70
60
50
40
30
20
10
0
dic/2012
jun/2013
dic/2013
jun/2014
dic/2014
Comms Test
GTS
Fax
SMS
Email


NTWC Web Access and Reporting Rates
Sucess rate (%)
100
90
80
70
60
50
40
30
20
10
0
dic/2012
jun/2013
dic/2013
jun/2014
dic/2014
Comms Test
Web Access
Web Reporting

ANNEX VIII

REPORT OF WORKING GROUP 3 ON TSUNAMI AWARENESS AND RESPONSE

Prepared by Dr. Harkunti P. Rahayu, Chair of WG3

1. EXECUTIVE SUMMARY

Preparedness and Response form as one of the pillars of the IOTWS, along with Risk Assessment, and Tsunami Detection, Monitoring and Dissemination. These three pillars are determining the role and tasks of working groups. They are inter-linked to accomplish a better strategy in reducing potential loss of lives toward natural hazards particularly tsunamis, a lesson which the Indian Ocean tsunami 2004 will always reflect. In particular, WG3 have responsibility to ensure the appropriate tsunami preparedness and response measures are taken by member states of the ICG IOTWS as well as to coordinate and share the best practices of tsunami awareness and response initiatives with working groups from the other ocean basins through TOWS WG on Disaster Management and Response.

Mainstreaming the tsunami warning and mitigation system into capacity building of tsunami preparedness and response program is a key issue for WG 3 and need to be consistently carried out. The Working Group 3 identifies the understanding of member states about their risks, including the capacity and capability to assess their risks as the foundation of increasing their preparedness and response to tsunami warning. To this purpose, the WG3 under collaboration with IOTIC in UNESCAP two-year project 2013-2015 has viewed at how the tsunami risk assessment and tsunami exercise are encouraged and/or mainstreamed in the policy of the member states. Through a series of UNESCAP Project activities, i.e. stock taking survey and training workshops, the WG3 has viewed at whether national SOP on tsunami warning were in place among the member states, and how tsunami warning and tsunami response were mainstreamed into the SOP from national level to reach the *first mile*. The enforcement and effectiveness of the National SOP can be tested through End-to-End Tsunami Exercise. The IO Wave Exercises are tools to observe the effectiveness of capacity building in encouraging the member states to develop and to test their tsunami early warning SOPs.

Two WG3 inter-sessional meeting for member states were able to be conducted during this periods, supported by activities of Final Round-up Session German Indonesia on Tsunami Early Warning System in 2013 and SOP Training Workshop for Northern and Western Indian Ocean Member States in 2014. These meetings were participated by the NDMO of member states and also invited observer such as media. The meetings became very important steps for WG3, beside for identifying best practices and problems but also for consolidation, strengthen the network and brainstorming the need for the group and the way forward to keep the WG3 to be active in the region. Therefore several recommendations have been outlined for the strategic work plan for the next period, including to set up media for communication, an attempt to include media a part of WG3 members, adapting the Tsunami Ready for the member states, and conducting preparedness survey to update the 2005 baselines data of preparedness conducted by UNESCO. Beside its achievements and outstanding work, WG3 have faced problems in having consistent WG3 delegate from member state for every meeting. Therefore the initiatives and actions endorsed in ToR could not be effectively to be implemented for all the member states.

Disaster is always evolving, and the initiatives and works in tsunami preparedness and response should always be improved for the region. From the perspective of ensuring building preparedness and response in the Indian Ocean region, the existence of WG3 is still needed in ICG/IOTWS.

2. INTRODUCTION TO TOR

Preparedness and Response form as one of the pillars of the IOTWS, along with Risk Assessment, and Tsunami Detection, Monitoring and Dissemination. These three pillars are determining the role and tasks of working groups. They are inter-linked to accomplish a better strategy in reducing potential loss of lives toward natural hazards particularly tsunamis, a lesson which the Indian Ocean tsunami 2004 will always reflect. In particular, WG3 have responsibility to ensure the appropriate tsunami preparedness and response measures are taken by member states of the ICG IOTWS as well as to coordinate and share the best practices of tsunami awareness and response initiatives with working groups from the other ocean basins through TOWS WG on Disaster Management and Response.

Working Group 3 objective is to provide advice, develop guidelines, and to promote good practice in capacity building for community resilience through preparedness and response activities for Member States in the Indian Ocean.

As stated in Executive Report of ICG/IOTWS 9 held in Jakarta in November 2012, the Working Group 3 is composed of members nominated by Member States and invited observers. While the scope of works or activities for WG3 has stated in the Terms of References, which was revised at the ICG/IOTWS 9 held in Jakarta in November 2012. The ToR has clearly defined 7 initiatives, which should be the main focus of WG 3 works. Those initiatives cover:

I1) Promote good practice in capacity building for community resilience through preparedness and response activities.

I2) Encourage mainstreaming of tsunami risk assessment, warning and mitigation systems into national development policy, plans, practice and legislation.

I3) Encourage the integration of national tsunami program into the defined national platforms for disaster risk reduction and national disaster management.

I4) Develop, enhance and encourage the adoption of tsunami-related guidelines, manuals and tools for downstream activities e.g. public information, education, training, communication processes, evacuation planning and drills, standard operating procedures and emergency management.

I5) Assess national capacity and capability in tsunami awareness and response.

I6) Liaise with other working groups within the ICG/IOTWS, and with working groups from the other ocean basins through TOWS WG, to coordinate tsunami awareness and response.

I7) Under the direction of the Steering Group, carry out assessments of the IOTWS performance after each exercise and real tsunami event. Encourage and assist national assessments following real events

3. PROGRESS AGAINST ACTIONS

Recognizing the limitation and consistency of WG3 members in numbers and representatives, during the period of 2012 – 2014 several important actions have been conducted under WG3 in building a common understanding among the member states toward the system and stakeholder as well as planning for moving forward for WG 3. These actions and relevant activities of the ToR covered by these actions are shown in the brackets.

3.1 Contribution by the Chair of WG3 on the Revision and expansion of the Guideline on Tsunami Risk Assessment at Regional Level (I1, I4 and I6).

The Chair of WG3 has taken part as the Task Team of WG1's TRATE Project in revising and expanding the Guideline on Tsunami Risk Assessment at regional level and updating the curriculum of tsunami risk assessment training. These activities has synergized the role and initiatives/activities of two working group to build/increase the capacity of member states by providing the updated tsunami risk assessment and management guideline and training for reducing the tsunami risk and increasing preparedness.

3.2 Participation of WG3 members in Regional Training Workshop on Standard Operating Procedures for Tsunami Warning and Emergency Response (I2, I6, and I1).

The two regional training workshops of SOP (Standard Operating Procedures) for Tsunami Warning and Emergency Response actively participated by member of WG2, WG3 and media were very important for WG3 members. These were not only for increasing the capacity and preparedness of the member states but also becoming windows of opportunity to meet, to share experiences and problems, as well as to consolidate and to strengthen network among the WG3 members. Looking at the capacity of media to reach the first mile for response and preparedness, there was a need to invite media to be part of WG3 members. However this issues needed to be discussed in ICG/IOTWS meeting from the perspective of support and nomination by member states.

3.3 Inter-sessional Meetings of WG3 (I1, I2, I3, I4, I5, I6, and I7).

Two WG3 inter-sessional meeting for member states were able to be conducted during this periods, supported by activities of Final Round-up Session German Indonesia on Tsunami Early Warning System in 2013 and SOP Training Workshop for Northern and Western Indian Ocean Member States in 2014. The first meeting was attended by 14 WG3 members, i.e. Australia, Bangladesh, India, Indonesia, Kenya, Malaysia, Maldives, Mauritius, Myanmar, Oman, Pakistan, Srilanka, Thailand, and Timor Leste, and several invited observers from the region. The second meeting was participated by 8 WG3 members participated in this meeting, i.e. India, Kenya, Madagascar, Maldives, Mozambique, Seychelles, Tanzania and Yemen. These meetings were participated by the NDMO of member states and also invited observer such as media. The meetings became very important steps for WG3, beside for identifying best practices and problems but also for consolidation; strengthen the network and brainstorming the need for the group and the way forward to keep the WG3 to be active in the region. Therefore several recommendations have been outlined.

