Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG)

Seventh Meeting
Paris, France
12–13 February 2014
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* This document contains the executive summary in English, French, Spanish and Russian.
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EXECUTIVE SUMMARY

The Seventh Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-VII) was held in Paris, France, on 12 and 13 February 2014, at UNESCO Headquarters, under the chairmanship of Mr Yutaka Michida (IOC Vice-Chair). The meeting evaluated progress in actions and decisions taken by the Governing Bodies, through Resolution XXVI-7, Decision EC-XLV/Dec.3.2, and Decision IOC-XXVII Decision 5.2.2.

The Group noted of the IOC-XXVII Decision 5.2.2 to extend TOWS-WG for the intersessional period (i.e. up to IOC-XXVIII).

The Group noted the progress made by four ICGs during the last inter-sessional period as summarized in this report.

The Group accepted the recommendations from the Task Team on Disaster Management and Preparedness and requested the Task Team to implement them, in particular:

- Publish a Standard Operating Manual.
- Initiate development of a document containing (i) reference list of tsunami evacuation mapping material, and (ii) a template for comprehensive mapping guidelines.
- Promote education and awareness strategies as well as accredited community preparedness programmes as exampled in the CARIBE-EWS.
- Contribute to the development of tsunami guidance for tourism industry.
- Finalize and publish the Post-Event Performance Survey.
- Underline the role of Tsunami Information Centres (TICs) have in the management of post event performance surveys, and requested that ICGs provide for appropriate resourcing and mandate of their TICs to be able to perform this function.

The Group accepted the recommendations from the Task Team on Tsunami Watch Operations in particular:

- The maps describing (i) 'Existing services of the global tsunami warning system as of Date' and detailing coverage and service provision; and (ii) Earthquake source zone monitoring areas for each of the warning systems.
- A generic naming convention for ICG tsunami service providers be as follows:
  - CARIBE-EWS Tsunami Service Provider (CARIBE-EWS-TSP)
  - IOTWS Tsunami Service Provider (IOTWS-TSP)
  - NEAMTWS Tsunami Service Provider (NEAMTWS-TSP)
  - PTWS Tsunami Service Provider (PTWS-TSP)
- The procedures and guidelines for ICG-TSPs issuing and disseminating tsunami bulletins for earthquakes outside their respective ICG coverage.
- That the Chair of TOWS-WG will communicate with and request the Executive
Secretary of IOC (i) to contact UN-OCHA and WMO to express concern of the Group about the confusion that the GDACS tsunami alert products creates vis-à-vis with the products issued by the ICG-TSPs, and (ii) to seek clarification about the scope, methodology, purpose and intended users of the GDACS service.

- That Rick Bailey (Chair ICG/IOTWS) and Srinivas Kumar (Chair of Task Team Tsunami Watch Operations) develop a Global Tsunami Services Definition document be developed based on agreed concepts and guidelines as informed by the Task Team report to TOWS-WG-IV, and report on the development to the TOWS-VIII.

- That ICG-TSPs adapt their bulletins to clearly define water levels, tsunami arrival times and the method/terminology in order to avoid confusion and achieve more harmonized products.

The group accepted the recommendations and proposed approach by Task Team on Hazard Assessment Related to Highest Potential Tsunami Source Areas and requested the Task Team in collaboration with the IOC Secretariat to continue the planning and preparations for the envisioned workshop “Assessing Earthquake triggered Tsunami Potential”. The Group noted the importance of the scientific outcome from the workshop and that it could provide valuable input to the work of the two other Task Teams.

The Group requested the Chair of the Inter-ICG Task Team on Tsunami Watch Operations to communicate with the Executive Secretary of IOC and request her to inform IMO, IHO, WMO on what tsunami products are available and seek feedback on requirements and better ways of disseminating tsunami threat information to maritime community.

The Group agreed that the work on an ‘Outreach and Communications Plan for the IOC Tsunami Programme’ should be continued and finalized as a working document by 1 May 2014 (Chairs of ICG, and TIC representatives and chaired by ICG/IOTWS Chair).

- The Group acknowledged the need for harmonization of terminology across the ICGs. For definitions of National Tsunami Warning Centre (NTWC) and Tsunami Warning Focal Point (TWFP) the Group recognised, based on the development experience since 2005 of CARIBE-EWS, IOTWS and NEAMTWS and the enhancement of PTWS, that (i) the number of NTWCs has significantly increased, and (ii) it is critically important that tsunami bulletins are sent to the appropriate points of contact. To that effect the Group recommends to update definitions for TWFP and NTWC to read 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 Operation Procedures.

  - Tsunami Warning Focal Point (TWFP). A 24 x 7 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 Standard Operation Procedures. The TWFP may or not be the NTWC.

Pending approval of the recommendations the Group requests the corresponding updates to reflect the recommended definitions.

The Group noted the need for advocacy of the tsunami hazard in the context of Disaster Risk Reduction in the build-up to the third UNISDR World Conference of Disaster Risk
Reduction (14–18 March 2015, Sendai, Japan) and that the IOC should call upon the IOC and UNESCO’s collective capacity and structures in this regard.

The group also noted that a number of events will take place over the next 18 months and encouraged high level visibility of the IOC tsunami program, for example:

- The ten year commemoration of the 2004 Indian Ocean tsunami.
- The fifty year anniversary for the establishment of the PTWS.
- The ten year anniversary for the establishment of ICG/CARIBE-EWS, ICG/IOTWS, and ICG/NEAMTWS.
- The launch of the Oman National Multi Hazard Early Warning System and associated high level scientific conference (Muscat, Oman, December 2014)
- Third UN International Conference on Small Island Developing States (1–4 September 2014, Apia, Samoa)

The Group further noted that the tourist industry plays a large role in the economy of many countries, and effort should be made by the ICGs and TICs to engage with regional tourist organisations.

The Group recognized that the current financial situation strongly limits the implementation of the tasks of the Group, ICGs and Inter-ICG Task Teams and strongly urged the Member States to increase their extra-budgetary contributions to the IOC to provide the needed resources for the priorities identified by TOWS-WG and ICGs.

The Group endorsed the Post-Tsunami Field Survey Guide (2nd edition) and recommended that it be published.

The Group nominated Rick Bailey to be TOWS WG contact point for the JCOMM ETWCH and requested the secretariat to inform the JCOMM co-presidents.

The Group requested the Secretariat to continue to report on the performance and membership of the IOC Tsunami mail list server, and requested that the legal disclaimer be revised so it does not include wording on “warnings”.
RESUMÉ EXÉCUTIF

La septième réunion du Groupe de travail sur les systèmes d'alerte aux tsunamis et aux autres aléas liés au niveau de la mer, et de mitigation (TOWS-WG) s’est tenue à Paris, France, les 12 et 13 février 2014, au Siège de l’UNESCO, sous la présidence de M. Yutaka Michida (Vice-Président de la COI). Les participants à la réunion ont évalué les progrès accomplis relatifs aux actions menées et aux décisions prises par les organes directeurs, par le biais de la résolution XXVI-7 et des décisions EC-XLV/3.2 et IOC-XXVII/5.2.2.

Le Groupe a pris note de la décision IOC-XXVII/5.2.2 de maintenir le TOWS-WG pour la durée de l'intersession (c'est-à-dire jusqu'à la 28e session de l'Assemblée, IOC-XXVIII).

Le Groupe a pris acte des progrès accomplis par quatre GIC pendant la dernière intersession, dont la synthèse figure dans le présent rapport.

Le Groupe a accepté les recommandations de l’Équipe spéciale sur la gestion et la préparation en cas de catastrophe et a prié cette dernière de les mettre en œuvre, en particulier :

- de publier un manuel des procédures opérationnelles normalisées ;
- d’amorcer l’élaboration d’un document contenant (i) une liste de référence des matériels utiles à la cartographie des voies d’évacuation en cas de tsunami et (ii) un modèle de directives de cartographie globale ;
- de promouvoir des stratégies d’éducation et de sensibilisation ainsi que des programmes agréés de préparation des populations aux tsunamis à l’exemple de CARIBE-EWS ;
- de participer à l’élaboration de conseils sur les tsunamis à l’intention de l’industrie du tourisme ;
- de finaliser et publier l’étude de performances post-événement.
- de mettre en lumière le rôle des centres d’information sur les tsunamis dans la gestion des études de performances post-événement et a demandé que les GIC fournissent à leurs centres d'information sur les tsunamis les ressources et le mandat nécessaires pour remplir cette fonction.

Le Groupe a accepté les recommandations de l’Équipe spéciale sur les opérations de veille aux tsunamis, en particulier :

- les cartes décrivant (i) « les services du système mondial d’alerte aux tsunamis mis en place à ce jour » et présentant le détail de la couverture et des services fournis ; et (ii) les zones de surveillance des foyers de séismes pour chacun des systèmes d’alerte ;
- la convention ci-après de dénomination générique des prestataires de services des GIC pour les tsunamis :
  - Prestataire de services relatifs aux tsunamis pour CARIBE-EWS (CARIBE-EWS-TSP)
  - Prestataire de services relatifs aux tsunamis pour IOTWS (IOTWS-TSP)
  - Prestataire de services relatifs aux tsunamis pour NEAMTWS (NEAMTWS-TSP)
  - Prestataire de services relatifs aux tsunamis pour PTWS (PTWS-TSP)
- les procédures et directives destinées aux GIC-TSP qui émettent et diffusent des avis...
de tsunami pour des séismes survenus hors de la zone couverte par leurs GIC respectifs ;

- que le Président du TOWS-WG communique avec la Secrétaire exécutive de la COI et la prie (i) de prendre contact avec le Bureau de la coordination des affaires humanitaires des Nations Unies et l’OMM pour leur faire part de la préoccupation du Groupe à propos de la confusion que créent les produits d’alerte aux tsunamis du système d’alerte mondial sur les catastrophes (GDACS) par rapport à ceux des prestataires de services des GIC et (ii) de demander des éclaircissements concernant la portée, la méthode, l’objet et les utilisateurs visés du service du GDACS ;

- que Rick Bailey (Président du GIC/IOTWS) et Srinivas Kumar (Président de l’Équipe spéciale pour les opérations de veille aux tsunamis) élaborent un document de définition des services mondiaux relatifs aux tsunamis sur la base de concepts et directives convenus, tels qu’énoncés dans le rapport de l’Équipe spéciale à TOWS-WG-IV, et fassent rapport sur son état d’avancement à la huitième session du TOWS-WG (TOWS-WG-VIII) ;

- que les prestataires de services des GIC adaptent leurs avis afin de définir clairement les niveaux d’eau, les heures d’arrivée des tsunamis et la méthode/terminologie afin d’éviter toute confusion et de fournir des produits mieux harmonisés.

Le Groupe a accepté les recommandations et l’approche proposée par l’Équipe spéciale sur l’évaluation des aléas dans les régions les plus exposées au risque de tsunami et demandé que cette dernière, en collaboration avec le Secrétariat de la COI, poursuive la planification et les préparatifs de l’atelier envisagé, sous l’intitulé « Évaluation du risque de tsunami déclenché par un séisme ». Le Groupe a noté l’importance des conclusions scientifiques de l’atelier et noté que celles-ci pourraient constituer une contribution précieuse aux travaux des deux autres équipes spéciales.

Le Groupe a demandé au Président de l’Équipe spéciale inter-GIC sur les opérations de veille aux tsunamis de communiquer avec la Secrétaire exécutive de la COI et de la prier d’informer l’OMI, l’OHI et l’OMM sur les produits relatifs aux tsunamis disponibles ainsi que d’obtenir d’eux des informations sur leurs besoins et sur les meilleurs moyens de diffuser les informations sur les risques de tsunami dans la communauté maritime.

Le Groupe est convenu que le travail sur un « plan de communication et de sensibilisation pour le Programme relatif aux tsunamis de la COI » doit être poursuivi et finalisé sous la forme d’un document de travail avant le 1er mai 2014 (Présidents des GIC et représentants des centres d’information sur les tsunamis, sous la présidence du Président du GIC/IOTWS).

Le Groupe a reconnu la nécessité d’harmoniser la terminologie entre les différents GIC. Pour les définitions des Centres nationaux d’alerte aux tsunamis (NTWC) et des Points focaux pour l’alerte aux Tsunamis (TWFP), le Groupe a noté, en se fondant sur l’expérience du développement depuis 2005, de CARIBE-EWS, IOTWS et NEAMTWS et l’amélioration de PTWS, que (i) le nombre de NTWC a sensiblement augmenté et (ii) qu’il est d’une importance cruciale que les avis de tsunami soient envoyés aux points de contact adéquats. À cette fin, le Groupe recommande d’actualiser comme suit les définitions des TWFP et NTWC :

- Centre national d’alerte aux tsunamis (NTWC) : centre officiellement désigné par les pouvoirs publics pour surveiller les tsunamis et émettre dans leur pays des alertes et autres communiqués correspondants, conformément aux procédures opérationnelles nationales normalisées.

- Point focal pour l’alerte aux tsunamis (TWFP) : point de contact opérationnel 24
heures sur 24 et 7 jours sur 7 (bureau, unité ou poste opérationnel, pas une personne) officiellement désigné par le NTWC ou les pouvoirs publics pour recevoir et diffuser des informations relatives aux tsunamis émanant d’un prestataire de services des GIC pour les tsunamis, conformément aux procédures opérationnelles nationales normalisées. Le TWFP peut être ou non le NTWC.

Dans l’attente de l’approbation des recommandations, le **Groupe demande** que les mises à jour correspondantes soient effectuées conformément aux définitions recommandées.

**Le Groupe a noté** le besoin de plaidoyer concernant les risques de tsunami dans le cadre de la réduction des risques de catastrophe, en prévision de la troisième conférence de l’UNISDR sur la réduction des risques de catastrophe (14–18 mars 2015, Sendai, Japon) et a encouragé la COI à faire appel à la capacité et aux structures collectives de la Commission et de l’UNESCO à cet égard.

**Le Groupe a également noté** qu’un certain nombre de manifestations vont avoir lieu aux cours des 18 prochains mois et encouragé une meilleure visibilité du programme de la COI relatif aux tsunamis, par exemple :

- Le dixième anniversaire du tsunami de 2004 dans l’océan Indien.
- Le cinquantième anniversaire de la création du PTWS.
- Le dixième anniversaire de la création du GIC/CARIBE-EWS, du GIC/IOTWS et du GIC/NEAMTW.
- La mise en service du système national d’alerte rapide multi-aléas d’Oman et l’ouverture de la conférence scientifique de haut niveau associée (Mascate, Oman, décembre 2014).

**Le Groupe a noté en outre** que l’industrie du tourisme joue un rôle majeur dans l’économie de nombreux pays et encouragé les GIC et les centres d’information sur les tsunamis à nouer le dialogue avec des organisations touristiques régionales.

**Le Groupe a reconnu** que la situation financière actuelle limite considérablement la mise en œuvre de ses activités ainsi que des activités des GIC et des équipes spéciales inter-GIC et a **vigoureusement exhorté** les États membres à augmenter leurs contributions extrabudgétaires à la COI afin de fournir les ressources nécessaires aux priorités identifiées par le TOWS-WG et les GIC.

**Le Groupe a approuvé** le Guide des études de terrain consécutives aux tsunamis (2e édition) et recommandé sa publication.

**Le Groupe a désigné** Rick Bailey comme point de contact du TOWS-WG pour l’Équipe d’experts pour les systèmes de prévision des vagues et des risques côtiers (ETWCH) de la JCOMM et a prié le Secrétariat d’informer les coprésidents de la JCOMM.

**Le Groupe a demandé** au Secrétariat de continuer à faire rapport sur les performances du serveur de la liste de diffusion de la COI sur les tsunamis ainsi que sur les membres de cette liste et a demandé que l’avis de non-responsabilité juridique soit révisé de sorte que le terme « alertes » en soit supprimé.
RESUMEN DISPOSITIVO

La séptima reunión 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-VII) se celebró en París (Francia) los días 12 y 13 de febrero de 2014, en la Sede de la UNESCO, bajo la presidencia del Sr. Yutaka Michida (Vicepresidente de la COI). En la reunión se pasó revista a los avances relativos a las medidas y decisiones adoptadas por los órganos rectores, particularmente por medio de la Resolución XXVI-7 y las Decisiones EC-XLV/3.2 e IOC-XXVII/5.2.2.

El Grupo tomó nota de la Decisión IOC-XXVII/5.2.2 en virtud de la cual se prorroga el TOWS-WG por el periodo entre reuniones (es decir hasta la 28ª reunión de la Asamblea de la COI).

El Grupo tomó nota de los avances realizados por cuatro ICG durante el último periodo entre reuniones, que se resumen en el presente informe.

El Grupo aceptó las recomendaciones formuladas por el Equipo de Trabajo sobre Gestión de Desastres y Preparación y le pidió que las aplicara, en particular que:

- publicara un manual de procedimientos estándar;
- comenzara a preparar un documento que incluyera: i) una lista de referencia de material cartográfico para la evacuación en caso de tsunami; y ii) un modelo de directrices de cartografía de carácter global;
- promoviera estrategias de enseñanza y sensibilización, así como programas acreditados de preparación de las comunidades para los casos de tsunami, siguiendo el ejemplo del CARIBE-EWS;
- contribuyera a elaborar orientaciones sobre los tsunamis para el sector del turismo;
- ultimara y publicara la encuesta de desempeño tras un desastre;
- pusiera de relieve el papel que desempeñan los centros de información sobre tsunamis en la gestión de las encuestas de desempeño tras los desastres; por otra parte, solicitó a los ICG que dotaran a sus centros de información sobre tsunamis de los recursos y los mandatos adecuados para que pudieran cumplir esta función.

El Grupo aceptó las recomendaciones formuladas por el Equipo de Trabajo sobre Actividades de Vigilancia de Tsunami, en especial en lo relativo a:

- los mapas en los que consten: i) “los servicios existentes del sistema mundial de alerta contra los tsunamis hasta la fecha” y se den pormenores sobre la cobertura y prestación de servicios; y ii) las zonas de origen de seísmos vigiladas por cada uno de los sistemas de alerta;
- la siguiente convención genérica de nomenclatura para los proveedores de servicios sobre tsunamis de los ICG:
  o proveedor de servicios sobre tsunamis del CARIBE-EWS (CARIBE-EWS-TSP)
  o proveedor de servicios sobre tsunamis del IOTWS (IOTWS-TSP)
  o proveedor de servicios sobre tsunamis del NEAMTWS (NEAMTWS-TSP)
  o proveedor de servicios sobre tsunamis del PTWS (PTWS-TSP)
• los procedimientos y directrices para los ICG-TSP que elaboran y difunden boletines de tsunamis en relación con seísmos que se producen fuera del ámbito respectivo de sus ICG;

• la presidencia del TOWS-WG, que se pondrá en contacto con la Secretaría Ejecutiva de la COI y le solicitará que: i) contacte a la Oficina de Coordinación de Asuntos Humanitarios de las Naciones Unidas y la OMM para expresar la preocupación del Grupo por la confusión que crean los productos de alerta contra tsunamis del GDACS con respecto a los de los proveedores de servicios de los ICG-TSP; y ii) pida aclaraciones sobre el alcance, la metodología, el objetivo y los usuarios a que se destina el servicio del GDACS;

• el documento de definición de los servicios mundiales sobre tsunamis que Rick Bailey (Presidente del ICG/IOTWS) y Srinivas Kumar (Presidente del Equipo de Trabajo sobre Actividades de Vigilancia de Tsunami) elaborarán sobre la base de conceptos y directrices acordados según se enuncian en el informe del Equipo de Trabajo para la reunión TOWS-WG-IV, acerca de cuyos progresos se informará a la octava reunión del TOWS-WG;

• la adaptación de los avisos de los ICG-TSP con miras a definir claramente los niveles de agua; la hora de llegada del tsunami y la metodología/terminología, a fin de evitar confusiones y lograr productos más armonizados.

El Grupo aceptó las recomendaciones del Equipo de Trabajo sobre la evaluación de riesgos en zonas de alto potencial tsunamigénico y el enfoque propuesto, y le pidió que, en colaboración con la Secretaría de la COI, continuara planificando y preparando el taller previsto “Evaluar el potencial de los tsunamis desencadenados por seísmos”. El Grupo tomó nota de la importancia de los resultados científicos del taller, y de que éste podría brindar una valiosa contribución a la labor de los otros dos Equipos de Trabajo.

El Grupo pidió al Presidente del Equipo de Trabajo de los ICG sobre actividades de vigilancia de tsunamis que se pusiera en contacto con la Secretaria Ejecutiva de la COI y le solicitara que informara a la OMI, la OHI y la OMM sobre los productos relativos a los tsunamis que se encontraban disponibles y recabara información sobre sus necesidades y sobre las maneras más idóneas de difundir a la comunidad marítima información sobre las amenazas de tsunamis.

El Grupo acordó que continuara y se ultimara la labor relativa a un “Plan de sensibilización y comunicación del programa de tsunamis de la COI”, que se plasmaría en un documento de trabajo, a más tardar el 1º de mayo de 2014 (presidentes de los CIG y representantes de los centros de información sobre tsunamis, bajo la presidencia del Presidente del ICG/IOTWS).

El Grupo estuvo de acuerdo en la necesidad de armonizar la terminología entre los distintos ICG. Para las definiciones del Centro nacional de alerta contra los tsunamis (NTWC) y los Puntos focales de alerta contra los tsunamis (TWFP), el Grupo reconoció, basándose en la experiencia de la evolución desde 2005 del CARIBE-EWS, el IOTWS y el NEAMTWS y la mejora del PTWS, que: i) el número de NTWC había aumentado considerablemente; y ii) era de vital importancia que los avisos de tsunamis se enviaran a los puntos de contacto adecuados. Con ese fin, el Grupo recomienda actualizar las definiciones de TWFP y NTWC, que rezarán de la siguiente manera:

• Centro nacional de alerta contra los tsunamis (NTWC): centro designado oficialmente por el gobierno para realizar un seguimiento de las alertas de tsunami y otros comunicados conexos en su país y emitirlos, de acuerdo con los procedimientos operacionales nacionales normalizados;
• Punto focal de alerta contra los tsunamis (TWFP): punto de contacto disponible todos los días del año, 24 horas al día, (oficina, unidad operativa o puesto, pero no una persona) designado oficialmente por el NTWC o el gobierno para recibir y difundir información sobre tsunamis de un proveedor de servicios sobre tsunamis de un ICG, de acuerdo con los procedimientos operacionales nacionales normalizados establecidos. El TWFP no será necesariamente el NTWC.

A la espera de la aprobación de las recomendaciones, el Grupo solicita que las actualizaciones correspondientes reflejen las definiciones recomendadas.

El Grupo tomó nota de la necesidad de sensibilizar acerca del peligro de los tsunamis en el marco de la reducción del riesgo de desastres como parte de los preparativos de la tercera Conferencia mundial de la UNISDR sobre la reducción del riesgo de desastres (14–18 de marzo de 2015, Sendai (Japón)), y de que la COI deberá promover la capacidad y estructuras colectivas de la Comisión y la UNESCO en este sentido.

El Grupo también tomó nota de que en los próximos 18 meses tendría lugar cierto número de eventos, e instó a que se diera la mayor visibilidad posible al programa sobre tsunamis de la COI. Entre los eventos figuran los siguientes:

• el décimo aniversario del tsunami del océano Índico de 2004;
• el quincuagésimo aniversario de la creación del PTWS;
• el décimo aniversario de la creación del ICG/CARIBE-EWS, el ICG/IOTWS y el ICG/NEAMTWS;
• la puesta en marcha del sistema de alerta temprana multirriesgo nacional de Omán y la conferencia científica de alto nivel conexa (Mascate (Omán), diciembre de 2014);
• la tercera Conferencia internacional sobre los Pequeños Estados Insulares en Desarrollo (1–4 de septiembre de 2014, Apia (Samoa)).

El Grupo tomó nota además de que el sector del turismo desempeña un importante papel en la economía de muchos países, y de que los ICG y los centros de información sobre tsunamis debían desplegar esfuerzos orientados a cooperar con organizaciones turísticas regionales.

El Grupo reconoció que la actual situación financiera limita considerablemente la realización de sus tareas y de las de los ICG y los Equipos de Trabajo de los ICG, e instó encarecidamente a los Estados Miembros a que incrementaran sus contribuciones extrapresupuestarias a la COI, con miras a proporcionar los recursos necesarios para atender a las prioridades definidas por el TOWS-WG y los ICG.

El Grupo respaldó la Guía de campo para levantamientos posteriores a un tsunami (segunda edición) y recomendó que se publicara.

El Grupo nombró a Rick Bailey punto de contacto del TOWS-WG para el ETWCH de la JCOMM y pidió a la Secretaría que informara al respecto a los copresidentes de la JCOMM.

El Grupo pidió a la Secretaría que siguiera informando sobre el funcionamiento del servidor de la lista de alertas sobre tsunamis de la COI y sus suscriptores, y además que se revisara el aviso de deslinde de responsabilidad jurídica a fin de evitar incluir la palabra “warnings” (alertas).
РАБОЧЕЕ РЕЗЮМЕ

12-13 февраля 2014 г. в Штаб-квартире ЮНЕСКО в Париже, Франция, под председательством г-на Ютаки Мичиды (заместитель председателя МОК) состоялось Седьмое совещание Рабочей группы по системам предупреждения и смягчения последствий цунами и других опасных явлений, связанных с изменением уровня моря (РГ-СПЦО-ВII). Участники совещаний оценили прогресс в осуществлении мероприятий и выполнении решений, принятых Руководящими органами в резолюции XXVI-7 и решении ЕС-XLV/3.2., а также в решении IOC-XXVII/5.2.2.

Группа приняла к сведению решение IOC-XXVII/5.2.2. о продолжении деятельности РГ-СПЦО в следующем межсессионном периоде (т.е. до 28-й сессии Ассамблеи МОК).

Группа приняла к сведению результаты работы четырех МКГ в предыдущий межсессионный период, кратко изложенные в этом докладе.

Группа одобрила рекомендации Целевой группы по обеспечению готовности к стихийным бедствиям и ликвидации их последствий и предложила Целевой группе осуществить их, в частности:

- опубликовать Справочник по стандартным оперативным процедурам;
- инициировать подготовку документа, содержащего: (i) справочный перечень картографических материалов с маршрутами эвакуации при цунами и (ii) типовую форму общих руководящих принципов картирования;
- содействовать реализации стратегий просвещения и информированности, а также аккредитованных программ по обеспечению готовности местного населения к цунами на примере КАРИБ-СРП;
- содействовать разработке руководства по вопросам предупреждения о цунами для туристической индустрии;
- доработать и опубликовать обзор эффективности деятельности после прохождения цунами;
- подчеркнуть роль центров информации о цунами (ЦИЦ) в проведении обзоров эффективности деятельности после прохождения цунами, а также просила МКГ обеспечить надлежащий объем ресурсов и наделение ЦИЦ полномочиями для осуществления этой функции.

