

Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies



Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS)

Twenty-fourth Session

Beijing, China

24–27 May 2011

UNESCO

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(ICG/PTWS)**

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¹ The Executive Summary is available in English, French, Spanish and Russian and the speech of Mr Zhanhai Zhang (Annex II) is available in English and Chinese.

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Executive Summary

The Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) was held in Beijing, China, from 24 to 27 May 2011 under the Session Chairship of Lt. Giorgio de La Torre, Chair of the ICG/PTWS. It was attended by 51 participants from 16 ICG/PTWS Member States and representatives from one organization (WDC/NGDC).

The **ICG decided** to continue Working Group 1 on Tsunami Risk Assessment and Reduction with Dr François Schindelé (France) as Chair and established a Task Team on Tsunami Modelling Hazard Assessment (Chair: Dr V Titov–USA) and a Task Team on Tsunami Risk Assessment (Chair: Dr Nguyen Hong Phuong–Vietnam).

The **ICG agreed** to continue Working Group 2 on Tsunami Detection, Warning and Dissemination with Dr Chip McCreery (USA) as Chair and Mr Daniel Jaksa (Australia) as Vice-Chair and continued WG2 Task Team on Warning Dissemination (formerly Emergency Communications), WG2 Task Team on PACWAVE 11 (formerly PTWS Exercises), WG2 Task Team on Enhancing Products (formerly Enhancing Tsunami Warning Products), WG2 Task Team on Seismic Data Sharing in the South West Pacific, and **established** a WG2 Task Team on Sea Level Monitoring with Mr Chris Ryan (Australia) as Chair.

The **ICG agreed** that Member States should regularly review the information on TWFPs and TNCs at the IOC password protected website for accuracy and advise the IOC Secretariat regarding any errors or changes.

The **ICG agreed** that the PTWC should disseminate a communication test message once a month on the same day and at the same time to the PTWS Member States TWFPs. Member States should ensure they receive these regular tests by all designated means and troubleshoot with PTWC or other appropriate organizations only if any message is not received by the designated method. In addition, PTWC will conduct twice yearly unannounced communication tests. Member States should respond to these tests within an hour, indicating the methods by which the message was received and the time at which it was received. Testing will begin in October of 2011. Member States' TWFPs and TNCs will be informed in advance regarding details on the conduct of these tests by an IOC circular letter.

The **ICG requested** the Secretariat to inquire by October 2011 of PTWS Member State TWFPs regarding their need to receive PTWC message products by fax.

The **ICG agreed** that all PTWS Member States having offshore sea level data, such as that from undersea cabled observatories, from differential GPS buoys, or from deep-ocean bottom pressure sensors connected to buoys, should share those data for tsunami detection and warning purposes.

The **ICG requested** the IOC Secretariat to seek funds for follow-up training in the configuration and use of seismic monitoring and analysis systems for Member States in the SW Pacific.

The **ICG decided** to continue Working Group 3 on Tsunami Awareness and Response with Mr David Coetzee (New Zealand) as Chair.

The **ICG decided** to continue the Regional Working Group on Tsunami Warning and Mitigation on the Central American Pacific Coast with Mr Alejandro Rodriquez (Nicaragua) as Chair.

The **ICG accepted** the offer of SHOA (Chile) of hosting in 2011 a seminar focused on numerical modelling of tsunami risk scenarios and requested the Secretariat and other regional organizations and donors (i.e. CPPS, SOPAC, CEPREDENAC, and USAID) to seek/contribute funding for this event.

The **ICG decided** to continue the Regional Working Group on Tsunami Warning and Mitigation in the Southeast Pacific Region with Lt. Luis Pinto (Ecuador) as Chair.

The **ICG decided** to continue Regional Working Group on Tsunami Warning and Mitigation in the South China Sea Region with Dr Mohd. Rosaidi bin Che Abas (Malaysia) as Chair and Dr Fujiang Yu (China) as Vice-Chair.

The **ICG decided** to continue the Working Group on Tsunami Warning and Mitigation in the Southwest Pacific Region and elected Ms Filomena Nelson (Samoa) as the Chair and Mr Don Anderson (Australia) as Vice Chair.

The **ICG agreed** that PTWC should proceed with its development of improved tsunami procedures and products.

The **ICG further agreed** to continue the Task Team on Enhancing Products (renamed) under WG2 to guide and provide feedback to PTWC regarding these changes and **requested** the Task Team Chair to provide a report on the recommendations and any implementations at ICG/PTWS-XXV.

The **ICG also agreed** that any new products and procedures only be exercised in an experimental mode as they are developed and until they are approved for official use later by the ICG.

The **ICG agreed** that the PACWAVE 11 exercise be conducted on 9 and 10 November of 2011 and include several tsunami scenarios that can be independently selected by each Member State for their practice. Each scenario will be initiated by PTWC, NWPTAC, and or WC/ATWC with a message product announcing its start.

The **ICG agreed** to task the PTWS Steering Committee with finalising the PTWS Funding Strategy and complete the information about existing funding towards the three pillars of the PTWS Implementation Plan.

The **ICG encouraged** Member States to include representation of National Disaster Management Organizations (NDMO's) in their delegations to the ICG and inter-sessional Working Groups.

The **ICG thanked** the Russian Federation and agreed to hold the ICG/PTWS-XXV in Vladivostok, Russian Federation, on August–September 2013.

The **ICG noted** the interest indicated by USA of hosting its Twenty Sixth session in 2015.

The **ICG elected** Dr Ken Gledhill (New Zealand) as Chair and Captain Patricio Carrasco (Chile), Dr Fujiang Yu (China) and Mr Takeshi Koizumi (Japan) as Vice-Chairs for the ICG/PTWS for the period May 2011–May 2013.

Résumé exécutif

Le Groupe intergouvernemental de coordination du Système d'alerte aux tsunamis et de mitigation dans le Pacifique (GIC/PTWS) a tenu, du 24 au 27 mai, à Beijing (Chine) ,sa 24e session sous la présidence de M. Giorgio de La Torre, Président du Groupe. Y ont assisté 50 participants venant de 16 États membres du GIC//PTWS et des représentants d'une organisation (WDC/NGDC).

Le GIC **a décidé** de proroger le Groupe de travail 1 sur l'évaluation et la réduction du risque de tsunami, avec M. Francois Schindelé (France) à la présidence, et **a créé** une Équipe de travail sur la modélisation du risque de tsunami (Président : V. Titov–États-Unis) et une Équipe de travail sur l'évaluation du risque de tsunami (Président: Nguyen Hong Phuong–Viet Nam).

Le GIC **a décidé** de proroger le Groupe de travail 2 sur la détection des tsunamis, de l'alerte et de la diffusion, avec M. Chip McCreery (États-Unis) comme Président, et M. Daniel Jaksa (Australie), Vice-Président, et de proroger l'Équipe de travail du GT2 sur la diffusion de l'alerte (ancien Équipe de travail sur les communications d'urgence), l'Équipe de travail du GT2 sur PACWAVE 11(ancien Équipe de travail sur les Exercices PTWS) , l'Équipe de travail du GT2 sur l'amélioration des produits (ancien Équipe de travail sur l'amélioration des produits d'alerte aux tsunamis), l'Équipe de travail du GT2 sur la mise en commun des données sismiques dans le sud-ouest du Pacifique et **a créé** une Équipe de travail sur la surveillance du niveau de la mer, présidée par M. Chris Ryan (Australie).

Le GIC **est convenu** que les États membres devraient examiner périodiquement, sur le site Internet protégé par un code secret, l'information relative aux TWFC et aux TNC pour en vérifier l'exactitude et signaler au Secrétariat de la COI toute erreur ou modification.

Le GIC **est convenu** que le PTWC devrait diffuser une fois tous les mois, le même jour et à la même heure, un message de test de communication à tous ses États membres. Les TWFC des États membres devraient s'assurer qu'ils reçoivent ces tests périodiques par tous les moyens désignés et n'intervenir auprès du PTWC ou tout autre organisme approprié pour régler éventuellement un problème que si un message quelconque n'est pas reçu par une méthode désignée. En outre, le PTWC procèdera deux fois par an à des tests de communication sans avis préalable. Les États membres devraient répondre à ces tests dans l'heure de la réception, indiquant les méthodes par lesquels le message a été reçu et l'heure à laquelle il a été reçu. Les tests commenceront en octobre 2011. Les TTWFC et TNC des États membres seront informés à l'avance, par lettre circulaire de la COI, des détails concernant le déroulement de ces tests.

Le GIC **a demandé** au Secrétariat de s'enquérir, en octobre 2011 au plus tard, auprès des TWFP des États membres afin de déterminer s'ils ont besoin de recevoir par télécopie les produits de message du PTWC.

Le GIC **est convenu** que tous les États membres du PTWS qui ont des données relatives au niveau de la mer au large, telles que les données en provenance d'observatoires sous-marins reliés à des câbles, de bouées GPS différentielles, de capteurs de pression dans les fonds océaniques, de mettre en commun ces données aux fins de la détection et l'alerte aux tsunamis.

Le GIC a demandé au Secrétariat de la COI de rechercher des crédits destinés à dispenser une formation complémentaire à la configuration et à l'utilisation de la surveillance sismique et des systèmes d'analyse dans les États membres de région du sud-ouest du Pacifique.

Le GIC a décidé de proroger le Groupe de travail 3 sur la sensibilisation et la réponse aux tsunamis, placé sous la présidence de M. David Coetzee (Nouvelle-Zélande).

Le GIC **est convenu** de proroger le Groupe de travail régional sur l'alerte aux tsunamis et la mitigation sur la côte Pacifique de l'Amérique centrale, avec, à la présidence, M. Alejandro Rodriguez (Nicaragua).

Le GIC **a accepté** l'offre du Service hydrographique et océanographique chilien de la marine (SHOA) d'accueillir en 2011 un séminaire axé sur la modélisation des scénarios de risque de tsunami **et demandé** au Secrétariat, et à d'autres organismes et bailleurs de fonds (notamment: CPPS, SOPAC, CEPREDENAC, et USAID) de rechercher/contribuer à un financement de cette action.

Le GIC a décidé de proroger le Groupe de travail régional sur l'alerte aux tsunamis et à la mitigation dans la région du sud-est du Pacifique, avec M. Luis Pinto (Équateur) comme Président.

Le GIC **a décidé** de proroger le Groupe de travail régional sur l'alerte aux tsunamis et la mitigation dans la région de la mer de Chine méridionale, avec M. Moohd Rosaidi ben Che Abbas (Malaisie), comme Président, et M. Fujiang Yu (Chine), Vice-Président.

Le GIC **a décidé** de proroger le Groupe de travail sur l'alerte aux tsunamis et la mitigation dans le sud-ouest du Pacifique et élu Mme. Filomena Nelson (Samoa) Présidente, et M. Don Anderson (Australie) Vice-Président.

Le GIC **est convenu** que le PTWC devrait poursuivre la mise au point des procédures et produits améliorés relatifs aux tsunamis.

Le GIC **est convenu aussi** de proroger, au titre du GT2, l'Équipe spéciale pour l'amélioration des produits, chargé de donner au PTWC des orientations et un retour d'information concernant ces changements, et **a demandé** au président de l'Équipe spéciale de lui rendre compte, à sa 25^e session, des recommandations et de toute mise en œuvre.

Le GIC **est convenu par ailleurs** que tout nouveau produit, ou toute nouvelle procédure, ne serait appliqué qu'à titre expérimental au fur et à mesure de sa mise au point et jusqu'à ce qu'il soit, ultérieurement, approuvé pour être utilisé officiellement.

Le GIC **est convenu** que l'exercice PACWAVE 11 se déroulerait les 9 et 10 novembre 2011 et comprendrait plusieurs scénarios de tsunami, que chaque État membre pourrait choisir indépendamment aux fins de l'exercice. Chaque scénario sera lancé par le PTWC, le NWPTAC et/ou le WC/ATWC, avec un message annonçant son commencement.

Le GIC **est convenu** de charger le Comité directeur du PTWS de mettre définitivement au point la stratégie du financement du PTWS et de parachever l'information relative au financement existant orienté vers les trois piliers du Plan de mise en œuvre du PTWS.

Le GIC **a encouragé** les États membres à inclure dans leur délégation au GIC et aux groupes de travail intersession la représentation des organismes nationaux de gestion des catastrophes (NDMO).

Le GIC **a remercié la** Fédération de Russie et **est convenu** de tenir sa 25^e session à Vladivostok (Fédération de Russie) en août-septembre 2013.

Le GIC **a noté** l'intérêt que les États-Unis ont manifesté pour l'accueil de sa 26^e session, en 2015.

Le GIC a élu M. Ken Gledhill (Nouvelle-Zélande) Président, et MM. Patricio Carrasco (Chili), Fujiang Yu (Chine) et Takeshi Koizumi (Japon) Vice-Présidents du GIC/PTWS pour la période allant de mai 2011 à mai 2013.

Resumen dispositivo

La 24ª reunión del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS) se celebró en Beijing (China), del 24 al 27 de mayo de 2011 bajo la presidencia del Sr. Giorgio de La Torre, Presidente del ICG/PTWS. Asistieron a la reunión 50 participantes de 16 Estados Miembros del ICG/PTWS y representantes de una organización (Centro Mundial de Datos/National Geophysical Data Centre).

El **ICG decidió** que prosiguiera la actividad del Grupo de Trabajo 1 (WG1) sobre Evaluación y reducción de los riesgos de tsunami, bajo la presidencia del Dr. Francois Schindelé (Francia), **y estableció** un Equipo de trabajo sobre modelos de evaluación de riesgos (Presidente: V. Titov, Estados Unidos de América) y un Equipo de trabajo sobre evaluación de riesgos de tsunamis (Presidente: Nguyen Hong Phuong, Vietnam).

El ICG **decidió** que prosiguiera la actividad del Grupo de Trabajo 2 (WG2) sobre Detección, alerta y difusión, con el Dr. Chip McCreery (Estados Unidos de América) como Presidente y el Sr. Daniel Jaksá (Australia) como Vicepresidente, y continuar la actividad de los equipos de trabajo del WG2 sobre Difusión de alertas (antiguo equipo sobre Comunicaciones de emergencia), sobre PACWAVE 11 (antiguo equipo sobre Ejercicios PTWS), sobre Perfeccionamiento de productos (antiguo equipo sobre Perfeccionamiento de productos de alerta de tsunamis), y sobre Intercambio de datos sísmicos en el Pacífico sudoccidental, y **estableció** un Equipo de trabajo del WG2 sobre Vigilancia del nivel del mar, presidido por el Sr. Chris Ryan (Australia).

El **ICG convino** en que los Estados Miembros debían verificar regularmente la exactitud de la información sobre los Puntos focales de alerta contra los tsunamis (TWFP) y los Contactos nacionales sobre tsunamis (TNC) que figuran en el sitio web de la COI protegido por contraseña, y comunicar a la Secretaría de la COI los posibles errores o modificaciones.

El **ICG acordó** que el PTWC difundiría un mensaje de prueba de comunicaciones una vez por mes, el mismo día y al mismo tiempo, a todos los Estados Miembros del PTWS. Los Estados Miembros deberán cerciorarse de que esos mensajes de prueba son recibidos por todos los medios designados y señalar el problema al PTWC u otras organizaciones apropiadas solamente si un mensaje no es recibido por el medio designado. Además, el PTWC efectuará pruebas de comunicación sin aviso previo dos veces por año. Los Estados Miembros deben responder estos mensajes de prueba en el lapso de una hora, indicando los métodos por los cuales se recibió el mensaje, así como la hora de recepción. Las pruebas comenzarán en octubre de 2011. Se informará con antelación a los TWFP y TNC de los Estados Miembros, mediante una carta circular de la COI, acerca de los detalles de la realización de esas pruebas.

El **ICG pidió** a la Secretaría que antes de octubre de 2011 consultara a los TWFP de los Estados Miembros del PTWS sobre la necesidad de enviarles los mensajes del PTWC por fax.

El **ICG acordó** que todos los Estados Miembros del PTWS que dispongan de datos sobre el nivel del mar en alta mar, como los procedentes de observatorios submarinos con cable, de boyas diferenciales GPS o de sensores de presión instalados en el fondo del mar y conectados a las boyas, los intercambien con fines de detección y alerta sobre tsunamis.

El **ICG pidió** a la Secretaría de la COI que buscara fondos para formación complementaria sobre la configuración y el uso de sistemas de vigilancia y análisis sísmico para los Estados Miembros del Pacífico Sudoccidental.

El **ICG decidió** proseguir las actividades del Grupo de Trabajo 3 sobre Sensibilización a los tsunamis y respuesta ante los mismos, bajo la presidencia del Sr. David Coetzee (Nueva Zelanda).

El **ICG acordó** proseguir las actividades del Grupo de trabajo regional sobre Alerta contra los tsunamis y atenuación de sus efectos en la Costa Centroamericana del Pacífico, bajo la presidencia del Sr. Alejandro Rodríguez (Nicaragua).