3.4 Participation of WG3 Chair in ICG IOTWS Steering Group Meeting in Perth, December 9-10, 2013 (I1, I4 and I6).

3.5 Participation of WG3 Chair in Inter-ICG Task Team on Disaster Management and Preparedness, TOWS Meeting at Morioka, March 11-13, 2015 (I1, I4 and I6).

During the meeting, best practices among the basin were shared. WG3 plan to adapt and implement the Tsunami Ready for the member states. While the technical guideline on Evacuation Planning developed by Indonesia were needed in other basin, however there is need to be translated into English.

3.6 Participation of WG3 Chair in UNESCAP Project on Strengthening Policy Supports, SOP and Guidelines for Tsunami Exercise for the Indian Ocean member states (Bangladesh, Myanmar, and Timor Leste) 2013 – 2015 (I1, I2, I3, I4, I5 and I7)

Mainstreaming the tsunami warning and mitigation system into capacity building of tsunami preparedness and response program is a key issue for WG 3 and need to be consistently

carried out. The Working Group 3 identifies the understanding of member states about their risks, including the capacity and capability to assess their risks as the foundation of increasing their preparedness and response to tsunami warning. To this purpose, the WG3 under collaboration with IOTIC in UNESCAP two-year project 2013-2015 has viewed at how the tsunami risk assessment and tsunami exercise are encouraged and/or mainstreamed in the policy of the member states. Through a series of UNESCAP Project activities, i.e. stock taking survey and training workshops, the WG3 has viewed at whether national SOP on tsunami warning were in place among the member states, and how tsunami warning and tsunami response were mainstreamed into the SOP from national level to reach the *first mile*. The enforcement and effectiveness of the National SOP can be tested through End-to-End Tsunami Exercise. The IO Wave Exercises are tools to observe the effectiveness of capacity building in encouraging the member states to develop and to test their tsunami early warning SOPs.

3.7 WG3 Chair invited by IOI for PIM XXXIV International Forum on Sustainable Governance of the Ocean, September 3-8, 2013 Bangkok Thailand

4. ACTIVITIES UNDERTAKEN IN THE INTER-SESSIONAL PERIOD

4.1 Contribution by the Chair of WG3 on the Revision and expansion of the Guideline on Tsunami Risk Assessment at Regional Level (I1, I4 and I6).

The Chair of WG3 has taken part as the Task Team of WG1's TRATE Project in revising and expanding the Guideline on Tsunami Risk Assessment at regional level. The works were carried out closely between the chair two working groups, i.e. WG 1 and WG2, with several regional experts in tsunami risk assessment and mitigation. The working group was conducted twice in Colombo Srilanka, i.e. 27 February-1 March 2013 and 29 September – 1st October 2014. During the second task team meeting, the outline of tsunami risk assessment training workshop has also been developed. These activities has synergized the role and initiatives/activities of two working group to build/increase the capacity of member states by reducing the tsunami risk and increase preparedness.

4.2 Participation of WG3 Member States in Regional Training Workshop on Standard Operating Procedures for Tsunami Warning and Emergency Response (I2, I6, and I1).

During the inter-sessional periods, there have been two regional training workshops of SOP (Standard Operating Procedures) for Tsunami Warning and Emergency Response. The first event is for the Northern and Eastern Indian Ocean Countries conducted in Jakarta, September 23-27, 2013. The second event is for the Northern and Western Indian Ocean Countries conducted in Hyderabad, June 23-27, 2014. These activities have been actively participated by member of WG2, WG3 and media.

The WG3 has taken advantage of these two activities not only for building the capacity of NDMO of each member states to response the tsunami warning but also for strengthening the WG3 members to be able to share experiences, and discuss for proposed action planning of WG3. Besides, WG3 has also identified to see the media group is as potential member or as invited observers. The idea of having media to be part of WG3 activities is to achieve the Initiatives 1 (I1) of WG3, i.e. promote good practice in capacity building for community resilience through preparedness and response activities. The media group will be the best partner in disseminating and promoting the good practices to the wider outreach. In total there have been 24 members of WG3 gathered in this two events.

4.3 Inter-sessional Meetings of WG3 (I1, I2, I3, I4, I5, I6, and I7).

There have been two inter-sessional WG3 meeting during the period of 2012 – 2014.

The first inter-sessional WG3 meeting was conducted under collaboration with GFZ in line with the event of Final Round-up Session German Indonesia Cooperation on Tsunami Early Warning System 2005-2014, March 24 – 27, 2014, BMKG Jakarta and Bali. The four objectives of this WG3 inter-sessional meeting are: for consolidation, strengthening the network, sharing experience and brainstorming to prepare the WG3 Action Planning for two years. This WG3 meeting was attended by 14 member states, i.e. Australia, Bangladesh, India, Indonesia, Kenya, Malaysia, Maldives, Mauritius, Myanmar, Oman, Pakistan, Srilanka, Thailand, and Timor Leste, and several invited observers from the region.

After sharing the best practices of downstream tsunami warning chain as well as problems faced by each member states of WG3, all the participants agreed that this WG3 is important and needed in the region due to several reasons. First, after successful development of tsunami warning system in Indian Ocean, the effectiveness of warning system is not only relying on the technological approach but also the socio-cultural approach. All WG3 participants have agreed that the downstream tsunami warning chain is more complex than upper warning chain, it takes 3 to 4 times longer to build the capacity of down stream warning chain than the upper stream. Second, warning system is tools in emergency, where emergency itself requires appropriate and correct responses. Third, many best practices on successful system can be shared among the member states. Even though each state is unique and different, however learning and sharing from each other will increase the capacity not only for each member states but also strengthening regional capacity. Other important issues discussed were the encouragement for low-cost appropriate technology development for down stream warning chain that can be done by community and local university.

Beside, there were discussion among the WG3 members regarding building common understanding of the warning system and stakeholder. Several related issues outlined by the members were the need for:

- Credible institution which is trusted by people
- Multi level approach with integrated strategy from policy development to training implementation to community
- PPP public private partnership which imply MOU, budget sharing knowledge sharing as one of the effective stakeholders coordination mechanism
- Clarity of DM regulation and law enforcement
- Common communication strategy within the country to deal with language diversity
- Media as part of warning chain mechanism, but ensure the media follow the rule and policies

To conclude, the meeting has been very fruitful and able to propose three actions to be conducted in the next period until ICG/IOTWS Meeting in Oman 2015. First is the request from the WG3 member to optimize the IOTIC for sharing the best practices. Second is to develop knowledge management of initiatives or activities related with tsunami awareness, preparedness and response in the region or done by each member state. Third is to find out he simplest way of communication among the members, i.e. emails or social media.

The second inter-sessional WG3 meeting was conducted in Hyderabad, June 26 2014, which is in line with the SOP Training Workshop of Tsunami Warning for Northern and Western Indian Ocean Region. There were 8 WG3 members participated in this meeting, i.e. India, Kenya, Madagascar, Maldives, Mozambique, Seychelles, Tanzania and Yemen. Most of the participants were from national disaster management office and media.

From these two WG3 inter-sessional meeting, the activities proposed by WG3 members were:

- Database and information sharing will optimize the existence of IOTIC
- Develop coordination scheme (after the membership of WG3 have been proposed and approved by the member states)
- Develop action plan for ICG March 2015.

Several challenges faced by national and local disaster management office of member states were:

- Lack of confidence to warning product of NTWC, partly due to lack of knowledge/understanding on how the system work
- Common understanding between NTWC, NDMO and LDMO need to be improved at cultural level.
- Public education needs to be continuously done, as at the end is individual decision, affected by different factors, with warning advice as one of them

4.4 Participation of WG3 Chair in ICG IOTWS Steering Group Meeting in Perth, December 9-10, 2013 (I1, I4 and I6).

4.5 Participation of WG3 Chair in Inter-ICG Task Team on Disaster Management and Preparedness, TOWS Meeting at Morioka, March 11-13, 2015 (I1, I4 and I6).