Группа одобрила рекомендации Целевой группы по наблюдению за цунами, в частности:

- Картирование с описанием (i) существующих по состоянию на сегодняшний день услуг глобальной системы предупреждения о цунами и подробным описанием охвата и спектра оказываемых услуг и (ii) районов мониторинга источников землетрясения для каждой из систем предупреждения.
- Присвоение провайдерам данных слежения за цунами МКГ следующих наименований:
  - Провайдер услуг по цунами КАРИБ-СРП (КАРИБ-СРП-ПУЦ)
  - Провайдер услуг по цунами СПЦИО (СПЦИО-ПУЦ)
  - Провайдер услуг по цунами СПЦСВАСМ (СПЦСВАСМ-ПУЦ)
  - Провайдер услуг по цунами СПЦТО (СПЦТО-ПУЦ).
• Применение процедур и руководящих принципов МКГ-ПУЦ, осуществляющих выпуск и распространение бюллетеней по цунами, в отношении землетрясений за пределами зоны действия соответствующих МКГ.

• Председателю РГ-СПЦО рекомендуется поддерживать контакты с Исполнительным секретарем МОК и предлагается (i) связаться с ООН-УКГД и ВМО и выразить обеспокоенность Группы по поводу путаницы, которую вносит одновременное представление продуктов предупреждения о цунами ГЦСД и продуктов МКГ-ПУЦ, а также (ii) получить разъяснения в отношении охвата, методологии, назначения и целевой группы пользователей службами ГЦСД.

• Г-ну Рику Бэйли (председатель МКГ/СПЦИО) и г-ну Шринивасу Кумару (председатель Целевой группы по наблюдению за цунами) рекомендуется обеспечить подготовку документа, в котором дается Глобальное определение услуг по предупреждению о цунами, на основе согласованных концепций и руководящих принципов, содержащихся в докладе Целевой группы для РГ-СПЦО-IV, а также представить информацию о ходе подготовки этого документа на восьмом совещании РГ-СПЦО.

• МКГ-ПУЦ рекомендуется во избежание путаницы адаптировать формат бюллетеней с целью четкого указания уровня моря, времени прихода цунами и метода/терминологии, а также добиваться большей согласованности между различными предлагаемыми продуктами.

Группа одобрила рекомендации и подходы, предлагаемые Целевой группой по оценке опасностей, связанных с потенциально наиболее цунами-генерируемыми районами, и просила Целевую группу во взаимодействии с Секретариатом МОК продолжить разработку программы и подготовку запланированного семинара по теме «Оценка уровня угрозы цунами, вызванного землетрясением». Группа отметила, что научные итоги такого семинара имеют большое значение и могли бы стать ценным вкладом в работу двух других целевых групп.

Группа просила председателя Общей целевой группы МКГ по наблюдению за цунами поддерживать контакт с Исполнительным секретарем МОК и просить ее проинформировать ИМО, МГО и ВМО об имеющихся продуктах по цунами, а также поинтересоваться отзывами в отношении потребностей и оптимальных способов доведения информации об угрозе цунами до морского сообщества.

Группа согласилась с необходимостью продолжить работу над «Планом охвата и коммуникации для Программы МОК по цунами» и завершить ее подготовкой до 1 мая 2014 г. соответствующего рабочего документа (председатели МКГ и представители ЦИЦ под руководством председателя МКГ/СПЦИО).

Группа признала необходимость согласования терминологии в рамках МКГ. В отношении определений, касающихся Национальных центров предупреждения о цунами (НЦПЦ) и Координаторов по предупреждению о цунами (КПЦ), Группа признана, основываясь на опыте работы с 2005 г. КАРИБ-СРП, СПЦИО и СПЦСВАСМ, а также модернизации СПЦТО, что (i) число НЦПЦ значительно возросло и что (ii) рассылка бюллетеней по цунами соответствующим координаторам имеет критически важное значение. В связи с этим Группа рекомендует пересмотреть формулировку определения в отношении КПЦ и НЦПЦ следующим образом:

• Национальный центр предупреждения о цунами (НЦПЦ): Центр, официально уполномоченный правительством осуществлять мониторинг и выпускать предупреждения о цунами и другие связанные с этим сообщения на территории
своей страны в соответствии с утвержденными национальными стандартными оперативными процедурами.

- Координатор по предупреждению о цунами (КПЦ): Круглосуточно функционирующий контактный пункт (учреждение, оперативное подразделение или штатная должность, но не лицо), официально уполномоченный НЦПЦ или правительством получать и распространять информацию об угрозе цунами от провайдеров услуг по цунами МКГ в соответствии с утвержденными национальными стандартными оперативными процедурами. КПЦ может, хотя не обязательно, одновременно являться НЦПЦ.

В ожидании утверждения предложенных рекомендаций Группа просит внести соответствующие изменения с целью учета рекомендуемых определений.

Группа отметила актуальность информационно-разъяснительной работы по вопросам опасности цунами в контексте мер по уменьшению опасности бедствий при подготовке к проведению третьей Всемирной конференции по уменьшению опасности бедствий ООН/МСУОБ (14-18 марта 2015 г., Сендай, Япония), а также необходимость задействования в этой работе коллективного потенциала и возможностей подразделений МОК и ЮНЕСКО.

Группа отметила также, что в ближайшие полтора года ожидается проведение ряда мероприятий, и призвала обеспечить высокий уровень наглядности программы МОК по цунами, в частности в рамках таких мероприятий, как:

- Десятая годовщина цунами в Индийском океане 2004 г.;
- 50-летие создания СПЦТО;
- Десятая годовщина создания МКГ/КАРИБ-СРП, МКГ/СПЦИО и МКГ/СПЦСВАСМ;
- Введение в эксплуатацию Оманской национальной системы раннего оповещения о многих опасных явлениях и проведение связанной с этим научной конференции высокого уровня (декабрь 2014 г., Мускат, Оман);
- Третья Международная конференция по малым островным развивающимся государствам (1-4 сентября 2014 г., Алиа, Самоа).

Группа отметила далее, что туристическая индустрия имеет важное значение для экономики многих стран, в связи с чем МКГ и ЦИЦ должны предпринять усилия по налаживанию взаимодействия с региональными туристическими организациями.

Группа признала, что текущая финансовая ситуация в значительной степени ограничивает Группу, МКГ и общие целевые группы МКГ в осуществлении возложенных на них задач, и настоятельно призвала государства-члены увеличить внебюджетные взносы в МОК для предоставления необходимых средств на приоритетные направления деятельности, установленные РГ СПЦО и МКГ.

Группа утвердила Руководство по проведению обследования на местах после цунами (2-е издание) и рекомендовала опубликовать его.

Группа назначила г-на Рика Бэйли координатором РГ-СПЦО для СКОММ ГЭВОП и просила Секретариат проинформировать об этом сопредседателей СКОММ.

Группа просила Секретариат продолжить представление информации о функционировании сервера списков рассылки МОК по цунами и о составе подписчиков, а также предложила пересмотреть формулировку оговорки об отказе от ответственности, исключив из нее формулировку об «оповещениях».
1. **OPENING AND WELCOME**

1.1 OPENING

1. Mr Yutaka Michida, Chair of TOWS-WG opened the meeting on Wednesday 12 February 2014 at 9:00. He first invited Dr Wendy Watson Wright, Executive Secretary of the Intergovernmental Oceanographic Commission (IOC), to offer some opening remarks.

2. Dr Wendy Watson Wright welcomed participants and thanked for the contributions to the Tsunami work Programme. She highlighted that the TOWS-WG Inter-ICG Task Teams on Tsunami Watch Operations and on Disaster Management & Preparedness had met on 10 and 11 February 2014 in Paris, France. This was the first time since 2010 that several Inter-ICG Task Teams and the TOWS-WG (Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems) had met back-to-back.

3. The Executive Secretary highlighted some of the achievements since the Sixth Meeting of TOWS-WG ([IOC/TOWS-WG-VI/3](#)) held on 20 and 21 February 2013 in Paris, France: (i) The Inter-ICG Task Team on Hazard Assessment Related to Highest Potential Tsunami Source Areas met on 24 September 2013 in Fethiye, Turkey; (ii) IOC managed to keep the ICG coordination process going last year through help from the UNESCO emergency fund; (iii) tsunami warning exercises have been carried out in Caribbean and Pacific regions; (iv) Portugal and Italy have announced that their national tsunami warning centres will be operational in early 2014 and they will be ready to act as candidate Tsunami Watch Providers (TWPs) for the NEAM (North-Eastern Atlantic, the Mediterranean and Connected Seas) region; (v) the first phase of the NEAMTIC project (funded by the EU) came to a close in April 2013; (vi) new tsunami warning products will be available in the Pacific in 2014; (vii) South China Sea Tsunami Advisory Center (SCS-TAC) continues to advance as part of PTWS; (viii) in the Caribbean, there has been a steady growth of the number of operational sea-level stations and six stations were recently installed through funds by the IOC; (ix) the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) committed funding of 600,000 USD towards two projects on Tsunami Hazard Assessment in the Indian Ocean, and for collecting eyewitness accounts and other information about the 1945 tsunami in the NW of the Indian Ocean (Makran area); (x) IOC managed to get a special contribution of 130,000 USD from the UNESCO Emergency Fund towards the establishment of the Caribbean Tsunami Information Centre; (xi) through extra budgetary projects and partnerships, IOC has maintained activities related toward awareness and preparedness; (xii) and overall IOC has managed to keep a fair level of training activities and publications flowing.

4. The Executive Secretary also highlighted some of the activities that will come to closure and also noted a number of commemorative events on the horizon which she encouraged the Group to take advantage of with respect to awareness raising for the Tsunami Programme notably: (i) The first phase of Oman’s National Multi-Hazard Early Warning System (NMHEWS) project will come to an end in March 2015 and will conclude with a major workshop and the opening of the NMHEWS Centre in Oman; (ii) the 10 year commemoration of the Indian Ocean tsunami; (iii) the 50 anniversary of the Pacific Tsunami Warning and Mitigation System (PTWS), and (iv) the Third UNISDR World Conference on Disaster Risk Reduction (Sendai, Japan, 14–18 March 2015)

5. In closing the Executive Secretary stressed that while all the activities sound like things are just going well, the past two years the situation has been very challenging to manage. The Tsunami Unit has lost a number of staff over the last two years. The Unit has many temporary staff and is critically dependent on ExB funds. At the same time, the Unit is dependent on having a stable staffing situation in order to sustain the system coordination and preserve corporate memory. The Executive Secretary stressed that she is working with
the Director General to identify additional resources for the Tsunami Unit. She also appealed to Member States for their support and emphasized that since IOC is established by Member States, has programs that are decided by Member States and serves Member States, it is also ultimately Member States that have to pay for this one way or the other.

1.2 ADOPTION OF THE AGENDA

6. The Agenda for this meeting was adopted as indicated in ANNEX I.

1.3 WORKING ARRANGEMENTS

7. Mr Thorkild Aarup provided an overview of logistic details for the meeting. All documents and presentations delivered at this meeting are available from the following website:
http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=1417

2. REPORTS FROM RELEVANT BODIES

2.1 REPORT FROM THE IOC BODIES

2.1.1 Pacific Tsunami Warning and Mitigation System (PTWS)

8. Dr Ken Gledhill (New Zealand), Chair of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), indicated that PTWS spans over a large basin with 58 Member States. It is organized under three main pillars as described in the Medium-term strategy: Pacific Tsunami Warning and Mitigation System (PTWS MTS), 2014-2021 (IOC/2013/TS/108) recently approved at the Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS-XXV/3) held in Vladivostok, Russian Federation, from 9 to 11 September 2013. It is structured with a PTWS Steering Committee that includes 3 technical Working Groups and 4 regional Working Groups. The foundational elements of PTWS are interoperability, research, capacity building and funding and sustainability. The United States of America will host the Twenty-sixth Session of the ICG/PTWS in Honolulu in April 2015, when the 50th anniversary of the PTWS will take place. The main outcomes of the Twenty-fifth Session of the ICG/PTWS are the endorsement of the PTWC enhanced products for PTWS, the establishment of an Advisory System for the South China Sea, and the continuation of wave exercises. Consequently, a huge amount of efforts has been put into training for Standard Operating procedures (SOPs) and enhanced products. Challenges ahead of PTWS are ensuring the smooth transition of the enhanced products, securing funding for operational training, and maintaining the current high level of public awareness over the long-term.

9. Mr Aarup asked about funding priorities. Mr Gledhill indicated that training, ensuring the enhanced products get smoothly introduced, and enabling participation of some countries in PTWS activities are funding priorities.

2.1.2 Indian Ocean Tsunami Warning and Mitigation System (IOTWS)

10. Mr Rick Bailey, Chair of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), provided an update on the status and progress made by the IOTWS since the last meeting of the Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-
He recalled the three pillars of the ICG, which are risk assessment and reduction; detection, warning and dissemination; and awareness and response.

11. He noted the success of the Secretariat in obtaining funds to support the Working Group workplans, particularly from UNESCAP. He listed some of the milestones for IOTWS, and noted that 26 December 2014 will mark the Tenth anniversary of the Indian Ocean tsunami. He thanked all partners, particularly from Japan and USA, for the support and advice they have given in developing the IOTWS Regional Tsunami Service Provider (RTSP) service, which assumed full operational responsibility on 31 March 2013.

12. Mr Bailey stated the main policies of the IOTWS, noting that tsunami warnings are the sovereign responsibility of the National Tsunami Warning Centres (NTWCs); the RTSPs only advise of threat/no threat status and provide this information to NTWCs via registered user websites. RTSP public products only reflect the final warning decision by a country’s NTWC and any observations of sea level.

13. Looking to the future, sustainability of the IOTWS resources will be a key issue. Capacity building in awareness and response will also need to be maintained. The IOTWS supports the establishment and development of the Indian Ocean Tsunami Information Center (IOTIC). An RTSP Service Definition document will be produced soon. Annual Standard Operating Procedures (SOP) training workshops will be held, subject to the availability of funding, with the next “IOTWS Regional Workshop on Standard Operating Procedures for Tsunami Warning and Emergency Response for Northern and Western Indian Ocean Countries” to be held in Hyderabad, India, from 23 to 26 June 2014. An exercise Indian Ocean Wave (IOWave) will be held later in 2014 and it is proposed to hold the Tenth Session of the ICG/IOTWS in Oman in late 2014 or early 2015.

14. Ms Christa von Hillebrandt-Andrade enquired about the IOTWS definition of Tsunami Warning Focal Points (TWFPs) and National Tsunami Warning Centres (NTWCs). Mr Bailey commented that the TWFP should be the operational contact at an NTWC, but this is not always the case, with some personal email addresses on the database. Dr Laura Kong explained the background to the definition of the term TWFP in the Pacific Ocean in the 1990s, and agreed that there was now a need for a formal definition for NTWCs.

2.1.3 Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS)

15. Mr Ahmet Yalciner, Chair 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), reported on progress.

16. He stated that the Tenth Session of ICG/NEAMTWS was held from 19 to 21 November 2013 in Rome, Italy, and the Eleventh Session of ICG/NEAMTWS will take place from 12 to 14 November 2014 in Cyprus. Presently, three Candidate Tsunami Watch Providers deliver alert services to NEAMTWS countries. At the ICG/NEAMTWS-X, Italy and Portugal have announced that their National Tsunami Warning Centres will be in operation in 2014, and they will subsequently also be able to act as Candidate Tsunami Watch Providers.

17. The Chair explained that ICG/NEAMTWS has concluded the analysis of the exercise NEAMWAVE 12 held on 27 and 28 November 2012 (IOC/2012/TS/103 VOL.1 + VOL.2) and the exercise report has been published at http://unesdoc.unesco.org/images/0021/002189/218990e.pdf. Exercise NEAMWAVE 14 is now under planning and will take place from on 28 and 29 October 2014.
18. Mr Yalciner also highlighted a collaborative project “Assessment, Strategy And Risk Reduction for Tsunamis in Europe” (ASTARTE) recently funded at the level of 6M € by the European Union. The ultimate goal of ASTARTE is to reach a higher level of tsunami resilience in the NEAM region to improve preparedness of coastal populations and ultimately save lives and assets. Elements of ASTARTE can be seen as contributing to the program and development of NEAMTWS. The project has 26 partners from 16 different countries. More information about the project is available at [www.astarte-project.eu](http://www.astarte-project.eu).

2.1.4 Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE-EWS)

19. Dr Christa von Hillebrandt-Andrade (USA), Chair of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), indicated that ICG/CARIBE-EWS has 32 Member States and 16 territories. It is organized with a Board of Officers, 4 Working Groups and 5 Task Teams. A revised Implementation Plan was approved at the ICG/CARIBE-EWS-VIII (30 April–1 May 2013, Port of Spain, Trinidad and Tobago). The region is served on an interim basis by the Pacific Tsunami Warning Center (PTWC) but there are also in-region arrangements from NTWC for US territories and PRSN for Puerto Rico (USA).

20. She indicated that as in the PTWS, the Caribbean is evaluating the possibility of using enhanced products for the CARIBE-EWS. As part of the annual regional tsunami exercises, the last one *Exercise Caribe Wave/Lantex 13* was held on 20 March 2013 (IOC/2012/TS/101 VOL.1) an evaluation of communications mechanisms is showing that only a few of the TWFPs received the tsunami message through GTS, and that email and fax continue to be the main receiving mechanisms.

21. Dr von Hillebrandt explained that the Caribbean Tsunami Warning Programme (CTWP) was established by the USA as a first phase of a potential contribution to the establishment of a Caribbean Tsunami Warning Center (CTWC), however during the Eighth session of ICG/CARIBE-EWS (ICG/CARIBE-EWS-VIII/3) held in Port of Spain, Trinidad and Tobago, from 29 April to 1 May 2013, the National Oceanic and Atmospheric Administration (NOAA) of the United States of America informed that it is considering leveraging other capabilities of NOAA instead of establishing a CTWC. US intend to provide a final decision at the Ninth Session of the ICG/CARIBE-EWS-IX that will be held from 13 to 15 May 2014 in St Thomas, United States.

22. Dr Hillebrandt-Andrade reported that ICG/CARIBE-EWS decided in 2009 to accept the offer of the Government of Barbados to establish and host a Caribbean Tsunami Information Center (CTIC). Towards this end, a Memorandum of Understanding (MoU) was signed in 2013 between Barbados and UNESCO/IOC for the establishment of the CTIC. Funding from Italy channeled through the United Nations Development Programme (UNDP) and from the United Nations Educational, Scientific and Cultural Organization (UNESCO) was made available to support CTIC’s establishment, including for SOP training, development of public awareness materials, and the hiring of an interim CTIC Director, which was recruited in September 2012.

23. She provided technical information about detection thresholds in the Caribbean which is less than 1.5 minutes thanks to seismic data network sharing among countries. Sea-level has also improved enormously within the region, reaching close to 60% of completion of the core network defined in the Implementation Plan. An exercise Caribe Wave/Lantex 14 is planned for 26 March 2014 with two scenarios, one of which is replicating the 1755 Lisbon earthquake, in coordination with the ICG/NEAMTWS, the other is a submarine landslide generated in the Gulf of Mexico. The Caribbean established a Task Team to evaluate current
community preparedness recognition schemes like TsunamiReady and explore a regional programme.

2.2 REPORT FROM NON IOC BODIES

2.2.1 Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM)

24. Mr Rick Bailey reported on behalf of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM). He highlighted the Coastal Inundation Forecasting Demonstration Project (CIFDP), which is being developed under the auspices of WMO, JCOMM and the WMO Commission for Hydrology (CHy). The CIFDP aims to provide an example of cooperative work as a strategy for building improved operational forecast and warning capability for coastal inundation, combining extreme waves, surges and river flooding events, that can be sustained by responsible national agencies through: (i) identifying the national and regional requirements, (ii) implementing open source coastal inundation end-to-end operational forecasting and warning systems; (iii) developing cross-cutting cooperation among different scientific disciplines and user communities; (iv) building communication platforms between researchers, forecasters and disaster managers involved in coastal inundation management; and (v) developing specialized training for operators, forecasters and disaster managers. The CIFDP is implemented in a five phased approach starting with (i) project preparation and seeking initial national agreement; (ii) information gathering and project adaptation; (iii) system development; (iv) pre-operational testing and capacity development, and (v) live running and evaluation. The CIFDP has started phased implementation in Bangladesh, Fiji, Dominican Republic and Indonesia. Mr Bailey highlighted that there could be areas for collaboration between the regional tsunami warning systems and the CIFDP demonstration projects, notably in areas such as bathymetry, tidal constituents and wave models. The CIFDP is coordinated under the JCOMM through the Expert Team on Waves and Coastal Hazards Forecasting Systems (ETWCH).

25. The Group considered it important to collaborate with CIFDP. It decided to appoint Mr Bailey as a point of contact for coordination with ETWCH.

2.2.2 World Meteorological Organization (WMO)

26. Mr Kenji Tsunoda, Co-Chair of the Open Programme Area Groups on Information Systems and Services (OPAG-ISS) under the WMO Commission for Basic Systems (CBS), provided a brief overview of the WMO Information System (WIS).

27. The regional and global connectivity of the WIS structure is guaranteed by the existence of a small number of node centres called Global Information System Centres (GISC). GISCs primary role is to collect and information from WIS contributing centres in their area of responsibility and pass information to centres in their area and send information meant for global distribution to the other GISCs. Mr Tsunoda made practical demonstrations on how to obtain data and metadata from a GISC. More information about WIS and GISCs are available from http://www.wmo.int/pages/prog/www/WIS/ http://www.wmo.int/pages/prog/www/WIS/GISCs.html

2.2.3 International Hydrographic Organization (IHO)

28. Mr Thorkild Aarup informed that the International Hydrographic Organization (IHO) had asked him to convey on their behalf the need for coastal bathymetry data, and reiterate that IHO stand ready to coordinate such contributions from coastal Member States.
3. REVIEW OF PROGRESS

3.1 STATUS OF IMPLEMENTATION OF IOC DECISION RESOLUTION IOC-XXVII/DEC. 5.2.2

29. Mr Yutaka Michida provided a brief overview of the present, the current governance structure for TOWS-WG, the 4 regional tsunami warning systems, and the past resolutions and decisions from the IOC Executive Council and Assembly that direct the work of TOWS. Mr Michida noted that the Twenty-seventh session of the Assembly of IOC (IOC-XXVII/3 PROV.) decided to keep TOWS-WG in place until 2015. Mr Michida also noted that the present governance and coordination structure is logical for the tasks. The presentation given by Mr Michida is available from the meeting website.

30. Mr Thorkild Aarup reviewed recommendations and decisions as tabled in the executive summary of the Sixth Session of the TOWS-WG held in Paris, France, on 20 and 21 February 2013 (IOC/TOWS-WG-VI/3). The Task Teams have addressed or are addressing: (i) the documentation of areas of responsibilities; (ii) the development of a standard questionnaire for post-event analysis; and (iii) the present status of issuing of tsunami advisories to shipping in consultation with relevant organizations including WMO, IHO and IMO. For additional details see the Task Team reports in ANNEX IV, ANNEX V, and ANNEX VI.

31. Mr Bernardo Aliaga provided an overview of the performance of the IOC tsunami mail list server as requested at the Sixth Session of the TOWS-WG. He explained that the IOC Tsunami mail list server was established at the end of 2004 and started its service in the beginning of 2005. It is possible to sign up to the mailist from http://www.ioc-tsunami.org/index.php?option=com_content&view=article&id=81&Itemid=24&lang=en.

32. Mr Aliaga informed that the mail list is based on Sympa, an opensource mailing list manager software system hosted at UNESCO. He explained that the tsunami mail list server presently distributes public tsunami alert messages from the Pacific Tsunami Warning Center (located in Honolulu, Hawaii), the US National Tsunami Warning Center (located in Palmer, Alaska) and the Japan Meteorological Agency (located in Tokyo). He indicated that until the end of 2012, the mail list server also distributed public tsunami alerts from the Indonesian Agency for Meteorological, Climatological and Geophysics (BMKG) and the Indian National Center for Ocean Information Services (INCOIS). He recalled that the disclaimer about the mail list service (see https://lists.unesco.org/wws/info/tsunami-information-ioc) was reviewed by UNESCO Legal Affairs.

33. Mr Aliaga also provided technical details about the system architecture and the changes after April 2012 when the newsletter robot server and the subscriber database server were merged to further reduce the number of computers in the system and potential failure points. Mr Aliaga described the management procedures that exist for elimination due to limits on the automatic bouncing of emails. He noted that many military servers and the Yahoo servers have anti spam filters that preclude automatic messages. Mr Aliaga also showed the evolution in the net number of new subscribers since the start of the service. In total there are now 15,331 subscribers.

34. The Group welcomed the report and recommended that an update be provided at the Eighth meeting of TOWS-WG. The Group also expressed interest in additional information (if available) about who are subscribers or from what countries.

35. Mr Rick Bailey reminded the Group that he had volunteered to work on a communication and outreach plan at the Seventh meeting of TOWS-WG. Due to health
matters, this work had not been advanced as much as had been anticipated. Mr Bailey provided some reflections mainly from an IOTWS perspective on the elements of a plan including: (i) key messages; (ii) target audiences; (iii) outreach opportunities; and (iv) communication tools.

36. The Group recognised that there are many important anniversaries and conferences in the next 1–2 years where it would be useful to prepare tsunami information and awareness raising material while, at the same time, coordinating the information flow.

37. The Group decided to continue the work on this topic and requested Mr Bailey and the Chairs of the ICGs and representatives of the TICs to produce a consolidated document based on events from all four ICG areas by 1 May 2014.

4. REPORTS OF THE INTER-ICG TASK TEAMS

4.1 INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS

38. Mr David Coetze reported on the outcome of this Task Team which met on 10 and 11 February 2014 in Paris, France. The full summary of the Task Team meeting and its recommendations are provided in ANNEX IV of this report.


4.2 INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS

40. Mr Srinivas Kumar reported on the outcome of this Task Team which met on 10 and 11 February 2014 in Paris, France. The full summary of the Task Team meeting and its recommendations are provided in ANNEX V of this report.

41. The presentation given by Mr Kumar is available at http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventAgenda&eventID=1417.

4.3 INTER-ICG TASK TEAM ON HAZARD ASSESSMENT RELATED TO HIGHEST POTENTIAL TSUNAMI SOURCE AREAS

42. Mr Thorkild Aarup reported on the outcome of this Task Team which met on 24 September 2013 in Fethiye, Turkey. The full summary of the Task Team meeting and its recommendations are provided in ANNEX VI of this report.

5. OTHER ISSUES

43. Mr Thorkild Aarup informed about the work carried out by the International Tsunami Survey Team (ITST) on the second edition of the Post-tsunami survey field guide (IOC/2013/MG/37; SC.98/WS/24 Rev. in process). In order to improve understanding of tsunamis and to develop tools and programs to mitigate their effects, it is vital to learn from past events. The Post-tsunami survey field guide has been prepared to assist Member States, scientists, authorities and community leaders in organizing and conducting post-tsunami field survey reconnaissance investigations. The first edition of this guide was published in 1998 (SC.98/WS/24). This second edition represents a thorough revision in recognition of the developments that have taken place in the tsunami field since 1998, as well as the expansion of International Tsunami Survey Team efforts into disciplines not
covered in the first edition. The revision of the guide began in a sub-committee of the IUGG (International Union of Geodesy and Geophysics) Joint Tsunami Commission. As such, this guide also represents a productive collaboration between the tsunami science community and the community of decision and policy makers involved in the tsunami warning and mitigation systems. IOC has organised the technical edit of the guide and organized external review of document via the respective technical working groups of the four ICGs. The Group welcomed the completion of this guide and endorsed it.