El **ICG aceptó** el ofrecimiento del Servicio Hidrográfico y Oceanográfico de la Armada de Chile (SHOA) de acoger en 2011 un seminario sobre modelos numéricos de hipótesis sobre peligro de tsunamis y pidió a la Secretaría y a otras organizaciones regionales y donantes (a saber, la Comisión Permanente del Pacífico Sur (CPPS), la Pacific Islands Applied Geoscience Commission (SOPAC), el Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPRENAC) y el Organismo de los Estados Unidos para el Desarrollo Internacional (USAID)) que buscaran o proporcionaran fondos para esa actividad.

El **ICG decidió** proseguir las actividades del Grupo de trabajo regional sobre Alerta contra los tsunamis y atenuación de sus efectos en la Región del Pacífico Sudoriental, bajo la presidencia del Teniente Luis Pinto (Ecuador).

El **ICG decidió** proseguir las actividades del Grupo de trabajo regional sobre Alerta contra los tsunamis y atenuación de sus efectos en la Región del Mar de China meridional, con el Dr Mohd Rosaidi bin Che Abas (Malasia) como Presidente y el Sr. Fujiang Yu (China) como Vicepresidente.

El **ICG decidió** proseguir las actividades del Grupo de trabajo regional sobre Alerta contra los tsunamis y atenuación de sus efectos en la Región del Pacífico Sudoccidental, y eligió Presidenta a la Sra. Filomena Nelson (Samoa) y Vicepresidente al Sr. Don Anderson (Australia).

El **ICG acordó** que el PTWC debía continuar elaborando productos y procedimientos mejorados sobre tsunamis.

El **ICG acordó además** prolongar el Equipo de trabajo del WG2 sobre Perfeccionamiento de productos para orientar y enviar información de retorno al PTWC sobre esos cambios, y **pidió** al Presidente del Grupo de trabajo que preparara un informe sobre las recomendaciones y su aplicación en la 25ª reunión del ICG/PTWS.

El **ICG acordó también** que los nuevos productos y procedimientos se pusieran en práctica solamente a título experimental durante su elaboración y hasta que el ICG aprobara oficialmente su uso.

El **ICG acordó** que el ejercicio PACWAVE 11 se realizaría los días 9 y 10 de noviembre de 2011 y comprendería varios escenarios de tsunami que pudieran ser seleccionados independientemente por cada Estado Miembro para ponerlo en práctica. Cada escenario será iniciado por el PTWC, el Centro de Asesoramiento sobre los Tsunamis del Pacífico Noroccidental (NWPTAC) y/o el Centro de Alerta contra los Tsunamis de Alaska y la Costa Occidental (WC/ATWC) con un mensaje que indique este comienzo.

El **ICG acordó** encargar al Comité de Dirección del PTWS que finalizara la Estrategia de financiación del PTWS y completara la información acerca de los fondos existentes para los tres pilares del Plan de Ejecución del PTWS.

El **ICG alentó** a los Estados Miembros a incluir en las delegaciones a sus reuniones y a las de los grupos de trabajo en el periodo que media entre ellas a representantes de las organizaciones nacionales de gestión de casos de desastre.

El **ICG dio las gracias** a la Federación de Rusia y convino en celebrar la 25ª reunión del ICG/PTWS en Vladivostok (Federación de Rusia) en agosto–septiembre de 2013.

El **ICG tomó nota** del interés de los Estados Unidos de América en acoger su 26ª reunión en 2015.

El **ICG eligió** Presidente al Dr. Ken Gledhill (Nueva Zelandia) y Vicepresidentes al Capitán Patricio Carrasco (Chile), el Dr. Fujiang Yu (China) y el Sr. Takeshi Koizumi (Japón) del ICG/PTWS para el periodo de mayo de 2011 a mayo de 2013.

Рабочее резюме

Двадцать четвертая сессия Межправительственной координационной группы по Системе предупреждения о цунами и смягчения их последствий в Тихом океане (МКГ/СПЦТО) состоялась в Пекине, Китай, 24–27 мая 2011 г. под председательством г-на Хиорхио де ла Торре, председателя МКГ/СПЦТО. В ней приняли участие 50 участников из 16 государств–членов МКГ/СПЦТО, а также представители от одной организации (МЦД/ НГДЦ).

МКГ постановила продолжить деятельность Рабочей группы 1 по оценке и уменьшению риска цунами под председательством д-ра Франсуа Шинделя (Франция) и **учредила** Целевую группу по моделированию оценки рисков цунами (Председатель: В. Титов – США) и Целевую группу по оценке риска цунами (Председатель: Нгуен Хонг Фуонг – Вьетнам).

МКГ постановила продолжить деятельность Рабочей группы 2 по обнаружению, оповещению и распространению информации о цунами с д-ром Чипом Маккрири (США) в качестве Председателя и г-ном Дениэлем Джэксом (Австралия) в качестве заместителя председателя и продолжила деятельность Целевой группы РГ2 по распространению оповещений (бывшая группа по передаче сообщений о чрезвычайных ситуациях), Целевой группы РГ2 PACWAVE11 (бывшая группа по реализации подготовительных мероприятий в Тихом океане), Целевой группы РГ2 по совершенствованию программ (бывшая группа по совершенствованию качества продуктов предупреждения о цунами), Целевой группы РГ2 по совместному использованию сейсмических данных в юго-западной части Тихого океана и **учредила** Целевую группу РГ2 по мониторингу уровня моря под председательством г-на Криса Райяна (Австралия).

МКГ пришла к договоренности о том, что государства-члены должны проводить регулярный обзор информации о КПЦ и НКЦ на защищенном паролем веб-сайте МОК на предмет ее точности и консультировать Секретариат МОК относительно ошибок или изменений.

МКГ пришла к договоренности о том, что ПТВЦ должен направлять КПЦ государств – членов СПЦТО оповещение для тестирования связи раз в месяц в один и тот же день и в одно и то же время. Государства-члены должны удостовериться в том, что они получают эти регулярные тестовые оповещения всеми установленным способами и сообщать о неисправности ПТВЦ или другим соответствующим организациям, только если сообщение не было получено установленным методом. Кроме того, два раза в год ПТВЦ будет проводить тестирование связи без предварительного объявления. Государства-члены должны ответить на эти тестовые оповещения в течение часа, указав способы, благодаря которым сообщение было получено, а также время, когда оно было получено. Тестирование начнется в октябре 2011 г. Государства – члены КПЦ и НКЦ будут заранее проинформированы о деталях проведения этих тестов в циркулярном письме МОК.

МКГ просила Секретариат выяснить к октябрю 2011 г. у КПЦ государств – членов СПЦТО, необходимо ли им получать сообщение ПТВЦ по факсу.

МКГ пришла к договоренности о том, что все государства – члены СПЦТО, располагающие данными морских измерений об уровне моря, например, получаемыми благодаря подводным кабельным обсерваториям, различным буям GPS или глубоководным сенсорам для измерения давления на океанских глубинах,

подсоединенным к буйам, должны совместно использовать эту информацию для обнаружения цунами и в целях предупреждения о цунами.

МКГ просила Секретариат МОК изыскивать финансирование для проведения подготовки в области конфигурации и использования систем сейсмического мониторинга и анализа для государств-членов в юго-западной части Тихого океана.

МКГ постановила продолжить деятельность Рабочей группы 3 по информированию общественности и мерам реагирования в отношении цунами под председательством г-на Дэвида Коэтзи (Новая Зеландия).

МКГ постановила продолжить деятельность Региональной рабочей группы по предупреждению о цунами и смягчению их последствий для Тихоокеанского побережья Центральной Америки под председательством г-на Алехандро Родригеса (Никарагуа).

МКГ приняла предложение ГОСА выступить в 2011 г. в качестве принимающей стороны семинара, посвященного цифровому моделированию сценариев в отношении риска цунами, и просила Секретариат и другие региональные организации и доноров (например, ПКЮТО, СОПАК, СЕПРЕДЕНАК и ЮСЭЙД) изыскивать финансирование/оказывать финансовую поддержку этому мероприятию.

МКГ постановила продолжить деятельность Региональной рабочей группы по предупреждению о цунами и смягчению их последствий для юго-восточной части Тихого океана под председательством лейтенанта Луиса Пинто (Эквадор).

МКГ постановила продолжить деятельность Региональной рабочей группы по предупреждению о цунами и смягчению их последствий для региона Южно-Китайского моря с д-ром Мохд. Росаиди бин Ше Абасом (Малайзия) в качестве Председателя и г-ном Фуджиангом Юем (Китай) в качестве заместителя председателя.

МКГ постановила продолжить деятельность Рабочей группы по предупреждению о цунами и смягчению их последствий для юго-западной части Тихого океана и избрала Филомену Нельсон (Самоа) в качестве Председателя и Дона Андерсона (Австралия) в качестве заместителя председателя.

МКГ пришла к договоренности о том, что ПТВЦ должен приступить к разработке усовершенствованных процедур и программ, касающихся цунами.

МКГ далее пришла к договоренности о сохранении Целевой группы по совершенствованию программ в рамках РГ2 для направления работы и обеспечения обратной связи ПТВЦ в отношении этих изменений и **просила** председателя Целевой группы представить доклад о рекомендациях и их реализации на 25-й сессии МКГ/СПЦТО.

МКГ также пришла к договоренности о том, что любые новые программы и процедуры после их разработки должны осуществляться исключительно в экспериментальной форме до тех пор, пока они не будут утверждены МКГ для официального использования.

МКГ пришла к договоренности о том, что учение в Тихом океане Волна 11 состоится 9-10 ноября 2011 г. и будет включать в себя несколько сценариев цунами, которые каждое государство-член может выбрать самостоятельно для тренировки. Сигнал о начале каждого сценария даст ПТВЦ, КЦСЗТО и/или ВК/АТВЦ посредством соответствующего сообщения.

МКГ пришла к договоренности поручить Руководящему комитету СПЦТО окончательно доработать Стратегию финансирования СПЦТО и дополнить информацию в отношении существующего финансирования трех основных направлений Плана осуществления СПЦТО.

МКГ рекомендовала государствам-членам включить представителей национальных организаций по ликвидации последствий бедствий (НОЛПБ) в свои делегации, участвующие в работе МКГ и межсессионных рабочих групп.

МКГ поблагодарила Российскую Федерацию и пришла к договоренности провести 25-ю сессию МКГ/СПЦТО во Владивостоке, Российская Федерация, в августе-сентябре 2013 г.

МКГ отметила интерес, выраженный США, выступить в качестве принимающей стороны ее 26-й сессии в 2015 г.

МКГ избрала д-ра Кена Гледхилла (Новая Зеландия) в качестве Председателя и капитана Патрисио Карраско (Чили), д-ра Фуджианга Юйя (Китай) и г-на Такеши Коизуми (Япония) в качестве заместителей председателя МКГ/СПЦТО на период с мая 2011 г. по май 2013 г.

1. WELCOME AND OPENING OF SESSION

- 1 The Twenty-fourth Session of the IOC Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIV) was held at the Beijing Friendship Hotel, in Beijing, People's Republic of China, from 24 to 27 May 2011.
- 2 The Session was opened on Tuesday 24 May 2011, under the Chairship of Lt. Giorgio De la Torre (Ecuador), Chair of the ICG/PTWS.
- 3 Mr Abhimanyu Singh, Director and Representative, UNESCO Office Beijing, on behalf of UNESCO's Director General, Mme Irina Bokova, and IOC's Executive Secretary, Mme Wendy Watson-Wright, thanked kindly the Government of China for receiving the coordination group in Beijing. He also thanked the National Marine Environmental Forecasting Center (NMEFC) for kindly hosting the opening ceremony and facilitating the organization of the meeting. He recalled that the People's Republic of China hosted in Beijing the Eleventh meeting of the former International Tsunami Coordination Group (ITSU) now Intergovernmental Coordination Group ICG/PTWS back in 1987.
- 4 Mr Singh indicated that although much progress has been made in implementing tsunami warning systems globally after the Indian Ocean tsunami in 2004, the events of Samoa/Tonga in 2009, Chile in 2010 and Japan in 2011 clearly demonstrate that there is still much to do and that there is no room for complacency. These events indeed act as a reminder for countries with communities living close to potentially tsunamigenic zones to step up their efforts to develop awareness, preparedness and mitigation measures. Communities must learn to recognize the natural warning signs and act immediately to save their lives. Mr Singh also required a focused research to continue updating our knowledge about subduction zones capable of generating great earthquakes and tsunamis.
- 5 Lt. Giorgio De la Torre, Chair of the ICG/PTWS then addressed the meeting and invited Delegates to contribute actively to evaluate PTWS's performance with respect to the main pillars of the PTWS Medium Term Strategy (2009–2014) as well as to its Implementation Plan, to enable decisions to improve the effectiveness of the tsunami warning and mitigation efforts in the Pacific basin.
- 6 Lt. De la Torre further indicated that the results and benefits of the current governance and working structure of the ICG/PTWS is another important topic to be reported and discussed by Member States, considering the need of continuously improving the decision making process of the ICG. This assessment is particularly important, because of the occurrence of three tsunamis in the Pacific Ocean, since the last meeting in Samoa, when the ICG precisely adopted such governance and working structure.
- 7 To close the opening ceremony Mr Zhanhai Zhang, Director, Department of International Cooperation, State Oceanic Administration of China, SOA (State Oceanic Administration), welcomed the Delegates of all Member States on behalf of the Government of China and declared the ICG/PTWS-XXIV officially open.
- 8 All opening speeches are under Annex III.

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF THE AGENDA

- 9 The Chair informed the Plenary that the provisional agenda was prepared by the Secretariat and the Officers in consultation with the PTWS Steering Committee taking into

account the Recommendations and instructions given at ICG/PTWS-XXIII, as well as the relevant parts of the IOC Rules of Procedures. He referred to document ICG/PTWS-XXIV/1 Prov Rev. 1.

10 He informed Delegates that following a formal request of the Government of China a new agenda item 4.3 was added to the provisional agenda to discuss about a Sub-regional Tsunami Early Warning and Mitigation System of the South China Sea.

11 The agenda was approved with the above amendment and is available under Annex I.

2.2 DESIGNATION OF THE RAPPORTEUR

12 The Chair requested Delegates to propose candidates for Rapporteur of the meeting. The Chair also informed Delegates that, as per established practices for subsidiary bodies, there is not a line by line approval of the report at the meeting but only of the Decisions and Recommendations.

13 The United States of America proposed Ms Paula Dunbar as Rapporteur.

14 The **ICG approved** the proposal and thanked the United States for providing the Rapporteur.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

15 The Chair noted that the original intention was to have interpretation available in French, English and Spanish for this meeting but due to the limited number of delegations making use of this service as compared with the cost, and after checking with concerned delegations it was decided to run the meeting only in English, on an exceptional basis.

16 He informed Delegates that a Workshop entitled “Looking Back, Looking Forward: Scientific, Technical, Operational, and Preparedness Aspects of the Samoa 2009, Chile 2010, and Japan 2011 Tsunamis” has been scheduled during the session. This workshop was proposed by the Secretariat and the PTWS Steering Committee with the aim of allowing all Delegates to analyse in detail and from several angles the recent tsunami events in the Pacific basin, to inform the deliberations of the ICG.

17 The local host provided logistic details about the venue and the Secretariat reported about the logistics for working groups and plenary.

18 The Chair then informed the plenary that in order to facilitate the proceedings of the meeting a timetable was prepared by the Secretariat in coordination with the Officers, the local organising committee and the PTWS Steering Committee. He referred to document ICG/PTWS-XXIV/1 Prov Add Rev 1 Provisional Timetable.

19 Delegates from Australia and China commented on the timetable to make sure that the results of the Fourth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS WG-IV) inform the session and that the South China Sea sub-regional is allocated enough time for discussion.

20 The timetable was approved without changes.

21 Delegates then constituted statutory commissions as follows:

- Elections Commission: France (Chair) and USA.

- Programme and Budget Commission: Samoa (Chair), Chile, and China.
- Recommendations Commission: Australia (Chair), China, and France.

22 In order to smooth the work of the session and facilitate the generation of recommendations and agreements the ICG agreed that the established Working Groups meet during the session to address some of the major issues addressed at the meeting. It was also agreed that the Task Team on Enhancing PTWS Tsunami Warning Systems and the Task Team on Pacific Wave Exercises meet during the session. All of them met under the Chairship of their respective chairs.

3. REPORTS ON ICG/PTWS INTERSESSIONAL ACTIVITIES

3.1 CHAIR'S INTRODUCTION: ROLE, STRUCTURE AND WORKING MODES OF ICG/PTWS, REPORT OF THE PTWS STEERING COMMITTEE

23 The Chair presented his report for the inter-sessional period 2009–2011 by recalling the essential role of the PTWS Medium Term Strategy 2009–2014 and its three Pillars structure, which is mirrored by the three technical Working Groups of the ICG/PTWS. He made special mention to the guiding role of the PTWS Steering Committee (PTWS-SC) that met twice in the inter-sessional period.