During the meeting, best practices among the basin were shared. WG3 plan to adapt and implement the Tsunami Ready for the member states. While the technical guideline on Evacuation Planning developed by Indonesia were needed in other basin, however there is need to be translated into English.

4.6 Participation of WG3 Chair in UNESCAP Project on Strengthening Policy Supports, SOP and Guidelines for Tsunami Exercise for the Indian Ocean member states (Bangladesh, Myanmar, and Timor Leste) 2013 – 2015 (I1, I2, I3, I4, I5 and I7)

Mainstreaming the tsunami warning and mitigation system into capacity building of tsunami preparedness and response program is a key issue for WG 3 and need to be consistently carried out. The Working Group 3 identifies the understanding of member states about their risks, including the capacity and capability to assess their risks as the foundation of their development planning. To this purpose, the Working Group 3 under collaboration with IOTIC and Working Group 1 in UNESCAP project to look at how tsunami risk assessment and tsunami exercise are encouraged or mainstreamed in the policy of the member states. Other important matter was whether national SOP on tsunami early warning has been in place among the member states, test cases was conducted in the form of IO Wave 2014 Exercise to observe the effectiveness of capacity building in encouraging the member states to develop tsunami early warning SOPs. The two-year work conducted in Myanmar, Bangladesh and Timor Leste during 2013-2014 with regional workshop in 2015, has been

managed by the ICG IOTWS Secretariat and IOTIC. Through the stock taking survey up to the implementation of two workshops on policy statement development on tsunami risk assessment and Tsunami Early Warning SOPs in those three countries, WG3 Chair have the opportunity to find out the potential member and identify the administrative problems faced by the potential member.

4.7 WG3 Chair invited by IOI for PIM XXXIV International Forum on Sustainable Governance of the Ocean, September 3-8, 2013 Bangkok Thailand

4.8 Tsunami Early Warning and Preparedness Documentation of Experience from IOTWS

The interim document has been prepared during these two inter-sessional periods by the task team. During the ICG/IOTWS will be circulated to several focal members to review.

5. CURRENT STATUS

Several outstanding activities consist of:

5.1 General Need for the WG3

5.2 Database and information sharing will optimize the existence of IOTIC

5.3 Develop coordination scheme (after the membership of WG3 approval from MS)

5.4 Develop work plan before ICG March 2015

5.5 Finalizing the interim document Tsunami Early Warning and Preparedness Documentation of Experience from IOTWS

5.6 Setting up communication media of communication for the WG3 members.

5.7 Approval for WG3 members from the member states, in order to have consistent members for every meeting.

5.8 Finalizing the interim document Tsunami Early Warning and Preparedness Documentation of Experience from IOTWS

5.9 Setting up communication media of communication for the WG3 members.

5.10 Need approval from member states for WG3 members, in order to have consistent members for every meeting

5.11 Needs to have vice chair to tandem with WG3 Chair → proposed from Makran Region:

5.12 Oman

5.13 Pakistan

6. GAPS AND DEFICIENCIES

7. ACTION PLAN FOR THE NEXT INTER-SESSIONAL PERIOD (2015 – 2017)

For the next inter-sessional period 20015 - 2017, based on the several meeting with WG3 members as well as the participating in TOWS and collaboration with IOTIC, the proposed activities are as follows:

7.1 To update the preparedness baseline data of member states conducted in 2005 via in-depth preparedness survey.

7.2 To adapt and to pilot test best practices from other basin to Indian Ocean member states, i.e. Tsunami Ready from Caribbean TEWS, in 4 locations covering 2 Member States from West Indian Ocean and 2 Members States from East Indian Ocean.

7.3 Replicate the outcome of TE Guide and Policy under UNESCAP project to other member states (Western IO) in 3 Member States from: Northwest Indian Ocean (Makran Region either Oman, Pakistan and Yaman), Africa

7.4 Setting up communication media of communication for the WG3 members.

7.5 Approval for WG3 members from the member states, in order to have consistent members for every meeting.

7.6 Inter-sessional Meeting WG3 and field trip ("seeing is believing") – 1 Meetings (meeting and travel supports)

7.7 Finalizing the interim document Tsunami Early Warning and Preparedness Documentation of Experience from IOTWS

Details of the proposed action of WG3 with proposed estimated budget are outlined as follows:

No	Proposed Activities 2015 - 2017	Proposed Budget
1	To update the preparedness baseline data of member states conducted in 2005 via in-depth preparedness survey	USD 225K
2	To adapt and to pilot test best practices from other basin to Indian Ocean member states, i.e. Tsunami Ready from Caribbean TEWS. – 4 Members States	USD 120K
3	Replicate the outcome of TE Guide and Policy under UNESCAP project to other member states (Western IO) – 3 Member States	USD 135K
4	Setting up communication media among the WG3 members	USD 0
5	Approval and commitment of the member states for WG3 member	USD 0
6	Inter-sessional Meeting WG3 and field trip ("seeing is believing") – 1 Meetings (meeting and travel supports)	USD 85K
7	Finalizing the interim document Tsunami Early Warning and Preparedness Documentation of Experience from IOTWS (Final Editing, Lay-out and Printing)	USD 15K

ANNEX IX

LIST OF DOCUMENTS

WORKING DOCUMENTS		
Agenda Item	Code	Title
2.1	ICG/IOTWS-X/1 Prov	ICG/IOTWS-X Provisional Agenda
2.3	ICG/IOTWS-X/1 Prov. Add.	ICG/IOTWS-X Provisional Timetable
3.1	ICG/IOTWS-X/6	Chair's Report to ICG/IOTWS-X
3.1	ICG/IOTWS-X/7	Report of the 8th Meeting of the ICG/IOTWS Steering Group
3.1	ICG/IOTWS-X/8	Report of the 9th Meeting of the ICG/IOTWS Steering Group
3.2	ICG/IOTWS-X/9	Report of the IOC Secretariat to ICG/IOTWS-X
3.4	IOC/TOWS-WG-VI/3	Sixth meeting of Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems; Paris, France; 20-21 February 2013
3.4	IOC/TOWS-WG-VII/3	Seventh meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, France, 12-13 February 2014
3.5	IOC/BRO/2015/2	Summary Statement of the International Conference to Commemorate the 10th Anniversary of the Indian Ocean Tsunami
3.6	ICG/IOTWS-X/11	IOTIC Report to ICG/IOTWS-X
3.7	ICG/IOTWS-X/21	National Report from India to ICG/IOTWS-X
3.7	ICG/IOTWS-X/22	National Report from Madagascar to ICG/IOTWS-X
3.7	ICG/IOTWS-X/23	National Report from Australia to ICG/IOTWS-X
3.7	ICG/IOTWS-X/24	National Report from Bangladesh to ICG/IOTWS-X
3.7	ICG/IOTWS-X/25	National Report from Maldives to ICG/IOTWS-X
3.7	ICG/IOTWS-X/26	National Report from Thailand to the ICG/IOTWS-X