44. Mr Aarup explained that definitions of National Tsunami Warning Centre and new definition of National Tsunami Warning Focal Point will be updated. In light of the increasing number of National Tsunami Warning Centres that are being established and to insure efficient communication and that tsunami bulletins from Regional Tsunami Service Providers go to the appropriate national points of contacts, the Group recommended to (i) establish a definition for National Tsunami Warning Centre; and (ii) update the present definition of national Tsunami Warning Focal Point (TWFP). To that effect the Group recommends to update definitions for TWFP and NTWC to read 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 Operation Procedures.

- Tsunami Warning Focal Point (TWFP). A 24 x 7 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 Standard Operation Procedures. The TWFP may or not be the NTWC.

6. DATE AND PLACE OF THE NEXT MEETING

45. The Chair suggested to have the next meeting in February or March 2015. Some of the Task Team may meet back-to-back.

46. The Chair will explore the possibility of having the meeting prior to the third UNISDR World Conference of Disaster Risk Reduction that will take place from 14 to 18 March 2015 in Sendai, Japan.

7. CLOSURE OF MEETING

47. Mr Yutaka Michida thanked participants for their active participation. He stated that there had been good progress achieved in the past intersessional period. At the same time, he stressed that there is a clear need to continue the work in order to achieve a global and effective tsunami warning system.

48. The Seventh meeting of the Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG) was closed a 15:00 on 13 February 2014.
ANNEX I

AGENDA

1 OPENING AND WELCOME
   1.1 OPENING
   1.2 ADOPTION OF AGENDA
   1.3 WORKING ARRANGEMENTS

2 REPORTS FROM PARTICIPANT BODIES
   2.1 REPORTS FROM IOC BODIES
   2.2 REPORTS FROM NON-IOC BODIES

3 REVIEW OF PROGRESS
   3.1 STATUS OF IMPLEMENTATION OF IOC DECISION RES. IOC-XXVII/Dec. 5.2.2

4 REPORTS OF THE INTER-ICG TASK TEAMS
   4.1 INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS
   4.2 INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS
   4.3 INTER-ICG TASK TEAM ON HAZARD ASSESSMENT RELATED TO HIGHEST POTENTIAL TSUNAMI SOURCE AREAS

5 OTHER ISSUES

6 DATE AND PLACE OF THE NEXT MEETING

7 CLOSURE OF MEETING
ANNEX II

DECISIONS AND RECOMMENDATIONS

The Seventh Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-VII) was held in Paris, France, on 12 and 13 February 2014, at UNESCO Headquarters, under the chairmanship of Mr Yutaka Michida (IOC Vice-Chair). The meeting evaluated progress in actions and decisions taken by the Governing Bodies, through Resolution XXVI-7, Decision EC-XLV/Dec.3.2, and Decision IOC-XXVII Decision 5.2.2.

The Group noted of the IOC-XXVII Decision 5.2.2 to extend TOWS-WG for the intersessional period (i.e. up to IOC-XXVIII).

The Group noted the progress made by four ICGs during the last inter-sessional period as summarized in this report.

The Group accepted the recommendations from the Task Team on Disaster Management and Preparedness and requested the Task Team to implement them, in particular:

- Publish a Standard Operating Manual.
- Initiate development of a document containing (i) reference list of tsunami evacuation mapping material, and (ii) a template for comprehensive mapping guidelines.
- Promote education and awareness strategies as well as accredited community preparedness programmes as exampled in the CARIBE-EWS.
- Contribute to the development of tsunami guidance for tourism industry.
- Finalize and publish the Post-Event Performance Survey.
- Underline the role of Tsunami Information Centres (TICs) have in the management of post event performance surveys, and requested that ICGs provide for appropriate resourcing and mandate of their TICs to be able to perform this function.

The Group accepted the recommendations from the Task Team on Tsunami Watch Operations in particular:

- The maps describing (i) 'Existing services of the global tsunami warning system as of Date' and detailing coverage and service provision; and (ii) Earthquake source zone monitoring areas for each of the warning systems.
- A generic naming convention for ICG tsunami service providers be as follows:
  - CARIBE-EWS Tsunami Service Provider (CARIBE-EWS-TSP)
  - IOTWS Tsunami Service Provider (IOTWS-TSP)
  - NEAMTWS Tsunami Service Provider (NEAMTWS-TSP)
  - PTWS Tsunami Service Provider (PTWS-TSP)
- The procedures and guidelines for ICG-TSPs issuing and disseminating tsunami bulletins for earthquakes outside their respective ICG coverage.
• That the Chair of TOWS-WG will communicate with and request the Executive Secretary of IOC (i) to contact UN-OCHA and WMO to express concern of the Group about the confusion that the GDACS tsunami alert products creates vis-à-vis with the products issued by the ICG-TSPs, and (ii) to seek clarification about the scope, methodology, purpose and intended users of the GDACS service.

• That Rick Bailey (Chair ICG/IOTWS) and Srinivas Kumar (Chair of Task Team Tsunami Watch Operations) develop a Global Tsunami Services Definition document be developed based on agreed concepts and guidelines as informed by the Task Team report to TOWS-WG-IV, and report on the development to the TOWS-VIII.

• That ICG-TSPs adapt their bulletins to clearly define water levels, tsunami arrival times and the method/terminology in order to avoid confusion and achieve more harmonized products.

The group accepted the recommendations and proposed approach by Task Team on Hazard Assessment Related to Highest Potential Tsunami Source Areas and requested the Task Team in collaboration with the IOC Secretariat to continue the planning and preparations for the envisioned workshop “Assessing Earthquake triggered Tsunami Potential”. The Group noted the importance of the scientific outcome from the workshop and that it could provide valuable input to the work of the two other Task Teams.

The Group requested the Chair of the Inter-ICG Task Team on Tsunami Watch Operations to communicate with the Executive Secretary of IOC and request her to inform IMO, IHO, WMO on what tsunami products are available and seek feedback on requirements and better ways of disseminating tsunami threat information to maritime community.

The Group agreed that the work on an ‘Outreach and Communications Plan for the IOC Tsunami Programme’ should be continued and finalized as a working document by 1 May 2014 (Chairs of ICG, and TIC representatives and chaired by ICG/IOTWS Chair).

• The Group acknowledged the need for harmonization of terminology across the ICGs. For definitions of National Tsunami Warning Centre (NTWC) and Tsunami Warning Focal Point (TWFP) the Group recognised, based on the development experience since 2005 of CARIBE-EWS, IOTWS and NEAMTWS and the enhancement of PTWS, that (i) the number of NTWCs has significantly increased, and (ii) it is critically important that tsunami bulletins are sent to the appropriate points of contact. To that effect the Group recommends to update definitions for TWFP and NTWC to read 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 Operation Procedures.

Tsunami Warning Focal Point (TWFP): A 24 x 7 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 Standard Operation Procedures. The TWFP may or not be the NTWC.

Pending approval of the recommendations the Group requests the corresponding updates to reflect the recommended definitions.
The Group noted the need for advocacy of the tsunami hazard in the context of Disaster Risk Reduction in the build-up to the third UNISDR World Conference of Disaster Risk Reduction (14-18 March 2015, Sendai, Japan) and that the IOC should call upon the IOC and UNESCO’s collective capacity and structures in this regard.

The group also noted that a number of events will take place over the next 18 months and encouraged high level visibility of the IOC tsunami program, for example:

- The ten year commemoration of the 2004 Indian Ocean tsunami.
- The fifty year anniversary for the establishment of the PTWS.
- The ten year anniversary for the establishment of ICG/CARIBE-EWS, ICG/IOTWS, and ICG/NEAMTWS.
- The launch of the Oman National Multi Hazard Early Warning System and associated high level scientific conference (Muscat, Oman, December 2014)
- Third UN International Conference on Small Island Developing States (1–4 September 2014, Apia, Samoa)

The Group further noted that the tourist industry plays a large role in the economy of many countries, and effort should be made by the ICGs and TICs to engage with regional tourist organisations.

The Group recognized that the current financial situation strongly limits the implementation of the tasks of the Group. ICGs and Inter-ICG Task Teams and strongly urged the Member States to increase their extra-budgetary contributions to the IOC to provide the needed resources for the priorities identified by TOWS-WG and ICGs.

The Group endorsed the Post-Tsunami Field Survey Guide (2nd edition) and recommended that it be published.

The Group nominated Rick Bailey to be TOWS WG contact point for the JCOMM ETWCH and requested the secretariat to inform the JCOMM co-presidents.

The Group requested the Secretariat to continue to report on the performance and membership of the IOC Tsunami mail list server, and requested that the legal disclaimer be revised so it does not include wording on “warnings”.
# LIST OF DOCUMENTS

## WORKING DOCUMENTS

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ANNEX IV

REPORT OF THE INTER-ICG TASK TEAM
ON DISASTER MANAGEMENT AND PREPAREDNESS

12–13 February 2014
Paris, France

1. BACKGROUND
AND TERMS OF REFERENCE

The Sixth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (IOC/TOWS-WG-VI) held in Paris, France, on 20 and 21 February 2013, recognized the importance of continued exchange of experiences and information on preparedness and public education among the Intergovernmental Coordination Groups (ICGs), and that this is to a large extent facilitated via the Tsunami Information Centres (TICs). With TICs having been established in all four regions, the meeting decided that TICs should be represented in the Task Team on Disaster Management and Preparedness and to update the Terms of Reference (TOR) of the Task Team to reflect this. The updated TOR are:

(i). Facilitate, in collaboration with organization such as UNISDR, the exchange of experiences and information on preparedness actions, education/awareness raising campaigns, and other matters related to disaster management and preparedness.

(ii). Promote preparedness in coastal communities through education and awareness products and campaigns.

(iii). Facilitate SOP training across ICGs to strengthen emergency response capabilities of Member States and their Disaster Management Offices.

(iv). Promote preparedness programs and assessment tools that have been successful in one regional Tsunami Warning and Mitigation System in the others as appropriate.

(v). Facilitate the coordination of the TICs of the ICGs;

(vi). Report to the TOWS-WG.

The representatives to the Inter-ICG Task Team on Disaster Management and Preparedness shall be nominated by their respective ICG Chairpersons. The membership shall consist of two representatives from each ICG, one of which should represent the ICG’s Tsunami Information Centre. The IOC Chair will appoint the Chair of the Task Team.

In June/July 2013, the IOC Assembly, by its decision IOC-XXVII/Dec.5.2.2 on the Tsunami and Other Coastal Hazards Warning Systems, accepted the report and decisions of the Sixth meeting of TOWS-WG and decided to continue the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) for the next inter-sessional period.

Following the First Meeting of the Inter-ICG Task Team held from 29 November to 1 December 2010, in Seattle, United States; the Task Team was unable to organize any further meetings due to funding and the limitations of both the IOC and Task Team members’ agencies or countries. The Inter-ICG Task Team subsequently continued its activities through electronic communication which proved less ideal (this problem will likely continue). The resignation of the previous Chair of the Inter-ICG Task Team had an effect the momentum of Task Team activities in 2013.
The Inter-ICG Task Team on Disaster Management and Preparedness met again on 10 and 11 February 2014 in Paris, France, following the appointment of a new Chair and prior to the IOC/TOWS-WG-VII meeting. New momentum for the Task Team was established as a result.

This report covers the period 2012–2013.

2. UPDATES FROM ICG WORKING GROUPS RELEVANT TO DISASTER MANAGEMENT AND PREPAREDNESS

The Task Team collected updates on Disaster Management and Preparedness activities across basins over the last two years. This information is important in order to reflect the progress and identification of collective relevant issues to be addressed at global level.

2.1 INTERGOVERNMENTAL COORDINATION GROUP FOR THE INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM (ICG/IOTWS) – WORKING GROUP 3 ON TSUNAMI AWARENESS AND RESPONSE

Awareness and Response forms one of the pillars of the Indian Ocean Tsunami Warning and Mitigation System (IOTWS), along with Risk Assessment, and Tsunami Detection, Warning and Dissemination. These three pillars are determining the role and tasks of Working Groups. Working Group 3 in particular, holds the responsibility to ensure that the appropriate preparedness and response measures are taken by Member States of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS). The three pillars 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.

UNDP APRC (United Nations Development Programme-Asia-Pacific Regional Centre) conducted a study to determine the change in capacities of Member States as a result of workshops and trainings in an end-to-end perspective, including strengthening the last mile of the system, which was held since the early establishment of the IOTWS. This was conducted in the first semester of 2012 by UNDP in coordination with the Chair of Working Group 3 (WG3) and ICG/IOTWS Secretariat.

Mainstreaming the tsunami warning and mitigation system into development planning is a key issue pointed out within item 2 of the TOR (Terms of Reference) for Working Group 3 on Tsunami Awareness and Response (Encourage mainstreaming of tsunami risk assessment, warning and mitigation systems into national development policy, plans, practice and legislation) and need to be carried out consistently. 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, Working Group 3 closely collaborates with Working Group 1 on Tsunami Risk Assessment and Reduction, as well as with the Jakarta Tsunami Information Centre (JTIC)/Indian Ocean Tsunami Information Center (IOTIC) and the Economic and Social Commission for Asia and the Pacific (UNESCAP). The project will look at how risk assessment and development planning is encouraged, with test cases in the form of tsunami drills to observe the effectiveness of capacity strengthening in these areas to be conducted in Myanmar, Bangladesh and Timor Leste in 2012–2014. The project will be managed by the ICG/IOTWS Secretariat and IOTIC. In 2013, through this project, Working Group 3 has conducted a stock taking survey in three countries. The stock taking used survey tools to learn about the country’s documents, programmes and activity on policies supporting tsunami risk assessment and tsunami exercises in the country. Through this project, Working Group 3 also developed training modules on how to strengthen disaster risk reduction policy to
support tsunami exercises and on how to plan and implement tsunami exercises. The first training has been implemented in Bangladesh (2013) and Timor Leste (2014). The training/workshop in Myanmar will be conducted in March 2014. The UNESCAP project will continue to provide support to these three countries until end of 2014.

IOTWS is paying specific attention to engaging media to be familiarized with the warning services in SOP (Standard Operating Procedure) training. A guideline for media in warning dissemination was developed by Indonesia and introduced in the SOP training/workshop held in 2011, adapting the Japan Broadcasting Corporation (NHK) and US experiences. Member States had adapted the guideline and continue with local media workshops with their National Tsunami Warning Centres (NTWCs). A draft of a simpler guiding document for media is currently developed jointly with Working Group 2 of IOTWS.

A document is being compiled “Tsunami Early Warning & Community Preparedness - Insights and Compilation of Good Practices” to provide insights and good practices to strengthen community preparedness in the ICG/IOTWS member countries. A substantial support from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (The German Society for International Cooperation) and UNESCO in this effort is contributed to roll out the initiative. Highly respected authors, resource persons, practitioners and experts from the ICG/IOTWS Member States and observers had confirmed their contribution and had submitted their first draft. The target groups of the publication are professional officials, related organizations and civil societies involved in the tsunami early warning and disaster management. The document will focus on experiences within the IOTWS region, especially since the establishment of the ICG/IOTWS. They faced some delay in its final draft, especially in getting the writings from some of the contributors.

During 2013, there were several opportunities for strengthening capacity in WG 3. Besides the UNESCAP project described above, the activities of ICG-IOTEWS SOP Training Workshop held from 23 to 27 September 2013 in Jakarta under collaboration with the Indonesian Agency for Meteorological, Climatological and Geophysics (BMKG) has been able to synergize the Standard Operation Procedures between the National Tsunami Warning Centre (NTWC) with the National Disaster Management Office (NDMO), and the media from Member States. Through the workshop, several new Focal Points from NDMO of Member States were identified for strengthening the capacity of WG3. Other opportunities for WG3 in regional and international perspectives were under collaboration with the International Ocean Institute (IOI) during Pacem in Maribus XXXIV International Forum on Sustainable Governance of the Ocean held in Bangkok, Thailand, from 3 to 8 September 2013. During the Forum, IOTWS was able to promote the preparedness and response program, to share knowledge on tsunami preparedness, to learn from others on Tsunami Science State of the Art, and from other region such as Pacific, Mediterranean and South China Sea.

During the 9th International Symposium for Social Management Systems (SSMS) held in Sydney, Australia, from 2 to 4 December 2013, under the collaboration of the Society of Social Management System, there was the opportunity of sharing knowledge and gaining perspective for extending capacity building on preparedness and response from psychology, legal, economic and social management point of view. Further international opportunity will be develop in 2014, which has been prepared since 2013 in collaboration with GIZ and GFZ (German Research Centre for Geosciences) to conduct an International Seminar and Field Trip on “Tsunami Early Warning & Community Preparedness” in Jakarta and Bali in March 2014. The expected participants are WG 3 members and new members from NTWC of related Member States. Other opportunities came from university networks, such as participating in DRC (Disaster Resilient Countries) in exchange with faculties, and conducting disaster resilient credit earning courses with 5 universities: Kyoto University, Institut Teknologi Bandung (ITB), Chulalongkorn University, Asian Institute of Technology (AIT),
Kasetsart University, and National Vietnam University, other perspective of increasing response and preparedness.

In Indonesia, there were several activities which will support WG 3 in sharing knowledge with Indonesia NDMO (National Agency for Disaster Management, BNPB) in the development of a tsunami disaster risk reduction master plan, the development of technical guidelines for hazard map development, the planning and designing on tsunami vertical evacuation, the structural design for tsunami vertical evacuation building, the designing for artificial hill and natural hill for tsunami vertical evacuation.

Along the development of the IOTWS, the most difficult challenge is perhaps to assess whether the system had worked properly and contributed to saving lives. At the end, for the last mile, it is important to look at different levels of government response and also communities and how they understand the warnings and make the best judgments using available information to reduce their risks. Lessons from most recent tsunami events are perhaps the best way to reflect the status of community preparedness, also in cases where an earthquake did not generate a tsunami. It is also important to understand that all events are entirely unique, and there is a danger in treating countries with the same approach in assessing risks, developing education materials and evacuation strategies.

2.2 INTERGOVERNMENTAL COORDINATION GROUP FOR THE PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEM (ICG/PTWS) – WORKING GROUP 3 ON DISASTER MANAGEMENT AND PREPAREDNESS

The Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS-XXV) held in Vladivostok, Russian Federation, from 9 to 11 September 2013, agreed to align the previous Terms of Reference of its Working Group 3 on Awareness and Response (as determined in the PTWS Medium-Term Strategy 2009–2013, ICG/PTWS-XXIII, Annex V), with the new Terms Of Reference of the TOWS Task Team (as decided by the IOC/TOWS-WG-VI meeting held in Paris, France, on 18 and 19 February 2013), as well as that its title be changed from the “Awareness and Response Working Group” to the “Disaster Management and Preparedness Working Group” so that the PTWS reflects the TOWS direction. It was noted that “Response” is a broad concept that spans wider than the original intent for PTWS WG3. This change may also solicit better involvement of countries’ Disaster Management agencies in the PTWS.

Currently the primary focus of WG3 is on assisting Member States to prepare for the new enhanced PTWC products. Together with the International Tsunami Information Centre (ITIC), WG3 was instrumental in organizing regional SOP workshops and trainings towards the new PTWC experimental products in 2013. Some countries have requested further assistance with their development of SOPs in preparation for the new products. Assistance will be provided in the first and second quarters of 2014 through bilateral Member State support where appropriate arrangements exist, or through ITIC. Repeats of these trainings are planned for all regions in 2014.

Together with ITIC, WG3 was also instrumental in the preparation, delivery and evaluation of Pacific wave exercises. Exercise Pacific Wave 13 (IOC/2013/TS/106 Vol.1 + Vol.2) was aimed specifically at Member States’ preparedness with regards to the new enhanced PTWC products.

WG3 contributed to the objectives of the Task Team through the development of the Manual How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises (IOC/2012/MG/58 REV.) that has now been adopted by the Intergovernmental Oceanographic Commission (see 3.2) and the development of the capability assessment tool (see 3.1), tsunami training
capacity building (via ITIC) as well as the development of a SOP Manual (in progress, see 3.3). The Chair of WG3 was invited by the IOTWS to participate in the development of training modules on the development of tsunami policy support and exercises. The Chair attended a workshop hosted by the UNESCO Jakarta Office in May 2013 to assist with the development of a framework and content for this purpose. Since then, the modules were developed by the Indian Ocean Tsunami Warning Center (IOTWC) and sent to the Chair of WG3 for review. The WG also noted with interest a survey conducted by the ICG/IOTWS among Member States on “Improvements of Risk Assessment and Response Capacities for Tsunamis in Indian Ocean Countries” and will seek insight into the results of this assessment from the IOTWS in order to learn from and draw comparisons with our own programmes in this regard.

The Chair of the ICG/PTWS WG3 attended the Fifth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (IOC/TOWS-WG-V) held in Tokyo, Japan, on 15 February 2012. Support was provided to the Chair of the TOWS Task Team 2 on Disaster Management and Preparedness in reporting to the WG on the Task Team’s activities. As a member of WG3, the Director of ITIC represented and reported on behalf of the TOWS Task Team 2 on Disaster Management and Preparedness at the Sixth Meeting of the TOWS-WG that took place in Paris, France, on 20 and 21 February 2013 (IOC/TOWS-WG-VI).

2.3 INTERGOVERNMENTAL COORDINATION GROUP FOR THE TSUNAMI EARLY WARNING AND MITIGATION SYSTEM IN THE NORTH-EASTERN ATLANTIC, THE MEDITERRANEAN AND CONNECTED SEAS (ICG/NEAMTWS)– WORKING GROUP 4 PUBLIC AWARENESS, PREPAREDNESS AND MITIGATION

A guideline to national civil protection and disaster management organizations in countries of the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAM) region for their assessment and management of risks to coastal populations has been produced and published on 7 December 2011 as Reducing and managing the risk of tsunamis (IOC Manuals and Guides Nº57). The guidance is specific to the tsunami hazard but within a multi-hazard context. This manual presents case study contributions from Member States. It has been reviewed by the United Nations Office for Disaster Risk Reduction (UNISDR) and revised after by the Eighth session of the ICG/NEAMTWS (ICG/NEAMTWS-VIII/3S). It is available at the address: http://unesdoc.unesco.org/images/0021/002147/214734e.pdf

A workshop on “Tsunami emergency preparedness in Mediterranean coastal zones” took place in the Stromboli Island, Italy, from 30 May to 2 June 2012. It was organized together with the Euro-Mediterranean Programme for the Prevention Preparedness and Response to Natural and Man-Made Disasters coordinated by the Italian Civil Protection Department and the NEAMTIC (Tsunami Information Centre for the North-Eastern Atlantic, the Mediterranean and Connected Seas) project. Contributions to the workshop were made by the ICG/NEAMTWS Chairperson, by the Co-Chairs of the Task Team on Communication Test and Tsunami Exercise, and by the IOC Secretariat. A presentation on “Tsunami Hazard and Social Perception in the Euro-Mediterranean Region” was prepared by WG4.

Moreover, the WG4 has been requested by the ICG to provide guidance on messaging between National Tsunami Warning Centres (NTWCs)/Tsunami Warning Focal Points (TWFPs) and Emergency Response Managers. It has been observed that, since the alert messages adopted by the ICG and used by the candidate TWPs (Tsunami Warning Providers) need to be properly understood and interpreted by the NTWCs/TWFPs of the Member States, the TWPs not only should include in the SOP specific training on messaging for the TWP staff, but also should encourage and be ready to participate upon request in training of the NTWC staff and of personnel involved in the Emergency Response structure
of the Member States. It has been underlined that the format, content and structure of the TWP alert messages have to be appropriate not only for TWPs, but also for the NTWC/TWFPs of the Member States, that in case of an alert are expected to make prompt decisions.

It has been further stressed that the experience on messaging gained by Member States participating in Exercise NEAMWAVE 12 (IOC/2012/TS/103 VOL.1 + VOL.2.) had to be used to evaluate if the messages fully match the Member States’ needs, and, in case of inadequacies are identified, possible amendments should be proposed to the ICG. It has been remarked that for NTWC/TWFPs receiving messages from more TWPs can be problematic in case of contradicting information and that providing guidelines on dealing with multiple messages could be quite useful for Members States. Stressing those discrepancies in messages can be reduced if the monitoring systems (seismic and especially sea-level networks) are sufficiently dense and efficient, and if the processing software is adequately validated, it is suggested that one possible option for the Member States, in case of contradicting level of alert, is to consider the worst case scenario. It has been stressed that the awareness of tsunami risk for the national institutions and also for the local authorities and population is a major work for a substantial improvement of the TWS in the NEAM region.

It has been recognized that there is a large spectrum of the NEAMTIC activities on preparedness and mitigation that are of fundamental interest for the WG4. As a consequence, it is considered essential that the NEAMTIC can continue to work on these subjects even in the future, and a more strict cooperation between NEAMTIC and WG4 is encouraged. A number of educational materials have been produced by NEAMTIC and in particular, a poster for elementary school kids on safe behaviour to be adopted in case of a tsunami event, and an online course for middle school kids on sea-level related hazards. Moreover, guidelines for coastal managers and civil protection authorities and hotel managers have been developed as well. Those materials are available in Arabic, English, Greek and Italian.

It has been observed that the Directive 2007/60/EC on the assessment and management of flood risks that entered into force on 26 November 2007 (and that requires EU Member States to assess if all water courses and coastlines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk) can be a tool to exploit by several ICG Member States in the context of tsunami preparedness and of tsunami risk mitigation.

2.4 INTERGOVERNMENTAL COORDINATION GROUP FOR THE TSUNAMI AND OTHER COASTAL HAZARDS WARNING SYSTEM FOR THE CARIBBEAN AND ADJACENT REGIONS (ICG/CARIBE-EWS)

The Caribbean Tsunami Information Centre (CTIC), a Government of Barbados-UNESCO/IOC initiative, was formally established on 2 September 2013 at the Department of Emergency Management (DEM) of Barbados. The efforts of UNESCO/IOC and the Government of Barbados to establish the CTIC over the period 2011–2013 were supported by the Enhancing Resilience to Reduce Vulnerability in the Caribbean (ERC) Project sponsored by the Government of Italy and implemented by the United Nations Development Programme (UNDP), the Department of Emergency Management (DEM) of the Government of Barbados, and the Organisation of Eastern Caribbean State (OECS). The work of the CTIC will contribute to the progress of the Inter-ICG Task Team on Disaster Management and Preparedness and in this regard, the CTIC has convened a number of activities and developed some Public Awareness and Educational (PAE) products during both the pre and post establishment phases.
The Exercise Caribe Wave/Lantex 13 (IOC/2012/TS/101_VOL_1.), second regional tsunami exercise, was conducted on 20 March 2013. The tsunami scenario simulated a tsunami generated by a magnitude 8.5 earthquake occurred 57 miles north of Oranjestad, Aruba, in the Caribbean Sea. The initial dummy message will be issued by the Pacific Tsunami Warning Center (PTWC) and the West Coast and Alaska Tsunami Warning Center (WCATWC) and disseminated over all its standard broadcast channels. A participant handbook was prepared that included: the tsunami and earthquake scenario information, timelines, the PTWC/WCATWC exercise messages, a model press release for local media, and instructions for post-exercise evaluation. Four online webinars were conducted in support of this exercise. Almost 40,000 people were registered to participate in this second regional wave exercise. The exercise and media report for the Exercise Caribe Wave/Lantex 13 are available at http://unesdoc.unesco.org/images/0021/002183/218367e.pdf.