24 Chair De la Torre reported on the activities of the PTWS-SC and referred to document Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS): Steering Committee Second Meeting. He indicated that the PTWS-SC recommended to include the International Tsunami Information Center (ITIC) and the North West Pacific Tsunami Advisory Center (NWPTAC) as permanent members of the PTWS-SC.

25 Under this agenda item the Chair informed Delegates that two meetings of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) have been held in the inter-sessional period. He indicated that the Fourth Session was held on 21 and 22 March 2011.

26 Mr Rick Bailey (Australia) summarised the main results of TOWS-WG-IV: TOWS-WG-IV reviewed and endorsed progress reports from each of the established Inter-ICG Task Teams, namely the TT1 (Sea Level) which work was estimated to be completed, TT2 (Disaster Management and Preparedness) that is expected to continue and TT3 (Tsunami Watch Operations) whose work was also estimated to be completed but with a clear need for an ongoing coordination role. Mr Bailey indicated that a relevant outcome of TT3 is a set of Recommendations for Global Harmonization of Products to be issued by Regional Tsunami Services Providers (RTSPs). TT3 recommended that while National Tsunami Warning Centres and National Tsunami Warning Focal Points (NTWCs/NTWFPs) are solely responsible for providing warnings to their citizens based on their analysis of the situation, RTSPs distribute tsunami information products to NTWCs and other RTSPs within a region. According to TT3 ideally there should be more than one RTSP for each region to secure backup services and RTSPs should be interoperable not only within the same basin but with other ocean basin RTSPs.

27 The main change in terminology proposed by TT3 is to decide at each ICG in consultation with its Member States the level criteria for determination of Threat Status to be used by the RTSPs in the Tsunami Exchange bulletins and the coastal zones/points. Four threat levels are suggested: 0, 1, 2 and 3, where 0 is not threat and 3 is inundation. Under this scheme, the criteria for determination of Threat Level at the national level and any action to be taken in response will be decided by the NTWCs of the respective Member State in consultation with its National/Local authority.

28 Samoa asked where the line is drawn between the WGs of the ICGs and the Inter-ICG Task Teams. Ms Filomena Nelson raised for example some concerns about holding a tsunami awareness day. Mr Bailey replied that the TOWS group was put in place to coordinate and harmonise between the ICGs to avoid duplication of effort. TOWS is not a parallel ICG, so it will do nothing itself. The recommendations of the Inter-ICG Task Teams will go to the IOC Assembly and then passed on to the ICGs. So each ICG needs to look at this and try and implement the recommendations.

29 PTWC Director Chip McCreery commented that the Seattle meeting was interesting and useful, emphasizing that this work needs to go on. New Zealand commented that the TOWS is all about standardisation and there is a lot to be done.

30 The **ICG agreed** to include the International Tsunami Information Center (ITIC) and the North West Pacific Tsunami Advisory Center (NWPTAC) as permanent members of the PTWS-SC.

31 The **ICG noted** the report of the Chair and further noted the results of the TOWS-WG-IV meeting.

32 The **ICG approved** Recommendation ICG/PTWS-XXIV.1.

3.2 REPORT BY SECRETARIAT

33 Under this agenda item the Technical Secretary of the ICG/PTWS Mr Bernardo Aliaga presented his report, by referring to the main activities engaged through the inter-sessional period.

34 He indicated that the Secretariat provided support to the following meetings: PTWS Steering Committee (August 2010), Working Group 2 on Detection, Warning and Dissemination (February 2011), Task Team on Seismic Data Sharing for the South West Pacific (November 2009 and February 2011), South East Pacific Working Group (May and August 2009, October 2010), Central America Working Group (October 2009).

35 Mr Aliaga also reported that as announced at the ICG/PTWS-XXIII meeting, a new post was established for a Disaster Risk Reduction Officer under the Apia UNESCO Office, based in Fiji. At this point the incumbent Mr Rajendra Prasad reported on the activities developed and planned for the South West Pacific Area, many of them in cooperation with the Applied Geosciences and Technology Division of the Secretariat of the Pacific Community (SOPAC).

36 The Technical Secretary also reported that the Secretariat did a complete check of contact details and status of nominations for all Tsunami Warning Focal Points and Tsunami National Contacts (TWFPs/TNCs). As well a website was developed to provide secured access to this information to all Member States.

37 Also in the inter-sessional period with funding from the European Union (DIPECHO) and in close coordination with UNESCO Santiago Office the Secretariat was able to support the South East Pacific Working Group, also in cooperation with the Permanent Commission for the South East Pacific (CPPS). Furthermore, in coordination with the regional organisation for Disaster Management CEPREDENAC and UNESCO Costa Rica, DIPECHO funding was obtained to support the Working Group for Central America, including through Standard Operating Procedures training scheduled for Nicaragua on 13 and 15 June 2011.

38 Under this item Mr Wenxi Zhu, Head of the Office of the IOC Sub commission for the West Pacific (WESTPAC), reported on its activities. He indicated that his office is

considering mobilising funds to establish a Disaster Risk Reduction officer in the premises of WESTPAC to contribute to the work of ICG/PTWS in particular for the Asia Pacific region.

39 Mr Tony Elliott, Head of the Secretariat for the Indian Ocean Tsunami Warning and Mitigation System (IOTWS), reported on its activities related to the area of responsibility of the ICG/PTWS. He made reference to the IOTWS sub-regional training workshop on SOPs for South China Sea Tsunami Warning Centres that was held at the offices of the Malaysian Meteorological Department in Petaling Jaya and was attended by 27 participants from eight South China Sea countries: Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. The participants comprised of representatives from National Tsunami Warning Centres and the training content focused on regional earthquake detection and analysis, creation of timelines, harmonisation of individual country SOPs, communications between warning centres, and the conduct of a tabletop exercise to test SOPs. The key outcomes of the workshop were the provision of templates and guidelines to be used to create SOPs at the national level and a draft set of SOPs created by the breakout groups at the workshop. Further important outcomes were the fostering of closer coordination between the NTWCs of the region and the initiation of a strategy for maintaining and sustaining regional linkages through the South China Sea Working Group of the ICG/PTWS. During the inter-sessional period, the IOC under the same project funded by the UNESCAP, conducted country SOP training workshops in the Philippines and Vietnam.

40 The **ICG noted** the reports of the Secretariat.

3.3 WARNING & ADVISORY SERVICES REPORT

3.3.1 PTWC

41 Dr Chip McCreery, Director of PTWC, presented a report on the activities of the PTWC in the inter-sessional period. He informed Delegates that PTWC receives data from over 400 seismic stations globally. He presented a plot showing elapsed time to P wave arrival in the Pacific Ocean based on five seismic stations. For most zones the arrival time is two to three minutes. However there are some areas, particularly in the SE Pacific, where arrival time is closer to ten minutes. He informed the ICG that the number of sea level stations around the Pacific and available to PTWC in real time has steadily increased since 2004.

42 Dr McCreery noted that the PTWC had responded to more than 2,000 global earthquakes since February 2009. One thousand and three hundreds fourteen (1314) observatory messages and seventy seven (77) information bulletins for earthquakes of magnitude greater than 6.5 Mw and 8 (eight) PTWS Tsunami Warnings were issued.

43 The main modes for disseminating messages are by GTS, AFTN, EMWIN, fax, e-mail and RANET (via SMS). There have been issues with communications tests in the past. Less than 10% responses are received to random communications tests. To address this problem, the PTWC proposes to issues test messages on the same day and time every month. The TWFPs will only need to respond if they do not receive test messages. He noted that the IOC is posting official TWFP contact information on the Tsunami website. This will be the official location for this information.

44 Dr McCreery informed the ICG that the cost of PTWC's commercial faxing service is relatively high. He proposed some solutions to this problem, such as: reducing the designated fax numbers to one or two for each TWFP, and issuing faxes only for the first bulletin. He recommended a task team to look into this.

- 45 Japan agreed to reduce the number of faxes if possible and to have regular communications tests. However a potential problem could arise if NTWCs do not receive the tests messages but do not inform the PTWC of this. Dr McCreery noted that the Caribbean had decided on a mixture of routine and random tests.
- 46 Samoa asked if the test messages only went to the TWFP. Dr McCreery confirmed this.
- 47 Mr Rajendra Prasad, UNESCO/IOC Officer for Disaster Risk Reduction based in Fiji, Suva, commented that fax should not be the primary method for receiving messages. He suggested that GTS should be the primary medium for receiving bulletins at least for meteorological services acting as TWFP. He also noted that UN/OCHA forwarded bulletins to some National Disaster Management Offices (NDMOs).
- 48 Samoa supported deciding on selecting a certain day of the month for the tests but advised that all communications methods should be maintained, as fax communication is important in some countries.
- 49 Australia commented on the use of the word “warning” in the PTWC message. The Chair indicated that this topic would be taken up in agenda item 4.1.
- 50 The Technical Secretary noted that gaps in the seismic network coverage for the Pacific should be addressed by WG2. Dr McCreery agreed that this would fall under the Terms of Reference of Working Group 2 on Tsunami Detection, Warning and Dissemination (WG2).
- 51 The Chair summarised that there appeared to be agreement to hold monthly tests, but no consensus on stopping the use of fax communications. These matters were addressed by the intra-sessional Working Groups and reported under agenda item 3.6.

3.3.2 NWPTAC

- 52 Mr Tomoaki Ozaki, Senior Coordinator for Tsunami Forecast Modelling from the Earthquake and Tsunami Observations Division of the Seismological and Volcanological Department of the Japan Meteorological Agency (JMA), reported on NWPTAC’s activities in the inter-sessional period.
- 53 He recalled the history of the service since it was inaugurated as a PTWS service in February 2006. The NWPTAC service is provided to 11 countries. During the period from February 2009 to April 2010, the NWPTAC issued advisories for 53 major earthquakes in the Northwest Pacific region. Almost all advisories were issued within 30 minutes of the occurrence of the earthquake events. In total the NWPTAC has issued advisories for 105 events since 2005. On 11 March 2011 the NWPTAC issued 9 bulletins for the Tohoku event and a further one bulletin for a large aftershock. Mr Ozaki noted that the magnitude for the Tohoku event was upgraded from 7.9 Mjma to 8.8 Mw and finally to 9 Mw on 13 March, after analysing long wave components from overseas seismometers.
- 54 The **ICG noted** the report of NWPTAC.
- 55 Under this agenda item the Chair requested the Organising Committee of the Workshop entitled “Looking Back, Looking Forward: Scientific, Technical, Operational, and Preparedness Aspects of the Samoa 2009, Chile 2010, and Japan 2011 Tsunamis” to present the main results of the deliberations and the recommendations of the panel. Dr Tatiana Ivelskaya reported on behalf of the Organising Committee. The report of the Workshop is available as Annex IV.

56 The Technical Secretary summarised the PTWS post event assessment following the tsunami of February 2010 in Chile (IOC Technical Series No 92 [IOC/2010/TS/92]) and preliminary results of the post event assessments for the tsunami of March 2011 in Japan (IOC Technical Series No 96). According to the assessments e-mail remains as the main receiving mechanism for tsunami bulletins from PTWC across the Pacific Ocean while several other methods are used as well, like fax and GTS. For both events the post-event assessment indicates that most of countries took action after receiving a bulletin, but response capabilities are limited due to the absence of hazard assessment maps: only six Member States indicated inundation maps were available for evacuated zones on March 11, 2011. In contrast the area of monitoring shows clear progress across the Pacific Ocean for example with 16 countries being capable of monitoring in near-real time sea-level changes during the 11 March 2011 event.

3.4 NATIONAL PROGRESS REPORTS

57 France highlighted the tsunami observations in French Polynesia for the last few events. The Delegate reported that for the Japan event, there was some damage in French Polynesia and the maximum value for tsunami heights was not on the side facing the source, but on the opposite one.

58 Australia provided an overview of the progress it had made in the inter-sessional period. Australia had conducted tsunami hazard assessments for their vulnerable coastlines. The Head of Delegation, Mr Rick Bailey noted that Australia has installed a total of 46 coastal gauges and six or seven tsunameters. Australia uses the MOST T2 model, with 522 source locations and 1866 scenarios. Australia's approach to threat assessment for warnings was described and the Joint Australian Tsunami Warning Centre (JATWC) performance in the last 12 months was noted. The JATWC had responded to 66 events for which national bulletins were issued, all "no threat" to Australia. Average time from earthquake to bulletin was 23 minutes. Mr Bailey described JATWC's response to the Tohoku event of March 2011 and then described Australia's progress in Awareness and Preparedness. He gave a summary of the capacity building efforts, in particular through projects for South West Pacific islands, funded by the Australian Agency for International Development (AusAID). Plans for the future include enhanced seismic analysis, continued expansion of the model scenario database and continued research into the use of sea level to objectively modify scenario forecasts.

59 Following Australia's presentation, France enquired about the threshold for marine threat. Mr Bailey clarified that the threat level is defined for deep water. Canada enquired about the models used for the probabilistic hazard map. Mr Bailey replied that it was based on the MOST model scenarios. Vietnam enquired about the time required to run different model scenarios and its real value for issue warnings. Mr Bailey clarified that the model is not run in real time and that the scenarios are pre-computed.

60 Mr Gary Rogers, Head of Canada's Delegation, reported that there are now 15 water level stations capable of recording tsunamis on Canada's Pacific coast. Four are specifically for tsunami warning (TWS) and there are 11 other Permanent Water Level Network (PWLN) stations. These stations are operated jointly by the Canadian Hydrographic Service (CHS) of Fisheries and Oceans Canada and Water Survey of Canada of Environment Canada. The Geological Survey of Canada (GSC) of Natural Resources Canada contributes real-time seismic data from 25 broadband seismographs stations to the PTWS and from 22 stations to the WCATWS. Since 2006 the GSC has been operating a prototype GPS network for evaluation as a tool for rapid near-field recognition of tsunamigenic motion. NEPTUNE Canada has attached tsunami recording bottom pressure recorders and broadband seismographs to its 850 km fibre optic cable loop off the west coast of Canada. The Provincial Emergency Program of Emergency Management BC of the province of British

Columbia (PEP) continues to be the agency for distributing tsunami warnings on Canada's Pacific coast and takes the lead in tsunami public education. PEP regularly conducts tsunami communications tests with coastal communities. In March 2011 PEP participated in PACIFEX 11, a cross-border tsunami training exercise involving, B.C., Alaska, Oregon, Washington, California and the WCATWC.

61 Captain Miguel Vasquez presented Chile's country report. He reported on the legal framework for the National Tsunami Warning System (NTWS/SNAM). SNAM is the NTWC for Chile and is part of the Hydrographic and Oceanographic Service of the Navy (SHOA). He described the SOPs for a local tsunami. He informed the ICG that Chile is densifying its sea-level network. He provided an overview of Chile's summary plan for future tsunami warning and a comprehensive list of national programmes and activities to achieve the plan.

62 China reported on its response to the Chilean and Japan tsunami of 2010 and 2011. For the Chile event, it monitored sea-level and ran model scenarios. China provided the timeline for the Tohoku tsunami response and showed model animations and sea level measurements. The Delegate of China reported that two tsunameter buoys have been deployed in the South China Sea.

63 France provided a presentation and highlighted that it is using Seiscomp3 and SEEDlink for seismic data analysis. Eight tide gauges have been installed in French Polynesia. It has also introduced a three level warning system. It has also introduced estimation of tsunami heights into its warnings.

64 Indonesia's Delegate reported that the Indonesia Tsunami Early Warning System (InaTEWS) was launched on November 2008 and the Indonesia Decision Support System (Ina DSS) was launched on March 2011, with the hope that the victim result earthquake and tsunami disaster will be reduced significantly. However, the loss of life and property due to earthquake and tsunami disaster is unavoidable. Out of the lessons learnt from the Mentawai local tsunami (October 2010) and Japan distant tsunami (March 2011), the Indonesian tsunami early warning systems need strengthening at both the component of detection, warning, dissemination, capacity building, risk assessment and at the component of awareness and response. The Delegate of Indonesia stated that in an effort to strengthen the operational Indonesia tsunami early warning system, Indonesia has made some programs as follows :

- Developing Seismic network,
- The construction of tide gauges for tsunami,
- Upgrading Bali Regional Center as a back-up InaTEWS Center in Jakarta,
- The extension of down-stream communication system,
- The integration of an accelerometer network,
- Intensifying training of trainers, and tsunami drill.

65 Developing for seismic monitoring network and setting up tide gauges are focused to densify the InaTEWS monitoring network such as in eastern Indonesia. This development is expected to increase the speed and accuracy of earthquake information and tsunami early warning in Indonesia. Increased capacity building, training of trainers and tsunami drill is expected to increase community awareness and response when faced with disaster.