WORKING DOCUMENTS		
Agenda Item	Code	Title
3.7	ICG/IOTWS-X/27	National Report from Tanzania to ICG/IOTWS-X
3.7	ICG/IOTWS-X/28	National Report from Mozambique to ICG/IOTWS-X
3.7	ICG/IOTWS-X/29	National Report from Malaysia to ICG/IOTWS-X
3.7	ICG/IOTWS-X/30	National Report from Kenya to ICG/IOTWS-X
3.7	ICG/IOTWS-X/31	National Report from Sri Lanka to ICG/IOTWS-X
3.7	ICG/IOTWS-X/32	National Report from Pakistan to ICG/IOTWS-X
3.7	ICG/IOTWS-X/33	National Report from France to ICG/IOTWS-X
3.7	ICG/IOTWS-X/34	National Report from Indonesia to ICG/IOTWS-X
3.7	ICG/IOTWS-X/35	National Report from Mauritius to ICG/IOTWS-X
3.7	ICG/IOTWS-X/36	National Report from Iran to ICG/IOTWS-X
3.7	ICG/IOTWS-X/37	National Report from Myanmar to ICG/IOTWS-X
3.7	ICG/IOTWS-X/38	RIMES-INCOIS Collaboration on Provision of Tsunami and Other Ocean Information Services to RIMES Member States
4.1	ICG/IOTWS-X/12	Report of TSP Australia to ICG/IOTWS-X
4.2	ICG/IOTWS-X/13	Report of TSP India to ICG/IOTWS-X
4.3	ICG/IOTWS-X/14	Report of TSP Indonesia to ICG/IOTWS-X
5	ICG/IOTWS-X/15	Report of the IOWave14 Exercise (Draft)
6.1	ICG/IOTWS-X/16	Report of Working Group 1 to ICG/IOTWS-X
6.2	ICG/IOTWS-X/17	Report of Working Group 2 to ICG/IOTWS-X
6.2	ICG/IOTWS/SOP/WR/Jun14	Report of IOTWS Regional Workshop on SOPs for Tsunami Warning and Emergency Response, Hyderabad, June 2014
6.2	ICG/IOTWS/WG2/MR/Jun14	IOTWS WG2 and IOWave14 TT Meeting Report, Hyderabad, Jun14
6.3	ICG/IOTWS-X/18	Report of Working Group 3 to ICG/IOTWS-X
6.3	ICG/IOTWS-X/39	Tsunami Early Warning & Community Preparedness - Experiences from the IOTWS

WORKING DOCUMENTS		
Agenda Item	Code	Title
7.1	ICG/IOTWS-X/19	IOTIC Terms of Reference
7.4	ICG/IOTWS-X/20	IOTWS-TSP Service Definition Document (Draft)
8.1	IOC Technical Series No. 71 Rev 4	IOTWS Implementation Plan Revision 4, 2011
8.2	ICG/IOTWS-VIII/18	IOTWS Medium Term Strategy 2011-2015
11	ICG/IOTWS-X/40	Report of the Elections Committee
11	ICG/IOTWS-X/41	Elections Procedures and Forms

BACKGROUND DOCUMENTS	
Code	Title
CL-2567	Tenth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-X), Muscat, Oman, 24-26 March 2015
ICG/IOTWS-X/Inf.1	ICG/IOTWS-X Meeting Arrangements
ICG/IOTWS-X/Inf.2	Local Administration and Hotel Reservation Form

ANNEX X

LIST OF PARTICIPANTS

ICG/IOTWS Officers

Mr Rick BAILEY
ICG/IOTWS Chair
Head of Tsunami Warning & Ocean Services
Bureau of Meteorology, Melbourne
700 Collins Street
Docklands
GPO Box 1289
Melbourne VIC 3001
Australia
Tel: 61 3 9669 4103
Fax: 61 3 9669 4495
Email: R.Bailey@bom.gov.au

Mr T. Srinivasa KUMAR
ICG/IOTWS Vice-Chair
Head, ASG & In-charge, National Tsunami Warning Centre
Indian National Centre for Ocean Information Services
"Ocean Valley"
P.B No.21
IDA Jeedimetla P.O
Hyderabad 500 055
India
Tel: +91 40 23895006
Fax: +91 40 23895001
Email: srinivas@incois.gov.in

Heads of Delegation

AUSTRALIA

Mr Daniel JAKSA
Co-Director, Joint Australian Tsunami Warning Centre
Geoscience Australia
Cnr Jerrabomberra Ave and Hindmarsh Drive
Symonston
Canberra ACT 2609
Australia
Tel: +61 (0)2 6249 9685
Fax: +61 (0)2 6249 9984
Email: Daniel.Jaksa@ga.gov.au

INDIA

Dr Satheesh SHENOI
Director
Indian National Centre for Ocean Information Services
"Ocean Valley", Pragati Nagar, Nizampet
Hyderabad 500090
Telengana
India
Tel: +91 40 23895000
Fax: +91 40 23895001
Email: shenoi@incois.gov.in

INDONESIA

Mr Mochammad RIYADI
Director of Earthquake and Tsunami Center
Indonesian Metrorological Climatological and Geophysical Agency
Head Office
Jl. Angkasa 1 No.2
Kemayoran
Jakarta Pusat 10720
Jakarta
Indonesia
Email: mochammad.riyadi@bmkg.go.id

MALAYSIA

Mohd Rosaidi CHE ABAS
Deputy Director General (Strategic and Technical)
Malaysian Meteorological Department
Jalan Sultan
58000 Petaling Jaya
Selangor
Malaysia
Tel: 603-79678000
Fax: 603-79550964
Email: rosaidi@met.gov.my

OMAN

Dr Juma AL-MASKARI
Asst. Director General for Meteorological Affairs
Directorate General of Meteorology & Air Navigation
P.O. Box 1
P.C. 111

Muscat
Oman
Tel: 0 968 24 519196
Fax: 00 968 24 518979
Email: j.almaskari@met.gov.om

SRI LANKA

Rear Admiral Nimal SARATHSENA
Director Emergency Operation
Disaster Management Centre
Vidya Mawath
Colombo 7
Sri Lanka
Tel: +94(0)773957903
Fax: +94(0)112670079
Email: nsarathsena@gmail.com

Delegates of ICG/IOTWS Member States

AUSTRALIA

Mr Peter COBURN
Operations Manager, Joint Australian Tsunami Warning Centre
Bureau of Meteorology, Melbourne
700 Collins Street
Docklands
GPO Box 1289
Melbourne VIC 3001
Australia
Email: p.coburn@bom.gov.au

Dr Mark LEONARD
Research Scientist
Geoscience Australia
Cnr Jerrabomberra Ave and Hindmarsh Drive
Symonston
Canberra ACT 2609
Australia
Tel: +61 2 6249 9111
Email: mark.leonard@ga.gov.au

INDONESIA

Mr Yedi DERMADI
Earthquake Management Operation Subdivision
Indonesian Meteorological Climatological and Geophysical Agency
Head Office
Jl. Angkasa 1 No.2
Kemayoran
Jakarta Pusat 10720
Jakarta
Indonesia
Email: ydermadi@yahoo.com

Mr Mohamad Taufik GUNAWAN
Head of Earthquake and Tsunami Operation Management
Badan Meteorologi Klimatologi dan Geofisika
Jl. Angkasa 1 No. 2 Gunung Sahari Selatan
Centre of Jakarta 10720
DKI Jakarta
Indonesia
Tel: +6281381273891
Fax: +62216546311
Email: motagu_60@yahoo.com

Mr Medi HERLIANTO
Director of Disaster Preparedness
BNPB - National Agency for Disaster Management
Jl. Ir. H. Juanda No. 36
Jakarta
Indonesia
Email: herlianto_ces@yahoo.com

Ms Irina RAFLIANA
Public Education & Science Communication
Indonesian Institute of Sciences,Research Center for Oceanography-IIS
Pasir Putih I,Road. East Ancol
North Jakarta 14430
DKI Jakarta 14
Indonesia
Tel: +62 813 10332282
Fax: +62 21 3901214
Email: irina_rafliana@hotmail.com

Dr Harkunti RAHAYU
Institut Teknologi Bandung (Bandung Institute of Technology)
Campus
Jl. Ganesha no. 10
Bandung 40132
West Java
Indonesia
Email: harkunti_rahayu@yahoo.com

IRAN

Dr Nasser HADJIZADEH ZAKER
Director
Iranian National Institute for Oceanography and Atmospheric Science

No.3, EtemadZadeh St., Fatemi Ave.,
Tehran , Iran, 1411813389
014155-4781 Tehran
Iran Islamic Rep of
Tel: +9821 66944867
Fax: +9821 66944869
Email: inioas@inio.ac.ir