Caribe Wave/Lantex 14, the third tsunami wave exercise, is scheduled on 26 March 2014 and is being led by the Caribbean Tsunami Warning Program (CTWP) and supported by CTIC. The exercise will provide simulated tsunami messages from the PTWC and NTWC based on a hypothetical earthquake located offshore Portugal and a submarine landslide within the Gulf of Mexico. The Portugal event will be modelled off the 1 November 1755 earthquake and tsunami. This scenario is based on a M 8.5 earthquake, which occurs 270 km in the SW of Portugal and generates a tsunami, affecting the coasts of Portugal, Spain, North Africa, and the Caribbean. The second scenario is based on a M 6.6 earthquake occurring on the north end of Mississippi Canyon which generates a 100 cubic km volume landslide. The planning of this exercise was strengthened by a Task Team meeting in November 2013 which was hosted by the CTIC in Puerto Rico. Three (English, French and Spanish) webinars have been convened in support of this exercise and another series are scheduled for the week of 19 February 2014. The exercise manuals and link to the online registration are available at www.caribewave.info.

The ICG/CARIBE-EWS will be conducting a regional tsunami exercise on an annual basis, and next exercise will be proposed on 25 March 2015. There has been a request from Central America that the scenario for the tsunami wave exercise 2015 include tsunami impacts along the Caribbean coast of Central America.

English educational materials designed and published by the International Tsunami Information Centre with support from the UNESCO/IOC Tsunami Programme including the brochures: Tsunami, The Great Waves (IOC/BRO/2012/4); Tsunami Glossary (IOC/2008/TS/85); Surviving a Tsunami: Lessons from Chile, Hawaii, and Japan (1960 Chile tsunami) (IOC/BRO/2012/5); Where the first wave arrives in minutes: Indonesian lessons on surviving tsunamis near their sources (2004 and 2006 Indonesia tsunamis) (IOC/BRO/2010/4), and the poster Tsunami Sources (1410 BC to AD 2011) that will continue to be distributed. The poster was recently translated into Spanish and has also been distributed. Discussions were also convened in relation to the availability of materials for schools within the Caribbean and adjacent regions. In addition to the materials of Tsunami and Other Coastal Hazards Warning System (TCHWS) Project developed by the Caribbean Disaster Emergency Management Agency (CDEMA) and the Seismic Research Centre (SRC) for the English-speaking Caribbean, the Puerto Rico Seismic Network (UPRM) has developed K-12 Curriculum in English and Spanish, and materials are also being developed for use in schools in Central America through the initiative of the Program Disaster Preparedness Directorate General for Humanitarian Aid of the European Commission (DIPECHO).

As part of the CTIC establishment process through the ERC Project, the multilingual Tsunami Safety Rules flyer (English, French, and Spanish) and the English version of the brochure Understanding tsunamis in the Caribbean: A guide for the public were adapted. These public education products have been tailored for the Caribbean and the French and...
Spanish versions of the brochure are currently being finalized. The completed products are already in distribution.

During the pre-establishment phase of CTIC, a *Tsunami Public Awareness and Education Strategy for the Caribbean and Adjacent Regions* (IOC/2013/TS/107 REV) was developed in consultation with ICG/CARIPE-EWS Members States and experts including a regional workshop “Tsunami Public Awareness and Educational (PAE) stakeholders consultation meeting” that took place in Bayahibe, Dominican Republic, on 19 and 20 November 2012. This initiative seeks to strengthen institutional capacities and support tsunami public education programmes. This strategy focuses on building long-term education and awareness of how to prepare and respond to tsunamis. This is the first time that a tsunami awareness and educational strategy of this scope and magnitude has been developed for this region. As such, extensive research, analysis and consultation have taken place over a seven month period in 2012 and 2013.

The communications component of this Strategy recommends a harmonized approach to tsunami public awareness and education by countries and territories from the Caribbean and adjacent regions. Long-term implementation results of this framework are expected to standardize messaging, increase information flow, strengthen cooperation, and bring regional continuity amongst countries and partners. The document further advocates that tsunami education and awareness are executed in the context of broader disaster risk reduction (DRR) concept to build and sustain disaster resilience as a shared responsibility across the region. It is also expected to complement other PAE work being done in each of the countries.

Global initiatives that underpin this framework include several priorities in the Hyogo Framework for Action (HFA), the Post–2015 Framework for DRR, and the Post–2015 Development Agenda that will supersede the Millennium Development Goals (MDGs). Regional initiatives that also affect this document are the sustainable development agenda for the 2014 International Conference of Small Island Developing States, and the Regional Stakeholder Consultation on the Comprehensive Disaster Management (CDM) Strategy Beyond 2012 of the Caribbean Disaster Emergency Management Agency (CDEMA).

The strategy builds on the 2009 Tsunami Smart® PAE Strategy initially drafted by the CDEMA with input from several stakeholders including the Seismic Research Centre (SRC). This new plan also takes into account lessons learned from recent disasters, incorporates feedback from PAE practitioners in all relevant regions, and it also incorporates lessons learned and best practices from the early warning component of the implemented Regional Risk Reduction Initiative (R3i) of the United Nations Development Programme (UNDP) for 11 English and Dutch Overseas Countries and Territories (OCTs), and the US National Tsunami Hazard Mitigation Program (NTHMP).

In April 2012, four sessions of the Tsunami Awareness (AWR-217) course developed and delivered through the joint collaboration of the National Disaster Preparedness Training Center (NDPTC), the University of Hawaii; the International Tsunami Information Centre (ITIC), the Puerto Rico Seismic Network (PRSN), and the Caribbean Tsunami Warning Program (CTWP) were given in Puerto Rico. In these trainings also participated the Chair Ms Kerry Hinds (Barbados), Working Group 4, ICG/CARIPE-EWS and the CTIC Consultant to the ERC Project, and it was agreed that it was pertinent that the adaptation of this course be considered by CTIC. Since 2012, this course has also been taught on several occasions in the US Virgin Islands. It sought to provide a basic understanding of tsunamis, hazard assessment, warning and dissemination, and community response strategies to effectively reduce tsunami risk. The goal of the course is to enhance the ability of participants to support their organizational preparedness and response efforts in order to facilitate the development of an end-to-end tsunami warning system.
In conjunction with UNESCO/IOC, ITIC, PTWC, and CTWP with support from ERC Project and DEM, two one-week “Regional Tsunami Training Workshop on Strengthening Standard Operating Procedures (SOP) for Tsunami Warning and Emergency Response, and the Development of the ICG/CARIBE-EWS PTWC New Enhanced Products” were hosted by the CTIC in the Dominican Republic and Barbados from 4 to 8 November 2013. These trainings covered essential topics involved in end-to-end tsunami warning including event monitoring and detection, threat evaluation and warning, alert dissemination, emergency response, evacuation, and public action. The trainings also included an information and feedback session on the proposed PTWC Enhanced Tsunami Products. These products were approved for development by the Eighth 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) held in Port of Spain, Trinidad and Tobago, from 29 April to 1 May 2013, and recommended a joint Exercise Caribe Wave/Lantex 14 (IOC/2013/TS/109VOL.1). These proposed products will also be a feature during the 2014 exercise wave.

The ICG/CARIBE-EWS Working Group 4 on Preparedness, Readiness and Resilience membership and leadership was renewed in April 2012. The Terms of Reference were under revision to reflect the current state of development of the ICG/CARIBE-EWS, and the amended Terms of Reference were approved at the Eighth Session of the ICG/CARIBE-EWS in April 2013. A first full meeting of the Working Group 4 was organized and held in March 2013.

During the period 2012–2013, the members of Working Group 4 contributed to the development and review of the Regional Tsunami Public Awareness Strategy, as well as to the elaboration of a number of public awareness materials for the Member States within the Caribbean and adjacent regions and also assisted with the planning for the Exercise Caribe Wave/Lantex 14.

Based on the success of the implementation of the US National Weather Service (NWS) TsunamiReady® recognition programme and of its implementation as a joint UNESCO/IOC–NWS Pilot Project in UNESCO and other community-based programmes, Working Group 4 and the CTIC convened a meeting of Task Team on Performance Based Tsunami Recognition Programme in November 2013 in Puerto Rico to develop a strategy for promoting and implementing a community-based recognition programme for tsunami preparedness by the ICG/CARIBE-EWS.

Various discussions have been convened concerning the roles of CTIC, ITIC, CTWP and the ICG/CARIBE-EWS Working Group 4 in the development and adaptation of tsunami awareness resources. The Office of U.S. Foreign Disaster Assistance (OFDA) of the United States Agency for International Development (USAID) has been also very supportive of strengthening tsunami awareness and preparedness in the Caribbean region.

3. UPDATES FROM TSUNAMI INFORMATION CENTRES

3.1 INTERNATIONAL TSUNAMI INFORMATION CENTER (ITIC)

The ITIC continued to host and deliver training in Hawaii (called ITP-Hawaii) and in-region (called ITP-International) for NTWC and NDMO staff in 2012 and 2013 to PTWS and ICG/CARIBE-EWS Member States. The ITIC also participated to IOTWS SOP Regional Training Courses in 2011 and 2013. The training focused on SOPs for tsunami warning and tsunami emergency response in the context of planning, conducting and evaluating tsunami exercises as a best practice for increasing country readiness. Specific attention was given for preparing for exercises and the introduction and feedback on new experimental PTWC tsunami products.
A number of general awareness materials are available free-of-charge from ITIC, publishing in collaboration with the IOC. Shipments of small amounts of materials have been distributed to PTWS Member States. English materials include the brochures: *Tsunami, The Great Waves 2012* (IOC/BRO/2012/4); *Tsunami Glossary 2013* (IOC/2008/TS/85); *Surviving a Tsunami: Lessons from Chile, Hawaii, and Japan* (1960 Chile tsunami) (IOC/BRO/2012/5); *Where the first wave arrives in minutes: Indonesian lessons on surviving tsunamis near their sources* (2004 and 2006 Indonesia tsunamis) (IOC/BRO/2010/4); and the posters: *Tsunami Sources* (1410 BC to AD 2011), *Significant Earthquakes* (2150 BC to AD 2013), and *Significant Volcanic Eruptions* (4360 BC to AD 2013). The Tsunami Sources as well as *Sensing a Tsunami* posters were translated into Spanish by the Hydrographic and Oceanographic Service (SHOA) of the Navy of Chile, and copies were printed. Additional Spanish language materials of the above were also printed by Chile in 2012. Low-resolution copies of documents are available from ITIC web site (www.tsunamiwave.info) and high-resolution copies are distributed by DVD by ITIC.

To assist warning centres and response agencies, ITIC also distributes free-of-charge tsunami warning decision support tools, which include: CISN (earthquake display), Tide Tool (sea-level monitoring display), TTT (tsunami travel time calculation software), TsuDig (global tsunami, earthquake, and volcano offline GIS database tool). In addition, ITIC hosts the Tsunami Bulletin Board (list serve for tsunami professionals), and supports the RANET Project in providing heads-up courtesy SMS texts of PTWC messages.

ITIC has developed a 1-day Tsunami Awareness Course aimed at stakeholders responsible for planning and responding to tsunami emergencies, which was used in Tonga and Fiji in 2010. The course materials are posted at the IODE OceanTeacher website: http://classroom.oceanteacher.org.

ITIC is developing a Tsunami Warning and Emergency Response SOP Manual and Guide in collaboration with the IOC/IOTWS Secretariat, and is piloting a Business SOP Short Course aimed at preparing small business and hotels to effectively respond to a local and distant tsunami.

### 3.2 JAKARTA TSUNAMI INFORMATION CENTER

– INDIAN OCEAN TSUNAMI INFORMATION CENTER

The Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) supported the initiative to transform the Jakarta Tsunami Information Center (JTIC) as the Indian Ocean Tsunami Information Center (IOTIC) to support IOTWS Member States.

The Ninth Session of the ICG/IOTWS (ICG/IOTWS-IX) held in Jakarta, Indonesia, from 27 to 30 November 2012 requested JTIC to develop the Terms of Reference for the Indian Ocean Tsunami Centre (IOTIC). The Terms of Reference has been presented at the IOTWS Steering Group meeting (ICG/IOTWS SG-8) held in West Perth, Australia, on 10 and 11 December 2013.

IOTIC is an UNESCO/IOC entity and will operate under the overall authority of the Executive Secretary of IOC of UNESCO, and the day to day management of the UNESCO/IOC National Programme Officer stationed at UNESCO Jakarta in close coordination with the ICG/IOTWS Secretariat. The IOTIC will report to each session of the ICG/IOTWS and to the intersessional meetings of the ICG/IOTWS Steering Group, and its activities and work plans will be guided by and coordinated with the needs and requirements of the ICG/IOTWS.
The goal of IOTIC is to provide support to the countries of the Indian Ocean region in disaster risk reduction focusing on tsunamis through the preparation and dissemination of awareness and preparedness materials and the development of educational programmes.

The Terms of Reference of Indian Ocean Tsunami Information Center covers:

- Work closely and in coordination with the ICG/IOTWS, its Steering Group, Working Groups and Secretariat;
- Serve as an information resource for the availability of educational, preparedness, and other awareness materials required for an effective tsunami warning and mitigation system;
- Develop, manage and maintain the Indian Ocean Tsunami Information Center website as a platform for sharing information on tsunami education, awareness and preparedness;
- Develop strategic and long-term plans for sustaining the Indian Ocean Tsunami Information Center.

IOTIC has developed the IOTIC website (http://iotic.ioc-unesco.org/; or www.iotsunami.net; or www.iotsunami.info; or www.iotsunami.org). This website will be dedicated to be the clearing house of information and the point of dissemination of tsunami information in the Indian Ocean region. Information from JTIC will be transferred to this IOTIC website.

3.3 TSUNAMI INFORMATION CENTRE FOR THE NORTH-EASTERN ATLANTIC, THE MEDITERRANEAN AND CONNECTED SEAS

The Tsunami Information Centre for the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTIC) was approved by the 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 (ICG/NEAMTWS-VI) held in Istanbul, Turkey, from 11 to 13 November 2009, based on the model of tsunami information centres in other regions. NEAMTIC started in December 2010 as two-year project funded by the European Commission Directorate General–Humanitarian Aid & Civil Protection (DG ECHO). The project was officially concluded in April 2013.

NEAMTIC worked on four main activities:

- Collect information on the international warning activities for tsunamis and other sea-level related hazards in the NEAM region, including establishing contacts with the Monitoring and Information Centre (MIC) of the European Civil Protection, as well as civil protection agencies of Member States.
- Provide to regional and national stakeholders information on tsunamis and other sea-level related hazards, and on tsunami warning and mitigation systems.
- Foster identification and exchange of best practices and assist national stakeholders in the establishment of regional and national components of NEAMTWS, and the reduction of risks from tsunamis and other sea-level related hazards through comprehensive mitigation programmes.
- Act as an information resource for the development and distribution of awareness, educational and preparedness materials, event data collection, and the fostering of research and its application with the aim of mitigating loss of life and property from tsunamis and other sea-level related hazards. Currently the NEAMTIC web-portal is functioning as repository of ICG/NEAMTWS documents and information, and the NEAMTIC educational and awareness raising products are being translated into ICG/NEAMTWS Member States’ languages.
3.4 CARIBBEAN TSUNAMI INFORMATION CENTER

The Caribbean Tsunami Information Center (CTIC) was formally established on 2 September 2013 at the Department of Emergency Management (DEM), Barbados, and is staffed by an Interim Director. The CTIC has already advanced draft MOUs (Memorandum of Understanding) with the Governments of France and Venezuela in respect of secondments and resource mobilization proposals in association with UNESCO/IOC and UNDP. The ICG/CARIBE-EWS will also continue to seek monetary contributions as well as secondments from Member States to support the work of the CTIC through the following mechanisms:

- Memoranda of Understanding.
- Voluntary contributions to the IOC Special Account.
- Support for specific activities.

Administrative and logistical support to the CTIC is being provided through agreements with Barbados Government, UNESCO/IOC and UNDP.

The CTIC has developed a draft business and sustainability plan which was reviewed at the CTIC Board Meeting on 23 November 2013 and is to be revised for approval at the level of the ICG/CARIBE-EWS.

4. TASK TEAM ACTIVITIES

As decided at its Inter ICG Task Teams meeting (Res XXV-13) held in Seattle, United States, from 29 November to 1 December 2010, the Task Team (TT) reflected upon its activities:

- Stock-take on ICG status of public awareness and NTWC/DMO response
- Inter and intra-regional (ICG) sharing of community-based EWS best practices
- Discussion with ISDR, ECHO UN regional organizations and other relevant donors, including on the use of CBDRR/CBDRM platform
- Basic framework for standard operational procedures in tsunami warning dissemination
- Exercise guideline
- Training and capacity building
- Other activities
  - Wave exercises
  - Strengthening the roles of TICs

4.1 STOCK-TAKE ON ICG STATUS OF PUBLIC AWARENESS AND NTWC/DMO RESPONSE

The respective regional Intergovernmental Coordination Groups (ICGs) have all established a number of specialist Working Groups, one of which with an ‘Awareness and Response’ focus (in some cases the focus extends to ‘Reduction’ and ‘Assessment’). An assessment of current capacity is therefore required within each ICG to inform the focus of the Working Groups. It was recommended during Inter ICG Task Teams meeting held in Seattle, United States, from 29 November to 1 December 2010 that the relevant Working Group(s) within each ICG conducts a survey of the status of public awareness and response capacity among their Member States in the form of a short questionnaire - to be completed by each Member State.
An assessment template was developed (and implemented) in English, French and Spanish and was circulated by email in 2011 to PTWS Tsunami Warning Focal Points. This template was made available to other ICGs and has since been adapted by the IOTWS for distribution to all its Member States.

The response to the survey by Member States was found to be low, and subsequently did not support a representative assessment of the overall awareness and response status development needs. However, it did provide some indication of development needs among Member States.

In the PTWS and the CARIBE-EWS, through the Exercise Pacific Wave 11 (IOC/2011/TS/97VOL.1; IOC/2011/TS/97VOL.2) and Caribe Wave 13 Post-Exercise Evaluation Questionnaire, countries did provide an assessment of their current readiness to respond.

The Inter ICG Task Team noted that the IOTIC (in coordination with the ICG/IOTWS secretariat) plans to conduct an Indian Ocean ‘end to end’ stock take that will include preparedness and response as a project under the Malaysian Fund in Trust. The survey will be made available to the Inter ICG Task Team for consideration by other ICGs.

4.2 INTER AND INTRA-REGIONAL (ICG) SHARING OF COMMUNITY-BASED EWS BEST PRACTICES

The Inter ICG Task Team noted there are currently many examples of community-based initiatives, for instance the Developing Early Warning and Community Preparedness in Indonesia (GITEWS) TSUNAMIKit. The Inter ICG Task Team recommends that whenever possible ICGs, WGs and national agencies partner with local NGOs to promote tsunami community-based early warning and disaster risk reduction initiatives.

4.3 DISCUSSION WITH THE INTERNATIONAL STRATEGY FOR DISASTER REDUCTION (ISDR), ECHO-UN REGIONAL ORGANIZATIONS AND OTHER RELEVANT DONORS, INCLUDING ON THE USE OF CBDRR/CBDRM PLATFORM

Some of the activities have been undertaken. Regional and international exercises were also held in the interest of evaluating response preparedness. These exercises often use tsunami hazards and other sea-related hazards for example storm surges, which test the interoperability of systems among countries. An example being held at the ASEAN (Association of South-East Asian Nations) forum for example is ASEAN Regional Forum Disaster Relief Exercise 2013 (ARF DIREx 2013) or the ASEAN Disaster Emergency Response Simulation Exercise 2013 (ARDEx-13). The trigger of the response would engage a tsunami warning or advice; therefore, other communities need to be familiarized with the warning products and protocols, as part of the outreach as well as mainstreaming efforts towards a wider or global context.

The Session of the Secretariat of the Pacific Regional Environment Programme (SPREP) in 2012 approved the recommendation for a Pan-Pacific Tsunami Awareness day as a mechanism for encouraging tsunami preparedness amongst island communities. SPREP was designated as the lead agency for the coordination and implementation.

ICGs and the Secretariat continue to promote Community-Based Disaster Risk Reduction (CBDRR) activities with Non-Governmental Organizations (NGOs), while some projects should be taken by the ICGs themselves including International Day for Disaster Reduction (IDDR).
4.4 BASIC FRAMEWORK FOR STANDARD OPERATIONAL PROCEDURES IN TSUNAMI WARNING DISSEMINATION

Extensive work had been undertaken by the Inter ICG Task Team to develop guidelines and training material in relation to Standard Operating Procedures (SOPs), taking into account and using already existing material from ICG Member States. The Tsunami Information Centres (TICs) also make available a range of real examples in this regard. The current draft is based on a product of the UNESCO/IOC Project funded through UNESCAP Multi-Donor Voluntary Trust fund for tsunami preparedness in the Indian Ocean and Southeast Asian Region titled “Strengthening Tsunami Warning and Emergency Responses: Training Workshops on the Development of Standard Operating Procedures for Indian Ocean and Southeast Asian Countries” (2008–2010). It is expected that this SOP Guideline will be finalized and published as an UNESCO/IOC document to be used across basins under the coordination of TOWS-WG.

4.5 EXERCISE GUIDELINE

The purpose of a wave exercise is to evaluate the ability of countries and their national and local organizations to respond to a tsunami, whether local or distant. These exercises provide an opportunity for countries to exercise their operational lines of communications, review their tsunami response procedures and, at the same time, promote emergency and tsunami preparedness. Noting the absence of a generic and consistent guideline available for ICGs about the development and management of regional tsunami exercises, the TOWS Inter-ICG Task Team on Disaster Management and Preparedness initiated and concluded the development of How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises (IOC Manual and guides, 58). This manual has been briefed to and distributed by IOC and ITIC in all tsunami Standard Operating Procedures training in the Pacific and Caribbean in 2012 and 2013. The Manual has also been discussed and briefed during IOTWS SOP trainings in 2011 and 2013.

4.6 TRAINING AND CAPACITY BUILDING

This activity is on-going; the concept of a cadre of regional trainers must be pursued by the Intergovernmental Coordination Groups.

4.7 OTHER ACTIVITIES

4.7.1 Wave Exercises

Every ICG maintains a programme of international tsunami exercises to test and improve their products, as well as processes and readiness of regional warning centres and Member States.

The ICG/NEAMTWWS conducted its first Exercise NEAMWAVE 12 (IOC/2012/TS/103 VOL.1 + VOL.2) on 27 and 28 November 2012. This real-time simulation, based on four scenarios in which earthquakes provoked tsunamis in different regions, demonstrated that the communication system for sending and receiving alert messages to concerned national authorities worked smoothly. Turkey, France, Greece, and Portugal were in charge of generating the four earthquake and tsunami scenarios for the test, and 18 member countries participated.

The ICG/PTWS conducted Exercise Pacific Wave 13 (IOC/2013/TS/106 Vol.1 + Vol.2) from 1 to 14 May 2013 to test Member States' readiness for, and to obtain their feedback on the enhanced warning products of the Pacific Tsunami Warning Center (experimental). Based on the exercise evaluation, adjustments to the products were made and the Twenty-fifth Session
of the ICG/PTWS (ICG/PTWS-XXV) held in Vladivostok, Russian Federation, from 9 to 11 September 2013 decided to implement the enhanced products starting from 1 October 2014. Although the exercise focused on the experimental products, it also served to further inform the ICG of areas of focus. The next planned PTWS exercise will be in early 2015.

The second regional tsunami exercise, Caribe Wave/Lantex 13 (IOC/2012/TS/101 VOL.1) was conducted on 20 March 2013. The tsunami scenario simulated a tsunami generated by a magnitude 8.5 earthquake originating 57 miles north of Oranjestad, Aruba, in the Caribbean Sea. The initial dummy message was issued by Pacific Tsunami Warning Center (PTWC) and the West Coast and Alaska Tsunami Warning Center (WCATWC), and disseminated over all its standard broadcast channels. A participant handbook was prepared that included: the tsunami and earthquake scenario information, timelines, the PTWC/WCATWC exercise messages, a model press release for local media, and instructions for post-exercise evaluation. Four online webinars were conducted in support of this exercise. Almost 40,000 people were registered to participate in this second regional exercise. Exercise and media report for Caribe Wave/Lantex 13 are available at caribewave.info

Exercise Caribe Wave/Lantex 14 (IOC/2013/TS/109VOL.1), the third tsunami exercise, was scheduled on 26 March 2014 and was led by CTWP and supported by CTIC. The exercise provided simulated tsunami messages from the PTWC and NTWC based on a hypothetical earthquake located offshore Portugal and a submarine landslide within the Gulf of Mexico. The Portugal event was modelled off the 1 November 1755 earthquake and tsunami. This scenario is based on a M 8.5 earthquake, which occurred 270 km in the SW of Portugal and generated a tsunami, affecting the coasts of Portugal, Spain, North Africa, and the Caribbean. The second scenario was based on a M 6.6 earthquake occurring on the north end of Mississippi Canyon which generates a 100 cubic km volume landslide. The planning of this exercised was strengthened by a Task Team meeting in November 2013 which was hosted by the CTIC in Puerto Rico. Three webinars (English, French and Spanish) were convened in support of this exercise and another series was scheduled for the week of 19 February 2014. The exercise manuals and link to the online registration are available at www.caribewave.info.

The ICG/CARIBE-EWS will be conducting a regional tsunami exercise on an annual basis and the next exercise will be proposed for 25 March 2015. There has been a request from Central America that the scenario for the 2015 exercise include tsunami impacts along the Caribbean coast of Central America.

4.8 STRENGTHENING THE ROLES OF TICS

Since the Inter ICG Task Teams meeting held in Seattle, United States, from 29 November to 1 December 2010, the Inter ICG Task Team on Disaster Management and Preparedness has discussed and agreed that the TICs (Tsunami Information Centres) can play a stronger, strategic role as information sharing and capacity building hubs that will benefit not only the region but all ICGs. A TIC coordination meeting took place in Paris, France, on 14 February 2014 to discuss coordination.

5. PLANNED ACTIVITIES

Based on the reports received and progress made with actions agreed in 2010, the Inter ICG Task Team on Disaster Management and Preparedness considered its future activities:

- SOP manual
- Tsunami evacuation mapping guidelines
5.1 SOP MANUAL

A focus of the Inter ICG Task Team will be to take the lead in the review and finalizing the SOP Manual that is currently in draft (see 4.4) for submission to the IOC. The Chair of the Task Team will take the lead.