66 Japan reported that during the inter-sessional period they responded to more than eight events. The Delegate of Japan indicated that in cooperation with JICA, technical support has been provided to BMKG (Indonesia) and Chile. As well the International Institute

of Seismology and Earthquake Engineering are conducting a one year tsunami training course starting in September 2011.

- 67 The Republic of Korea reminded the ICG that it has been a member of the International Co-ordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) since 1968. Since hosting the Seventeenth Session of ICG/ITSU at the Korea Meteorological Administration (KMA) in 1999, Korea has been increasingly aware of the importance of preparedness against tsunami hazards. KMA continued its participation in the meeting after ICG/ITSU changed its name as ICG/PTWS in 2005. KMA has performed the project for strengthening the Korea National Seismographic Network (KNSN) and the tsunami warning system. This system was completely constructed in 2002 and has been continuously reinforcing. This network is currently composed of 19 broad-band seismometers, 32 short-period seismometers, 112 accelerometers and earthquake analysis system also. Many inland type seismometers and accelerometers were also installed in 2007. The one-stop earthquake & tsunami analyzing and broadcasting (warning) system that disseminates warning messages to the relevant organizations has been improved continuously. Especially, KMA made a plan, which is considered as a long-term plan for the Earthquake policy and early warning systems last 2009. The plan includes that earthquake information will be announced within ten to fifty seconds after they occur, on the years 2015–2020. As a result if this early warning systems, if earthquake and tsunami occurs it would save many people.
- 68 The Republic of Korea is currently exchanging seismic data with Japan. KMA is keen to share seismic data with other countries. In addition, KMA is exchanging seismic data from 77 stations with other related institutions of Korea. KMA has been executing simulated tsunami preparedness drills to evaluate the tsunami warning and notification system each year and developed tsunami numerical simulation program for around the coast of the Korean peninsula. In order to inform for the general public, KMA published 'Understanding of the tsunami' and one catalogue on earthquakes and related fields at 2010. In addition KMA have executed many education programs about the earthquake and tsunami and how to behave against these disasters.
- 69 Malaysia provided detailed information on Malaysia's seismic stations and tide gauges networks. The Delegate indicated that a tsunameter has been deployed in Pulau Sipadan in the Sulawesi Sea. Malaysia is developing its modelled scenario database with a view to becoming a Regional Tsunami Service Provider (RTSP) for the Indian Ocean. It has model scenarios for the Manila trench. He reported that Malaysia's Government conducts public awareness campaigns and tsunami drills.
- 70 New Zealand showed results of an assessment tool developed for tsunami hazards and described the interpretation of threat levels and its use for evacuation zone guidelines. The Delegate of New Zealand described enhancements to national tsunami warning plans, tsunami signage, public alerting options and guidelines including mass evacuation guidelines. Australia inquired if the ISO standard for tsunami signs has been adopted. Delegate of New Zealand answered that it has investigated best practice and concluded to follow the blue and white standard similar to what is used in the USA. It also found that the ISO standard does not cater for the spectrum of signage required.
- 71 Peru reported that their main achievements from 2010 to date can be considered as follows:
- Improve the number of real time coastal station to 16 before December 2011,
 - Managing the allocations of a budget for the purchase, installation and maintenance of a DART buoy in front of the coast of Lima,

- Installation of the EMWIN and GTS systems,
- Improve the programs education of coastal people by agreements with the regional governments.

The Delegate of Peru reported that the main weakness of the national alert system is the lack of a model for distant tsunamis that allows the National Tsunami Warning Centre (NTWC) a review of this threat for decision making. To address this problem the NTWC for Peru has signed an agreement with the Peruvian engineering college that has a professional engineer in Japan learning about modelling far-field events.

72 The Russian Federation reported that the Russian Tsunami Warning System was modernized during the last five years under the Federal Target Programme including with a network of digital automated broadband seismometers as well as a network of automatic tide gauges. He summarized the main results as follows:

- Create a modern seismic network equipped with high-technology digital broadband apparatus,
- Reduce from 10 to 7 minutes the time of strong earthquakes parameters calculations and therefore improve the efficiency of the centre to react to the tsunami threat in case of strong earthquakes in the near zone of the Kuril-Kamchatka trench,
- Automate the process of obtaining the Estimated Time of Arrival (ETA) and the heights of tsunamis reducing the calculation time from five to one minute,
- Restore sea level instrumentation observations and install automated sea level observation points,
- Install deep-sea buoy station DART capable of registering tsunami wave at a distance of 500 km off the coastline,
- Create communication channels for urgent transmission of the information about the possibility of an emergency situation due to tsunami to the authorities of the Far Eastern Federal District.

73 The ultimate result of the works under the Programme is a general increase of the rapidity and stability of the Russian Tsunami Warning System and as the consequence the increase in population security in the Russian Far East.

74 The Russian Federation reported that some issues concerning the notification of the population are remaining to be solved. The Ministry for Emergency and local administrations are working on them. In the nearest future the Federal Programme is expected to be prolonged for the next five years thus they hope to fully complete the modernization and improve the indices of the Tsunami Warning System. The Delegate included a brief report on the impact of the Tohoku tsunami on the Pacific coast of Russia. Maximum tsunami height was on south Kurils with a run-up of 2.5 m.

75 Samoa indicated it continued to improve its tsunami warning system including by developing its seismic monitoring capability, which will also enhance the PTWS in the SWP region. ITIC supported Samoa through installing CISON and TideTool. Tide gauges will be installed with support from Japan. Tsunami evacuation maps will be developed with support from New Zealand and public awareness and education is also being addressed by the government to create a culture of resilience. Samoa is also exploring appropriate siren systems that can be used in villages. The Delegate indicated that Samoa is conducting a major review of its disaster management strategies and reported that they have held coordination meetings with American Samoa.

76 Malaysia enquired about the range and maintenance for the siren system in Samoa. The Delegate of Samoa informed that the range of sirens is five miles and they are in the port area at the moment where maintenance is provided.

77 USA provided a statement highlighting some components of its national report. USA continues to support warning services in the Pacific and Indian Ocean. The DART buoy design has been improved to make it more reliable. The tsunami event in Samoa 2009 also hit American Samoa, with 34 casualties. Since the last ICG, the warning centres have increased the bandwidth to receive seismic data continuously. The USA is making an effort to converge its IT infrastructure and is developing a portal to view information from both warning centres PTWC and the West Coast and Alaska Tsunami Warning Center (WCATWC). Eighty four communities are designated as TsunamiReady and 75 fine scale inundation models are expected to be completed over the next few years, 58 of which are already available.

78 Vietnam provided an overview of Vietnam's stakeholders in tsunami warning, and described its SOPs for local tsunami. The Delegate of Vietnam indicated they use Seiscomp3 and provided a summary of plans for the development of Vietnam's tsunami warning system, which include the establishment of a multi-hazard warning system, with a network of 110 warning towers.

3.5 ITIC'S REPORT

79 Dr Laura Kong, Director of ITIC, provided a report on Post-Tsunami Surveys since 2004. She indicated that data has been collected for 80 measured tsunamis during this period. She recalled that tsunami surveys focused on run-up and inundation measurements, impacts on natural environment, geology and social and human impacts.

80 The collection of impact data after all tsunami events is essential for improving global and national hazard and risk assessments, and improving tsunami numerical modelling to for better inundation maps and wave forecasting. All data should be provided to the World Data Center – Geology and Marine Geophysics, for inclusion in the authoritative global historical tsunami database. Challenges continue in the timely submission of these data. Additionally, starting with the 2004 Indian Ocean Tsunami, much more data from other disciplines have been collected and there is a need to further discuss and decide the best manner in which to archive these data.

81 A field guide published in 1998 by IOC (IOC Manuals and Guides No 37[SC-98/WS-24]) is now out of date. In 2011 a core IOC Working Group has been formed to update the guide, based on best practices and lessons learned since 2004.

82 She indicated that traditionally tsunami surveys have been single discipline, organised individually without a coherent and integrated effort. With the survey after the Samoa event in 2009 there was a different approach, integrated and coordinated by UNESCO/IOC under the title of International Tsunami Survey Team Samoa (ITST Samoa). This was very effective and was the catalyst for revising the field guide.

83 Dr Kong commented on the complexity of post-tsunami surveys and the problems of coordination. In Samoa, more than 60 scientists were involved. In Chile more than 70 scientists were involved. For Mentawai in Indonesia, five survey teams were involved.

84 The goal of an ITST is to understand the character of the tsunami and its impact in both the near-source and distant regions and provide information on the impacts to the Government of the affected country (ies) to enable it to enhance their tsunami disaster risk

management practice. Tsunami scientists need to document impacts before the evidence is destroyed.

85 Dr Kong then provided her director's report on ITIC's inter-sessional activities. She reminded the delegates of the organisational structure of ITIC. She recalled that ITIC is part of the ICG/PTWS according to its mission and function as per IOC Resolution X-23 (1977).

86 Dr Kong then provided a summary of the activities of trainings and meetings including a series of one-day tsunami awareness training courses. This is now offered through the IODE OceanTeacher programme. She informed the delegates that a number of tsunami warning decision support tools are available to responsible government agencies. She listed the printed materials that are available from ITIC, and provided details of future planned documents.

87 Dr Kong concluded by noting the governance and budget arrangements, including the UNESCO/IOC–NOAA Joint Partnership agreement which has been in place since 2009. She noted that ITIC's activities are largely supported by extra-budgetary sources, which are limited. In order to carry out the many requested activities, ITIC must seek extra-budgetary funds from donors and countries, and through partnered activities. She asked Member States for input on the ITIC Work Plan for 2011–2012 and for funding to conduct the requested activities.

88 Australia requested details of the Terms of Reference for the annual joint agreement with IOC. Dr Kong responded that the annual budget from IOC amounted to USD \$30,000 (thirty thousand US dollars) per year. A large part of this was taken up by the International Tsunami Training program (ITP).

89 Mr Prasad from UNESCO Apia noted that there is limited seed money to fund training activities and/or preliminary surveys that could be done quickly after a disaster. Dr Kong replied that after 2004, UNESCO/IOC had funds to fund surveys in remote areas but since then, funds have been limited.

90 The Technical Secretary, Mr Aliaga, commented that the UNESCO–NOAA partnership put a mechanism in place to transfer existing limited funds to ITIC. Mr Aliaga informed that the UNESCO Executive Board declined to support a Zero Real Growth budget of the regular programme, and IOC will be affected by the implicit reduction of the budget, including for the tsunami programme. He invited the Member States to make extra-budgetary donations to fund the activities of the ICG.

91 France enquired how the awareness materials of the different Tsunami Information Centres (TICs) could be combined and centralised to ease access to organisations and Member States. Dr Kong responded that the regional TICs are using mostly the same awareness materials. Russia inquired if there is any Russian training material available. Dr Kong replied that translation can be carried out if the country assists or provides funds to do this.

92 The Chair reminded the session that the PTWS–SC recommended that ITIC develops a team of regional trainers. He suggested amending the Terms of Reference of the Regional Working Groups to reflect this. Dr Kong noted that this issue had been raised at TOWS level as well.

93 The Chair suggested adding into the Terms of Reference of the Regional Working Groups the coordination of capacity building activities including Training of Trainers (ToT) courses, in association with ITIC.

94 The Chair asked if the results of the post-tsunami surveys were available on a database, and if Working Group 1 had been involved in the surveys. Dr Kong responded that there is one authoritative database which is the World Data Centre/National Geophysical Data Center (WDC/NGDC), but populating the database immediately is always a challenge as the scientists will want to publish their findings first. Ms Paula Dunbar (WDC/NGDC) noted that there are a lot of other data types now collected in surveys which are not yet included in the database. It is also not clear what surveys have been done and who has published it. NGDC and ITIC welcomed further progress and support from the ICG to more fully capture all important data types into the WDC system.

95 With respect to ITST Australia requested that the calls for participation go to the national contacts because going through the IOC mechanism will provide a more formal approach and will help control what happens to the data. Dr Kong commented that the approaches have been different, depending on whether the country impacted was a developed country like Japan or if it affected a small country like Samoa. Mr Aliaga encouraged Member States to help ITIC and IOC to reinforce and sustain the ITST approach which is gradually being recognized as a useful mechanism by scientists. France suggested that the ITST should be addressed at the sub-regional level as well. France also commented on the importance of collecting near and far-field impacts.

96 New Zealand commented that the post tsunami surveys have always focused on the scientific aspects and inquired if there is a place for awareness and response aspects in these surveys. Dr Kong commented that there are now a few people on tsunami post-event surveys who are conducting interviews to find out how people responded. There is generally a time lag between the scientific measurements and the societal aspects of the surveys, because collection of perishable science data needs to be done quickly before evidence is destroyed. She noted that communities need time to recover after an event before asking challenging questions on human response and understanding and reaction to government warnings.

97 The **ICG noted** the report of ITIC.

3.6 WORKING GROUP REPORTS

Working Group 1: Tsunami Risk Assessment and Reduction

98 Dr François Schindelé (France), Chair of WG1 reported that there were no meetings since the last ICG. He highlighted that the three recent events indicate that there is a need to conduct training in hazard and risk assessment, with focused priorities and addressed to the appropriate people in each Member State. He indicated that much research has been conducted but that using it for decision making is becoming a challenge. He remarked that the WG1 has only five nominated members. New Zealand commented that the low nomination of members is a generic problem for Working Groups and we should have a membership drive for all groups.

99 USA agreed that the focus should be put on some key activities and this may draw attention and members to the group.

100 The WG1 met intra-sessionally including representatives of China, France, USA, Vietnam and WDC/NGDC. It recognized that the activities and topics for WG1 are very broad and addressed to different communities and institutions. It decided to establish close relationship with the International Union of Geodesy and Geophysics–Tsunami Commission (IUGG-TC) to develop the scientific guidance and pilot studies to support ICG activities. It also decided to organise workshops/training in coordination with IUGG Tsunami Commission, and seek funding and contribution from Member States.

- 101 The **ICG decided** to continue Working Group 1 on Tsunami Risk Assessment and Reduction with Dr Francois Schindelé (France) as Chair and established a Task Team on Tsunami Modelling Hazard Assessment (Chair: Dr V. Titov–USA) and a Task Team on Tsunami Risk Assessment (Chair: Dr Nguyen Hong Phuong–Vietnam).

Working Group 2 Tsunami Detection, Warning and Dissemination

- 102 Mr Daniel Jaksa (Australia), Acting Interim Vice-Chair presented the report of WG2. He informed the ICG that the former Chair Ms Nora Gale has handed over the Chairship to Dr Charles McCreery (USA) on an interim basis. Working Group 2 has members from Australia (2), China, Ecuador, France, Guatemala, Japan, Malaysia (2), New Zealand (2), Papua New Guinea, Thailand, United States of America (4), and three invited experts.
- 103 Mr Jaksa reported that WG2 met in Wellington from 28 February to 4 March 2011. Its Task Team on Seismic Data Sharing met for the first time in Vanuatu on 19–20 October 2009 and Task Teams on Seismic Data Sharing, Emergency Communications, Enhancing Tsunami Warning Products and Exercises met in Wellington, New Zealand. He referred to this Working Group Two report titled “IOC/PTWS Working Group Two Meeting, 01–03 March 2011, MCDEM Wellington” and briefly summarized the recommendations and actions proposed by WG2 and its Task Teams.
- 104 WG2 recommended that the ICG approve the PTWC proposed enhanced tsunami products as described in the report to the ICG on the Task Team on Enhancing Tsunami Warning Products (see Annex V). This will include that the PTWC use the numerical tsunami forecast to enhance the PTWC products and that the PTWC applies a lower magnitude for local tsunami threat, subject to a study on historical records and numerical models of local tsunami. And to elaborate on the implementation process.
- 105 WG2 also suggested the Secretariat to seek funds for the follow-up training in the configuration and use of seismic monitoring and analysis systems for Member States in the South West Pacific.
- 106 Mr Prasad (UNESCO Apia) asked if the WG membership lists were closed or could new members still be nominated. Mr Aliaga clarified that members could be nominated at any time by their TNC, including at the ICG meeting itself following the same official nomination process.
- 107 The WG2 Chair (a.i.) Dr McCreery (USA) reported that UNESCO/IOC has now established a password-protected website containing the current TWFP and TNC contact information, intended to be the authoritative single source of this information to be used by PTWC, NWPTAC and WC/ATWC for maintaining their respective databases of TWFP contact information for product dissemination. Small changes to this information, such as those to an e-mail address or fax number can be made informally by the TNC or TWFP to the Secretariat. Significant changes, such as a change to the national organization that is the TWFP must be made through official channels such as the UNESCO National Commission, Foreign Affairs or the Permanent Delegation at UNESCO.
- 108 The Chair of WG2 also reported that WG2 will investigate the existing capabilities, both national and international, of the use of real time GNSS (GPS) for the detection and characterization of great subduction zone earthquakes for the purpose of more rapid and accurate tsunami warnings.
- 109 The WG2 met during the session and delivered additional recommendations that were discussed in plenary.