Dr Mohammad MOKHTARI
Director of National Center for Earthquake Prediction
International Institute of Seismology and Earthquake Engineering,
26 Arghavan Ave., Loavnsana BLVD,
Farmaneih
Tehran
Iran Islamic Rep of
Email: mokhtari@iiees.ac.ir

Dr Majid NADERI BENI
Chair of Marine Non-living Science Department
Iranian National Institute for Oceanography and Atmospheric Science
No.3, EtemadZadeh St., Fatemi Ave.,
Tehran , Iran, 1411813389
014155-4781 Tehran
Iran Islamic Rep of
Tel: +982166944873-5 ext. 215
Fax: +98 21 66944866
Email: amnaderi@inio.ac.ir

KENYA

Mr Paul OLOO
Principal Meteorologist
Kenya Meteorological Department
P.O. Box 30259
Nairobi
00100
Kenya
Tel: +254 721 624918
Fax: +254 20 3876955
Email: paul_oloo@yahoo.com

MADAGASCAR

Mr Jean Bernardo ANDRIANAIVOARISOA
Researcher
Institute and Observatory of Geophysics in Antananarivo (IOGA)
P.O. Box 3843
101 Antananarivo
Madagascar
Tel: +261 22 301 82
Email: andrijb08@gmail.com

MALAYSIA

Mr Shahruddin YUSOF
Principal Assistant Secretary
Ministry of Science, Technology and Innovation, National Oceanography Directorate
Kementerian Sains, Teknologi dan Inovasi (MOSTI)
Aras 1-7, Blok C4 & C5, Kompleks C,
Pusat Pentadbiran Kerajaan Persekutuan
62662 Putrajaya
Malaysia
Tel: +60388858204
Fax: +60388893008
Email: shahyu@mosti.gov.my

MALDIVES

Mr Ali SHAREEF
Deputy Director General
Maldives Meteorological Service
Hulhule
22000
Maldives
Tel: +960 3326200
Fax: +960 3320021
Email: shareef@meteorology.gov.mv

MAURITIUS

Mrs Surekha RAMESSUR
Acting Divisional Meteorologist
Mauritius Meteorological Services
St Paul Road
Vacoas
Mauritius
Email: surekra@gmail.com

MOZAMBIQUE

Mr Paulo SIGAUQUE
Thecnical, Oceanographer
Instituto Nacional de Hidrografia e Navegação
153 Karl Max avenue
2089 Maputo
Mozambican
Mozambique
Tel: +25821430186/8
Fax: +25821430185
Email: paulosiga76@yahoo.com.br

MYANMAR

Mr Hla SAW
Deputy Director, Head of National Earthquake Data Centre and Tsunami Early Warning System
Department of Meteorology and Hydrology, Nay Pyi Taw, Myanmar
Department of Meteorology and Hydrology, Nay Pyi Taw, Myanmar
Nay Pyi Taw
Myanmar
Email: uhlasaw4@gmail.com

OMAN

Mr Ahmed AL-HARTHI
Director Operations and Technical Services
P.O. Box 1, Muscat International Airport
Code 111
Muscat
Oman
Tel: +96824519360
Fax: +96824518360
Email: a.alharthy@met.gov.om

Mr Said Abdullah AL-HARTHI
Asst. Director Operation and Technology
Directorate General of Meteorology & Air Navigation
P.O. Box 1,
P.C. 111,
Muscat
Oman
Tel: +96824519360
Email: s.alharthy@met.gov.om

Salam Mabrook AL-HASHMI
Sultan Qaboos University
Earthquake Monitoring Center
P.O. Box 50
Al-Khod 123
Oman
Email: salam95@squ.edu.om

Nasser AL-ISMAILI
Forecaster
Oman
Email: alismaili.nasser@gmail.com

Mr Khalid AL-JAHWANI
Assistant Director of Forecasting and Observing Practices
Oman
Email: k.aljahwari@met.gov.om

Mr Sami AL-MAMARI
Meteorologist
Directorate General of Meteorology & Air Navigation
P.O. Box 1,
P.C. 111,
Muscat
Oman
Tel: 0096892510109
Email: s.almamari@met.gov.om

Director Badar AL-RUMHI
Director Forecasting and Observing Practices
111
Muscat
Oman
Tel: 0096824519610
Fax: 0096824519610
Email: b.alrumhi@met.gov.om

Dr Said Hamed AL-SARMI
Oman
Email: s.alsarmi@met.gov.om

Dr. Sultan AL-YAHYAI
Mazoon Electricity Company
Oman
Email: s.alyahyai@gmail.com

PAKISTAN

Mr Zahid RAFI
Director, National Seismic Monitoring Centre
Pakistan Meteorological Department
Pakistan Meteorological Department
Headquarters Office, PO Box 1214, Sector H- 8/2
Islamabad-44000
Pakistan
Tel: 92519250597
Fax: 92519250368
Email: dihazrafi@gmail.com

SEYCHELLES

Mr Paul Raymond Jean LABALEINE
Director General
Department of Risk and Disaster Management
Global Village Block B Suite 2 & 3 Mont Fleuri Mahe
Seychelles
Tel: +248 2722101 +248 4672200

Fax: +248 4325324
Email: plabaleine@gov.sc

SRI LANKA

Dr Sam HETTIARACHCHI
Professor
University of Moratuwa, Department of Civil Engineering
Moratuwa
Sri Lanka
Email: sampens1955@hotmail.com

TANZANIA

Mr Samwel MBUYA
Manger of Forecasting Services
Tanzania Meteorological Agency, Zanzibar Office Division
P.O. Box 3056
Dar es Salaam
Tanzania
Tel: +255 764 750980
Fax: +255 22 2460735
Email: samwel.mbuya@meteo.go.tz

THAILAND

Captain Song EKMAHACHAI
Acting Director, Warning & Dissemination section
National Disaster Warning Center
4353 Sukhumvit Rd.
Bangna District
Bangkok
Thailand
Tel: +6681-4003981
Fax: +662-399-1133
Email: song.ekmahachai@gmail.com

Mr Chayasarn TONANON
Director
National Disaster Warning Center
Ministry of Information and Communication Technology
The Government Complex, Bldg. B, 6-9th Fl.
Chaeng Watthana Rd, Laksi
Bangkok 10210
Thailand
Tel: 66 81 732 5191
Fax: 66 2 143 8045
Email: chayasarn.t@gmail.com

TIMOR LESTE

Mr Martinho FATIMA
Deputy Chief
National Disaster Management Directorate
Timor-Leste
Tel: +670 3322597
Email: martinho.fatima@mss.gov.tl

YEMEN

Mr Ahmed AL-SHAMI
Director of Monitoring & Control Dept. DG of Environmental Emergencies & Disasters
Ministry of Water & Environment
Amran St., Al-Hasabah District, Sana'a, Yemen
Sana'a
1038
Yemen
Tel: +967-777396002
Fax: +967-1-335015
Email: shamimwe@yahoo.com

Delegates of UN Organizations and Other Institutions

ESCAP

Mr Alf BLIKBERG
United Nations Economic and Social Commission for Asia and the Pacific
ESCAP/IDD, United Nations Building, Rajadamnern Nok Avenue
Bangkok 10200
Thailand
Tel: +66-22882700
Fax: +66-2288 1085
Email: blikberg@un.org

GFZ

Dr Joern LAUTERJUNG
Director
GFZ German Research Centre for Geosciences
14473 Potsdam
Brandenburg
Germany
Tel: +49(0)3312881020
Fax: +49 331 288 1002
Email: lau@gfz-potsdam.de

GIZ

Stephan HUPPERTZ
Regional Coordinator Asia - GIDRM
German International Cooperation (GIZ)
Global Initiative Disaster Risk Management (GIDRM)
The United Nations Building
Rajdamnern Nok Avenue
Bangkok 10200
Thailand
Tel: +66 (0)2 288 1575
Email: stephan.huppertz@giz.de

GIZ

Mr Harald SPAHN
Consultant
German International Cooperation (GIZ)
Dwaspadd 15
26689 Apen
Germany
26689 Apen
Germany
Tel: +49 404 9176
Email: harald.spahn@web.de