5.2 TSUNAMI EVACUATION MAPPING GUIDELINES

The Inter ICG Task team noted there are several initiatives existing within ICGs in this regard. The Task Team will compile a reference list of existing material, as well as a template to cover the themes or topics that must be considered for comprehensive guidelines. Following this work, the Task Team will consider further activity in this respect.

5.3 TSUNAMIREADY AND TSUNAMI SMART CAMPAIGNS

In the United States of America, the TsunamiReady programme is recognized as an effective programme to help protect the life, property and livelihood of people from tsunamis in coastal communities by helping emergency managers, government officials and community leaders to identify hazard and evacuation areas, improve tsunami warning reception and dissemination capabilities, prepare response plans, and educate residents and visitors. This concept was extended to the Caribbean as a pilot project in the Sixth 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) held in Santo Domingo, Dominican Republic, from 26 to 29 April 2011. An advantage of such a recognition program is that minimum local/community requirements for tsunami readiness and preparedness can be endorsed, thus allowing countries to clearly identify gaps and needs for improvement.

At the same time, Tsunami Smart awareness materials for the English speaking Caribbean countries have been developed through a CDEMA/USAID project. The materials are focused on the Caribbean arrangements, but take advantage of ITIC materials.

Promoting the programmes in the South West Pacific and elsewhere attracted varied levels of interest. However, the Inter ICG Task Team recognizes the positive regional efforts in the USA and the Caribbean, and considers the concept and material developed to be of a high standard. ICGs are therefore encouraged to consider similar programmes (noting the ‘TsunamiReady’ brand is trademarked for the USA).

5.4 TSUNAMI PUBLIC AWARENESS AND EDUCATION STRATEGY

The Eighth Session of the ICG/CARIBE-EWS (ICG/CARIBE-EWS-VIII) approved a Tsunami Public Awareness and Education (PAE) Strategy for the Caribbean and Adjacent Regions (IOC/2013/TS/107 REV) in 2013. The Strategy outlines regional communication objectives, target audiences, and communications approaches. The ICGs are encouraged to consider developing a PAE strategy linked to their Implementation Plan.
5.5 TSUNAMI GUIDE FOR HOTELS

A Guide to tsunamis for hotels: tsunami evacuation procedures (IOC/2012/MG/69) have been prepared and published by the Tsunami Information Centre (NEAMTIC) Project of the Intergovernmental Coordination Group (ICG) of the Tsunami Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS) in cooperation with Jakarta Tsunami Information Centre (JTIC). These guidelines provide practical guidance on hotel preparedness, and evacuation planning and procedures. As a follow-on, ITIC is developing guidelines and other good practice examples for use by small businesses and hotels to enable them to respond effectively to a tsunami. The Inter-ICG Task Team on Disaster Management and Preparedness recognizes the need for such material and will review these materials and provide feedback for their finalization by ITIC.

5.6 POST-EVENT PERFORMANCE SURVEY (JOINT ITEM WITH TASK TEAM ON TSUNAMI WATCH OPERATIONS)

The TOWS-WG agreed that tsunami response assessments and questionnaires are valuable. Recommendation 5 to TOWS-WG (IOC/TOWS-WG-VI) requested the development of a standard questionnaire for post-event analysis to be used by all ICGs. The TOWS-WG Task Teams on Tsunami Watch Operations and on Disaster Management and Preparedness were subsequently asked to develop a standard set of questions for IOC/TOWS-WG-VII.

ITIC briefed the Task Teams on the questions for consideration. Relevant background documents that were reviewed included RTSP Performance Indicators, Post-Event Questionnaires used by the IOC in past events (e.g., 26 August 2012, 11 April 2012, 11 March 2011, 27 February 2010, etc), and the Post Tsunami Field Survey Guide (SC.98/WS/24) Questionnaire used by International Tsunami Survey Teams (ITST).

The Task Teams agreed that a draft survey will be circulated among the Task Teams for feedback to ITIC for finalization under the title “Post-Event Performance Survey”. The survey will then be customized by the TICs for each ICG, and ICGs will determine the threshold for surveys to be conducted. The Task Teams agreed that the survey will be web-based and that process for conducting surveys will be as follows:

- IOC will send a circular letter to the Tsunami National Contacts (TNCs) in affected Member States within one month of tsunami events that met the threshold by the respective ICGs.
- TICs (in close cooperation with ICG Secretariats) will manage surveys and compilation of reports, assisted by a team of experts nominated by the ICG Steering Group if required (noting NEAMTIC and IOTIC do not currently have a mandate).
- Draft reports will be finalized within 3–6 months of an event.
- Reports will be reviewed and finalized by the ICG and then published as IOC Technical Series.

6. RECOMMENDATIONS TO TOWS-WG

As an outcome of the Seventh Meeting of the Working Group on Tsunami and other Hazards related to Sea-Level Warning and Mitigation Systems (IOC/TOWS-WG-VII) held in Paris, France, on 10 and 11 February 2014, the Task Team recommends that the TOWS-WG-VII:

- Finalizing an SOP Manual.
• Compiling a reference list of tsunami evacuation mapping material, and developing a template for comprehensive mapping guidelines.

• Promoting education and awareness strategies as well as ‘TsunamiReady and Tsunami Smart’ type programmes with reference to initiatives in the CARIBE-EWS.

• Finalizing a tsunami guide for hotels.

• Finalizing the Post Event Performance Survey.

Notes that Tsunami Information Centres (TICs) are to be involved in the management of post-event performance surveys, and therefore inquires that the TOWS-WG requests ICGs to give consideration to the appropriate resourcing and mandate of their TICs to be able to perform this function.

Notes that the ability to meet in advance of the TOWS-WG facilitated new momentum for the Task Team through facilitating progress with regards to initiatives and activities as well as engendering coordination between ICGs, and that:

• The Task Team recommends to meet again prior to the next meeting of the TOWS-WG.

• The Task Team recommends greater provision for joint meetings with the Task Team on Tsunami Watch Operations is made at a next meeting to ensure end-to-end considerations in relevant deliberations.

Notes that the Task Team recognizes a need for advocacy of the tsunami hazard in the context of DRR in the build-up to the 3rd World Conference on Disaster Risk Reduction (WCDRR) of UNISDR that will take place in Sendai, Japan, from 14 to 18 March 2015; and that the TOWS-WG should consider encouraging the IOC Executive Council to call upon the collective capacity and structures of IOC in this regard.
ANNEX V

REPORT OF THE INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS

10–11 February 2014
Paris, France

1 OPENING AND MEETING ORGANIZATION

The Chair of the Inter-ICG Task Team on Tsunami Watch Operations, Dr Srinivasa Kumar, welcomed the participants to the meeting and made some introductory remarks. He invited Dr Thorkild Aarup, Head of IOC Tsunami Unit, to make some opening remarks and to provide details of meeting arrangements and facilities. Dr Kumar then invited the participants to introduce themselves. He then reviewed the provisional agenda and asked for comments from the participants. There being no comments, the provisional agenda was adopted (APPENDIX I).

2 PRESENTATION ON THE PROGRESS OF THE TASK TEAM

Dr Kumar gave a presentation summarising the progress of the Inter-ICG Task Team to date. He reviewed the recommendations made to the Sixth meeting of the TOWS-WG held in Paris, France, on 20 and 21 February 2013 (IOC/TOWS-WG-VI/3) and noted that the meeting should examine their validity and provide feedback on the status of adoption in each ICG. He listed the newly nominated members of the Task Team and thanked past members for their contribution. He reminded the participants of the Terms of Reference for the Task Team as adopted by the Sixth meeting of the TOWS-WG. He recalled the progress made by the Task Team since its First meeting held, Seattle, United States, from 29 November to 1 December 2010, and in particular highlighted the outcomes of the last Inter-ICG Task Team meeting held in Paris, France, on 18 and 19 February, which would be reviewed and elaborated during this meeting.

Dr Kumar then referred to Areas of Responsibility (AoR) and geographical coverage and recalled the progress that had been made on developing maps since 2011. The last meeting of the Task Team had prepared two maps: a global map of Areas of Responsibility of the Regional Tsunami Service Providers (RTSPs), and a map of the earthquake source regions of each ICG. Since the last meeting, comments had been received from each ICG and he hoped that the maps could be finalised at this meeting under agenda item 4.

Dr Kumar noted that the recommendations on harmonised products and terminologies orginally made in Seattle in December 2010 were still valid. Procedures for handling events in quick succession had been discussed at the last Task Team meeting and it had been decided that it was not possible to be prescriptive and that each event should be considered case by case. Standard questionnaires for post-event analysis had also been discussed at the last Task Team meeting and would be discussed further under agenda item 7 of this meeting. Dr Kumar also noted that the naming convention for tsunami events had been discussed at the last meeting and a recommendation had been made to the TOWS-WG on this matter.

Dr Kumar then referred to procedures for RTSPs disseminating bulletins for areas outside their Areas of Responsibility and dissemination of public bulletins on the IOC Public List Server. Since the last meeting, there had been discussions between the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) and the Pacific Tsunami Warning and
Mitigation System (PTWS) on this issue and procedures had been agreed. This issue would be discussed further under agenda item 5 of this meeting.

Dr Kumar commented on the coordination of public dissemination of regional tsunami threat information and noted that at the last Task Team meeting, Australia had requested to be excluded from the current PTWC products until had been a detailed review of these issues while finalising the new PTWS products. This will be discussed further under agenda items 4 and 5.

Referring to standards for reporting of water levels by different RTSPs, Dr Kumar noted that there needed to be consistency in what is forecasted and reported in tsunami bulletins and that the Task Team needed to provide recommendations on standards to the TOWS-WG. A compilation of current procedures has been prepared and will be discussed under agenda item 5.

Dr Kumar noted that guidelines for the review of tsunami watch operations will be discussed further under agenda item 7. The IOTWS RTSP performance report had been circulated to the Task Team members and would be used as a basis for discussing capability requirements and Performance Indicators (PI) in each Intergovernmental Coordination Group (ICG).

Dr Kumar concluded by listing the recommendations of relevance to the Task Team that had been made at the last TOWS-WG meeting and noted that all of these were included for discussion on the agenda of this meeting.

Mr Rick Bailey noted that there had been some recommendations made by the Task Team that had already been adopted by the TOWS-WG and the IOC Assembly. He suggested that it would be useful to capture all of these in a single reference document. Dr Kumar agreed and suggested updating the Task Team 2011 document using the ICG implementation plans. This should be kept as a living document.

3 PRESENTATIONS FROM THE ICG REPRESENTATIVES

3.1 PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEM (PTWS)

Dr Chip Mc Creery gave a presentation based on the report User's guide for the Pacific Tsunami Warning Center: enhanced products for the Pacific Tsunami Warning System (IOC/2013/TS/105 REV.) prepared by PTWS Task Team on Enhanced Products, the Pacific Tsunami Warning Center (PTWC) and the International Tsunami Information Center (ITIC). He provided the background to the reasons for enhancing PTWS products. The last major revision had been in 2001 and the procedures in the PTWS are very conservative. There is more information available now from models to determine which areas are under threat and which are not. The major benefit of the enhanced products is to reduce over-warning, particularly for distant tsunamis. Another benefit is that graphical products will be issued as well as text products and these will provide more information. Text products will still exist, but warnings will no longer be given. Instead earthquake parameters and estimates of amplitudes will be given and potential impacts. Graphical products will show where energy is going and provide deep ocean amplitude forecasts, coastal tsunami amplitude forecasts using Green's Law, and areas in the Pacific under threat in 4 amplitude range levels depicted in large area polygons. Google Earth KMZ files will also be available and will provide more detailed information for coastal zones. The new modelling technique does not make use of nested models so it will not be possible to obtain fine detail such as in bays. However, the computational technique provides quick solutions in real-time. Tables of statistics will also be produced for each forecast polygon zone. PTWS is moving forward with full implementation
of the products in 2014 with a target changeover date of 1 October 2014. The text product will remain a public product but the graphical products will only be disseminated to the National Tsunami Warning Centres (NTWCs).

Dr Kumar enquired about the difference between coastal zone and polygon graphical products. Dr McCreery explained that the polygons show the value of the maximum point in each polygon and what range it fits into. They provide a quick overview and shows where the threats are in the Pacific.

Dr Francois Schindele remarked that he felt that the methodology was not accurate enough for small islands. In French Polynesia there is a specific Green's Law for each type of island. Modelling is not enough and there needs to be data to ensure that the model does not overestimate or underestimate.

Mr Michael Angove addressed this concern and noted that this is why PTWC is putting the RIFT (Rapid Inundation Forecasting of Tsunamis) model through an operational baseline to determine the uncertainties in the different scenarios. Dr Schindele commented that his main concern was with the polygon map which provides levels that are too large for small islands. Dr McCreery commented that Green's Law could be customised for areas where it is known not to apply.

Dr Ken Gledhill commented that the feedback from emergency managers is that they find the polygon map very useful, so this needs to be kept in mind.

Mr Rick Bailey enquired how the baseline testing was progressing. Mr Angove replied that it is in progress and there is a plan to run through a range of scenarios to determine uncertainties.

Mr Takeshi Koizumi gave a presentation on behalf of the Northwest Pacific Tsunami Advisory Center (NWPTAC). He presented a map showing the NWPTAC Area of Responsibility and noted that the Banda Sea area of Indonesia was a joint Area of Responsibility with the IOTWS. He remarked that NWPTAC had no assumed faults in the Banda Sea so if there was an earthquake they could only provide qualitative information. Models for this area would be included when the NWPTAC is upgraded. Mr Koizumi explained the procedure that PTWC and NWPTAC had adopted for issuing bulletins in the Pacific Ocean region to avoid any conflict of seismic parameter estimation. Mr Koizumi then explained the plans of the Japan Meteorological Agency (JMA) for the development of new NWPTAC products. Starting at the Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS-XXV/3 REV.) held in Vladivostok, Russian Federation, from 9 to 11 September 2013, the implementation timeline is to develop and implement new NWPTAC products progressively. A proposal will be submitted to the Twenty-sixth Session of the ICG/PTWS.

Dr Ken Gledhill provided a summary of the outcomes of the Twenty-fifth Session of the ICG/PTWS. The main issues covered were the enhanced products of the South China Sea Tsunami Advisory Centre, and the planning for exercise PacWave15. Unlike the other ICGs, PTWS has regional and technical Working Groups and Dr Gledhill would like to discuss how these are coordinated in the future. He noted that a lot of the same people are in the ICG Working Groups and Task Teams as in the TOWS-WG and Task Teams. This needs to be rationalised and he suggested that global Working Groups instead of regional ICG Working Groups might be an answer. Dr Gledhill noted that another outcome of the Twenty-fifth Session of the ICG/PTWS was that Member States wanted only text products to be in the public domain and not graphical products.
Dr Kumar enquired if there was any policy in the PTWS for magnitude thresholds for issuing bulletins for events outside the Pacific Ocean that might affect the PTWS region. Dr McCrerey remarked that there are some events for which PTWC issues bulletins, but no official magnitude threshold exists.

Dr Kumar enquired if there had been any discussion about Performance Indicators for the new products in the PTWS. Dr Gledhill commented that there were no Performance Indicators yet and they would follow the IOTWS on this matter.

3.2 TSUNAMI EARLY WARNING AND MITIGATION SYSTEM IN THE NORTH-EASTERN ATLANTIC, THE MEDITERRANEAN AND CONNECTED SEAS (NEAMTWs)

Dr Francois Schindele provided an overview of the status of NEAMTWs. He presented the NEAMTWs decision matrix, which is based on two thresholds: Advisory and watch. The watch threshold anticipates inundation whereas the advisory threshold is more for marine threat. The seismic criteria for the North-East Atlantic are similar to the IOTWS and PTWS but with two thresholds. The seismic criteria for the Mediterranean are lower than for other regions and the threshold for a basin-wide watch is >M7.0. The NTWCs have to request through the Intergovernmental Oceanographic Commission (IOC) which candidate watch provider they want to receive bulletins from, which is different from the other ICGs. Three candidates of Tsunami Watch Provider (TWP) are now operating, since summer 2012: Turkey, Greece and France. Two other centres are planning to commence operating in the second half of 2014: Italy and Portugal. All candidate TWPs will therefore be in place by the end of 2014. There is no official definition of Area of Responsibility in the NEAMTWs region but there is an unofficial understanding between each candidate TWPs to know the region that must cover. When all candidate TWPs will be operational, all regions will be fully covered, including the Adriatic and the North-East Atlantic. Dr Schindele reminded the meeting of the governance structure of the ICG/NEAMTWs, which comprises 4 Working Groups and 2 new Task Teams on Communications Tests, and on Tsunami Exercise. He also recalled that exercise NEAMWAVE 14 will be chaired by the civil protection authorities of France and Italy.

Mr Ocal Necmioglu added that although the NEAMTWs decision matrix has been agreed, it has not been implemented yet and it will take about two years to find a solution to some outstanding issues.

Mr Rick Bailey enquired if there was a formal agreement between the NTWCs and the candidate Tsunami Watch Providers. Dr Schindele replied that there was no formal agreement and the NTWCs made their requests through IOC. There is no accreditation process yet but this had been proposed by the ICG.

Dr Chip McCrerey enquired why some centres monitor only certain areas and do not cover the entire region. Dr Schindele noted that there was some sensitivity about this. It will evolve over time but, at present, the most important thing is to have 5 operational centres and at least 2 centres monitoring each zone.

Mr Takeshi Koizumi requested clarification on what data was available to each centre. Dr Schindele clarified that all sea-level and seismic data were available to all centres.

Mr Ocal Necmioglu noted that monitoring of real time data was not defined in the accreditation process, only parametric data. However, it is expected that bilateral agreements will be in place in the near future to share some real time data. He noted that deciding on the Areas of Responsibility had taken two years to resolve.
Dr Schindele commented that globally there were no final products in place yet and this will change in maybe 5 years. Research is still needed to determine which products are needed for each country.

Mr Rick Bailey enquired if there were any Key Performance Indicators (KPI) included as part of the accreditation process. Dr Schindele replied that there were no KPIs at present because of the lack of events to base them on. Mr Bailey noted that KPIs needed to be realistic for the system. They are for the future, not the past. Mr Necmioglu added that they were making progress on this and they were aware of the need for KPIs.

3.3 INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM (IOTWS)

Mr Rick Bailey provided an overview of tsunami watch operations in the IOTWS. He outlined the structure of the IOTWS in terms of the pillars of its Medium-Term Strategy, Working Groups and Task Teams. He reviewed the main policies of the IOTWS, noting that each RTSP covered the whole region and at least two of them must be operational. The RTSPs issue threat or no threat information. It is up to the individual NTWCs to decide on whether to issue warnings for their own countries based on their own thresholds. There is no accreditation process in the IOTWS but the RTSPs must report to the ICG against KPIs set by the ICG. RTSP products are provided to the NTWCs only via registered user websites. RTSP public products are now closely defined and only reflect the final warning decision by a country’s NTWC, plus any available sea-level observations.

Mr Michael Angove intervened and asked Mr Bailey to clarify how many RTSPs were operational in the IOTWS. Mr Bailey clarified that currently three were operational and that, at a minimum, there must always be two operating. Mr Angove requested further clarification of the RTSP public products and Mr Bailey responded that the RTSPs issued a summary of what other countries in the IOTWS were reporting. Not every RTSP needs to issue a summary, but for those that do the information must be the same.

Mr Bailey continued by outlining the thresholds and products issued by the RTSPs for the Indian Ocean, Pacific Ocean, and South Atlantic events that may impact the Indian Ocean. The RTSPs are interoperable and there are standard formats for the exchange of all information. Communications tests are run every 6 months and a service definition is currently in preparation. Mr Bailey then presented the current Area of Responsibility and Earthquake Source Zone for the IOTWS, noting the joint Area of Responsibility with the PTWS for the Banda and Java Sea regions of Indonesia. He then elaborated further on thresholds and the products issued by the RTSPs and provided examples. He summarised the SOP training programme for NTWCs, NDMOs and media, and outlined the Key Performance Indicators adopted by the ICG, and which the RTSPs report against at each ICG session. He concluded by presenting some statistics for the IOTWS communications tests.

3.4 TSUNAMI AND OTHER COASTAL HAZARDS WARNING SYSTEM FOR THE CARIBBEAN AND ADJACENT REGIONS (CARIBE-EWS)

Ms Christa von Hillebrandt-Andrade provided a status report on the CARIBE-EWS. She reminded the meeting that there were 32 Member States and 16 territories in the CARIBE-EWS, with 45 officially designated Tsunami Warning Focal Points (TWFPs). She presented the area covered by the CARIBE-EWS. There are three active Working Groups and four Task Teams in the CARIBE-EWS. She noted that there are many sources of tsunami in the region. Tsunami alerts are currently provided by the PTWC with the exception of Puerto Rico and the US Virgin Islands, which are served by the USA NTWC.
Ms von Hillebrandt-Andrade summarised the CARIBE-EWS tsunami products and the criteria for issuing products. She then provided an overview of the proposed enhanced products for CARIBE-EWS, which are similar to the PTWC enhanced products, based on the use of the RIFT model. Event information is disseminated online, on social media, EMWIN (Emergency Managers Weather Information Network), SMS as well as on the GTS (Global Telecommunication System). Most NTWCs rely on email and faxes and the use of GTS is very low.

Ms von Hillebrandt-Andrade outlined future plans for the Puerto Rico seismic network, the provider of tsunami warning services for Puerto Rico and the Virgin Islands, and reported on progress towards establishing the Caribbean Tsunami Warning Centre in Puerto Rico and the Caribbean Tsunami Information Centre (CTIC) in Barbados. She provided a summary of the seismic and sea-level station networks in the region, noting that 86% of the core seismic network (99 out of 115) contributes data in real-time, and 53% (53 out of 100) of the core sea-level network is contributing data to the IOC sea-level monitoring service. She provided a summary of events since the last TOWS-WG meeting, including a meteor-tsunami in June 2013, a M7.8 event in the Scotia Sea on 17 November 2013, and a M6.4 event in Puerto Rico on 13 January 2014 which was just below the M6.5 threshold. This event had caused some confusion because PTWC messages stated that there was a possibility of a local event within 100 km. This highlighted the need to consider the needs of emergency managers. She concluded by outlining the CARIBE-EWS testing and training programme. Communications tests are held every month and unannounced tests are held twice a year, generating a 10% response. There has been a very active SOP training programme and by April 2014 all countries will have received training. The next exercise Exercise Caribe Wave/Lantex 14 will take place on 26 March 2014.

4 DOCUMENT AREAS OF RESPONSIBILITY, GEOGRAPHICAL COVERAGE, AND SYSTEM ARCHITECTURES IN EACH ICG

Discussion on this agenda item was led by Dr Francois Schindele. He recalled that at the last meeting of the Task Team, maps of Areas of Responsibility and Earthquake Source Zone monitoring for each ICG had been prepared, and so subsequently each ICG had had the opportunity to provide comments and feedback to the Task Team. Referring to the Area of Responsibility Map first, he highlighted several areas that still need to be clarified. He noted that the Red Sea was not currently covered by any ICG and commented that earthquakes are possible in this region. The countries bordering the Red Sea should be notified that they are not currently covered by any regional Tsunami Warning System (TWS). Other changes of service provider in the Caribbean were noted and it was also noted that the name of the West Coast and Alaska Tsunami Warning Center (WCATWC) had been changed to the US NTWC.

The Task Team discussed the terminology used to describe the respective roles of the ICGs and the regional service providers, and agreed that the ICGs would cover “Areas of Responsibility” and the regional service providers would cover “Areas of Service”. The Task Team requested that the map should be amended accordingly.

The Task Team agreed that in order to harmonise the names of the regional service providers and avoid potential confusion between systems, the generic names of the service providers should be as follows:

- PTWS Tsunami Service Provider (PTWS-TSP)
- IOTWS Tsunami Service Provider (IOTWS-TSP)
- CARIBE-EWS Tsunami Service Provider (CARIBE-EWS-TSP)
NEAMTWS Tsunami Service Provider (NEAMTWS-TSP)

Mr Rick Bailey confirmed that after further consultation with the PTWC since the last meeting of the Task Team, Australia now agrees to include the East coast of Australia on the Area of Service map under the coverage of PTWC.

After detailed discussion, the Task Team agreed on amendments to be made to the Area of Service map and requested the Secretariat to edit the map accordingly for submission to the TOWS-WG. It was further agreed that the map should be dated, because it will be subject to periodic update as new service providers become operational. Country names of the Member States of each ICG should also be added to the map in a table.

Dr Schindele then provided an introduction to the history of development and purpose of the Earthquake Zone Map and summarised the written comments on the March 2013 version received from the Task Team members. It was noted that magnitude thresholds for issuing earthquake bulletins should be listed on the map as well as the areas monitored by each ICG. Because some ICGs monitor and issue bulletins for earthquakes outside their primary Areas of Responsibility, there is a requirement to provide clearer details of the magnitude thresholds for these bulletins on the map. It was further agreed that separate maps should be produced for each ICG region.

For the PTWS, Mr Takeshi Koizumi noted that for events outside the Area of Responsibility, no earthquake bulletins would be issued as such, but a bulletin would be issued if the threat of a tsunami reaching the Pacific Ocean is >30 cm.

For the CARIBE-EWS, Ms von Hillebrandt-Andrade commented that for earthquake sources in the Pacific and Indian Oceans, the forecast wave amplitude threshold for issuing a tsunami product is of 30 cm. Within the CARIBE-EWS region, the threshold is based on a magnitude of 6.0 and 6.5 for the entire Atlantic Ocean region.

In the NEAMTWS, Dr Schindele noted that there were two different zones. In the Northwest Atlantic, tsunami bulletins would be issued for earthquakes >M7.5. For earthquakes >M7.5 and <= M7.8 advisories would be issue, and for >M7.9 a watch bulletin would be issued. In the Northeast Atlantic and Mediterranean the threshold for issuing bulletins is M5.5.

For the IOTWS, Dr Kumar informed that the earthquake threshold for issuing earthquake and threat assessment bulletins is M6.5. In the Pacific Ocean and southern Atlantic, the threshold for issuing earthquake and threat assessment bulletins is M8.0.

It was agreed that each map should have a note that the boundaries are not exact and are subject to change as new products are implemented. The maps should also be dated.

**Recommendation 1** to TOWS-WG on Areas of Responsibility, geographical coverage, system architectures in each of the ICGs:

- A generic naming convention for ICG tsunami service providers to be adopted, as follows:
  - CARIBE-EWS Tsunami Service Provider (CARIBE-EWS-TSP)
  - IOTWS Tsunami Service Provider (IOTWS-TSP)
  - NEAMTWS Tsunami Service Provider (NEAMTWS-TSP)
  - PTWS Tsunami Service Provider (PTWS-TSP)
The Area of Responsibility map delineating the areas of responsibility of the four ICGs and areas of service covered by the ICG Tsunami Service Providers to be adopted as attached in APPENDIX II.

A table listing the Member States of each ICG should be attached to the Area of Responsibility map.

The maps delineating the Earthquake Source Zones monitored by each ICG and the thresholds for issuing bulletins to be adopted as attached in APPENDIX III.

Regarding the Banda/Java Sea joint Area of Responsibility, the Task Team agreed to the following action:

**Action 1**: IOTWS and PTWS to continue discussions about the Banda/Java Sea joint Area of Responsibility and seek clarification from Indonesia on what level of support is required.