- 110 The **ICG decided** to continue Working Group 2 on Tsunami Detection, Warning and Dissemination with Dr Chip McCreery (USA) as Chair and Mr Daniel Jaksa (Australia) as Vice-Chair and continued WG2 Task Team on Warning Dissemination (formerly Emergency Communications), WG2 Task Team on PACWAVE 11 (formerly PTWS Exercises), WG2 Task Team on Enhancing Products (formerly Enhancing Tsunami Warning Products), WG2 Task Team on Seismic Data Sharing in the South West Pacific, and established a WG2 Task Team on Sea Level Monitoring with Mr Chris Ryan (Australia) as Chair.
- 111 The **ICG agreed** that Member States should regularly review the information on TWFPs and TNCs at the IOC password protected website for accuracy and advise the IOC Secretariat regarding any errors or changes.
- 112 The **ICG agreed** that the PTWC should disseminate a communication test message once a month on the same day and at the same time to the PTWS Member States TWFPs. Member States should ensure they receive these regular tests by all designated means and troubleshoot with PTWC or other appropriate organizations only if any message is not received by the designated method. In addition, PTWC will conduct twice yearly unannounced communication tests. Member States should respond to these tests within an hour, indicating the methods by which the message was received and the time at which it was received. Testing will begin in October of 2011. Member State TWFPs and TNCs will be informed in advance regarding details on the conduct of these tests by an IOC circular letter.
- 113 The **ICG requested** the Secretariat to inquire by October 2011 of PTWS Member State TWFPs regarding their need to receive PTWC message products by fax.
- 114 The **ICG agreed** that all PTWS Member States having offshore sea level data, such as that from undersea cabled observatories, from differential GPS buoys, or from deep-ocean bottom pressure sensors connected to buoys, should share those data for tsunami detection and warning purposes.
- 115 The **ICG requested** the IOC Secretariat to seek funds for follow-up training in the configuration and use of seismic monitoring and analysis systems for Member States in the SW Pacific.

Working Group 3: Tsunami Awareness and Response

- 116 Mr David Coetzee (New Zealand), Chair of WG3 reported that as in the case of WG1 it also had very low membership with a total of four members. However the WG did attend to the deliverables under its TOR. An initial assessment of existing good practice revealed a wealth of information. The WG conducted a formal survey and needs assessment for NTWCs and National Disaster Management Organisations (NDMOs). From seventeen (17) replies received, only six (6) included NDMOs. Mr Coetzee requested that post tsunami assessments include Awareness and Response.
- 117 The WG provided support to ITIC and PTWC for training and outreach and has secured that Exercise Pacific Wave 2011 (PACWAVE 11) will cover Awareness and Response.
- 118 Mr Coetzee reported that ITIC has undertaken extensive work to develop SOP guidelines and training material and informed the ICG of the outcomes of the TOWS Inter-ICG Task Team 2, including the development of generic guidelines for tsunami wave exercises, which are at an advanced stage and will be available to help countries prepare for PACWAVE 11.
- 119 Mr Coetzee noted the need to collaborate more with WG1.

120 China informed the plenary that it has nominated Mr Hing-yim Mok as a member of WG3. USA informed that it has nominated Ms Julie Leonard as a member of WG3.

121 The **ICG decided** to continue Working Group 3 on Tsunami Awareness and Response with Mr David Coetzee (New Zealand) as Chair.

122 The **ICG approved** Recommendation ICG/PTWS-XXIV.2.

Regional Working Group on Tsunami Warning and Mitigation
on the Central American Pacific Coast

123 Mr Aliaga, Technical Secretary ICG/PTWS reported that the First Meeting of the ICG/PTWS Regional Working Group for Central America was held in Managua, Nicaragua, from the 4th to the 6th November 2009, under the Chairship of Dr Alejandro Rodriguez, Executive Director of INETER, and the representatives from Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama and Belize. The PTWS Regional Working Group for Central America agreed to request CEPREDENAC to identify the institutions responsible of Monitoring and Warning Dissemination in each country, to establish a Technical Coordination Group of the Regional Tsunami Warning System and to set up a Regional Tsunami Warning Centre. The Group also agreed to request funding from IOC as well as the rehabilitation and the strengthening of the tide gauges network. The group also agreed to create a tsunami catalogue for Central America, along both the Pacific and the Caribbean coasts and assist in the identification and description of the Central American communities under high risk of tsunami attacks and to contribute to identify and map areas that are vulnerable to tsunami attacks generated from landslides and volcanic eruptions.

124 The **ICG decided** to continue the Regional Working Group on Tsunami Warning and Mitigation on the Central American Pacific Coast with Dr Alejandro Rodriguez (Nicaragua) as Chair.

Regional Working Group on Tsunami Warning and Mitigation
in the Southeast Pacific Region

125 The Delegate of Ecuador, Cdr. Jorge Cardenas, presented the report of the Group on behalf of the Chair Lt. Luis Pinto (Ecuador). He reported that there had been three meetings of the Group since May 2009 and listed the recommendations from the WG.

126 Based on the lesson learned from the past three tsunami events (Samoa 2009, Chile 2010 and Japan 2011), the Regional Working Group on Tsunami Warning and Mitigation in the Southeast Pacific Region emphasizes the need for addressing important underlying technical deficiency issues of many Member States of the ICG. In particular, there are uncertainties at the local-national level about measuring the amplitude of arriving tsunami waves which is needed to predict risks of incoming events accurately. Without precise or at least more accurate information about these conditions, forecasting capabilities are reduced and it is not possible to guarantee an effective response of local risk management authorities, because this is more difficult to predict where and when tsunamis may reach the shore line and how big they might be upon arrival.

127 Therefore, the Regional Working Group proposed to the ICG, prioritize the working agenda of Technical Working Group 1 (Risk Assessment and Reduction), and focus its attention on topics related with numerical modelling of tsunami risk scenarios, both at the basic and advanced level. In order to contribute in this effort, the Oceanographic and Hydrographic Service of the Chilean Navy (SHOA), offered to host in 2011 a seminar focused on such topic, for all Member States of the ICG/PTWS interested in attending.

128 The **ICG accepted** the offer of SHOA (Chile) of hosting in 2011 a seminar focused on numerical modelling of tsunami risk scenarios and requested the Secretariat and other regional organizations and donors (i.e. CPPS, SOPAC, CEPREDENAC, and USAID) to seek/contribute funding for this event.

129 The **ICG decided** to continue the Regional Working Group on Tsunami Warning and Mitigation in the Southeast Pacific Region with Lt. Luis Pinto (Ecuador) as Chair.

Regional Working Group on Tsunami Warning and Mitigation
in the South China Sea Region

130 Dr Mohd. Rosaidi bin Che Abas (Malaysia), Chair of the Working Group on Tsunami Warning and Mitigation in the South China Sea Region, provided a progress report. The Group has had no meeting since 2009 and the current membership list is limited to representatives of only Malaysia, China and Japan. He listed a number of other meetings that had taken place of relevance to the South China Sea region, including a sub regional workshop on tsunami warning SOPs hosted in Malaysia in October 2010.

131 The Working Group on Tsunami Warning and Mitigation in the South China Sea Region met during the session with participants from China, Indonesia, Japan, Republic of Korea, Malaysia, Vietnam, and USA. The meeting elected Dr Fujiang Yu (China) as Vice-Chair.

132 On behalf of the Government of China, Dr Yu gave an introduction to China's draft proposal: "An Outlook of Tsunami Warning and Mitigation System of the South China Sea". He described the tsunami risk in the South China Sea (SCS). He noted that there are 9 countries bordering the South China Sea with tsunamigenic source zones in the Manila trench. He recalled that on 26 December 2006, there was an earthquake in south of Taiwan, which generated a tsunami of approximate 10 cm on the Chinese coastline. The Chilean earthquake in 2010 produced a small tsunami in China, as did the Tohoku earthquake in 2011. He mentioned that many countries in the SCS region have the fundamental capability to monitor earthquake and tsunami. However, monitoring and warning are limited to their own countries and only a few countries have specialized organizations or bureaus to deal with the task. There is no such a country or organization that is able to work solely to deliver tsunami monitoring and warning service to all countries in the region. Therefore, it is highly urgent to set up a regional centre to fulfil the task.

133 Dr Yu described the proposed framework of China's proposal. The sub-regional South China Sea Tsunami Warning and Mitigation System (SCS-TWS) should be made up of five sub-systems: earthquake monitoring system, sea level monitoring system, information sharing platform, a Tsunami Warning Centre (TWC), and a hazard mitigation and emergency management system.

134 The operating procedure for the proposed SCS-TWS was described. The SCS-TWS will be installed as a sub-regional system under the framework of ICG/PTWS. The system is based on resources and voluntary information from countries, and it will be supported, maintained, managed and operated by all countries of the region.

135 China recalled IOC Resolution EC-XLI.6 which encouraged the Member States of the South China Sea to build a sub-regional system and encouraged all South China Sea countries to work together to build a SCS-TWS, including more cooperation activities, promote data sharing, improve earthquake monitoring etc.

136 China clarified that the first step in the process was to agree the concept of a SCS-TWS. The second step would be the establishment of the TWC. Two months ago a proposal

was made to the State Council of China, and this had received full support for making contribution. But China invited every South China Sea country to participate in the centre.

137 After an exchange of views among the members of the Group the Chair summarized that there was in principle agreement to the concept of a sub-regional Tsunami Warning and Mitigation System for the South China Sea.

138 Vietnam indicated it wishes that the more training courses on tsunami modelling and software are organised in the future with its participation; and suggested to organize a joint-scientific project on Earthquake and Tsunami Hazard Assessment for the South China Sea region with participation of Member States.

139 China announced that it proposed to host a training course for tsunami modelling in 2012 under the auspices of IOC/WESTPAC as a one of steps to establish the Tsunami Warning and Mitigation System for South China Sea. The main content of the workshop is on tsunami hazard assessment, tsunami warning and mitigation. All scientists, technicians and emergency organization officers from South China Sea Countries are welcomed to participate in the training workshop.

140 The **ICG decided** to continue Regional Working Group on Tsunami Warning and Mitigation in the South China Sea Region with Dr Mohd. Rosaidi bin Che Abas (Malaysia) as Chair and Dr Fujiang Yu (China) as Vice-Chair.

Regional Working Group on Tsunami Warning and Mitigation
in the Southwest Pacific Region

141 Dr Ken Gledhill (Chair, New Zealand) provided a report on the activities of the SWP regional WG during the inter-sessional period. Although no formal WG meetings were held, progress was made on several regional issues. Two ad-hoc WG meetings were held, and the Task Team on Seismic Data Sharing in the South West Pacific (under WG2) met twice with one outcome being the holding of a seismology training workshop in July 2010. Other activities included training and education initiatives with the help of ITIC, and several aid funded projects (AUSAid and NZAid) which contributed to the objectives of the Working Group. The assessments of SOPAC member countries capacity to receive and respond to tsunami warnings (BoM, AUSAid) and the SWP tsunami hazard assessment (GA, AUSAid) projects were completed, and a pilot project in Samoa on community based tsunami evacuation maps (GNS Science, NZAid) began. The Working Group is making a significant contribution to tsunami warning and mitigation in the region and will continue this work in the next inter-sessional period, but it is suggested that the group refocus on tsunami mitigation including awareness education and SOP training because recent tsunami events confirm the importance of fast public response.

142 The WG SWP met intra-sessionally including representatives from Australia, New Zealand and Samoa. The group decided to provide a revised Terms of Reference based on the needs of and work already undertaken in the region and including its membership and officers. The group also explored opportunities to convene a meeting of the Working Group; and to consider urgent ICG/PTWS requirements for the Working Group to implement for the next biennium in particular the Exercise Pacific Wave 2011 in order for it to explore ways to expedite the facilitation of the involvement and active participation of the South West Pacific Working Group Members.

143 The members of the Regional Working Group on Tsunami Warning and Mitigation System for the South West Pacific agreed to convene a formal meeting of the Working Group in 2012 but in the interest of urgent ICG/PTWS requirements, identify opportunities

during other regional or international forums where a number of members of the Working Group attend to meet on an ad hoc basis.

- 144 The **ICG decided** to continue the Working Group on Tsunami Warning and Mitigation in the Southwest Pacific Region and elected Ms Filomena Nelson (Samoa) as Chair and Mr Don Anderson (Australia) as Vice Chair.

3.7 STATUS OF PROGRESS IN OTHER ICGs

- 145 Dr François Schindelé reported on the status of progress of the ICG/NEAMTWS. He noted that the ICG had held seven sessions and established four Working Groups and three Task Teams. The main improvement in the last five years is in the area of sea-level monitoring. The Task Team on Regional Tsunami Warning System Architecture met in Paris in March 2011. The next meeting will be held in October 2011. There will be a communication test in the first half of July 2011 and a tsunami and civil protection workshop will be held in Italy in June 2011. Six current NTWCs are planning to develop as Regional Centres.

- 146 The Secretariat secured funding to initiate the Tsunami Information Centre for this ICG: The NEAMTIC project has financial support from the European Union, with four participating countries and a multi-lingual approach to the development of materials including Arabic and Turkish.

- 147 Mr Rick Bailey reported on the status of ICG/IOTWS. He outlined the structure of the ICG, which is similar to ICG/PTWS. The last ICG was held in Melbourne in May, attended by 12 Member States. The main focus of the ICG is on the implementation of the Regional Tsunami Service Providers (RTSP) service. SOP training is also a focus. Greater focus is required on community awareness and preparedness. Risk Assessment guidelines have been developed. Under Pillar 2. Core seismic monitoring and sea level monitoring. As well as a limited number of tsunameters are providing data to all Member States. The new RTSP service will come into service later in 2011 as a forecast based system, defining threat/no threat zones, with sea level used for confirmation. RTSP public bulletins and website will reflect national warning status supplied by NTWCs. He presented the coastal forecast zones and noted that RTSPs will be using different models and that was viewed as useful to provide some diversity. Mr Bailey indicated that a lot of emphasis has been put on interoperability and showed the range of products that would be available on password protected websites. He described the implementation process and the timeline for implementation later in October 2011.

- 148 Mr Bailey noted that the Interim Advisory Service provided by PTWC and JMA will continue in parallel until the next ICG and reported that the ICG/IOTWS is looking to expand the role of the Jakarta Tsunami Information Center (JTIC) to a wider Indian Ocean role.

- 149 He referred to the Mentawai event and noted that this had demonstrated that more work was needed in the near field events.

- 150 Chile had a comment on threat levels. In Chile, the coastline is quite rugged in places and a wave of three meters will not mean inundation. Mr Bailey replied that the height only is given to the NTWCs and then it is up to individual countries to decide.

- 151 Mr Aliaga reported on the status of the ICG/CARIBE-EWS. He indicated the governance structure which is composed of three Officers and four Working Groups and provided information on progress made towards a Caribbean Tsunami Warning Center (CTWC) and a Caribbean Tsunami Information Center (CTIC). The Haiti earthquake and tsunami has been the main event in the region for the last two years, in which at least seven

persons died as a result of the tsunami. He reported that the Secretariat is working towards setting up a sea level gauge and a CTBTO National Data Center (NDC) in Haiti by the end of June. For the CARIBE EWS the seismic and sea level monitoring stations has improved considerably in the last few years for the Caribbean region, increasing from 19 to 31 stations today for sea level gauge and with a coverage of close to 100 seismic stations sharing data in real time. A lot of preparedness and awareness materials are available for the region. The CARIBE WAVE exercise in 2011 was very successful with good participation from Member States and NGOs.

152 The **ICG noted** the reports on the status of progress in other ICGs.

3.8 REPORTS FROM UN AND NON UN ORGANISATIONS

153 Ms Paula Dunbar (USA) provided a report on the activities of the WDC/NGDC. She provided details of the services and products. She indicated that the WDC/NGDC archives tide gauge and DART data, with a gap remaining with non-US data. As well it maintains a global historical database of destructive or tsunamigenic events. WDC/NGDC also provides Tsunami Travel Time (TTT) and TsuDig offline GIS Tool. WDC/NGDC works collaboratively with ITIC to populate the historical database and develop and distribute tools and awareness products. She presented some of the products provided for the Tohoku event.

154 Ms Dunbar went on to talk about data on fatalities caused by tsunamis, describing the results of a paper that tried to determine if the number of deaths from tsunamis is increasing. For a data set starting in 1701, although there is a dramatic increase in the last decade from 2001 to 2010 due to the 2004 Indian Ocean tsunami, there also appears to be periodic variations from 1701–1710, 1751–1760, 1861–1870, 1881–1890, and 1891–1900.