WMO

Mr Edgard CABRERA
Chief, Marine Meteorology and Ocean Affairs Division
World Meteorological Organization
7bis, avenue de la Paix
Case Postale 2300
1211 Geneva
Switzerland
Tel: +41 22 730 82 37
Fax: +41 22 730 81 28
Email: ecabrera@wmo.int

WMO/ESCAP PTC

Mr Arif Mahmood RANA
WMO/ESCAP Panel on Tropical Cyclones (PTC) Secretariat, Meteorological Complex
Islamabad-44000
Pakistan
Tel: 0092 51 9250591
Fax: 0092 51 9250368
Email: dgpakmet@gmail.com

Other Observers

GERMANY

Malte GIESENOW
Germany
Email: malte.giesenow@rwth-aachen.de

Dr Peter KOLTERMANN
Prof, Leading Scientist, Former Head of Section, Tsunami Unit (Ret.)
Faculty of Geography, Moscow State University, Moscow, Russia
Bockhorst 129
22589 Hamburg
Germany
Tel: +49-40-806352
Email: peter.koltermann@gmail.com

Iuliia SHUSTIKOVA
Germany
Email: iuliiashustikova@gmail.com

Dr Bernd WEBER
CEO; Scientist
gempa GmbH
Telegrafenberg C4
14473 Potsdam
Brandenburg
Germany
Tel: +493312881929
Email: weber@gempa.de

INDONESIA

Dr MUZLI
Reseacher
Indonesian Meteorogical Climatological and Geophysical Agency
Jl. Angakasa I No. 2
Kemayoran 10720
Jakarta
Indonesia
Tel: +6281291339533
Fax: +62216546316
Email: muzli@bmkg.go.id

Henny VIDIARINA
National Adviser
German International Cooperation (GIZ)
Deutsche Gesellschaft für Technische Zusammenarbeit
Menara BCA 46th floor
Jl.M.H.Thamrin No 1
Jakarta 10310
Indonesia

Tel: +62 (0) 812 105 1272
Fax: +62 (0) 21 2358 7570
Email: gidrm-id@giz.de

Rahmi YUNITA
Freelance Consultant
Freelance Consultant
Jln. Johar 2A 3rd Fl. Menteng
Jakarta 10350
DKI Jakarta
Indonesia
Tel: +62 (0)21 3149046
Fax: +62 (0)21 3106894
Email: rahmi.yunita@gmail.com

OMAN

Lieutenant-Colonel Faisal AL-HAJARI
National Committee for Civil Defense
Oman
Email: nccdom@yahoo.com

Khalid Ahmed AL-WAHAIBI
Directorate General of Meteorology & Air Navigation
P.O. Box 1,
P.C. 111,
Muscat
Oman
Email: k.alwahaibi@met.gov.om

Maysaa AMBUSAIDI
National Committee for Civil Defence
Oman
Email: maysa.ambusaidi@gmail.com

PAKISTAN

Dr Haider HASAN
Associate Professor
NED University of Engineering and Technology
University Rd
Karachi-75270
Pakistan
Tel: +922199261261
Email: hhasan@neduet.edu.pk

Dr Din Muhammad KAKAR
Professor
University of Balochistan
Department of Geology
Quetta
Pakistan
Email: dinkakar@yahoo.co.uk

Dr Akhtar KASSI
Professor
Department of Geology, University of Balochistan
Sariab Road
Quetta-Pakistan
Balochistan
Pakistan
Tel: +923218029105
Fax: +92819211323
Email: amkcem@yahoo.com

Mr Sahibzad KHAN
Director
Pakistan Meteorological Department
Regional Meteorological Centre
46 Jail Road
Lahore-54000
Punjab
Pakistan
Tel: 00924237420056
Fax: 00924237423728
Email: sahibzad@gmail.com

Ms Hira LODHI
Lecturer
NED University of Engineering and Technology
University Rd
Karachi-75270
Pakistan
Tel: +923342272379
Email: hiralodi@neduet.edu.pk

Ms Ghazala NAEEM
Consultant
Islamabad
Pakistan
Email: ghazala_ghq@hotmail.com

Mr Abdullah USMAN
District Coordinator
Gwadar Disaster Management Authority
Gwadar
Pakistan
Email: abdullahgwadari@yahoo.com

PHILLIPPINES

Bastian SCHNEIDER
Philippines
Email: Bastian.Schneider@rwth-aachen.de

UNITED STATES

Dr Brian ATWATER
U.S. Geological Survey at Department of Earth and Space Sciences University of Washington
U.S. Geological Survey at Department of Earth and Space Sciences University of Washington
Box 351310
Seattle Washington WA 98195-1310
United States
Tel: 206-553-2927
Fax: 206-553-8350
Email: atwater@usgs.gov

IOC Secretariat

Dr Thorkild AARUP
Head (a.i.) Tsunami Unit, Technical Secretary of GLOSS
Intergovernmental Oceanographic Commission of UNESCO
7, place de Fontenoy
75732 Paris cedex 07
France
Tel: +33 1 45 68 40 19
Fax: +33 1 45 68 58 12
Email: t.aarup@unesco.org

Mr Tony ELLIOTT
Head of ICG/IOTWS Secretariat, Senior Programme Specialist
Intergovernmental Oceanographic Commission of UNESCO
IOC/UNESCO Perth Programme Office
c/o Bureau of Meteorology
PO Box 1370, West Perth
1100 Hay Street
Perth WA 6872
Australia
Tel: +61 8 9226 0191
Fax: +61 8 9226 0599
Email: t.elliott@unesco.org

Dr FAUZI
Programme Specialist
UNESCO IOC Oman
Directorate General of Meteorology and Air Navigation
Muscat
Oman
Email: f.fauzi@unesco.org

Ms Nora GALE
Assistant Programme Specialist
Intergovernmental Oceanographic Commission of UNESCO
IOC/UNESCO Perth Regional Programme Office
c/o Bureau of Meteorology
PO Box 1370, West Perth
1 Ord Street
Perth WA 6872
Australia
Tel: +61-8-9321 9976
Fax: +61-8-9226 0599
Email: n.gale@unesco.org

Mr Ardito M. KODIJAT
Head of the Indian Ocean Tsunami Information Centre
UNESCO Office Jakarta
Jl. Galuh II no 5
Kebayoran Baru
Jakarta Selatan 12110
DKI
Indonesia
Tel: +62-21-7399818 Ext 878
Fax: +62-21-72796489
Email: a.kodijat@unesco.org

Mr. Vladimir RYABININ
IOC Executive Secretary
Intergovernmental Oceanographic Commission of UNESCO
7, place de Fontenoy
75732 Paris cedex 07
FranceEmail: v.ryabinin@unesco.org

ANNEX XI

LIST OF ACRONYMS

DMO	Disaster Management Organization
GLOSS	Global Sea-Level Observing System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ICG	Intergovernmental Coordination Group
ICG/CARIBE-EWS	Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System
IN-MHEWS	International Network for Multi Hazard Early Warning Systems
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IOTIC	Indian Ocean Tsunami Information Centre
IOTWS	Indian Ocean Tsunami Warning and Mitigation System
IOWave	Exercise Indian Ocean Wave
KPIs	Key Performance Indicators
NEAMTWS	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas
NTWC	National Tsunami Warning Centre
RIMES	Regional Integrated Multi-hazard Early Warning System
PTC	Panel on Tropical Cyclones
SOPs	Standard Operating Procedures
TNC	Tsunami National Contact
ToRs	Terms of Reference
TOWS-WG	Working Group on Tsunami and Other Hazards Related to Sea-Level Warning and Mitigation Systems (IOC)
TSP	Tsunami Service Provider
TT	Task Team

UNESCAP	Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
WG	Working Group
WMO	World Meteorological Organization