### 5 PROCEDURES, TERMINOLOGIES, PRODUCTS AND DISSEMINATION

Mr Rick Bailey introduced this agenda item. He listed the main issues to be considered: harmonisation of procedures for RTSPs disseminating bulletins outside their Area of Responsibility, management of public dissemination of tsunami bulletins including information sent to the IOC Public List Server, implications of service provided by the Global Disaster Alert and Coordination System (GDACS), and dissemination of threat information to the maritime community.

#### 5.1 HARMONISATION OF PROCEDURES FOR RTSPS DISSEMINATING BULLETINS FOR AREAS OUTSIDE THEIR AREA OF RESPONSIBILITY

Mr Bailey described the detailed structure and information that is provided in IOTWS public bulletins and invited comments from the other ICGs. He indicated that there was a need to harmonise the format of public bulletins across ocean basins, especially if bulletins are to be issued on the GTS.

It was agreed that although the GTS is not officially a public network it is readily accessible by the public, especially the media. It is therefore very important to manage what information is available on the GTS.

There followed a general discussion about the dissemination of bulletins on the GTS and it was noted that there were different headers on the GTS for differentiating between earthquake (SE) and tsunami (WE) information. However, many NTWCs only monitor for WE headers on the GTS and it may not be advisable to use the SE header for a potentially tsunamigenic earthquake. The SE header should be used only for smaller earthquakes with no tsunamigenic potential.

Mr Takeshi Koizumi commented on the dissemination of IOTWS bulletins on the IOC Public List server and noted that it had been agreed that the IOTWS RTSPs had ceased sending bulletins to the IOC server for Pacific Ocean events between M6.5 and <M8.0.

Dr Kumar noted that the IOTWS Steering Group had proposed that IOTWS public bulletins and notification messages to NTWCs should be posted on the GTS. Mr Koizumi requested IOTWS not to send public bulletins to the GTS for earthquake events between M6.5 and <M8.0 in the Pacific Ocean. Regarding the IOTWS notification messages to NTWCs for the same events, it was agreed that the IOTWS RTSPs would cease sending these to the GTS.
for the time being and that this matter would be tabled for discussion at the next meeting of Task Team.

The discussion then turned to the general criteria for TSPs issuing public bulletins to the IOC Public List server and the GTS for events outside their Earthquake Source Zones. A consensus was reached and the Task Team agreed to make the following recommendation to the TOWS-WG.

**Recommendation 2** to TOWS-WG on procedures for ICG-TSPs disseminating bulletins for events outside their Areas of Service:

- For events outside the Earthquake Source Zones of the ICGs, the ICG-TSPs will send Public Bulletins to the IOC Public List server and the GTS only for events above an earthquake magnitude or forecast wave amplitude that could potentially impact coasts at a hazard level within their Area of Service.

- General guidelines regarding the structure and content of the Public Bulletins to be adopted by all the ICGs needs to be finalized in coordination with the TOWS-WG Task Team on Disaster Management and Preparedness.

- Bulletins relayed to the IOC Public List server by the ICG-TSPs should be the public bulletins generated by the ICG-TSPs as approved by the respective ICGs.

- IOTWS-TSPs to resume sending bulletins to the IOC Public List server for events based on the agreed magnitude thresholds on the IOTWS Earthquake Source Zone map and using the bulletin format to be agreed between IOTWS and PTWS.

### 5.2 THE ROLE OF THE GLOBAL DISASTER ALERT AND COORDINATION SYSTEM (GDACS)

Mr Bailey introduced the key issues raised by the service provided by the Global Disaster Alert and Coordination System (GDACS). He noted that GDACS is a cooperation framework between the United Nations, the European Commission and disaster managers worldwide to improve alerts, information exchange and coordination in the first phase after major sudden-onset disasters (http://www.gdacs.org). The partners are: Joint Research Centre European Commission (Geneva, Switzerland), UN Office Coordination of Humanitarian Affairs (UN/OCHA) (Geneva, Switzerland), UNITAR-UNOSAT (Geneva, Switzerland), Dartmouth Flood Observatory (Boulder, USA), SARWeather (Commercial, Iceland), and the Pacific Disaster Center (Hawaii, USA).

Mr Ocal Necmioglu was interested to know the role of UN in GDACS and to understand if a formal agreement is established. Dr Ken Gledhill commented that there are many websites that claim to provide similar services and they compile information from many sources. Ms von Hillebrandt-Andrade noted that GDACS uses USGS earthquake information to trigger its real time modelling of tsunamis. The key concern for the Task Team is that GDACS is issuing tsunami warning information in the form of forecast wave heights and arrival time, and that this information goes out on the GTS.

**Recommendation 3** to TOWS-WG on the role of the Global Disaster Alert and Coordination System (GDACS):

- The Task Team is concerned about the confusion that the GDACS tsunami alert products may create with the products issued by the ICG-TSPs and requests the IOC, based on the recommendation of the TOWS-WG, to inform UN-OCHA and WMO (World Meteorological Organization) of this concern and seek clarification about the scope, methodology, purpose and intended users of the GDACS service.
5.3 DISSEMINATION OF TSUNAMI ADVISORIES TO SHIPPING

Mr Bailey introduced this item and noted that the key issue that needs to be addressed is to advise the maritime safety agencies on tsunami threats to the maritime community. He noted that the JCOMM (Joint Technical Commission for Oceanography and Marine Meteorology) committee on marine services is also concerned with this issue. There is therefore a need to consider how to provide appropriate services to the maritime safety agencies. For safety of life and property and efficiency in operations international shipping requires information on: tsunami hazards (waves and debris) en route to next port of call; and the safety status of port operations at the next port of call.

Mr Bailey listed the following options/proposals:

- NTWCs alert their national port authorities who advise shipping companies, who then advise their shipping.
- TSPs for each basin:
  - Provide information direct to shipping.
  - Provide specialised tsunami summary bulletins for shipping for inclusion in High Seas warnings/routine reporting by WMO meteorological (Met) services with responsibility for Met Service regions.

There was general consensus that this issue needed to be addressed and the Task Team agreed on the following action.

Action 2: The Chair of the Task Team on Tsunami Watch Operations to write to the International Maritime Organization (IMO) and the Chair of the JCOMM Expert Team on Maritime Safety Services to:

- Inform them about the tsunami public bulletins available from the ICG-TSPs,
- Explore the best ways of disseminating these to the maritime community, and to enquire if there are any specific products that could be developed for the maritime community.

5.4 STANDARDS FOR REPORTING OF WATER LEVELS

This agenda item was introduced by Dr Chip McCreery. He referred to the summary document on the current reporting of water levels in the products issued by each ICG prepared by Dr Kumar (APPENDIX IV). He noted that the differences between the ICGs are in some cases due to the different methodologies used. Although there are differences there are not many inconsistencies. He highlighted some of the differences he had noted:

- Every centre puts out ETAs in their forecasts, but some are issuing these for coastal points whereas others are issuing for coastal zones.
- Forecast wave amplitudes: Some centres forecast for points, e.g. where there is a tide gauge. Others put out for a continuous series of points along a coast. Some others put out a range of amplitudes along a coastal zone.
- Duration of hazard is given by some centres. There does not appear to be an accepted methodology for this. This can depend on if there is a reflected wave.
- Forecast of ETAs are only given for threatened areas. It can be useful to give them for other areas.
• Observations have some variability. In most cases, centres report only wave amplitude. Consistency of measurements is important for reporting tsunamis. Most centres are reporting mean to crest. Mean to trough can be important in harbours.
• Some centres report wave period. Not sure if this is useful as most gauges are in harbours and are subject to resonance.
• Most centres report max wave amplitude on record, but this can change with time.

Dr McCreery commented that he felt that as long as all parameters were defined clearly in the individual products and manuals it was acceptable to have differences between the ICGs.

Prof Ahmet Yalciner noted that deep ocean wave period can be useful for estimating the duration of inundation and can also indicate the width of the fault.

Mr Bailey questioned if it was necessary and possible to harmonise the reporting of water level parameters. He suggested that there should be guidelines for water level information going into public bulletins.

The Task Team agreed on the following action.

**Action 3**: The Task Team to formulate recommendations for the reporting of water levels and tsunami arrival times for inclusion in the Global Service Definition Document to be developed before the next TOWS-WG meeting.

This action will be led by Dr Srinivas Kumar and Mr Rick Bailey.

The Task Team agreed to make the following recommendation to the TOWS-WG.

**Recommendation 4 to TOWS-WG on Standards for Reporting of Water Levels**:

• Recognising the current variation in the reporting of water levels, both forecasted and observed, ICG-TSPs are to clearly state which water level parameters and terminology they are reporting in their respective bulletins.

### 5.5 TOWARDS A GLOBAL SERVICE DEFINITION DOCUMENT

Dr Srinivas referred to the report that the Task Team had submitted to the Fourth meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (IOC/TOWS-WG-IV) held in Paris, France, on 21 and 22 March 2011 and suggested that this should be updated to reflect the current status of the various components as agreed at the last and current meeting of the Task Team. Each section update should be coordinated by a member of the Task Team.

Mr Bailey suggested that a framework for a Global Tsunami Services Definition should be constructed for comment first. This should be informed by the Task Team report to TOWS-WG-IV as mentioned by Dr Kumar. The recommendations made in the original document can be reviewed to reflect what has been achieved or changed since then. The Global Tsunami Services Definition document should be forward-looking based on agreed concepts and guidelines. This action will be led by Dr Kumar and Mr Bailey.

**Action 4**: The Task Team to develop a Global Tsunami Service Definition Document based on agreed concepts and guidelines, and informed by the Task Team report to TOWS-WG-IV. This activity will be led by Dr Srinivasa Kumar and Mr Rick Bailey.
6 GUIDELINES FOR THE REVIEW OF TSUNAMI WATCH OPERATIONS

Mr Bailey introduced this agenda item and referred to the Key Performance Indicators (KPIs) adopted by the ICG/IOTWS. He noted that was a need to have a set of KPIs for each ICG and that these would probably be different each ICG.

There was considerable discussion about the applicability of KPIs in each ICG and it was agreed that Key Performance Indicators (KPI) are important and that the IOTWS KPIs (APPENDIX V) should be used as a basis for developing KPIs for other ICGs.

The KPIs will also help to inform the development of post-event assessment guidelines. The changes to the IOTWS KPIs will be used as a baseline and modified to make them more generic so that they can be applicable to all ICGs.

Action 5: The Task Team will continue to work on the KPIs, led by the Task Team IOTWS members, and include them in the Global Service Definition Document to be developed before the next TOWS-WG meeting.

7 DISCUSSIONS ON CROSS-CUTTING ISSUES RELATED TO OTHER TOWS TASK TEAMS AND ACTION ITEMS

7.1 REVISED STANDARD QUESTIONNAIRE FOR POST-EVENT ASSESSMENT

This agenda item was held jointly with the TOWS-WG Task Team on Disaster Management and Preparedness and the following report was provided by its Chair, Mr David Coetzee.

The TOWS-WG agreed that tsunami response assessments and questionnaires are valuable. Recommendation 5 to IOC/TOWS-WG-VI requested the development of a standard questionnaire for post-event analysis to be used by all ICGs. The TOWS-WG Task Teams on Tsunami Watch Operations and on Disaster Management and Preparedness were subsequently asked to develop a standard set of questions for IOC/TOWS-WG-VII.

ITIC briefed the Task Teams on the questions for consideration. Relevant background documents that were reviewed included RTSP Performance Indicators, post-event questionnaires used by the IOC in past events (e.g.: 26 August 2012, 11 April 2012, 11 March 2011, 27 February 2010, etc), and the Post-Tsunami Survey Field Guide Questionnaire (SC.98/WS/24) used by International Tsunami Survey Teams (ITST).

The Task Teams agreed that a draft survey will be circulated among the task teams for feedback to ITIC for finalization under the title Post-Event Performance Survey. This action will be led by the Task Team on Disaster Management and Preparedness. The survey will then be customized by the TICs for each ICG, and ICGs will determine the threshold for surveys to be conducted. The Task Teams agreed that the survey will be web-based and that the process for conducting surveys will be as follows:

- The IOC will send a circular letter to the Tsunami National Contacts in affected Member States within one month of tsunami events that met the threshold by the respective ICGs.
- TICs (in close cooperation with ICG Secretariats) will manage surveys and compilation of reports, assisted by a team of experts nominated by the ICG Steering Group if required (noting NEAMTIC and IOTIC do not currently have a mandate).
• Draft reports will be finalized within 3–6 months of an event.
• Reports will be reviewed and finalized by the ICG and then published as IOC Technical Series.

8 REVIEW OF ACTION ITEMS AND RECOMMENDATIONS TO TOWS-WG

The Task Team made the following recommendations to the TOWS-WG:

Recommendation 1 to TOWS-WG on Areas of Responsibility, geographical coverage, system architectures in each of the ICGs:

• A generic naming convention for ICG tsunami service providers to be adopted, as follows:
  o CARIBE-EWS Tsunami Service Provider (CARIBE-EWS-TSP)
  o IOTWS Tsunami Service Provider (IOTWS-TSP)
  o NEAMTWS Tsunami Service Provider (NEAMTWS-TSP)
  o PTWS Tsunami Service Provider (PTWS-TSP)
• The Area of Responsibility map delineating the areas of responsibility of the four ICGs and areas of service covered by the ICG Tsunami Service Providers to be adopted as attached in APPENDIX II.
• A table listing the Member States of each ICG should be attached to the Area of Responsibility map.
• The maps delineating the Earthquake Source Zones monitored by each ICG and the thresholds for issuing bulletins to be adopted as attached in APPENDIX III.

Recommendation 2 to TOWS-WG on procedures for ICG-TSPs disseminating bulletins for events outside their Areas of Service:

• For events outside the Earthquake Source Zones of the ICGs, the ICG-TSPs will send Public Bulletins to the IOC Public List server and the GTS only for events above an earthquake magnitude or forecast wave amplitude that could potentially impact coasts at a hazard level within their Area of Service.
• General guidelines regarding the structure and content of the Public Bulletins to be adopted by all the ICGs needs to be finalized in coordination with the TOWS-WG Task Team on Disaster Management and Preparedness.
• Bulletins relayed to the IOC Public List server by the ICG-TSPs should be the public bulletins generated by the ICG-TSPs as approved by the respective ICGs.
• IOTWS-TSPs to resume sending bulletins to the IOC Public List server for events based on the agreed magnitude thresholds on the IOTWS Earthquake Source Zone map and using the bulletin format to be agreed between IOTWS and PTWS.

Recommendation 3 to TOWS-WG on the role of the Global Disaster Alert and Coordination System (GDACS):

• The Task Team is concerned about the confusion that the GDACS tsunami alert products may create with the products issued by the ICG-TSPs and requests the IOC, based on the recommendation of the TOWS-WG, to inform UN-OCHA and WMO of this concern and seek clarification about the scope, methodology, purpose and intended users of the GDACS service.
Recommendation 4 to TOWS-WG on Standards for Reporting of Water Levels:

Recognising the current variation in the reporting of water levels, both forecasted and observed, ICG-TSPs are to clearly state which water level parameters and terminology they are reporting in their respective bulletins.

Recommendation 5 to the TOWS-WG on the tenure of the Task Team:

To extend the term of the Task Team on Tsunami Watch Operations for a further intersessional period with the same Terms of Reference to allow it to continue its work.

The Task Team decided to undertake the following actions:

Action 1: IOTWS and PTWS to continue discussions about the Banda/Java Sea joint Area of Responsibility and seek clarification from Indonesia on what level of support is required.

Action 2: The chair of the Task Team on Tsunami Watch Operations to write to the International Maritime Organisation (IMO) and the Chair of the JCOMM Expert Team on Maritime Safety Services to:

- Inform them about the tsunami public bulletins available from the ICG-TSPs.
- Explore the best ways of disseminating these to the maritime community, and to enquire if there are any specific products that could be developed for the maritime community.

Action 3: The Task Team to formulate recommendations for the reporting of water levels and tsunami arrival times for inclusion in the Global Service Definition Document to be developed before the next TOWS-WG meeting.

Action 4: The Task Team to develop a Global Tsunami Service Definition Document based on agreed concepts and guidelines and informed by the Task Team report to TOWS-WG-IV. This activity will be led by Dr Srinivasa Kumar and Mr Rick Bailey.

Action 5: The Task Team will continue to work on the KPIs, led by the Task Team IOTWS members, and include them in the Global Service Definition Document to be developed before the next TOWS-WG meeting.

9 CLOSE OF MEETING

Dr Srinivasa Kumar thanked the participants for attending the meeting and for their contributions. He closed the meeting at 6:00 p.m.
## Day 1: Monday, 10 February 2014

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<td>08:30–09:00</td>
<td><strong>Registration</strong></td>
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<td>1</td>
<td>09:00–09:30</td>
<td><strong>Opening and Session Organization</strong></td>
<td>Srinivasa Kumar</td>
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<td>09:30–10:00</td>
<td><strong>Presentation on the Progress of the Task Team</strong></td>
<td>Srinivasa Kumar</td>
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<td><strong>Presentations from the ICG Representatives</strong></td>
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<td>14:00–15:30</td>
<td><strong>Document Areas of Responsibilities, geographical coverage, system architectures in each of the ICGs</strong></td>
<td>Francois Schindele/Victor Huerfano/Chip McCreery/Srinivasa Kumar</td>
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<td><strong>Procedures, Terminologies, Products and Dissemination</strong></td>
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### Day 2: Tuesday, 11 February 2014

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<td>Chip McCreery/ Takeshi Koizumi</td>
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<td>- Standards for reporting of water levels</td>
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<td>11:00–12:30</td>
<td>Guidelines for the review of tsunami watch operations</td>
<td>Rick Bailey/ Angelica Munoz</td>
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<td>- Feedback on the IOTWS Performance Document</td>
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<td>- Discuss Performance Indicators and mechanism for review of tsunami watch operations</td>
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<td>7</td>
<td>13:30–15:30</td>
<td>Discussions on cross-cutting issues related to other TOWS Task Teams (Joint Meeting with Task Team on Disaster Management and Preparedness)</td>
<td>Laura Kong / Rick Bailey</td>
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<td>- Revised standard questionnaire for post-event assessment</td>
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<td>8</td>
<td>16:00–16:30</td>
<td>Review of Action Items and Recommendations to TOWS-WG</td>
<td>Srinivasa Kumar</td>
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17:30

Close Day 1
APPENDIX II

MAP OF EXISTING SERVICES
OF THE GLOBAL TSUNAMI WARNING SYSTEM

Image V-1. Map of existing services of the Global Tsunami Warning System
<table>
<thead>
<tr>
<th>REGIONAL TSUNAMI WARNING SYSTEM</th>
<th>MEMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CARIBE-EWS</strong></td>
<td>Antigua and Barbuda¹, Bahamas, Barbados, Belize, Brazil, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, France [French Guiana, Guadeloupe, Martinique, Saint Barthélemy, St Martin], Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Netherlands (Kingdom of) [Aruba²,Bonaire, Curacao², Saba, Sint Eustatius, Sint Maarten³], Nicaragua, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United Kingdom [Anguilla², Bermuda, British Virgin Islands², Cayman Islands², Montserrat, Turks and Caicos], United States of America [Puerto Rico, US Virgin Islands], Venezuela (Bolivarian Republic of)</td>
</tr>
<tr>
<td><strong>IOTWS</strong></td>
<td>Australia, Bangladesh, Comoros, Djibouti, France [Crozet Islands, Île Amsterdam, Kerguelen Islands, Mayotte, Réunion], India, Indonesia, Islamic Republic of Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Singapore, Somalia, South Africa, Sri Lanka, Tanzania, Thailand, Timor Leste, United Kingdom [Diego Garcia], United Arab Emirates, Yemen</td>
</tr>
<tr>
<td><strong>NEAMTWS</strong></td>
<td>Albania, Algeria, Belgium (Kingdom of), Bosnia and Herzegovina¹, Bulgaria, Cabo Verde, Croatia, Cyprus, Denmark (Kingdom of) [Faroes² and Greenland], Egypt, Estonia, Finland, France, Georgia, Germany, Greece, Iceland, Ireland, Israel, Italy, Latvia¹, Lebanon, Libya, Lithuania¹, Malta, Mauritania, Monaco, Montenegro, Morocco, Netherlands (Kingdom of), Norway, Poland, Portugal, Romania, Russian Federation, Slovenia, Spain, Sweden, Syria, Tunisia, Turkey, Ukraine, United Kingdom</td>
</tr>
<tr>
<td><strong>PTWS</strong></td>
<td>Australia, Brunei Darussalam, Cambodia¹, Canada, Chile, China, Colombia, Cook Islands, Costa Rica, Democratic Republic of Korea, Ecuador, El Salvador, Fiji, France [French Polynesia, New Caledonia, Wallis and Futuna], Guatemala, Honduras, Indonesia, Japan, Kiribati, Malaysia, Marshall Islands¹ [Kwajalein, Majuro], Mexico, Micronesia¹ (Federated States of) [Chuuk, Kosrae, Pohnpei, Yap], Nauru¹, New Zealand, Nicaragua, Niue, Palau, Panama, Papua New Guinea, Peru, Philippines, Republic of Korea, Russian Federation, Samoa, Singapore, Solomon Islands, Thailand, Timor Leste, Tokelau¹, Tonga, Tuvalu, United Kingdom [Pitcairn Islands], United States of America [American Samoa, Guam, Northern Mariana Islands, Midway, Wake Islands], Vanuatu, Vietnam</td>
</tr>
</tbody>
</table>

¹Not Member of the Intergovernmental Oceanographic Commission
²UNESCO Associate Member

List of UNESCO Members: [http://en.unesco.org/countries/countries-list](http://en.unesco.org/countries/countries-list)

*Table V–1. List of Member States of each ICG*
APPENDIX III

EARTHQUAKE SOURCE ZONE MAPS
OF TSUNAMI WARNING SYSTEMS

Image V–2. CARIBE-EWS Earthquake Source Zone Map
Image V–3. IOTWS Earthquake Source Zone Map
Image V–5. PTWS Earthquake Source Zone Map
APPENDIX IV

BACKGROUND INFORMATION FOR DISCUSSIONS
ON AGENDA ITEM 5 OF THE TASK TEAM MEETING
“STANDARDS FOR REPORTING OF WATER LEVELS”

1. ACTION ON THE TASK TEAM

The Task Team had discussed the need to standardise the important issue of water level reporting, which varied between ICGs and warning centres. The Task Team recommended that there should be consistency between the ICGs on what wave height parameters are forecast and included in bulletins, and proposed to develop recommendations on appropriate parameters prior to the next TOWS-WG meeting.

2. COMPILATION OF THE TERMINOLOGIES
USED BY DIFFERENT TSUNAMI WARNING CENTRES

<table>
<thead>
<tr>
<th>TSUNAMI WARNING CENTRE – (TWC)</th>
<th>FORECAST TSUNAMI WAVE HEIGHT</th>
<th>OBSERVED TSUNAMI WAVE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PTWC ( Operational Products)</strong></td>
<td>• No Forecast Tsunami Wave Heights Provided Currently. Only Estimated Tsunami Arrival Times are given for forecast points within the Warning &amp; Watch Areas.</td>
<td>• Tsunami Wave Amplitude (<em>measured relative to normal sea level. It is not Crest-to-trough wave height.</em>) observed at Tide gauges and BPRs are listed in metres (M) and feet (ft) • Tsunami Wave Period (time from one wave to the next) observed at Tide gauges and BPRs are listed in Minutes</td>
</tr>
<tr>
<td><strong>PTWC (New Enhanced Products)</strong></td>
<td>• Estimated times of arrival (<em>ETA</em>) are given for forecast locations. • Estimated Tsunami wave forecast ranging from more than 3 metres, 1 to 3 metres and 0.3 to 1 metres (<em>above the normal tide</em>) given for coasts in list of regions.</td>
<td>• The maximum tsunami height (measured with respect to the normal tide level ) observed at coastal and deep-ocean sea level gauges are listed in metres (M) and feet (ft) • Tsunami Wave Period (time from one wave to the next) observed at coastal and deep-ocean sea level gauges are listed in Minutes</td>
</tr>
<tr>
<td><strong>JMA/</strong></td>
<td>• Estimated Tsunami Arrival Time</td>
<td>• Maximum tsunami wave (<em>half of...</em>)</td>
</tr>
</tbody>
</table>

URL1: http://ptwc.weather.gov/ptwc/text.php?id=pacific.2011.03.11.103006

Exercise Pacific Wave 13, URL: http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1830&Itemid=2422
<table>
<thead>
<tr>
<th>TSUNAMI WARNING CENTRE – (TWC)</th>
<th>FORECAST TSUNAMI WAVE HEIGHT</th>
<th>OBSERVED TSUNAMI WAVE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWPTAC (Existing Products)</td>
<td>and Estimated Tsunami Wave Amplitude (measured from middle to crest) listed for forecast points in countries in metres (M).</td>
<td>amplitude from the trough to the crest) observed at various coastal locations are listed in metres.</td>
</tr>
</tbody>
</table>

Exercise Pacific Wave 13, URL: http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1830&Itemid=2422

| US NTWC (Existing Products) | • Forecast max tsunami heights (the highest expected water level above the tide) are listed for list of Sites in feet (ft).  
|                            | • Forecast tsunami duration (the approximate length of time which the tsunami may produce dangerous currents and wave activity) are listed for list of Sites in hours.  
|                            | • Observed max tsunami heights (the highest recorded water level above the tide level up to this point) are listed for list of Sites in feet (ft).  
|                            | • The max tsunami height (the water level above the tide level at the time of measurement) observed at sites are listed in feet (ft) as Updated and Additional list. |

URL1: http://ntwc.arh.noaa.gov/ExampleProducts/WEAK51-Example1b.txt  
URL2: http://ntwc.arh.noaa.gov/?page=product_list

| IOTWS RTSPs (InaTEWS, ITEWC, JATWC) | • Estimated times of arrival (ETA) are given for list of coastal forecast zones of Indian Ocean rim countries  
|                                     | • Estimated maximum tsunami wave amplitude (max deep: deep ocean forecast, max beach: beach forecast after applying Greens’ law, measured from middle to crest) listed for coastal forecast zones of Indian Ocean rim countries in metres (M).  
|                                     | • CFZs with max beach of above 0.5 M listed as threat.  
|                                     | • The maximum wave amplitudes (measured relative to normal sea level; it is NOT the crest-to-trough wave height.) observed at Tide gauges and BPRs are listed in metres (M). |

### TSUNAMI WARNING CENTRE – (TWC)

<table>
<thead>
<tr>
<th>FORECAST TSUNAMI WAVE HEIGHT</th>
<th>OBSERVED TSUNAMI WAVE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>● No Forecast Tsunami Wave Heights Provided Currently. Only Estimated Tsunami Arrival Times are given for list of forecast points within the warning and watch areas.</td>
<td>● The tsunami recordings (measured crest-to-trough) observed at coastal and deep-ocean gauges are listed in centimetres (M).</td>
</tr>
</tbody>
</table>

**CARIBE-EWS (Existing Products) Interim services provided by PTWC**

- Forecast max tsunami heights (the highest expected water level above the tide) are listed for list of Sites in feet (ft).
- Forecast tsunami duration (the approximate length of time which the tsunami may produce dangerous currents and wave activity) are listed for list of Sites in hours.
- Observed max tsunami heights (the highest recorded water level above the tide level up to this point) are listed for list of Sites in feet (ft).