155 Two hundred and thirty-five (235) tsunami events caused over 600,000 deaths globally since 1410 B.C. With respect to the Pacific Ocean only, after the establishment of PTWS in the Pacific region there have been two far field events causing fatalities and 13 regional events causing deaths while for local events there is a total of 24,000 local fatalities.

156 According to Ms Dunbar the results above are clearly indicating that local earthquakes and tsunami are still a problem.

157 The **ICG noted** the report of WDC/NGDC.

4. POLICY MATTERS

4.1 ENHANCING PTWS TSUNAMI WARNING PRODUCTS

158 The Chair introduced this agenda item by recalling that through Recommendation PTWS-XXIII.1 a Task Team on Enhancing Tsunami Warning Products was established, under the Chairship of Dr Chip McCreery, PTWC Director.

159 Dr McCreery introduced a proposal for enhancing PTWC warning services that is attached in full under Annex V. He reminded the delegates of the current PTWS warning criteria, which are quite conservative and have led to “over-warning”. To address this problem PTWC proposes new criteria. These include lower magnitude thresholds for local tsunamis. As far as possible these new criteria will follow the guidelines suggested and developed by the Inter-ICG Task Team 3 on Tsunami Watching Operations. He indicated that following the Tohoku event an additional threat level is proposed – Major Land Threat –.

- 160 Dr McCreery presented some scenarios modelled using the RIFT model to illustrate how many regions are over-warned under current procedures. PTWC wants to use the forecast models to reduce the effects of over warning.
- 161 Dr McCreery proposed that the Task Team under WG2 on Enhancing Products be continued to provide guidance and receive feedback. The products would be introduced as experimental products at PACWAVE 11 with a view to start formal implementation at the next ICG.
- 162 Japan commented that the Task Team report also includes a timeline. Referring to this timeline the Delegate of Japan indicated that JMA will investigate the possibility of enhancing its products but they cannot confirm at this stage that this will happen as they need to investigate this possibility.
- 163 Dr Kong (ITIC) commented that it is proposed to hold a combined meeting of the Task Team on PACWAVE 11, the Task Team on Enhancing Products, and the PTWS Steering Committee in April 2012 to discuss and review the results of the experimental use of new products and its impact and performance during PACWAVE 11.
- 164 France expressed its appreciation for this effort of developing new products and inquired if the products will be available to the NTWCs within the coming year.
- 165 Dr McCreery indicated that the staging of the new products should be taking into account the needs of the Member States according to technical capacity to receive the new products.
- 166 New Zealand noted that for the South West Pacific area certain countries do not have the capacity to receive these new products and that they rely on current PTWC's products.
- 167 Australia asked how the Pacific will manage different threat information being issued by the warning centres and to the public domain. Dr McCreery stated that there is not an answer for this yet, but introducing the products first and obtaining feedback by the next ICG will help to provide this answer.
- 168 The Chair suggested that the present Task Team should continue its work but it needs a formal membership. Dr McCreery requested that this is formed at this ICG and suggested that the TOR for the Task Team will need to be amended to take on the new tasks, and this should be included in the draft recommendation.
- 169 The **ICG agreed** that PTWC should proceed with its development of improved tsunami procedures and products.
- 170 The **ICG further agreed** to continue the Task Team on Enhancing Products (renamed) under WG2 to guide and provide feedback to PTWC regarding these changes and **requested** the Task Team Chair to provide a report on the recommendations and any implementations at ICG/PTWS-XXV.
- 171 The **ICG also agreed** that any new products and procedures only be exercised in an experimental mode as they are developed and until they are approved for official use later by the ICG.
- 172 Details regarding the testing and implementation timeline as well as expected types of procedural and product changes are contained in Annex V: Report of Task Team on Enhancing PTWS Tsunami Warning Products.

4.2 PACIFIC WAVE EXERCISE 2011

- 173 The Chair recalled that the 23rd session of the ICG/PTWS decided to organise a PACWAVE exercise during the last quarter of 2010 and through Recommendation PTWS XXII.2 decided to establish under WG2 a Task Team in charge of organising this exercise. However, on 29 September 2009, just over seven months after the ICG/PTWS-XXIII, Samoa, American Samoa, and Tonga were hit by a destructive tsunami and this was followed five months later by the 27 February 2010 Chile tsunami. In view of these new elements the PTWS-SC in coordination with the Secretariat decided to re-schedule the exercise and the Task Team was formed and met in February 2011 under the co-Chairship of Dr Laura Kong (ITIC) and Ms Jo Guard (New Zealand).
- 174 Dr Laura Kong introduced this agenda item and acknowledged the input of her co-Chair, Ms Jo Guard. She provided the background to the PACWAVE 11 exercise, including the TOR for the exercise Task Team and its membership. She listed the lessons learned from the PACWAVE 08 and other exercises, including the need for up to date TWFP contact information. Recommendations emphasized the need for greater preparation time, importance of having pre-determined standard operating procedures, good communications to the last kilometre, and improved post-exercise evaluation aligned with the PTWS Medium Term Strategy. She indicated that local community preparedness was also an issue at that exercise and PACWAVE 11 would increase emphasis on this. At the previous exercise it was also unclear if countries had SOPs which is been now addressed by WG3 which is conducting a survey that will help to establish training priority including for SOPs.
- 175 Dr Kong reported that the post-exercise evaluation will involve a simpler questionnaire, available online, to improve the response from the Member States. It was also decided that New Zealand and ITIC will collaborate to compile a guidance manual on “How to Plan, Conduct and Evaluate Tsunami Exercises” in order to help countries prepare better for PACWAVE 11.
- 176 Dr Kong then provided a summary of how the exercise would be conducted. The exercise will be held on 9 and 10 November 2011 and will be a multi-scenario exercise that allows countries to practice responding to a local/regional tsunami. Member States are requested to nominate exercise focal points by 10 June 2011. She listed the scenarios for the exercise, which include sources for all the main trench source zones, 9 altogether. Messages will be available on a secure website and there will be only one exercise start message.
- 177 The main objectives of the exercise are: 1. to validate the readiness to respond to a local/regional source tsunami, and 2. to validate understanding and use of PTWS Experimental Products.
- 178 According to the planned schedule the Exercise Manual will be available on 9 August 2011 while the manual on “How to Plan, Conduct and Evaluate Tsunami Exercises” will be available in July 2011. PACWAVE 11 briefings and exercise training is available on request, subject to funding. The ITIC will conduct its ITP-Hawaii training from 22 August to 2 September 2011, with a focus on standard operating procedures and exercises with a focus on PACWAVE 11 and the PTWC experimental products.
- 179 Dr Kong then described plans for post-exercise evaluation and noted that this would be aligned with the PTWS MTS.
- 180 Japan requested clarification if the first message would be only to indicate the start of the exercise, or be an actual message. Dr Kong replied this was at the discretion of the warning centres.

- 181 France agreed with the exercise plan and suggested that the last message is sent as well to signify that everything is finished. The Delegate of France wanted clarification about the number of scenarios to be used and if the start message would be just one, or one for each scenario. Dr McCreery (PTWC) confirmed that there would be one start message for each scenario.
- 182 Dr McCreery indicated that PTWC planned to prepare only about six messages for each scenario since the focus of PACWAVE 11 will be on local and regional tsunami response. He also expressed concern that the cancellation messages would be difficult because the exercises are not all starting at the same time.
- 183 Vietnam requested that the messages should be sent to both focal points and that IOC TWFP/TNC data should be updated. Dr Kong noted that the Secretariat has conducted a thorough check of the database and that this would be used for the exercise.
- 184 Australia commented that if experimental products are to be used training should be conducted, otherwise countries will be testing the experimental products but over the current system that is in place. Dr McCreery noted that the exercise would be based on the existing system. However, new experimental products will be introduced through alternate communication methods for countries to use if they wanted and then to provide feedback on.
- 185 Japan stressed that the evaluation of the new products will start in August when the products are uploaded to the website, so there should be preparation before the exercise. Dr Kong noted that the training would start in July and would need to continue for a number of years, subject to available funding.
- 186 Australia noted with respect to one of the proposed scenarios that a magnitude 9 represents a land threat for the whole of the east coast of Australia, and this will require careful management. The Delegate from Vietnam noted that they have conducted the Manila Trench scenario three times and asked if there was any other scenario to conduct.
- 187 Australia asked if the Task Team under TOWS would take the lead in coordinating the exercise manual and noted that the IOTWS would like to be involved. Dr Kong responded that while the PTWS had taken the lead because of the focus on PACWAVE, she welcomed the coordination and collaboration with the IOTWS and its IOWAVE 11 Task Team; preliminary discussions had occurred during the PTWS WG2 Exercises Task Team in Wellington in March. Mr Coetzee agreed that the template would be shared with the Inter-ICG TT2 of TOWS. Australia asked that the "How to Plan, Conduct, and Evaluate Tsunami Exercises" draft should be sent to the Chair of the Inter ICG-TT2 for input as soon as possible.
- 188 Mr Aliaga pointed out that this exercise goes beyond the ICG/PTWS community, reaching local communities, public services, media and NGOs. He indicated that to support the holding of this exercise New Zealand has made a contribution of NZ\$ 15,000 that are available for example if there is a need for outreach meetings.
- 189 Australia recommended that the management of the outreach and communications for this exercise should be through the PTWS-SC.
- 190 The ICG decided that the PACWAVE 11 exercise be conducted on 9 and 10 November 2011 and include several tsunami scenarios that can be independently selected by each Member State for their practice. Each scenario will be initiated by PTWC, NWPTAC, and or WC/ATWC with a message product announcing its start.
- 191 The **ICG approved** Recommendation ICG/PTWS-XXIV.3.

4.3 SUB-REGIONAL TSUNAMI EARLY WARNING AND MITIGATION SYSTEM OF THE SOUTH CHINA SEA

192 The Chair expressed that the tsunami disasters generated in recent years indicate that it is very important for tsunami risk areas to have an effective tsunami warning system. Currently there is no tsunami warning system in the South China Sea. He reminded Delegates that Resolution EC-XLI.6 established from the IOC Executive Council in its Forty-first session encouraged the South China Sea region countries to build a sub-regional tsunami warning system.

193 China noted that an operational Tsunami Warning System will be very useful for the South China Sea. To facilitate the future discussion, China submitted a framework document which was circulated to Member States and that was discussed with members of the Regional Working Group on Tsunami Warning and Mitigation in the South China Sea Region.

194 Japan noted that the NWPTAC has expanded its service to the South China Sea on an interim basis and it has been endorsed by IOC. It would be happy to see a service in the South China Sea, but transition to the service needs to be decided by this ICG and endorsed by IOC as well.

195 China replied that it is currently obtaining warnings from JMA and PTWC but it is important to have a sub-regional warning system. It agrees that it needs to be agreed by ICG and endorsed by IOC.

196 Vietnam indicated that a regional Tsunami Warning System will be beneficial in terms of scientific research and for exchanging knowledge between the regional Member States. Vietnam fully supports the concept of setting up a sub-regional warning system for the SCS.

197 The Working Group on Tsunami Warning and Mitigation in the South China Sea Region met during the session with participants from China, Indonesia, Japan, Korea, Malaysia, Vietnam, and USA. The meeting discussed in detail the framework document submitted by China, and after an exchange of views among the members of the Group, it agreed in principle with the concept of a sub-regional Tsunami Warning and Mitigation System for the South China Sea.

198 The **ICG approved** Recommendation ICG/PTWS-XXIV.4.

4.4 IMPLEMENTATION PLAN AND MEDIUM TERM STRATEGY

199 Mr Aliaga, Technical Secretary of the ICG/PTWS, introduced this agenda item. He referred to Annex V of the Summary Report of ICG/PTWS-XXIII. He recalled that the PTWS Medium Term Strategy (MTS) was drafted by the PTWS-SC and was approved by ICG/PTWS-XXIII, for the period 2009–2014 as a very important document for guiding the structure of the system. He proposed that the ICG put in place a mechanism for developing the next MTS (2015–2020) during the next ICG. Mr Aliaga informed Delegates that based on the MTS the Secretariat developed a draft PTWS Implementation Plan that was also available at the ICG/PTWS-XXIII session.

200 The PTWS Implementation Plan (IOC/ICG-PTWS-XXIII/3) was updated after the 23rd session of the ICG/PTWS with contributions from the PTWS-SC and from WG2. Vice-Chair Ms Filomena Nelson (Samoa) was nominated by the PTWS-SC to coordinate updates to the PTWS Implementation Plan.

201 New Zealand suggested that the drafting of the MTS should be added to the tasks of the PTWS–SC. The Delegate commented that while WG2 made significant progress on updating the Implementation Plan at its meeting in Wellington this has not been fully reflected in the current version. Mr Aliaga suggested that the Working Groups should prepare input to the Implementation Plan as outcomes of their sessional meetings.

202 The **ICG instructed** the Working Groups to prepare input to the Implementation Plan during their sessional meetings.

5. PROGRAMME AND BUDGET FOR 2012–2013

203 The Budget Commission met to discuss the programme and budget for 2012–2013 and with the assistance of the Technical Secretariat decided to compile a budget based on two broad categories of potential sources of funding towards the three Pillars of the PTWS Implementation Plan. These categories includes:

- (i) Funding and technical assistance offered by international and regional organizations as well as Member States to fund the implementation of the PTWS Implementation Plan.
- (ii) Member States' programmes and projects that relate to tsunami and/or contribute to strengthening of their own tsunami warning and mitigation systems which are in the process of implementation and/or in the pipeline to be implemented and where funding has been secured/confirmed.

204 The idea behind this approach is to clearly highlight what the Member States are implementing to establish and/or strengthen their tsunami warning and mitigation systems so that financial and technical assistance available from donors organizations and other Member States can be allocated to assist those Member States that do not have the capacity in terms of financial and technical resources to upgrade and/or establish their tsunami warning and mitigation systems.

205 From the information collected from the Member States during this sessional period, the following figures became available:

- (i) Category A:
 - UNESCO IOC:
 - US\$ 250,000.00 – staff and ICGs running costs.
 - Central America – US\$ 100,000 (Donor–DIPECHO).
 - South East Pacific – US\$ 400,000 (Donor–DIPECHO).
 - South West Pacific – US\$ 26,000 for tsunami response plans, SoPs and strengthening of TWSS; and US\$ 60,000 for DRR initiatives.
 - US NOAA through ITIC–US\$ 600,000 per year to fund staff of ITIC and operational costs; and US\$ 40,000 for 2010–2011 to fund cost of development and distribution of tsunami awareness materials.
 - SOPAC/SPC–through its collaboration with the European Union has provided US\$ 378,000 Euros to Wallis and Futuna for disaster risk management programmes with particular focus on tsunami for Futuna. Member States of the SOPAC/SPC needs to come up with activities that require funding and tsunami could be one of these activities. There are also opportunities to fund regional projects to achieve the objectives and deliverables of the Implementation strategy.

- NZAid—Funding of NZD\$ 3 million has been earmarked for disaster risk management programmes for three years.
- AusAid—Two proposals for regional programmes related to tsunami proposed to be implemented by BOM and GA have been submitted and are pending of approval.

(ii) Category B:

- Chile—US\$ 120,000 for tsunami inundation mapping and modelling; US\$ 3,451,500—sea level monitoring instruments/equipment; US\$ 63,900 for awareness and education.
- China—US\$ 2,307,692 for numerical modelling; US\$ 10,000,000 for monitoring equipment; US\$ 2,307,692 for awareness and education.
- Malaysia—US\$ 1,562,500 for procurement of monitoring equipment; US\$ 94,000 for awareness and drills.
- New Zealand – US\$ 75,000 for tsunami risk review, and US\$ 40,000 for upgrade of warning dissemination system.
- Peru—US\$ 80,000 for tsunami inundation modelling and mapping, US\$ 360,000 for procurement of monitoring equipment; and US\$ 60,000 for awareness and education.
- Samoa—US\$ 592,777 for tsunami inundation modelling and mapping, US\$ 2,220,000 for monitoring equipment; and US\$ 140,000 for awareness and education.

206 Due to limited time available for this exercise to be completed, the Budget Commission made the following recommendations:

- (i) For the Steering Committee of the ICG/PTWS to finalize the funding strategy and solicit relevant information to complete this spreadsheet;
- (ii) For the relevant Regional and Technical Working Groups to work closely with their members to identify activities that may need some kind assistance from the identified sources of funding and technical assistance or other potential sources of funding available to the Member States of the PTWS within their regions.

207 The **ICG instructed** the PTWS Steering Committee to finalise the summary of existing funding available to the PTWS from national, bilateral and multilateral sources to develop a strategy for funding ICG/PTWS activities, to be reported at ICG/PTWS-XXV.