In this Series *Languages*

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2.	Seventeenth Session of the Executive Council	E , F, S, R,Ar
3.	Fourth Session of the Working Committee for Training, Education and Mutual Assistance	E, F, S, R
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5.	First Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions	E, F, S
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10.	Tenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific	
11.	Nineteenth Session of the Executive Council, Paris, 1986	E, F, S, R, Ar
12.	Sixth Session of the IOC Scientific Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S
13.	Twelfth Session of the IOC Working Committee on International Oceanographic Data Exchange	E, F, S, R
14.	Second Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Havana, 1986	E, F, S
15.	First Session of the IOC Regional Committee for the Central Eastern Atlantic, Praia, 1987	E, F, S
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19.	Fifth Session of the IOC Regional Committee for the Southern Ocean	E, F, S, R
20.	Eleventh Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Beijing, 1987	E, F, S, R
21.	Second Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Arusha, 1987	E, F
22.	Fourth Session of the IOC Regional Committee for the Western Pacific, Bangkok, 1987	E only
23.	Twenty-first Session of the Executive Council, Paris, 1988	E, F, S, R
24.	Twenty-second Session of the Executive Council, Paris, 1989	E, F, S, R
25.	Fifteenth Session of the Assembly, Paris, 1989	E, F, S, R
26.	Third Session of the IOC Committee on Ocean Processes and Climate, Paris, 1989	E, F, S, R
27.	Twelfth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Novosibirski, 1989	E, F, S, R
28.	Third Session of the Sub-Commission for the Caribbean and Adjacent Regions, Caracas, 1989	E, S
29.	First Session of the IOC Sub-Commission for the Western Pacific, Hangzhou, 1990	E only
30.	Fifth Session of the IOC Regional Committee for the Western Pacific, Hangzhou, 1990	E only
31.	Twenty-third Session of the Executive Council, Paris, 1990	E, F, S, R
32.	Thirteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, New York, 1990	E only
33.	Seventh Session of the IOC Committee for the Global Investigation of Pollution in the Marine Environment, Paris, 1991	E, F, S, R
34.	Fifth Session of the IOC Committee for Training, Education and Mutual Assistance in Marine Sciences, Paris, 1991	E, F, S, R
35.	Fourth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1991	E, F, S, R
36.	Twenty-fourth Session of the Executive Council, Paris, 1991	E, F, S, R
37.	Sixteenth Session of the Assembly, Paris, 1991	E, F, S, R, Ar
38.	Thirteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Baja California, 1991	E, F, S, R
39.	Second Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1992	E only
40.	Twenty-fifth Session of the Executive Council, Paris, 1992	E, F, S, R
41.	Fifth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1992	E, F, S, R
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43.	First Session of the Joint IOC-UNEP Intergovernmental Panel for the Global Investigation of Pollution in the Marine Environment, Paris, 1992	E, F, S, R
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47.	Second Session of the IOC Sub-Commission for the Western Pacific, Bangkok, 1993	E only
48.	Fourth Session of the IOC Sub-Cornmission for the Caribbean and Adjacent Regions, Veracruz, 1992	E, S
49.	Third Session of the IOC Regional Committee for the Central Eastern Atlantic, Dakar, 1993	E, F
50.	First Session of the IOC Committee for the Global Ocean Observing System, Paris, 1993	E, F, S, R
51.	Twenty-sixth Session of the Executive Council, Paris, 1993	E, F, S, R
52.	Seventeenth Session of the Assembly, Paris, 1993	E, F, S, R
53.	Fourteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Tokyo, 1993	E, F, S, R
54.	Second Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1993	E, F, S
55.	Twenty-seventh Session of the Executive Council, Paris, 1994	E, F, S, R
56.	First Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Melbourne, 1994	E, F, S, R
57.	Eighth Session of the IOC-UNEP-IMO Committee for the Global Investigation of Pollution in the Marine Environment, San José, Costa Rica, 1994	E, F, S
58.	Twenty-eighth Session of the Executive Council, Paris, 1995	E, F, S, R
59.	Eighteenth Session of the Assembly, Paris, 1995	E, F, S, R
60.	Second Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E, F, S, R

61.	Third Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1995	E only
62.	Fifteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Papetee, 1995	E, F, S, R
63.	Third Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1995	E, F, S
64.	Fifteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange	E, F, S, R
65.	Second Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E only
66.	Third Session of the IOC Sub-Commission for the Western Pacific, Tokyo, 1996	E only
67.	Fifth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Christ Church, 1995	E, S
68.	Intergovernmental Meeting on the IOC Black Sea Regional Programme in Marine Sciences and Services	E, R
69.	Fourth Session of the IOC Regional Committee for the Central Eastern Atlantic, Las Palmas, 1995	E, F, S
70.	Twenty-ninth Session of the Executive Council, Paris, 1996	E, F, S, R
71.	Sixth Session for the IOC Regional Committee for the Southern Ocean and the First Southern Ocean Forum, Bremerhaven, 1996	E, F, S,
72.	IOC Black Sea Regional Committee, First Session, Varna, 1996	E, R
73.	IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Fourth Session, Mombasa, 1997	E, F
74.	Nineteenth Session of the Assembly, Paris, 1997	E, F, S, R
75.	Third Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1997	E, F, S, R
76.	Thirtieth Session of the Executive Council, Paris, 1997	E, F, S, R
77.	Second Session of the IOC Regional Committee for the Central Indian Ocean, Goa, 1996	E only
78.	Sixteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Lima, 1997	E, F, S, R
79.	Thirty-first Session of the Executive Council, Paris, 1998	E, F, S, R
80.	Thirty-second Session of the Executive Council, Paris, 1999	E, F, S, R
81.	Second Session of the IOC Black Sea Regional Committee, Istanbul, 1999	E only
82.	Twentieth Session of the Assembly, Paris, 1999	E, F, S, R
83.	Fourth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1999	E, F, S, R
84.	Seventeenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Seoul, 1999	E, F, S, R
85.	Fourth Session of the IOC Sub-Commission for the Western Pacific, Seoul, 1999	E only
86.	Thirty-third Session of the Executive Council, Paris, 2000	E, F, S, R
87.	Thirty-fourth Session of the Executive Council, Paris, 2001	E, F, S, R
88.	Extraordinary Session of the Executive Council, Paris, 2001	E, F, S, R
89.	Sixth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, San José, 1999	E only
90.	Twenty-first Session of the Assembly, Paris, 2001	E, F, S, R
91.	Thirty-fifth Session of the Executive Council, Paris, 2002	E, F, S, R
92.	Sixteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Lisbon, 2000	E, F, S, R
93.	Eighteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Cartagena, 2001	E, F, S, R
94.	Fifth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2001	E, F, S, R
95.	Seventh Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Mexico, 2002	E, S
96.	Fifth Session of the IOC Sub-Commission for the Western Pacific, Australia, 2002	E only
97.	Thirty-sixth Session of the Executive Council, Paris, 2003	E, F, S, R
98.	Twenty-second Session of the Assembly, Paris, 2003	E, F, S, R
99.	Fifth Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Kenya, 2002 (* Executive Summary available separately in E, F, S & R)	E*
100.	Sixth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, St. Petersburg (USA), 2002 (* Executive Summary available separately in E, F, S & R)	E*
101.	Seventeenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
102.	Sixth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
103.	Nineteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Wellington, New Zealand, 2003 (* Executive Summary available separately in E, F, S & R)	E*
104.	Third Session of the IOC Regional Committee for the Central Indian Ocean, Tehran, Islamic Republic of Iran, 21-23 February 2000	E only
105.	Thirty-seventh Session of the Executive Council, Paris, 2004	E, F, S, R
106.	Seventh Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2005 (* Executive Summary available separately in E, F, S & R); and Extraordinary Session, Paris, 20 June 2005	E*
107.	First Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Perth, Australia, 3–5 August 2005	E only
108.	Twentieth Session of the Intergovernmental Coordination Group for the Tsunami Warning System in the Pacific, Viña del Mar, Chile, 3–7 October 2005 (* Executive Summary available separately in E, F, S & R)	E*
109.	Twenty-Third Session of the Assembly, Paris, 21–30 June 2005	E, F, S, R
110.	First Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Rome, Italy, 21–22 November 2005	E only
111.	Eighth Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Recife, Brazil, 14–17 April 2004 (* Executive Summary available separately in E, F, S & R)	E*
112.	First Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions (ICG/CARIBE-EWS), Bridgetown, Barbados, 10–12 January 2006	E only
113.	Ninth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Cartagena de Indias, Colombia, 19–22 April 2006 (* Executive Summary available separately in E, F, S & R)	E S*