**CARIBE-EWS (New Enhanced Products by PTWC)**

- The max tsunami height (the water level above the tide level at the time of measurement) observed at sites are listed in feet (ft) as Updated and Additional list.

**NEAMTWS (CENALT, FRANCE)**

- Estimated times of arrival (ETA) are given for forecast points with WATCH or ADVISORY in listed countries.
- Estimated Tsunami waves forecast ranging from more than 0.5 M wave height as WATCH, ranging from 0.5 M–0.3M as ADVISORY and less than 0.3M as INFORMATION given for coastal areas in list of countries.
- Only areas under WATCH are listed in table.

- The tsunami measurements or reports observed at coastal tide gauges are listed in metres as Amplitude with Period in minutes.


<table>
<thead>
<tr>
<th>TSUNAMI WARNING CENTRE – (TWC)</th>
<th>FORECAST TSUNAMI WAVE HEIGHT</th>
<th>OBSERVED TSUNAMI WAVE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise NEAMWAVE 12, URL: <a href="http://unesdoc.unesco.org/images/0021/002189/218990e.pdf">http://unesdoc.unesco.org/images/0021/002189/218990e.pdf</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEAMTWS (NOA GREECE)</td>
<td>• Estimated times of arrival (ETA) are given for forecast points with WATCH, ADVISORY, INFORMATION in listed countries.</td>
<td>• Tsunami Wave Amplitude (measured relative to normal sea level. It is ...not... Crest-to-trough wave height.) observed at Tide gauges and BPRs are listed in metres(M).</td>
</tr>
<tr>
<td></td>
<td>• Estimated Tsunami waves forecast ranging from more than 0.5 M wave height as WATCH, ranging from 0.5 M–0.3M as ADVISORY and less than 0.3M as INFORMATION given for coastal areas in list of countries.</td>
<td>• Tsunami Wave Period (time from one wave to the next) observed at Tide gauges and BPRs are listed in Minutes.</td>
</tr>
<tr>
<td></td>
<td>• Estimated Tsunami Wave Maximum Amplitude for areas within Watch/Advisory/Information of listed countries in metres (M) and feet (ft) along with distance.</td>
<td></td>
</tr>
<tr>
<td>Exercise NEAMWAVE 12, URL: <a href="http://unesdoc.unesco.org/images/0021/002189/218990e.pdf">http://unesdoc.unesco.org/images/0021/002189/218990e.pdf</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEAMTWS (IPMA, PORTUGAL)</td>
<td>• Estimated times of arrival (ETA) are given for forecast points with WATCH or ADVISORY in listed countries.</td>
<td>• Tsunami Wave Amplitude (measured relative to normal sea level. It is ...not... Crest-to-trough wave height.) observed at Tide gauges and BPRs are listed in metres(m).</td>
</tr>
<tr>
<td></td>
<td>• Estimated Tsunami waves forecast ranging from more than 0.5 M wave height as WATCH, ranging from 0.5 M–0.3M as ADVISORY and less than 0.3M as INFORMATION given for coastal areas in list of countries.</td>
<td>• Tsunami Wave Period (time from one wave to the next) observed at Tide gauges and BPRs are listed in Minutes.</td>
</tr>
<tr>
<td></td>
<td>• Only areas under WATCH are listed in table.</td>
<td></td>
</tr>
<tr>
<td>Exercise NEAMWAVE 12, URL: <a href="http://unesdoc.unesco.org/images/0021/002189/218990e.pdf">http://unesdoc.unesco.org/images/0021/002189/218990e.pdf</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEAMTWS (KOERI TURKEY)</td>
<td>• Estimated times of arrival (ETA) are given for forecast points with WATCH or ADVISORY in listed countries.</td>
<td>• Tsunami Wave Amplitude (measured relative to normal sea level. It is ...not... Crest-to-trough wave height.) observed at Tide gauges and BPRs are listed in</td>
</tr>
<tr>
<td>TSUNAMI WARNING CENTRE – (TWC)</td>
<td>FORECAST TSUNAMI WAVE HEIGHT</td>
<td>OBSERVED TSUNAMI WAVE HEIGHT</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td></td>
<td>forecast ranging from more than 0.5 M wave height as WATCH, ranging from 0.5 M–0.3M as ADVISORY and less than 0.3M as INFORMATION given for coastal areas in list of countries.</td>
<td>metres (m).</td>
</tr>
<tr>
<td></td>
<td>• Only areas under WATCH and ADVISORY are listed in table.</td>
<td>• Tsunami Wave Period (time from one wave to the next) observed at Tide gauges and BPRs are listed in Minutes.</td>
</tr>
</tbody>
</table>

Exercise NEAMWAVE 12, URL: http://unesdoc.unesco.org/images/0021/002189/218990e.pdf

Table V–1. Terminologies used by different Tsunami Warning Centres

3. GLOSSARY OF RELEVANT TERMS

Estimated time of arrival (ETA)

Time of tsunami arrival at some fixed location, as estimated from modelling the speed and refraction of the tsunami waves as they travel from the source. ETA is estimated with very good precision if the bathymetry and source are well known (less than a couple of minutes). The first wave is not necessarily the largest, but it is usually one of the first five waves.

Tsunami amplitude

Usually measured on a sea level record, it is 1) the absolute value of the difference between a particular peak or trough of the tsunami and the undisturbed sea level at the time, 2) half the difference between an adjacent peak and trough, corrected for the change of tide between that peak and trough. It is intended to represent the true amplitude of the tsunami wave at some point in the ocean. However, it is often an amplitude modified in some way by the tide gauge response.
Figure V-1. Mareogram (sea level) record of a tsunami

Tsunami period
Amount of time that a tsunami wave takes to complete a cycle, or one wavelength. Tsunami periods typically range from 5-60 minutes. Tsunami period is often measured as the difference between the arrival time of the highest peak and the next one measured on a water level record.

Tsunami wavelength
The horizontal distance between similar points on two successive waves measured perpendicular to the crest. The wavelength and the tsunami period give information on the tsunami source. For tsunamis generated by earthquakes, the typical wavelength ranges from 20 to 300 km. For tsunamis generated by landslides, the wavelength is much shorter, ranging from 100s of metres to 10s of kilometres.

Wave crest
1. The highest part of a wave.
2. That part of the wave above still water level.

Wave trough
The lowest part of a wave.

Mean sea level
The arithmetic mean of hourly heights of tide height on the open coast, or in adjacent waters which have free access to the sea, observed over some specified time period; often used as a datum for geodetic surveys. In the United States, mean sea level is defined as the average height of the surface of the sea for all stages of the tide over a 19-year period.

Sea level
The height of the sea at a given time measured relative to some datum, such as mean sea level.
**Tsunami Forecast Point**

The location where the Tsunami Warning Centre, or other organization, provides an estimate of tsunami arrival time and/or wave height. They may correspond to important coastal cities or populations, and/or to the locations of sea level gauges.

**REFERENCES:**

http://unesdoc.unesco.org/images/0018/001882/188226e.pdf


APPENDIX V

PERFORMANCE INDICATORS
AND TARGET VALUES FOR RTSPS IN THE IOTWS

Performance Indicators and Target Values for Regional Tsunami Service Providers (RTSPs) are as follows:

- Elapsed time from earthquake to initial earthquake information issuance: 10 min
- Probability of detection of Indian Ocean earthquakes with Mw>=6.5: 100%
- Accuracy of earthquake hypocentre location: 30 kms *
- Accuracy of earthquake hypocentre depth: 25km *
- Accuracy of initial earthquake magnitude: 0.3 *
- Elapsed time from earthquake to issuance of first bulletin containing tsunami threat info: 20 min
- Accuracy of the tsunami forecast amplitude/height: factor of 2.
- Probability of detection of tsunami above threat threshold: 100% #
- Accuracy of time arrival of tsunami (0.02m amplitude) within 5% of travel time#
- Accuracy of time of arrival of 1st significant wave (0.1m) within 5% of travel time#
- Accuracy of threat threshold exceedance within 5% #
- Percent of Indian Ocean countries issued a timely product as defined above: ....100%
- Elapsed time from any product issuance to potential receipts by Tsunami Warning Focal Points: 5 mins. ##
- Percent of time RTSP is operating and able to issue products: 99.5%
- Percent of regular Communications Tests participated in: 100%

* WG2 to further review these target figures at a later stage after analysis of past events
# WG2 to further review these target figures after a detailed study to confirm achievable values
## noting that some communications issues are outside the control of the RTSPs
1. OPENING AND MEETING ORGANIZATION

The Chair of TOWS-WG Inter ICG Task Team (TT) on Hazard Assessment Related to Highest Potential Tsunami Source Areas, Kenji Satake, welcomed the participants to the meeting and made some introductory remarks. Thorkild Aarup, Head (a.i) of IOC Tsunami Unit (TSU) welcomed the Task Team on behalf of the Intergovernmental Oceanographic Commission (IOC) and provided details of meeting arrangements and facilities. Kenji Satake then invited the participants to introduce themselves. Thorkild Aarup noted that Maria Ana Baptista and Helene Hebert, both representing the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS), and Sergio Barientos representing the Pacific Tsunami Warning and Mitigation System (PTWS) could not participate. He also informed that Ali Al-Lazki appointed from NEAMTWS had changed jobs and would not be able to participate in further work of the Task Team.

2. BACKGROUND TO THE TASK TEAM

Mr Thorkild Aarup provided a presentation on the background for the Task Team.

At the Fourth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) held in Paris, France, on 20 and 21 March 2011 (IOC/TOWS-WG-IV), the Group exchanged views on the extremely short time that very great earthquakes leave for local populations to react. The importance of comprehensive tsunami early warning and mitigation systems as well as tsunami local preparedness and education was once more highlighted.

The TOWS-WG found that improvements in the area of assessment of high impact hazard potential, including identifying the sites of the largest geophysical and social threats, would be a real contribution to all tsunami and related hazard warning systems. This assessment should identify areas that could generate earthquakes of magnitude above 8 (on moment magnitude Mw scale) or slow earthquakes that are capable of generating destructive tsunamis. The purpose of the assessment was described as a means to develop a worse case scenarios and strategies that meet social responsibility.

Due to the lessons learned about cascading damages from such high impact earthquake to infrastructures the TOWS-WG also discussed the need to examine the ability to simulate vulnerabilities, risks and pre-calculate potential impacts for these larger events.

Assessing the detection capacities for damaging currents and examination of the standard end-to-end sequence of processes for decision making in light of the experience of the 11 March 2011 Tohoku event may be also recommendable. The TOWS-WG also underlined that tsunami warnings should not be just about shoreline warnings but also about local inundation potential.

It was recommended that hazard assessment identifies all high risk areas and subduction zones with potential for large magnitude quakes, mega-tsunamis and extreme sea-level
events, prioritizes to inform science research and improves preparedness, structural mitigation in ports, and integrates coastal planning.

Subsequently, at the Fourth Session of TOWS-WG, it recommended that an Inter ICG Task Team on Tsunami Potential Assessment be established with Terms of Reference (ToRs) given in IOC/TOWS-WG-IV and it was approved at the Twenty-sixth Session of the IOC Assembly held at UNESCO Headquarters in Paris, France, from 21 June to 5 July 2011 (IOC-XXVI).

The presentation by Thorkild Aarup is available at the website for the Task Team meeting.

Laura Wallace and Phil Cummins provided presentations on studies that the Task Team might be able to build on.

2.1 FAULTED EARTH SUBDUCTION CHARACTERISATION PROJECT

Laura Wallace provided an overview of the Faulted Earth Subduction Characterisation Project developed under the Global Earthquake Model (GEM).

The aim of this project is to develop a globally consistent characterisation of the world’s subduction plate boundary faults to be used as a basis for generating earthquake event sets for inclusion in earthquake hazard and risk modelling. Given the obvious complexity of processes operating in subduction zones, and the recognition that the historical period is too short to provide a good basis for determining the frequency and maximum magnitude of earthquakes, there is a clear need to find a pragmatic approach that uses as much of the available knowledge as is possible, in a way that is neither too conservative nor too optimistic. In addition to outlining a viable approach to integrating subduction interface earthquake sources into a hazard model, we develop a comprehensive database of preferred source parameters and associated uncertainties to use for all of the world’s subduction zones (see Table and Appendices of the above mentioned report). The development of these parameters is based on an extensive literature search, and via consultation among the co-authors of this report.

The Global Earthquake Model forum (http://www.globalquakemodel.org/) organized a meeting of experts on subduction earthquakes and subduction margin tectonics held at the USGS in Menlo Park from 18 to 21 September 2011 to develop a database of potential subduction earthquake sources worldwide to be used as input to the Global Earthquake Model (GEM) to assess probabilistic seismic hazard and risk.

Following on from this, the Group developed a spreadsheet outlining the key parameters for all subduction zones worldwide, in terms of convergence rate, Mmax, b-values, coupling coefficients, among others. These data will go into the GEM Probabilistic seismic hazard model.

Although GEM does not deal with tsunami, the database has been utilized for the development of regional and distant sources for the New Zealand probabilistic tsunami hazard model, so is adaptable to tsunami hazard estimates.

The presentation by Laura Wallace is available at the TSU website. More information about the GEM Faulted Earth Subduction Characterisation Project (version 1.0, June 2013, GEM Faulted Earth Project), is available from http://www.nexus.globalquakemodel.org/gem-faulted-earth/posts.
2.2 PROBABILISTIC TSUNAMI HAZARD ASSESSMENT OF THE INDIAN OCEAN NATIONS

Phil Cummins provided an overview of a recent study on probabilistic Tsunami hazard assessment of the Indian Ocean nations.

The tsunami threat faced by Indian Ocean countries consists of a complex mix of tsunami from local, regional and distant sources, whose effects at any particular location in the Indian Ocean are highly dependent on variations in sea floor shape between the source and affected coastlines, complicating tsunami disaster management and the design of tsunami warning systems for the Indian Ocean. In order to provide national governments in the Indian Ocean with the information they need to make informed decisions about tsunami mitigation measures, including development of a warning system, a comprehensive hazard and risk assessment was carried out.

The study focused on tsunami caused by subduction zone earthquakes, because they are the most frequent source of large tsunami, and tsunami hazard is expressed as annual probability of a tsunami exceeding a given amplitude at a given offshore depth. Because so little is known about the recurrence rates of large megathrust earthquakes in the subduction zones bordering the Indian Ocean, it was decided to develop two hazard maps:

- A 'low-hazard' end member, based on only those earthquake sources of tsunami for which there is definite evidence.
- A 'high-hazard' end member, based on all potential megathrust earthquake sources, including hypothetical ones for which there is no historical or geological evidence that may affect Indian Ocean coastlines.

The actual hazard lies somewhere between these two end members, and the difference between the low hazard and high hazard maps is a simple and effective way to express the uncertainty in the hazard assessment. This uncertainty reflects the lack of knowledge of tsunamigenic earthquake occurrence, and can only be reduced through a better understanding of earthquake and tsunami occurrence in the Indian Ocean.

The presentation by Phil Cummins is available at the website for the Task Team meeting.


3. DISCUSSIONS OF FORMAT FOR THE REPORT TO IOC AND TIMELINES

The Task Team discussed the given ToRs and the plan of action that need to apply in responding to these ToR. In that context, it was also recognised that many tsunami hazard assessments have been carried out following different methods.

In summary, the Task Team decided to address the given ToRs through the following actions:

- Regarding the ToRs for the Task Team:
  - The Task Team interprets the given ToRs to be a request for a tsunami hazard assessment of the earthquake sources with the highest tsunamigenic potential. To be useful for the IOC Community (ICGs, Member States) not only size but also probability and potential impact on populations should be considered. This
has been done by a number of studies for different regions of the world using different approaches and assumptions.

- The Task Team recognizes that it would be appropriate to have a standard (or list of best practices) for how to carry out such a hazard assessment. In order to achieve this goal, the Task Team will:
  
  o Produce a summary with a first list of relevant studies and participants (see APPENDIX II including tsunami earthquakes).
  
  o Arrange a workshop among some of the lead researchers including researchers active in similar/on-going efforts under the respective Intergovernmental Coordination Groups) in hazard studies for different regions to:
    
    — Summarize current knowledge on “tsunami earthquakes”.
    
    — Present selected studies on tsunami hazard assessment studies and review how maximum credible earthquake size and likelihood have been incorporated.
    
    — Discuss how different approaches can be harmonised.
    
    — Work towards a consensus on best practices for tsunami hazard assessments.

- From the workshop, the Task Team will produce a report addressing all the recommendations from the Group of Experts, plus summarize the regional hazard assessment approaches and provide recommendations of best approaches.

The Task Team spent the remaining part of the time compiling a draft bibliography on Tsunami Hazard Studies and Tsunami Earthquakes. The bibliography was further augmented by the members of the Task Team following the meeting (see APPENDIX II)

In addition, the Task Team worked on developing a prospect document for the mentioned workshop (see APPENDIX III).

4. **NEXT MEETING**

The next meeting of the Task Team is envisioned to be back-to-back with the planned workshop.
APPENDIX I

AGENDA

1. OPENING AND MEETING ORGANIZATION
2. BACKGROUND TO THE TASK TEAM
   2.1 FAULTED EARTH SUBDUCTION CHARACTERISATION PROJECT
   2.2 PROBABILISTIC TSUNAMI HAZARD ASSESSMENT OF THE INDIAN OCEAN NATIONS
3. DISCUSSION OF FORMAT FOR THE REPORT TO IOC AND TIMELINES
4. NEXT MEETING
APPENDIX II

BIBLIOGRAPHY ON TSUNAMI HAZARD ASSESSMENTS AND TSUNAMI EARTHQUAKES

TSUNAMI EARTHQUAKES
(contributed by Kenji Satake)

An earthquake that generates a tsunami is called a tsunamigenic earthquake. A tsunami earthquake, on the contrary, is defined as an earthquake that excites much larger tsunamis than expected from its seismic waves (Kanamori, 1972). This discrepancy can be quantified in terms of the surface wave magnitude (Ms) and tsunami magnitude (Mt) scales; when Mt is larger than Ms by more than 0.5 units, a tsunami is classified as a tsunami earthquake (Abe, 1989). Newman and Okal (1998) introduced a new parameter called the slowness parameter, Θ=log_{10}(E/E_0), which is the ratio of radiated seismic energy E to seismic moment M_0. They showed that Θ is about -5 for regular tsunamigenic earthquakes and about -6 or smaller for tsunami earthquakes. They proposed to use this parameter for the discrimination of tsunami earthquakes.

Several proposals have been made for the generating mechanisms of tsunami earthquakes. Slow and long rupture processes reconcile the large discrepancy between seismic and tsunami waves (Kanamori, 1972). High-angle secondary faulting in the accretionary wedge can explain the relatively large tsunami excitation (Fukao, 1979). For a given slip, the seismic moment is smaller in the shallower portion of a subduction zone because of the smaller rigidity, but the tsunami becomes larger (Okal, 1988). Tsunami heights may not be anomalously large if compared to Mw rather than Ms (Pelayo and Wiens, 1992); the large discrepancy between the tsunami and Ms is due to the saturation of Ms at around 7.3 for those earthquakes that occurred in the accretionary wedge.

Recent tsunami waveform modelling showed that the fault parameters and locations of the tsunami earthquakes share a common feature: narrow and shallow faulting near the trench axis (Satake and Tanioka, 1999). The 2 September 1992 Nicaragua earthquake (Ms = 7.2, Mt=7.9) was the first tsunami earthquake recorded by modern broad-band seismic instruments. Seismological studies showed that the duration was very long for its size, which was approximately 100 seconds (Kanamori and Kikuchi, 1993). Comparison of numerically computed tsunami waveforms with tide gauge records (Satake, 1994) showed that a narrow (~40 km) and shallow (extending only to the upper 10 km of the ocean bottom) fault was responsible for the tsunami generation.

Other tsunami earthquakes occurred along the Sunda Trench south of Java Island, Indonesia, in 1994 and 2006 (Polet and Kanamori, 2000; Fujii and Satake, 2006). While only typical interplate or tsunamigenic earthquakes had been recorded off the coast of Sumatra Island, the 2010 Metawai earthquake (Ms=7.3, Mt=8.3) occurred at the trench side of the source region of the 2007 Bengkulu earthquake (Fujii and Satake, 2008) and is considered to be a tsunami earthquake (Satake et al., 2013).

Among the tsunami earthquakes, the 1896 Sanriku earthquake (Ms=7.2, Mt=8.6) and the 1946 Aleutian earthquake (Ms=7.3, Mt=9.3) were very anomalous (Kanamori, 1972; Kanamori and Kikuchi, 1993). Tsunami models showed a similar fault parameter for the tsunami earthquakes, i.e., a narrow fault was located near the trench axis (Tanioka and Satake, 1996; Johnson and Satake, 1997; Tanioka and Seno, 2001a; Tanioka and Seno, 2001b). Tanioka et al. (1997) showed that the 1896 tsunami earthquake occurred in a region where the ocean bottom topography was rough and characterized by well-developed horst and graben structures. Polet and Kanamori (2000) extended this model to global subduction zones, based on the examination of the source spectra of large (M>7) earthquakes in the
1990s. Okal and Newman (2001), however, failed to find any correlation between the slowness parameter and the depth, focal mechanism, or seismic moment for Central America, Java and Peru, suggesting an absence of the regional signal for the occurrence of tsunami earthquakes. Bilek and Lay (2002), from analysis of the source time functions of tsunamigenic earthquakes and tsunami earthquakes, found that shallower earthquakes have longer duration and claimed that the tsunami earthquakes are simply larger earthquakes at a very shallow depth. Seno (2002) proposed that an increase in fluid pressure causes a temporal change in the frictional properties near the trench axis and is responsible for slow ruptures, and therefore concluded that tsunami earthquakes are transient phenomena.

REGIONAL STUDIES ON TSUNAMI HAZARD ASSESSMENT

— Atlantic Ocean


— Caribbean Region


— **Indian Ocean**


— **Mediterranean and Marmara Seas**


— **Pacific Ocean**


— **South America**


Barrientos, S.E. 2011. Grandes Tsunamis que han afectado las costas de Chile, en La Sismología en Sudamérica y los Mecanismos de Prevención y Mitigación del Peligro y Riesgo Sísmico, pp 147-152. Homage to Alberto Giesecke, published by Ed. Museo Andrés del Castillo y CERESIS.

Barrientos, S. E. 2012. Terremoto y Maremoto del 27 de Febrero en Chile Central, ed. María O. Moroni, published by Cámara Chilena de la Construcción,


Montessus de Ballore, F.1912. *Historia sísmica de los Andes meridionales al sur del paralelo XVI*. Imprenta Cervantes, Barcelona, Santiago, Chile.


Soloviev, S.L. and Go, Ch.N. 1975. A catalogue of tsunamis on the eastern shore of the Pacific Ocean [dates include 1513-1968]. Academy of Sciences of the USSR, Nauka Publishing House, Moscow, 204 p. [Canadian Translation of Fisheries and Aquatic Sciences no. 5078, 1984, translation available from Canada Institute for Scientific and Technical Information, National Research Council, Ottawa, Ontario, Canada K1A OS2, 293 pp].


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**South China Sea**


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**Others**


REFERENCES CONCERNING TSUNAMI EARTHQUAKES
(compiled by Kenji Satake)


APPENDIX III

WORKSHOP PROSPECTUS
(DRAFT)

Title: ASSESSING EARTHQUAKE THAT TRIGGERED POTENTIAL TSUNAMI

Introduction/Background

Tsunami local preparedness and education are essential components of end-to-end tsunami warning and mitigations systems. This is well recognised by the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), and by the Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG), all sponsored by the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Many tsunami hazard assessments have been carried for different regions of the world using different approaches and assumptions. Tsunami hazard assessments involve tsunami generation (estimation of the earthquake source), propagation (numerical simulation), and coastal behaviours (run-up and inundation modelling). The largest uncertainty of current tsunami assessment is on the generation part.

Improvements in the area of assessment of high impact hazard potential, including identifying the sites of the largest geophysical and social threats, can provide a considerable contribution to all tsunami and related hazard warning systems.

The Task Team recognizes that it would be appropriate to have a standard (or list of best practices) for how to carry out such a hazard assessment.

In order to achieve this goal, the IOC and its Inter ICG Task Team on Hazard Assessment Related to Highest Potential Tsunami Source Areas will organise a workshop with the following:

- **Objectives**
  
  Establish hazard assessment of the earthquake sources with the highest tsunamigenic potential (not only size but also probability and potential impact on populations should be considered).

- **Outcomes**
  
  In practical terms the aim would be to arrange a workshop among some of the lead researchers including researchers active in similar/on-going efforts (under the respective Intergovernmental Coordination Groups) in hazard studies for different regions to:

  - Summarize current knowledge on “tsunami earthquakes”.
o Present select studies on tsunami hazard assessment studies and review how maximum credible earthquake size and likelihood have been incorporated.

o Discuss how different approaches can be harmonised.

o Work towards a consensus on best practices/standard for tsunami hazard assessments.

From the workshop a report will be produced that addresses all the recommendations from the Group of Experts, plus summarizes the regional hazard assessment approaches and provides recommendations of best approaches.

- **Venue**
  The workshop will be held potentially in Paris or Lisbon (second half of 2014 or first half of 2015). It will last 3 days.

- **Participants**
  Experts on tsunami earthquakes, experts on probabilistic tsunami hazard assessments and experts on earthquake fault parameters (Mmax), as well as members of the Task Team (in total 20–30 participants with due consideration to geographic balance).

- **Steering Committee**
  TOWS Inter-ICG Task Team on Hazard Assessment Related to Highest Potential Tsunami Source Areas.

- **Local Organization**
  The Intergovernmental Oceanographic Commission of UNESCO.