6. NEXT MEETING

6.1 CONFIRMATION OF DATE AND PLACE OF ICG/PTWS-XXV

208 The Chair recalled that at PTWS-XXIII the Government of the Russian Federation indicated its willingness to host the Twenty-fifth Session of the ICG/PTWS. He offered the floor to the Delegate of the Russian Federation to indicate the status of the offer and options for date and venue.

209 Mr Igor P. Kuzminykh, Head of Delegation of the Russian Federation, informed the ICG that on behalf of Mr Alexander Frolov, Head of Roshydromet, he confirmed the offer of hosting the Twenty-fifth session of the ICG in 2013 at the city of Vladivostok, Russian

Federation. He indicated that considering weather, the best time slot for this meeting would be August–September 2013.

210 The **ICG thanked** the Russian Federation and **agreed** to hold the ICG/PTWS-XXV in Vladivostok, Russian Federation, on August–September 2013.

6.2 TARGET DATE FOR ICG/PTWS-XXVI

211 The Chair invited expressions of interest for hosting the Twenty-sixth Session of the ICG/PTWS. The Head of the USA Delegation reported that the USA is pursuing the possibility of hosting the ICG/PTWS-XXVI in Hawaii, Honolulu, USA, in 2015 when the PTWC will be most probably located in a new building and also as a mark of the PTWS 50th anniversary.

212 The **ICG noted** the interest indicated by USA of hosting its 26th Session in 2015.

7. OFFICERS ELECTIONS

213 The Chair handed over the Chairship of this part of the Meeting to the Chair of the Elections Commission, Dr François Schindelé (France).

214 Dr Schindelé reported that the Elections Commission of the ICG/PTWS-XXIV was established under the agenda item 2.3 on 24 May 2011. This Commission consisted of representatives of France (Dr François Schindelé) and US (Dr Vasily V. Titov) with the Chairship of Dr François Schindelé.

215 The Commission convened its meeting on 25 May 2011 with objectives to review the nominations submitted from Member States for the Chair and two Vice-Chairs of the ICG/PTWS for the Term May 2011–May 2013, and provide suggestion on the election of officers to the ICG/PTWS.

216 Four nominations were submitted by Heads of Delegations and received by the IOC Secretariat prior to the deadline of submission (6 p.m., 24 May 2010), one from New Zealand, seconded by Japan and France for the post of Chair, and three nominations respectively from Chile, China and Japan for the two posts of Vice-Chairs. Details are:

Candidate for the post of Chair:

- Dr Ken Gledhill (New Zealand), seconded by Japan and France.

Three Candidates for the post of Vice-Chairs (in the alphabetical order of the country name):

- Captain Patricio Carrasco (Chile), seconded by USA and Ecuador;
- Dr Fujiang Yu (China), seconded by Malaysia and Indonesia;
- Mr Takeshi Koizumi (Japan), seconded by New Zealand and France.

217 The Elections Committee reviewed all nomination forms and certified that all nominations received fully met the requirement provided in the Annex I of the IOC Circular Letter 2385 and remained valid for election by the IOC/PTWS.

218 In accordance with Terms of Reference of ICG/PTWS adopted in the 39th Session of IOC Executive Council in 2006, “A Chair and two Vice-Chairs will be elected in accordance with the Statutes and Rules of Procedure of the IOC”.

219 The Commission considered with concern that the ICG/PTWS is currently in a fast-growing phase with a number of activities to be developed, coordinated and implemented

during the next inter-sessional period. Therefore, it was proposed that a third Vice-Chair be incorporated into ICG/PTWS Officers on an experimental basis, in order to further facilitate the implementation of ICG/PTWS programmes. The Commission further suggested this experimental arrangement be further reviewed at the next session of ICG/PTWS in 2013.

220 The **ICG accepted** the proposal of the Elections Commission and **elected** the Officers by acclamation as follows:

Chair: Dr Ken Gledhill (New Zealand).

Vice-Chairs (in alphabetical order by country):

- Captain Patricio Carrasco (Chile)
- Dr Fujiang Yu (China)
- Mr Takeshi Koizumi (Japan)

8. **ANY OTHER BUSINESS**

221 No other business was proposed.

9. **ADOPTION OF DECISIONS AND RECOMMENDATIONS**

222 The **ICG** debated in plenary and **approved** four recommendations as included under Annex II.

10. **CLOSE OF THE MEETING**

223 The Chair thanked Member States for their participation, commitment, and hard work during PTWS-XXIV and wished all success to the incoming Officers, in particular to Dr Ken Gledhill, newly appointed Chair of the ICG/PTWS for the period May 2011–May 2013.

224 The Deputy Director of the National Marine Environment Forecast Center (NMEFC) of the State Oceanic Administration of China closed the meeting on behalf of the government of China. He thanked the Secretariat, Delegates, organizations, and participants for its hard work and welcomed the decisions about the establishment of a Tsunami Warning System for the South China Sea.

225 The Chair closed the meeting at 3:30 p.m. on 27 May 2011.

ANNEX I

AGENDA

- 1 WELCOME AND OPENING OF SESSION**
- 2 ORGANIZATION OF THE SESSION**
 - 2.1 ADOPTION OF AGENDA
 - 2.2 DESIGNATION OF THE RAPPORTEUR
 - 2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION
- 3 REPORT ON INTER-SESSIONAL ACTIVITIES**
 - 3.1 CHAIR'S INTRODUCTION: ROLE, STRUCTURE AND WORKING MODES OF ICG/PTWS, REPORT OF THE PTWS STEERING COMMITTEE
 - 3.2 SECRETARIAT REPORT
 - 3.3 WARNING & ADVISORY SERVICES REPORT
 - 3.4 NATIONAL PROGRESS REPORTS
 - 3.5 ITIC's REPORT
 - 3.6 WORKING GROUP REPORTS
 - 3.7 STATUS OF PROGRESS IN OTHER ICGs
 - 3.8 REPORTS FROM UN AND NON UN ORGANISATIONS
- 4 POLICY MATTERS**
 - 4.1 ENHANCING PTWS TSUNAMI WARNING PRODUCTS
 - 4.2 PACIFIC WAVE EXERCISE 2011
 - 4.3 SUB-REGIONAL TSUNAMI EARLY WARNING AND MITIGATION SYSTEM OF THE SOUTH CHINA SEA
 - 4.4 IMPLEMENTATION PLAN AND MEDIUM TERM STRATEGY
- 5 PROGRAMME AND BUDGET FOR 2012-2013**
- 6 NEXT MEETING**
 - 6.1 CONFIRMATION OF DATE AND PLACE OF ICG/PTWS XXV
 - 6.2 TARGET DATE FOR ICG/PTWS XXVI
- 7 OFFICERS ELECTIONS**
- 8 ANY OTHER BUSINESS**
- 9 ADOPTION OF DECISIONS AND RECOMMENDATIONS**
- 10 CLOSE OF THE MEETING**

ANNEX II

DECISIONS AND RECOMMENDATIONS

Recommendation ICG/PTWS-XXIV.1

PTWS Governance

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Having met for its 24th Session from 24 to 27 May 2011 in Beijing, China,

Expresses its deep condolences to the people of Samoa, Chile, Indonesia and Japan for the loss of many lives caused by the earthquakes and tsunamis in 2009, 2010 and 2011;

Recalling IOC Resolution IV-6 that established the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) and IOC Resolution XXXIX-8 that renamed ITSU to be the Pacific Tsunami Warning and Mitigation System (PTWS) and to provide continuity through the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Reaffirming that the Pacific Tsunami Warning and Mitigation System (PTWS) will be a coordinated network of national systems and capacities, and will be part of a global network of early-warning systems for all ocean-related hazards,

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

Noting with appreciation the tsunami forecasting guidance materials provided for the Member States of the PTWS by the PTWC hosted by the USA and the NWPTAC hosted by Japan,

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

Having noted IOC Resolution XXV-13 outlining the requirements for the future development of tsunami warnings, which established the TOWS-WG Inter-ICG Task Teams on Sea Level for Tsunami Purposes, Disaster Management and Preparedness, and Tsunami Watch Operations,

Having reviewed the progress made in the implementation of the PTWS since the 23rd Session of the ICG/PTWS,

Having considered the reports of:

- Working Group 1 on Tsunami Risk Assessment and Reduction
- Working Group 2 on Tsunami Detection, Warning and Dissemination and its Task Teams
- Working Group 3 on Tsunami Awareness and Response

- Regional Working Group on Tsunami Warning and Mitigation on the Central American Pacific Coast
- Regional Working Group on Tsunami Warning and Mitigation in the South East Pacific Region
- Regional Working Group on Tsunami Warning and Mitigation in the South West Pacific Region
- Regional Working Group on Tsunami Warning and Mitigation in the South China Sea
- 2nd Meeting of the PTWS Steering Committee held in Hawaii, USA, 17-20 August 2010
- Fourth Meeting of the TOWS-WG (Paris, 21–22 March 2011)
- North West Pacific Tsunami Advisory Center (NWPTAC)
- Pacific Tsunami Warning Center (PTWC)
- International Tsunami Information Center (ITIC),

Recognizing the difficulty in providing effective near-field tsunami warning in the recent events in Japan, Chile, and Samoa,

Acknowledging that the PTWS is effective in saving lives and reducing the impacts to communities in both near-field and distant-tsunami events through the three pillars of risk assessment and reduction, detection, warning and dissemination, and awareness and preparedness,

Noting the recommendations of the TOWS-WG of the need by ICGs to evaluate the impact and value of real time observations for tsunami warning,

Appreciates the recent report of the JCOMM Data Buoy Cooperation Panel and **endorses** the recommendations to help decrease the incidence of data buoy vandalism and seek to better understand the causes of damage and promote the importance of these observing systems for critical tsunami warning systems;

Encourages voluntary contributions to support Budget and Programme activities recommended by the ICG/PTWS either directly or through the IOC Special Account set up for the PTWS;

Recognizing the limited capacity of many Member States of the PTWS in hazard assessment and risk reduction;

Requests Member States to regularly review the list of Tsunami National Contacts (TNCs) and Tsunami Warning Focal Points (TWFPs) on the IOC website and inform the Secretariat of all changes;

Requests Member States to share any new forms of sea level data for tsunami warning purposes in accordance with the IOC Oceanographic Data Sharing Policy;

Requests PTWC not to use the terminology “warning” in its guidance to Member States in its new products on the tsunami threat across the region;

Decides to:

1. Continue existing Working Groups (WG):

WG1. Tsunami Risk Assessment and Reduction, with modified Terms of Reference as attached in Annex, Chair Dr François Schindelé (France);

WG2. Tsunami Detection, Warning and Dissemination, with modified Terms of Reference as attached in Annex, Chair Dr Charles McCreery (USA) and Vice-Chair Mr Daniel Jaksa (Australia);

- WG2 Task Team on Warning Dissemination
- WG2 Task Team on PACWAVE 11
- WG2 Task Team on Enhancing Products
- WG2 Task Team on Sea Level Monitoring
- WG2 Task Team on Seismic Data Sharing in the South West Pacific

WG3. Tsunami Awareness and Response, with Terms-of-Reference as attached in Annex, Chair Mr David Coetzee (New Zealand).

Sub-Regional Working Groups:

- Regional Working Group on Tsunami Warning and Mitigation on the Central American Pacific Coast, Chair Dr Alejandro Rodriguez (Nicaragua).
 - Regional Working Group on Tsunami Warning and Mitigation in the South East Pacific Region, with modified Terms of Reference as attached in Annex, Chair Lt. Edwin Pinto (Ecuador) and Vice-Chair to be nominated (Peru).
 - Regional Working Group on Tsunami Warning and Mitigation in the South West Pacific Region, Chair Ms Filomena Nelson (Samoa) and Vice-Chair Mr Don Anderson (Australia).
 - Regional Working Group on Tsunami Warning and Mitigation in the South China Sea with modified Terms of Reference as attached in Annex, Chair Dr Mohd Rosaidi bi Che Abas and Vice-Chair Dr Fujiang Yu (China).
2. Establish a WG1 Task Team on Tsunami Modelling Hazard Assessment with Terms of Reference as attached in Annex; Chair Dr Vasily Titov (USA);
 3. Establish a WG1 Task Team on Tsunami Risk Assessment with Terms of Reference as attached in Annex; Chair Dr Nguyen Hong Phuong (Vietnam);
 4. Continue the Steering Committee with modified Terms-of-Reference as attached in Annex;
 5. Disseminate a communication test message from the PTWC once a month on the same day and at the same time every month and two random unannounced tests annually to the PTWS Member State TWFPs starting October 2011;
 6. Conduct training workshops on hazard and risk assessment organised by WG1 in coordination with IUGG to enhance collaboration between the operational and research communities as recommended by the TOWS-WG, subject to extra-budgetary funding support being identified;
 7. Proceed with PTWC's development of improved tsunami procedures and products with the Task Team on Enhancing Products guiding and providing feedback and related documentation to PTWC and the ICG/PTWS regarding these changes, in accordance with the timeline in Annex V. Any new products and procedures will only be exercised in an experimental mode as they are developed and until they are approved for official use later by the ICG/PTWS.

Requests the Executive Secretary to:

1. Inform Member States of the timing and conduct of the PTWS communications tests by circular letter,
2. Survey the PTWS Member State TWFPs regarding their need to receive PTWC message products by fax by October 2011,
3. Inform the Member States about the website for TNC and TWFP contact details, provide them with passwords and advise them of the procedures for updating contact details,
4. Mobilise extra budgetary resources for follow up training in the configuration and use of seismic monitoring and analysis systems for Member States in the SW Pacific,
5. Also organize documentation on the IOC Tsunami website by discipline/topic to facilitate access and utility of reference material across Working Groups and ICGs,

Encourages Member States to include representation of National Disaster Management Organizations (NDMO's) in their delegations to the ICG and inter-sessional Working Groups;

Instructs the PTWS Steering Committee to finalise the summary of existing funding available to the PTWS from national, bilateral and multilateral sources to develop a strategy for funding ICG/PTWS activities, to be reported at ICG/PTWS-XXV;

Expresses its gratitude to the Government of China for kindly hosting the 24th Session of the ICG/PTWS in Beijing;

Accepts with appreciation the kind offer of the Russian Federation to host the 25th Session of the ICG/PTWS in Vladivostok in the time frame August or September 2013 subject to the approval of the Government, and

Accepts with appreciation the interest of USA to host the 26th session of the ICG/PTWS in Honolulu in 2015, subject to the approval of the Government.

Financial Implications: None

Annex to Recommendation ICG/PTWS-XXIV.1

WORKING GROUPS AND STEERING GROUP TERMS OF REFERENCE

Terms of Reference Working Group 1: Tsunami Risk Assessment and Reduction

1. Review and report on existing arrangements with regard to tsunami hazard identification and characterization;
2. Advise on credible seismic scenarios that need to be captured for numerical tsunami modelling e.g., location, magnitude, rupture, orientation, dip, and probability of occurrence;
3. Review details on models that are currently used or in development and desirable standards of documentation (model inputs and outputs etc.);
4. Explore cooperation regarding coastal inundation models, including appropriate requirements for bathymetry;

5. Develop guidance on mandatory metadata including details of bathymetry, hydrography and topography;
6. Consider the issue of assessing hazard, vulnerability and risk, including the facilitation of access to models and mitigation measures;
7. Liaise with Working Groups from the other ocean basins, as well as other working groups within ICG/PTWS to coordinate and ensure efficient and effective information for tsunami warning and mitigation.

The Group will be composed of members nominated by Member States, with a Chair and a Vice-Chair to be elected.

WG1 Task Team on Tsunami Modelling Hazard Assessment

Chair Dr Vasily Titov (USA).

Terms of Reference:

1. Develop relevant methodology and recommend standards for tsunami modelling for hazard assessment;
2. Define and recommend tsunami risk and hazard assessment products, for planning and/or real-time hazard assessment.

WG1 Task Team on Tsunami Risk Assessment

Chair Dr Nguyen Hong Phuong (Vietnam).

Terms of Reference:

1. Define relevant methodology and required data and products for tsunami risk assessment based on existing ones;
2. Establish links with the WG3 activities, in particular the required products.

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

1. Review and report on existing arrangements with regard to seismic, sea level and other kind of measurements, data collection and exchange;
2. Advice on how best to ensure that all events likely to cause tsunami can be reliably located and sized in a timely manner;
3. Review and make recommendations regarding upgrades and enhancements to the PTWS seismic and sea level stations and networks, communications, processing and analysis, particularly those that are important for the rapid characterization of earthquakes capable of generating local tsunamis, to further reduce the time required for source characterization to meet desired warning responses;
4. Liaise with the appropriate organizations and relevant experts to ensure effective data representation and code forms are used for the exchange of data (standards, metadata requirements);
5. Review and report on various means of transmitting data to warning centres, and conduct tests of latency (timeliness) of transmissions as required;
6. Coordinate the development and operational implementation of [the upstream part of] warning systems in the Pacific;
7. Liaise with Working Groups from the other ocean basins, as well as other working groups within ICG/PTWS to coordinate and ensure efficient and effective information for tsunami warning and mitigation;

8. Coordinate and ensure training on existing and new operational procedures and products;
9. Coordinate regular exercises to test the end-to-end performance of the PTWS;
10. Review and report on various means of transmitting warning products end-to-end to improve their efficiency and effectiveness.