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114.	Second Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Hyderabad, India, 14–16 December 2005	E only
115.	Second Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology, Halifax, Canada, 19–27 September 2005 (Abridged final report with resolutions and recommendations)	E, F, R, S
116.	Sixth Session of the IOC Regional Committee for the Western Indian Ocean (IOCWIO), Maputo, Mozambique, 2–4 November 2005 (* Executive Summary available separately in E, F, S & R)	E*
117.	Fourth Session of the IOC Regional Committee for the Central Indian Ocean, Colombo, Sri Lanka 8–10 December 2005 (* Executive Summary available separately in E, F, S & R)	E*
118.	Thirty-eighth Session of the Executive Council, Paris, 20 June 2005 (Electronic copy only)	E, F, R, S
119.	Thirty-ninth Session of the Executive Council, Paris, 21–28 June 2006	E, F, R, S
120.	Third Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Bali, Indonesia, 31 July–2 August 2006 (*Executive Summary available separately in E,F,S & R)	E*
121.	Second Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Nice, France, 22–24 May 2006	E only
122.	Seventh Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 16–18 March 2005 (* Executive Summary available separately in E, F, S & R)	E*
123.	Fourth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-IV), Mombasa, Kenya, 30 February-2 March 2007 (* Executive Summary available separately in E, F, S & R)	E*
124.	Nineteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Trieste, Italy, 12–16 March 2007 (* Executive Summary available separately in E, F, S & R)	E*
125.	Third Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Bonn, Germany, 7–9 February 2007 (* Executive Summary available separately in E, F, S & R)	E*
126.	Second Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Cumaná, Venezuela, 15–19 January 2007 (* Executive Summary available separately in E, F, S & R)	E*
127.	Twenty-first Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Melbourne, Australia, 3–5 May 2006 (* Executive Summary available separately in E, F, S & R)	E*
128.	Twenty-fourth Session of the Assembly, Paris, 19–28 June 2007	E, F, S, R
129.	Fourth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Lisbon, Portugal, 21–23 November 2007 (* Executive Summary available separately in E, F, S & R)	E*
130.	Twenty-second Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Guayaquil, Ecuador, 17–21 September 2007 (* Executive Summary available in E, F, S & R included)	E*
131.	Forty-first Session of the Executive Council, Paris, 24 June–1 July 2008	E, F, R, S
132.	Third Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Panama City, Panama, 12–14 March 2008 (* Executive Summary available separately in E, F, S & R)	E*
133.	Eighth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 17–20 April 2007 (* Executive Summary available separately in E, F, S & R)	E*
134.	Twenty-third Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Apia, Samoa, 16–18 February 2009 (*Executive Summary available separately in E, F, S & R)	E*
135.	Twentieth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Beijing, China, 4–8 May 2009 (*Executive Summary available separately in E, F, S & R)	E*
136.	Tenth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Puerto La Cruz, Bolivarian Republic of Venezuela, 22–25 October 2008 (*Executive Summary available separately in E, F, S & R)	E, S*
137.	Seventh Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VII), Sabah, Malaysia, 26–29 May 2008 (*Executive Summary available separately in E, F, S & R)	E*
138.	Ninth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, France, 10–12 June 2009 (* Executive Summary available separately in E, F, S & R);	E*
139.	Fifth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Athens, Greece, 3–5 November 2008 (* Executive Summary available separately in E, F, S & R)	E*
140.	Fourth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Fort-de-France, Martinique, France, 2–4 June 2009 (* Executive Summary available separately in E, F, S & R)	E*
141.	Twenty-fifth Session of the Assembly, Paris, 16–25 June 2009	E, F, R, S
142.	Third Session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology, Marrakesh, Morocco, 4–11 November 2009	E, F, R, S
143.	Ninth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 22–24 April 2009 (* Executive Summary available separately in E, F, S & R)	E*
144.	Fifth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Managua, Nicaragua, 15–17 March 2010 (* Executive Summary available in E, F, S & R)	E*
145.	Sixth Session of the IOC Regional Committee for the Central and Eastern Atlantic Ocean, Accra, Ghana, 28–30 March 2010 (* Executive Summary available in E, F, S & R)	E*
146.	Forty-second Session of the Executive Council; Paris, 15, 19 & 20 June 2009	E, F, R, S
147.	Forty-third Session of the Executive Council; Paris, 8–16 June 2010	E, F, R, S
148.	Sixth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Istanbul, Turkey, 11–13 November 2009 (* Executive Summary available separately in Ar, E, F, S & R)	E*
149.	Seventh Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Paris, France, 23–25 November 2010 (* Executive Summary available separately in Ar, E, F, S & R)	E*
150.	Sixth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Santo Domingo, Dominican Republic, 26–29 April 2011 (* Executive Summary available in E, F, S & R)	E*

151.	Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Beijing, China, 24–27 May 2011 (*Executive Summary in E, F, S & R included)	E*
152.	Twenty-first Session of the IOC Committee on International Oceanographic Data and Information Exchange, Liège, Belgium, 23–26 March 2011 (*Executive Summary available separately in E, F, S & R)	E*
153.	Eighth Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VIII), Bali, Indonesia, 10–13 May 2010 (*Executive Summary available separately in E, F, S & R)	E*
154.	Tenth IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 12–14 April 2011 (* Executive Summary available separately in E, F, S & R)	E*
155.	Forty-fifth Session of the Executive Council, Paris, 26–28 June 2012 (* Decisions available in E, F, S & R)	E*
156.	Seventh Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Willemstad, Curacao, 2–4 April 2012 (*Executive Summary available in E, F, S & R)	E*
157.	Eleventh Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Miami, USA, 17–20 May 2011 (*Executive Summary available separately in E & S)	E, S*
158.	Eight Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-VIII), Trinidad & Tobago, 29 April–1 May 2013 (*Executive Summary available in E, F, S & R)	E*
159.	Twenty-seventh Session of the Assembly, Paris, 26 June–5 July 2013 and Forty-sixth Session of the Executive Council, Paris, 25 June 2013	E, F, R, S
160.	Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), Vladivostok, Russian Federation, 9–11 September 2013 (*Executive Summary in E, F & R)	E*
161.	Ninth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions, US Virgin Islands, 13-15 May 2014 (*Executive Summary available in E, F, S & R)	E*
162.	Forty-seventh Session of the Executive Council, Paris, 1–4 July 2014 (* Decisions available in E, F, S & R)	E*
163.	Ninth Session of the IOC Sub-Commission of the Western Pacific (WESTPAC-IX), Busan, Republic of Korea, 9–12 May 2012	E
164.	Eleventh Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, 12–14 November 2014, Nicosia, Cyprus (*Executive Summary available in E, F, S & R)	E*
165.	Twenty-sixth Session of the Intergovernmental Coordination Group for the for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVI), Hawaii, USA, 22–24 April 2015 (*Executive Summary available in E, F, S & R)	E*
166.	Tenth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), Philipsburg, Sint Maarten, Kingdom of the Netherlands, 19–21 May 2015 (*Executive Summary available in E, F, S & R)	E*
167.	Tenth Session of the IOC Sub-Commission of the Western Pacific (WESTPAC-X), Phuket, Thailand, 12–15 May 2015	E
168.	Twenty-eighth Session of the Assembly, Paris, 18–25 June 2015	
169.	Twelfth 12th Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS-XII), Dublin, Ireland, 16-18 November 2015 (*Executive Summary available in E, F, S & R)	E*
170.	Eleventh Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-XI), Cartagena, Colombia, 5-7 April 2016 (*Executive Summary available in E, F, S & R)	E*
171.	Tenth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Muscat, Oman, 24–26 March 2015	E*