- **Sponsors/Potential donors**
  The Intergovernmental Oceanographic Commission of UNESCO.
ANNEX VII

LIST OF PARTICIPANTS

TOWS-WG-VII

Dr Khaled ALBANAA
Associate Research Scientist
Kuwait Institute for Scientific Research,
Engineering Department
Kuwait Institute for Scientific Research (KISR)
P.O. Box 24885
13109 Safat
Kuwait
Tel: +965 24989762
Fax: +965 24989759

Mr Michael ANGOVE
Director, NOAA Tsunami Program
National Weather Service/National
Oceanic Atmospheric Administration
1325 East-West Highway
Silver Spring MD 20910
United States
Tel: 301-713-1858X106

Mr Rick BAILEY
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

Ms Alison BROME
Director (a.i.)
Caribbean Tsunami Information Centre
Building #30 Warrens Industrial Park,
Warrens, St. Michael
Bridgetown
BB22026
Barbados
Tel: 1-(246)-438-7575
Fax: 1-(246)-421-8612

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

Mr Miguel CABRERA
Chile

Mr David COETZEE
Manager, Capability & Operations / National Controller
New Zealand Ministry of Civil Defence & Emergency Management
New Zealand Ministry of Civil Defence & Emergency Management
PO Box 5010
Wellington 6045
New Zealand
Tel: +64 (4) 495 6806
Fax: +64 (4) 473 7369

Dr Ken GLEDHILL
GeoNet Project Director
GNS Science – Te Pu Ao
Lower Hutt P.O. Box 30-368
New Zealand
Tel: 64-4-5704848
Fax: 64-4-5704600

Ms Erika HAYAMI
Scientific Officer
Japan Meteorological Agency, Tokyo
1-3-4 Otemachi Chiyoda-ku
100-8122
Tokyo
Japan
Tel: (813) 32114966
Fax: (813) 32112032

Mr Mohammad Hossein KAZEMINEZHAD
Assistant Professor, (PhD)
Iranian National Institute for Oceanography (INIO)
No. 9 Etemad Zadeh St.
West Fatemi Ave.
1411813389 Tehran
Iran Islamic Rep of
Tel: (098)2166944867
Mr Takeshi KOIZUMI
Senior Coordinator for International Earthquake and Tsunami Information
Japan Meteorological Agency, Tokyo
1-3-4 Otemachi Chiyoda-ku
100-8122
Tokyo
Japan
Tel: (81)432486159
Fax: +81 (0)3 3215 2963

Dr Laura KONG
Director ITIC
UNESCO IOC NOAA International Tsunami Information Centre
737 Bishop Street, Suite 2000
Honolulu Hawaii 96813 USA
United States
Tel: 1-808-532-6423
Fax: 1-808-532-5576

Mr Charles MCCREERY
Pacific Tsunami Warning Center
91-270 Fort Weaver Rd, HI 96706
United States
Tel: (808)6898207x301

Dr Yutaka MICHIDA
Professor
University of Tokyo, Atmosphere and Ocean Research Institute
5-1-5, Kashiwanoha
Kashiwa-shi
277-8564
Chiba
Japan
Tel: +81 4 7136 6362

Mr Michel OKANDANDJADI
Technical adviser in Natural Disaster
Ministere de l'Agriculture, de la Peche, et de l'Environnement
Ave ex Papa Ileo, numero 15,
Kinshasa/gombe
Kinshasa, DR Congo
Congo
Tel: (243)998181198

Mr Angel Marcial PARRA YARZA
Directeur General du Bureau des Frontieres du Ministere des Relations Extérieures
Ministere des Relations Extérieures
Esquina Conde a Carmelitas, Torre MPPRE, Piso 5

Caracas
Venezuela
Tel: (58) (212)8064395

LCL Philippe SARRON
Head of the French West Indies emergency management organisation.
Préfecture de Martinique
RUE VICTOR SÉVÈRE - BP 647-648
97262 FORT-DE-FRANCE
FWI
Martinique
Tel: +596 596393937

Mr Kenji TSUNODA
GTS Expert
Japan Meteorological Agency, Tokyo
1-3-4 Otemachi Chiyoda-ku
100-8122
Tokyo
Japan

Mr Srinivasa Kumar TUMMALA
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

Mr Patrick TYBURN
Head of the French West Indies emergency management organisation
Préfecture de Martinique
RUE VICTOR SÉVÈRE - BP 647-648
97262 FORT-DE-FRANCE
FWI
Martinique
97200
Martinique
Tel: +596596393813

Ms Christa VON HILLEBRANDT-ANDRADE
Manager and Researcher
NOAA NWS Caribbean Tsunami Warning Program
Mayaguez Puerto Rico 00680
United States
Tel: 1-787-833-8433
Fax: 1-787-265-1684

Prof. Dr. Ahmet C. YALCINER
Chairman, METU Dept. of Civil Engineering Dir, Ocean Engineering Research Center
METU Dept Civil Engineering, Ocean Engineering Research Center
Department of Civil Engineering
Ocean Engineering Research Center, 06800 Ankara Turkey
06800 Ankara Cankaya Ankara Turkey
Tel: +90 312 210 2401
Fax: +90-312 210 18 00

INTER-ICG TASK TEAM ON DISASTER MANAGEMENT & PREPAREDNESS

Ms Alison BROME
Director (a.i.)
Caribbean Tsunami Information Centre
Building #30 Warrens Industrial Park, Warrens, St. Michael
Bridgetown
BB22026
Barbados
Tel: 1- (246)-438-7575
Fax: 1-(246)-421-8612

Mr David COETZEE
Manager, Capability & Operations / National Controller
New Zealand Ministry of Civil Defence & Emergency Management
New Zealand Ministry of Civil Defence & Emergency Management
PO Box 5010
Wellington 6045
New Zealand
Tel: +64 (4) 495 6806
Fax: +64 (4) 473 7369

Mr Ardito KODIJAT
Head of the Jakarta Tsunami Information Centre
UNESCO Jakarta
Jakarta
Indonesia
Tel: +62-21-7399818 Ext 878

Dr Laura KONG
Director ITIC
UNESCO IOC NOAA International Tsunami Information Centre
737 Bishop Street, Suite 2200
Honolulu Hawaii 96813 USA
United States
Tel: 1-808-532-6423
Fax: 1-808-532-5576

Prof Stefano TINTI
Department of Physics, University of Bologna
Bologna University Viale Berti-Pichat 8
40127 Bologna
Italy

Mr Patrick TYBURN
head of the French West Indies emergency management organisation
Préfecture de Martinique
RUE VICTOR SEVERE - BP 647-648
97262 FORT-DE-FRANCE FWI
Martinique
97200
Martinique
Tel: +596596393813

IOC SECRETARIAT

Mr Bernardo Aliaga
Programme Specialist
UNESCO/IOC
7 Place de Fontenoy
75352 Paris 07
France
Email: b.aliaga@unesco.org
Tel: +33 1 456 83980

INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS

TASK TEAM MEMBERS

Mr Rick BAILEY
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

Mr Takeshi KOIZUMI
Senior Coordinator for International Earthquake and Tsunami Information
Japan Meteorological Agency, Tokyo
1-3-4 Otemachi Chiyoda-ku
100-8122
Tokyo
Japan
Tel: +81 (0)3 3284 1743
Fax: +81 (0)3 3215 2963

Dr Charles (Chip) MCCREERY
Director PTWC
Pacific Tsunami Warning Center
91-270 Fort Weaver Rd, HI 96706
United States
Tel: 808-689-8207 x301
Fax: 808-689-4543

Mr Öcal NECMIOGLU
Geophysicist
Kandilli Observatory and Earthquake
Research Institute
Kandilli Rasathanesi ve Deprem Araştırma
Enstitüsü
34684 Çengelköy
İstanbul
Turkey
Tel: (813) 32114966
Fax: (813) 32112032

Dr François SCHINDELÉ
International expert
CEA/DIF/DASE
Bruyères le Châtel
91297 ARPAJON Cedex
France
Tel: +33 1 69 26 50 63

Mr Srinivasa Kumar TUMMALA
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

OBSERVERS

Mr Michael ANGOVE
Director, NOAA Tsunami Program
National Weather Service/National
Oceanic Atmospheric Administration

1325 East-West Highway
Silver Spring MD 20910
United States
Tel: 301-713-1858X106

Dr Ken GLEDHILL
GeoNet Project Director
GNS Science – Te Pu Ao
Lower Hutt P.O. Box 30-368
New Zealand
Tel: 64-4-5704848
Fax: 64-4-5704600

Ms Erika HAYAMI
Scientific Officer
Japan Meteorological Agency, Tokyo
1-3-4 Otemachi Chiyoda-ku
100-8122
Tokyo
Japan
Tel: (813) 32114966
Fax: (813) 32112032

Ms Christa VON HILLEBRANDT-
ANDRADE
Manager and Researcher
NOAA NWS Caribbean Tsunami Warning
Program
Mayaguez Puerto Rico 00680
United States
Tel: 1-787-833-8433
Fax: 1-787-265-1684

Prof.Dr Ahmet C. YALCINER
Chairman, METU Dept. of Civil
Engineering Dir, Ocean Engineering
Research Center
METU Dept Civil Engineering, Ocean
Engineering Research Center
Department of Civil Engineering
Ocean Engineering Research Center,
06800 Ankara Turkey
06800 Ankara Cankaya Ankara
Turkey
Tel: +90 312 210 2401
Fax: +90-312 210 18 00

IOC SECRETARIAT

Dr Thorkild AARUP
Head of Tsunami Unit (a.i.)
UNESCO/IOC
1 rue Miollis
75727 Paris Cedex 15
Paris
INTER-ICG TASK TEAM ON HAZARD ASSESSMENT RELATED TO HIGHEST POTENTIAL TSUNAMI SOURCE AREAS

TASK TEAM MEMBERS

Mr Franck A. Audemard M.
Earth Sciences Dpt.
Venezuelan Foundation for Seismological Research –FUNVISIS–
Final Prolongación Calle Mara, Quinta
Funvisis, Urbanización El Llanito
Caracas 1073, Estado Miranda
Venezuela
Tel: 58-(0)212-257.5153 /7672/9346 (ext.: 234)
Fax: 58-(0)212-257.9977
E-mail: faudemard@funvisis.gob.ve

Mr Phil R. Cummins
Research School of Earth Sciences
The Australian National University
Canberra ACT 0200 Australia
E-mail: phil.cummins@anu.edu.au

Mr Emile Okal
Department of Earth & Planetary Sciences
Northwestern University
Locy Hall
1850 Campus Drive
Evanston, IL 60201, USA

Mr Kenji Satake (Chair)
Earthquake Research Institute
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-0032
Japan
Tel: +81-3-5841-0219
Fax: +81-3-3814-5507
E-mail: satake@eri.u-tokyo.ac.jp

Alberto M. López Venegas
Catedrático Auxiliar
Departamento de Geología
Universidad de Puerto Rico - Mayagüez
Mayagüez, Puerto Rico 00681
Tel: (787) 832-4040 Ext. 2704
E-mail: alberto.lopez3@upr.edu

Ms Laura Wallace
The University of Texas at Austin
Institute for Geophysics
PO Box 7456
Austin, TX 78713, USA
E-mail: lwallace@ig.utexas.edu

IOC SECRETARIAT

Dr Thorkild Aarup
Intergovernmental Oceanographic Commission
UNESCO
1 rue Miollis
F-75732 Paris cedex 15
France
Tel: +33 (0) 145 684019
Fax: +33 (0) 145 685812
E-mail: t.aarup@unesco.org
**ANNEX VIII**

**LIST OF ACRONYMS**

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<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AIT</td>
<td>Asian Institute of Technology</td>
</tr>
<tr>
<td>AoR</td>
<td>Areas of Responsibility</td>
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<tr>
<td>ASEAN</td>
<td>Association of South-East Asian Nations</td>
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<tr>
<td>BMKG</td>
<td>Agency for Meteorological, Climatological and Geophysics</td>
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<tr>
<td>CARIBE-EWS</td>
<td>Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions</td>
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<tr>
<td>CARIBE-EWS-TSP</td>
<td>CARIBE-EWS Tsunami Service Provider</td>
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<tr>
<td>CBDRR</td>
<td>Community-Based Disaster Risk Reduction</td>
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<td>CDEMA</td>
<td>Caribbean Disaster Emergency Management Agency</td>
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<td>CENALT</td>
<td>Centre d’alerte aux tsunamis in France,</td>
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<tr>
<td>CTE</td>
<td>Communication Test Exercise</td>
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<td>CTIC</td>
<td>Caribbean Tsunami Information Centre</td>
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<tr>
<td>CTWC</td>
<td>Caribbean Tsunami Warning Center</td>
</tr>
<tr>
<td>CTWP</td>
<td>Caribbean Tsunami Warning Programme / Candidate Tsunami Watch Providers</td>
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<tr>
<td>DG</td>
<td>Director General</td>
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<td>DIPECHO</td>
<td>Program Disaster Preparedness Directorate General for Humanitarian Aid of the European Commission</td>
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<tr>
<td>DRC</td>
<td>Disaster Resilient Countries</td>
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<td>DRR</td>
<td>Disaster Risk Reduction</td>
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<tr>
<td>EC</td>
<td>Executive Council</td>
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<td>ECHO</td>
<td>European Commission Directorate Humanitarian Aid &amp; Civil Protection</td>
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<td>EMWIN</td>
<td>Emergency Managers Weather Information Network</td>
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<td>ETWCH</td>
<td>Expert Team on Waves and Coastal Hazards Forecasting Systems</td>
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<td>EU</td>
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GDACS  Global Disaster Alert and Coordination System
GEM  Global Earthquake Model
GFZ  German Research Centre for Geosciences
GITEWS  Developing Early Warning and Community Preparedness in Indonesia
GIZ  Deutsche Gesellschaft für Internationale Zusammenarbeit (The German Society for International Cooperation)
GTS  Global Telecommunication System
HFA  Hyogo Framework for Action
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
ICG/NEAMTWS  Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas
ICG/PTWS  Report from the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System
IHO  International Hydrographic Organization
IMO  International Maritime Organization
IOC  Intergovernmental Oceanographic Commission
IOTIC  Indian Ocean Tsunami Information Centre
IOTWS  Indian Ocean Tsunami Warning and Mitigation System
IOTWS-TSP  IOTWS Tsunami Service Provider
ISDR  Un International Strategy for Disaster Reduction
ITB  Institut Teknologi Bandung
ITIC  International Tsunami Information Centre
ITST  International Tsunami Survey Teams
JCOMM  Joint Technical Commission for Oceanography and Marine Meteorology
JMA  Japan Meteorological Agency
JTIC  Jakarta Tsunami Information Centre
KPI  Key Performance Indicators
MDG  Millennium Development Goal
MIC  Monitoring and Information Centre
MOU  Memorandum of Understanding
Mt  Tsunami Magnitude
NDMO  National Disaster Management Office
NDPTC  National Disaster Preparedness Training Center
NEAM  North-Eastern Atlantic, the Mediterranean and Connected Seas region
NEAMTIC  Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and connected seas
NEAMTWS  Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas
NEAMTWS-TSP  NEAMTWS Tsunami Service Provider
NGO  Non-Governmental Organization
NHK  Japan Broadcasting Corporation
NOAA  National Oceanic and Atmospheric Administration of the United States of America
NTHMP  US National Tsunami Hazard Mitigation Program
NTWC  National Tsunami Warning Centre
NWFP  National Tsunami Warning Focal Point
NWPTAC  Northwest Pacific Tsunami Advisory Center
NWS  National Weather Service
OFDA  Office of U.S. Foreign Disaster Assistance
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<th>Acronym</th>
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<tr>
<td>PAE</td>
<td>Public Awareness and Educational</td>
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<tr>
<td>PRSN</td>
<td>Puerto Rico Seismic Network</td>
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<td>PTWC</td>
<td>Pacific Tsunami Warning Center</td>
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<td>PTWS</td>
<td>Pacific Tsunami Warning and Mitigation System (formerly ITSU)</td>
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<td>PTWS-TSP</td>
<td>PTWS Tsunami Service Provider</td>
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<td>R3i</td>
<td>Regional Risk Reduction Initiative project</td>
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<td>Rapid Inundation Forecasting of Tsunamis model</td>
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<tr>
<td>RTSP</td>
<td>Regional Tsunami Service Provider</td>
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<td>RTWC</td>
<td>Regional Tsunami Warning (or Watch) Centre</td>
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<td>SIFT</td>
<td>Short-term Inundation Forecasting for Tsunamis</td>
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<td>Standard Operating Procedure</td>
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<td>Secretariat of the Pacific Regional Environment Programme</td>
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<td>Seismic Research Centre</td>
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<td>SSMS</td>
<td>Symposium for Social Management Systems</td>
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<td>TCHWS</td>
<td>Tsunami and Other Coastal Hazards Warning System Project</td>
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<td>Tsunami Information Centre</td>
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<tr>
<td>ToR</td>
<td>Terms of Reference</td>
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<tr>
<td>TOWS-WG</td>
<td>Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems</td>
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<tr>
<td>TSP</td>
<td>Tsunami Service Provider</td>
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<td>TSU</td>
<td>Tsunami Coordination Unit</td>
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<td>TT</td>
<td>Task Team</td>
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<td>TTT</td>
<td>tsunami travel time</td>
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<tr>
<td>TWFP</td>
<td>Tsunami Warning Focal Point</td>
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<tr>
<td>TWP</td>
<td>Tsunami Watch Provider</td>
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<tr>
<td>TWS</td>
<td>Tsunami Warning System</td>
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<tr>
<td>Abbreviation</td>
<td>Full Name</td>
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<tr>
<td>UNDP APRC</td>
<td>United Nations Development Programme-Asia-Pacific Regional Centre</td>
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<tr>
<td>UNESCAP</td>
<td>Economic and Social Commission for Asia and the Pacific</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<tr>
<td>UNISDR</td>
<td>United Nations Office for Disaster Risk Reduction</td>
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<tr>
<td>UN-OCHA</td>
<td>UN Office Coordination of Humanitarian Affairs</td>
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<td>UPRM</td>
<td>Puerto Rico Seismic Network</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>WCATWC</td>
<td>West Coast and Alaska Tsunami Warning Center</td>
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<tr>
<td>WCDRR</td>
<td>World Conference on Disaster Risk Reduction</td>
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<td>WG</td>
<td>Working Group</td>
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<tr>
<td>WMO</td>
<td>World Meteorological Organization</td>
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In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. First Session of the IOD-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
4. First Session of the IOD-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
5. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
6. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
7. First Session of the IOGEO Group of Experts on Marine Information Management
8. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
9. Tenth Session of the IOGEO Group of Experts on Marine Information Management
10. Sixteenth Session of the IOGEO Group of Experts on Marine Information Management
11. Fourth Session of the IODE Group of Experts on Marine Information Management
12. Second Session of the IOGEO Group of Experts on Marine Information Management
13. Second Session of the IOGEO Group of Experts on Marine Information Management
14. Second Session of the IOGEO Group of Experts on Marine Information Management
15. Fourth Session of the IOGEO Group of Experts on Marine Information Management
16. Eighth Session of the IOGEO Group of Experts on Marine Information Management
17. Seventh Session of the IOGEO Group of Experts on Marine Information Management
18. Sixth Session of the IOGEO Group of Experts on Marine Information Management
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60. First Session of the IOGEO Group of Experts on Marine Information Management
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. IUCN Meeting of Experts on a Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Second Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercomparison
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series (Also printed in French)
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans (Also printed in French)
68. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint ICP-WMO Meeting for Implementation of IGOS XBT ship-of-opportunity Programmes
71. ROPME-IOPC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of El Niño (Spanish only)
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (Also printed in Spanish)
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IOSE Group of Experts on Marine Information Management
76. Fifth Session of the IOSE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOPC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint ICG-WMO Meeting for Implementation of IGOS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IOSE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IOSE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO, Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IOSE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IOSE Group of Experts on Marine Information Management
106. ICG-NOAA Ad hoc Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOS XBT ship-of-opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS C10 Advisory Panel Meeting
113. First Meeting of the ICPWESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of El Niño (Spanish only)
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic (Also printed in French)
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997
122. First Session of the IOC-IUCN-NOAA Ad hoc Consultative Meeting on Large Marine Ecosystems (LME), France, 1997
123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997
124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996 (also printed in Spanish)
125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997
126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997
127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998
128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997
129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997
132. Sixteenth Session of the Joint IIOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997
134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997
136. Seventh Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting, Germany, 1997
137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998
139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998
140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998
143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998
144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999
145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999
146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999
147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999
149. Eighth Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting, Japan, 1999
150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999
151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999
152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999
153. Seventeenth Session of the Joint IIOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999
154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998
155. IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998
156. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICCSU/IMPL-II/III/3, France, 1999
157. First Session of the ad hoc Advisory Group for IOCARIIBE-GOOS, Venezuela, 1999 (also printed in Spanish and French)
158. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999
162. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000
163. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000
164. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000
165. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000
166. Second Session of the ad hoc Advisory Group for IOCARIIBE-GOOS, Cuba, 2000 (also printed in Spanish and French)
167. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000
168. First GOOS Users’ Forum, 2000
170. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 (also printed in French)
171. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001
172. First Session of the IOOC-SCOR Ocean CO2 Advisory Panel, France, 2000
173. Fifth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Norway, 2000 (electronic copy only)
174. Third Session of the ad hoc Advisory Group for IOCARIIBE-GOOS, USA, 2001 (also printed in Spanish and French)
175. Second Session of the Coastal Ocean Observations Panel and GOOS Users’ Forum, Italy, 2001
176. Second Session of the Black Sea GOOS Workshop, Georgia, 2001
177. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000
178. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABEOS), Morocco, 2002 (also printed in French)
179. Sixth Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Australia, 2001 (electronic copy only)
180. Cancelled
181. IOC Workshop on the Establishment of SEAGoOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 \(\text{(SEAGoOS preparatory workshop)} \text{(electronic copy only)}\)
182. First Session of the IODE Steering Group for the Resource Kit, USA, 19–21 March 2001
183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002
184. Seventh Session of the IOE Group of Experts on Marine Information Management (GEMIM), France, 2002 \(\text{(electronic copy only)}\)
185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GoOS), Republic of Korea, 2001 \(\text{(electronic copy only)}\)
186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002. \(\text{(electronic copy only)}\)
187. Fourth Session of the ad hoc Advisory Group for IOCARIBE-GoOS, 2002, Mexico \(\text{(also printed in French and Spanish)}\)
188. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IBCWO), Mauritius, 2000
189. Third session of the Editorial Board for the International Bathymetric Chart of the Western Pacific, China, 2000
192. Third Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Lisbon, 2003 \(\text{(also printed in French)}\)
193. Extraordinary Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Chile, 1999 \(\text{(Spanish only; electronic copy only)}\)
196. Fourth Session of the Coastal Ocean Observations Panel, South Africa, 2002 \(\text{(electronic copy only)}\)
197. First Session of the JCOMM/IOE Expert Team On Data Management Practices, Belgium, 2003 \(\text{(also JCOMM Meeting Report No. 25)}\)
198. Fifth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2003
199. Ninth Session of the IOC Consultative Group on Ocean Mapping, Monaco, 2003 \(\text{(Recommendations in English, French, Russian and Spanish included)}\)
200. Eighth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2003 \(\text{(electronic copy only)}\)
201. Fourth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Greece, 2004 \(\text{(also printed in French)}\)
202. Sixth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2004 \(\text{(electronic copy only)}\)
203. Fifth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Argentina, 2005 \(\text{(also printed in French)}\)
204. Ninth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2005 \(\text{(electronic copy only)}\)
205. Eighth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GoOS), China, 2003 \(\text{(electronic copy only)}\)
206. Sixth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Spain, 2006 \(\text{(also printed in French)}\)
207. Third Session of the Regional Forum of the Global Ocean Observing System, South Africa, 2006 \(\text{(electronic copy only)}\)
208. Seventh Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2005 \(\text{(electronic copy only)}\)
209. Eighth Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2006 \(\text{(electronic copy only)}\)
210. Seventh Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Gabon, 2007 \(\text{(bilingual English/French)}\)
211. First Meeting of the IOC Working Group on the Future of IOC, Paris, 2008 \(\text{(Executive Summary in English, French, Russian and Spanish included)}\)
212. First meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 3–4 April 2008 \(\text{(Executive Summary in English, French, Russian and Spanish included)}\)
213. First Session of the Panel for Integrated Coastal Observation (PICO-I), Paris, 10–11 April 2008 \(\text{(electronic copy only)}\)
214. Tenth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 6–8 June 2007 \(\text{(electronic copy only)}\)
216. Fourth Session of the Global Ocean Observing System (GOOS) Regional Alliances Forum (GRAF), Guayaquil, Ecuador, 25–27 November 2008 \(\text{(electronic copy only)}\)
217. Second Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 27 March 2009 \(\text{(Executive Summary in English, French, Russian and Spanish included)}\)
219. First Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 3), Broomfield, Colorado, U.S.A., 1 October 2005 \(\text{(electronic copy only)}\)
220. Second Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 6), Paris, France, 20 April 2007 \(\text{(electronic copy only)}\)
221. Third Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 10), Villefranche-sur-mer, France, 3–4 October 2008 \(\text{(electronic copy only)}\)
222. Fourth Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 15), Jena, Germany, 14 September 2009 \(\text{(electronic copy only)}\)
223. First Meeting of the joint IOC-ICES Study Group on Nutrient Standards (SGONS) (also IOCCP Reports, 20), Paris, France, 23–24 March 2010 \(\text{(Executive Summary in E, F, R, S included)}\)
224. Third Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Lisbon, Portugal, 5–6 May 2010 \(\text{(Executive Summary in English, French, Russian and Spanish included)}\)
226. Second Session of the Panel for Integrated Coastal Observation (PICO-II), Paris, 24–26 February 2009 \(\text{(electronic copy only)}\)
227. First meeting of the Task Team on Seismic Data Exchange in the South West Pacific of the ICG/PTWS Regional Working Group for the Southwest Pacific, Port Vila, Vanuatu, 19–20 October 2009 \(\text{(electronic copy only)}\)
228. Fourth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, France, 20–21 March 2011 \(\text{(Executive Summary in English, French, Russian and Spanish included)}\)
229. Second Session of the IOE Steering Group for Ocean Teacher (SG-OT), Miami, Florida, 11–15 April 2011
230. First Meeting of the Inter-IOC Task Team 1 on Sea Level Monitoring for Tsunami (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010
231. First Meeting of the Inter-ICG Task Team 2 on Disaster Management and Preparedness (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG)), Seattle, USA, 29 November–1 December 2010

232. First Meeting of the Inter-ICG Task Team 3 on Tsunami Watch Operations (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG)), Seattle, USA, 29 November–1 December 2010

233. Primera Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua (Nicaragua) del 4 al 6 de noviembre de 2009 (Resumen dispositivo en español e inglés)

234. Segunda Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), San Salvador (El Salvador) del 28 al 30 de septiembre de 2011 (Resumen dispositivo en español e inglés)

235. First Session of the Joint IODE-JCOMM Steering Group for the Global Temperature-Salinity Profile Programme (SG-GTSPP), 16–20 April 2012, Ostend, Belgium

236. Ad hoc Session of the Joint JCOMM-IODE Steering Group for the Ocean Data Standards Pilot Project (SG-ODSPP), 23–25 April 2012, Ostend, Belgium

237. First Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Sanya, China, 12–14 December 2011

238. First Meeting of the IODE Steering Group for OceanDocs (SG-OceanDocs), 24–27 January 2012, Ostend, Belgium

239. Fifth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Tokyo, Japan, 15 February 2012 (Executive Summary in English, French, Russian and Spanish Included)


241. Twelfth Session of the IODE Group of Experts on Marine Information Management (GE-MIM), Miami, USA, 22–25 January 2013

242. Twelfth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 9–11 November 2011 (electronic copy only)

243. Meeting of the Pacific Tsunami Warning System Working Group 2 on Detection, Warning and Dissemination Task Team on PacWave11, Honolulu, USA, 21 May 2012 (electronic copy only)

244. Sixth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 20–21 February 2013 (Executive Summary in English, French, Russian and Spanish Included)

245. Second Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Petaling Jaya, Malaysia, 16–18 October 2012 (electronic copy only)

246. Seventh Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems, UNESCO, Paris, 12–13 February 2014 (Executive Summary in English, French, Russian and Spanish Included)