The Group will be composed of members nominated by Member States, with a Chair and a Vice-Chair to be elected.

WG2 Task Team on Warning Dissemination

Chair Ms Filomena Nelson (Samoa), Co-Chair Mr Edward Young (USA).

Terms of Reference:

1. To encourage Member States to develop arrangements for the transmission and receipts of tsunami warning alerts from international centres, and the dissemination of alerts and public safety actions within their countries;
2. To provide a forum to identify methods and systems currently available and planned for the future for alert dissemination within Member States, and internationally across the Pacific, and between oceanic basins;
3. To consult with National Tsunami Warning Focal Points to determine appropriate requirements for the dissemination of alerts from the Tsunami Warning Centres and exchange of information for the confirmation of reception.

WG2 Task Team on PACWAVE 11

Co-Chairs Ms Jo Guard (New Zealand) and Dr Laura Kong (ITIC, USA).

Terms of Reference:

1. Identify lessons learned and develop recommendations based on the PACWAVE 08 evaluation and submit recommendations to the PTWS Steering Committee;
2. Design and carry out a third end-to-end Pacific-wide exercise with the following characteristics:
 - The exercise will take place preferably in the fourth quarter of 2011.
 - The exercise scenarios will be major tsunamis originating in various seismic zones of the Pacific to complement previous scenarios in other places.
 - The exercise date be finalized by the Task Team and the exercise announced to Member States at least 180 days in advance of the exercise date.
 - The exercise manual including instructions to Member States regarding their participation and the evaluation instrument be prepared with content and structure similar to what was prepared for the previous two Pacific-wide exercises, but taking into account lessons learned and any need to collect additional information.
 - The exercise manual be distributed to Member States at least 90 days in advance of the exercise date.
 - Participating Member States be asked to complete and return the evaluation instrument no more than 90 days following the exercise.
 - The exercise be played out in real time.
 - The exercise be considered as a way to test new products from the international TWCs including graphical products.

WG2 Task Team on Enhancing Products

Chair Dr Chip McCreery (USA).

Terms of Reference:

1. Review the capabilities and plans of the international TWCs with respect to their operational products and product dissemination for the PTWS;
2. Gather feedback from Member States regarding international TWC current and planned product content, format, and dissemination;
3. Consider best practices based on social science as well as the experiences of the Member States;
4. Consider the global harmonization of tsunami warning products and terminology;
5. Develop recommendations to improve current products and /or develop new products.

WG2 Task Team on Sea Level Monitoring

Chair Mr Chris Ryan (Australia).

Terms of Reference:

1. Review the PTWS Medium Term Strategy and make recommendations for upgrading and improvements relating to sea-level measurements, in coordination with GLOSS and the Data Buoy Cooperation Panel (DBCP) International Tsunameter Partnership (ITP);
2. Review and recommend changes to the ICG/PTWS Implementation Plan in relation to sea-level monitoring;
3. Review and suggest changes to the procedures for assigning transmission slots for sea-level station data to meteorological geostationary satellites;
4. Review existing training documents and coordinate the organisation of a training workshop for sea-level instrument operators and users in 2011.

WG2 Task Team on Seismic Data Sharing in the South West Pacific

Chair Ken Gledhill (New Zealand).

Terms of Reference:

1. To advocate seismic data sharing in the region;
2. To advise South West Pacific countries on data sharing protocols, techniques and technologies;
3. To work with SWP Countries and donors to ensure a common data sharing policy;
4. To ensure the recommendations of the ICG/PTWS-XXIII Sessional Working Group on Data Exchange in the South West Pacific are achieved.

Terms-of-Reference Working Group 3: Tsunami Awareness and Response

1. Promote good practice examples of capacity and resilience building and emergency management to improve the management of tsunami risk through mitigation, preparedness and response activities. Such measures include the following:
 - Preparedness: capacity assessments, education for public awareness, training, response and evacuation planning and exercising
2. Develop and codify good practices in emergency operations and evacuation plans and procedures through consistent Standard Operating Procedures (SOPs) and drills;

3. Liaise with Working Groups from the other ocean basins, as well as other working groups within ICG/PTWS to coordinate and ensure efficient and effective information for tsunami warning and mitigation.

The Group will be composed of members nominated by Member States, with a Chair and a Vice-Chair to be elected.

Terms of Reference Working Group for the Central American Pacific Coast

1. To assist the Central American countries in the development, improvement and implementation of their National Tsunami Warning and Mitigation Systems, and the countries which are becoming new members of ICG/PTWS in their integration into the ICG/PTWS;
2. To recommend CEPREDENAC to determine whether the National Tsunami Warning Centres of Nicaragua or El Salvador (or of both countries cooperating) could act as interim Regional Tsunami Warning Centre disseminating warnings to all Central American countries;
3. To invite CEPREDENAC to consider the implementation of a Technical Committee for the Development of Regional Tsunami Warning and Mitigation Systems;
4. To implement a regional communications and warning plan;
5. To facilitate Tsunami Hazard and Risk studies in the Central American Region.

The Group will be composed of member from Member States Nicaragua, El Salvador, Guatemala, Costa Rica, Honduras and Panama (as soon as they finalized the formal procedure of joining ICG/PTWS), with a Chair and a Vice-Chair to be elected.

Terms of Reference Working Group for the South East Pacific Region

1. To identify current gaps on the warning and mitigation capabilities of countries in the South East Pacific Region based upon the lessons learned from the last tsunami events. Understand and prioritize the new requirements from countries in the Southeast Pacific Region for the tsunami warning and mitigation services, and group them under the three central pillars of the Medium Term Strategy 2009-2013;
2. To organize the working plan and structure of the South East Pacific Region taking into account the three central pillars of the Medium Term Strategy 2009–2013;
3. To promote and facilitate tsunami hazard and risk studies in the region, through the active participation of appropriate national delegates from Member States, in the Working Group 1: Tsunami Risk Assessment and Reduction;
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks and communication systems in the region, and their interoperability in accordance with ICG/PTWS requirements, through the active participation of appropriate national delegates from Member States, in the Working Group 2: Tsunami Detection, Warning and Dissemination;
5. To improve the education programs with a regional criteria based on the regional social, cultural and economical reality, through the active participation of appropriate national delegates from Member States, in the Working Group 3: Tsunami Awareness and Response;

6. To facilitate capacity building and the sharing of tsunami information in the region, including the free and open exchange of data;
7. To promote and facilitate the creation of in-region trainers in order to meet the regional needs of training.

The Group will be composed of representatives nominated by the Member States of Colombia, Ecuador, Peru and Chile, with a Chair from Ecuador.

Terms of Reference Working Group for the South West Pacific Region

1. To continually review and evaluate capabilities of and make recommendations for improvements to countries in the Southwest Pacific Region for providing end-to-end tsunami warning and mitigation services;
2. To support the involvement and contribution of SWP countries in the activities of the ICG/PTWS;
3. To promote and facilitate the tsunami hazard and risk studies in the SWP region;
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks in the region, and the interoperability of these systems in accordance with ICG/PTWS requirements;
5. To facilitate training and capacity building in the end to end tsunami warning and mitigation system in the region;
6. To encourage the sharing of tsunami information in the region, including but not limited to the free and open exchange of data, and
7. To facilitate tsunami awareness in school curricula, and development and dissemination of public educational materials;
8. To work in cooperation with PTWS Working Group 3, especially on activities which strengthen country capacity in tsunami emergency response.

The Group to be comprised of representatives from Member States and territories of the Secretariat of the Pacific Community (SPC) as members and observers with Chair and Vice Chair to be elected by the members of the Working Group and endorsed by the ICG/PTWS.

Terms of Reference Working Group for the South China Sea

1. To evaluate capabilities of countries in the South China Sea Region for providing end-to-end tsunami warning and mitigation services;
2. To ascertain requirements from countries in the South China Sea for the tsunami warning and mitigation services;
3. To promote and facilitate tsunami hazard and risk studies in the region;
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks and communication systems in the region;
5. To facilitate improvement of the education programs on tsunami mitigation in the region;
6. To facilitate capacity building and the sharing of tsunami information in the region, including the free and open exchange of data.

The Group will be composed of members nominated by Member States Brunei, Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam and invited experts with a Chair and Vice-Chair to be elected.

Terms of Reference Steering Committee:

1. The Steering Committee shall act in an advisory capacity to the Chair of the ICG/PTWS during the inter-sessional period;
2. The Steering Committee shall coordinate and integrate the work of ICG/PTWS in the inter-sessional periods, as implemented through the various technical and regional working groups and task teams, including but not limited to:
 - Maintain the PTWS Medium Term Strategic Plan.
 - Monitor, maintain and update the PTWS Implementation Plan.
 - Develop a Strategy for funding PTWS activities.
 - Monitor the performance of the PTWS.
3. The Steering Group will be composed of the ICG/PTWS Officers (Chair and three Vice-Chairs), Chairs of the Technical and Regional Working Groups, Directors of PTWC, NWPTAC and ITIC or their representatives, other members' representatives by invitation of the Chair.

Recommendation ICG/PTWS-XXIV.2

Enhancing Tsunami Awareness and Response

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Recognizing that tsunami 'Awareness and Response' is recognized as one of the Pillars of the PTWS Medium Term Strategy,

Also recognizing that efficient tsunami 'Awareness and Response' is critical in the 'last mile' of any end-to-end tsunami warning system,

Re-confirms the role of the ITIC as the central point for the collation of good practice and delivery of training, and in conjunction with the relevant Working Groups, and in particular recent work towards the development of guidelines on exercises, Standard Operating Procedures and post event assessments, and therefore;

Encourages Member States to utilize these materials and environments in the development of their own exercises, processes and programmes to foster consistency within the PTWS;

Agrees that technical Working Group 3 assigned with Awareness and Response continues its work in support of the ITIC and its partners with regards to the development and standardization of Awareness and Response material and the delivery of training in this regard;

Recommends that the experience of ITIC be utilized in the design and implementation of regionalized training programmes to train trainers;

Encourages Member States to take advantage of the availability of distance learning environments such as through the IOC/IODE Ocean Teacher and US NOAA COMET as a means of economical training;

Notes that ICG Member States contribution to and participation in PTWS technical Working Group 3 assigned with 'Awareness and Response' has been limited and that this limited involvement is attributed to a low level of Disaster Management Organisations (DMOs) presence in the ICG;

Agrees to enhance the partnership between science and disaster management in the PTWS;

Encourages Member States to ensure strong institutional partnerships with clear responsibilities among all stakeholders, in particular between NTWCs and DMOs within their countries;

Considers that a wealth of good practice and experience with regards to Awareness and Response exists within the PTWS, and also **noting** the high value of shared good practices from recent events;

Invites UNESCO/IOC, other potential donor organizations or Member States to fund regional workshops in which to share best practices in community based warning and preparedness, an example of which was conducted between Central America and the Caribbean in 2008, and/or specific in-country programmes to enhance tsunami response capacity;

Recommends that technical Working Group 3 maintains its cooperation with similar working groups of other ocean basin systems, and in particular with TOWS Task Team 2, Disaster Management and Preparedness;

Also **notes** that Working Group 3 is conducting a survey among the NTWCs and DMOs of Member States to assess the status of Awareness and Response in the PTWS;

Requests all Member States to participate in the survey and Working Group 3 to develop a work plan based on the findings of the survey;

Further notes the emphasis on disaster risk reduction in international development programmes and the experience in the PTWS based on the 2009 Samoa, 2010 Chile and 2011 Japan tsunami;

Encourages international organizations to include a tsunami-specific focus as a benchmark end-to-end warning system in their development of disaster risk reduction programmes;

Further notes that International Tsunami Survey Teams (ITST) have conducted extensive post event surveys following the 2009 Samoa, 2010 Chile, and 2011 Japan tsunami and that data from these surveys can be of value to the affected country;

Urges ITST scientists to coordinate their surveys with the UNESCO/IOC, utilise the IOC Post-Tsunami Field Survey Guide in planning and conducting their surveys and to share their preliminary data, findings, and outcomes of their analysis in a timely manner with the affected country;

Requests the Executive Secretary and ITIC to work through the governments of affected countries in order to facilitate coordination of the ITSTs, including calls for nominations and approval of national participation through Tsunami National Contacts.

Financial implications:

Extra budgetary funding is required for:

- Regional best practice workshops and/or in-country programmes, including travel costs for presenters and some delegates.
- Offering and attending (some Member States) regional 'Training of Trainers'.
- Working Group members to attend an inter-sessional Working Group meeting (could be held back-to-back with one of the above) and for a Working Group delegate to attend a meeting of the Inter-ICG Task Team 2.

Recommendation ICG/PTWS-XXIV.3

PTWS Exercises

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Recalling Recommendation ICG/PTWS-XXIII.2,

Emphasising that 99% of deaths caused by tsunamis in the Pacific since the establishment of the PTWS is the result of local tsunamis,

Noting that during the inter-sessional period 2009–2011, three destructive and deadly tsunamis occurred in the Pacific, which placed PTWS countries in various levels of warning for distant tsunamis, and locally, five countries were impacted nearly immediately with people having only 10–30 minutes before the first large waves hit,

Recognizing all communities at risk need to be prepared for the next tsunami,

Recognising further that drills and exercises are an effective and important way to increase readiness and raise awareness,

Noting that the ICG/PTWS-XXIV agreed that PTWC should proceed with its development of improved tsunami procedures and products,

Decides to conduct Exercise Pacific Wave 2011 (PACWAVE 11) on 9 and 10 November 2011 and to continue with the PTWS Task Team on PACWAVE 11;

Decides further that:

1. The objectives of PACWAVE 11 will be to evaluate the readiness to respond to a local/regional source tsunami, and to also evaluate the understanding and use of new PTWC experimental products,
2. PACWAVE 11 will be conducted as a multi-scenario exercise with major tsunamis originating in various seismic zones of the Pacific to complement previous scenarios in other places,
3. The exercise manual including instructions to Member States regarding the exercise conduct and the evaluation instrument be prepared taking into account lessons learned and any need to collect additional information, provide feedback on the PTWC new products, and the recommendations of TOWS-WG Inter-ICG Task Team 2,
4. The exercise manual be distributed to Member States at least 90 days in advance of the exercise date,

5. An exercise guideline, How to Plan, Conduct, and Evaluate Tsunami Exercises be prepared in order to assist countries in preparing for PACWAVE 11 in collaboration with TOWS-WG Inter-ICG Task Team 2,
6. Participating Member States be asked to complete and return the evaluation instrument no more than 90 days following the exercise,
7. The PTWS Task Team on PACWAVE 11 and PTWS Task Team on Enhancing Products to meet after the exercise evaluation to compile a list of actions from the findings for consideration by the ICG/PTWS XXV.

Financial implications: None

Recommendation ICG/PTWS-XXIV.4

Sub-Regional Tsunami Warning and Mitigation System for the South China Sea Region

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Recognizing that the South China Sea is a region adjacent to the Pacific seismic zone and facing potential tsunami risks,

Noting with appreciation that PTWC and NWPTAC are providing tsunami advisory services on an interim basis to the South China Sea region,

Noting the need to further promote the capacity within the South China Sea region to provide tsunami warning and mitigation services,

Recalling that the Intergovernmental Oceanographic Commission (IOC) adopted Resolution EC-XLI.6, which the Member States around the South China Sea and other regional seas, as appropriate, to actively promote the development, establishment and sustained operation of national and sub-regional Tsunami Warning and Mitigation Systems within the framework of ICGs,

Recalling further that the ICG/PTWS adopted the Recommendation ICG/PTWS-XXIII.5, which established the Working Group for the South China Sea,

Having considered the *Outlook of Tsunami Warning and Mitigation System of South China Sea* proposed by China,

Decides to establish a sub-regional Tsunami Warning and Mitigation System for the South China Sea region within the framework of ICG/PTWS;

Decides further that the *Outlook of Tsunami Warning and Mitigation System of South China Sea* could serve as a basis for the establishment of a sub-regional Tsunami Warning and Mitigation System within the framework of ICG/PTWS;

Encourages members of the Working Group of the South China Sea as well as all coastal countries of this region to review and comment on the *Outlook of Tsunami Warning and Mitigation System of South China Sea* and actively participate in and contribute to the

establishment of the sub-regional Tsunami Warning and Mitigation System within the framework of ICG/PTWS;

Invites countries outside of the South China Sea region to provide appropriate support to the establishment of the sub-regional Tsunami Warning and Mitigation System within the framework of ICG/PTWS;

Decides to organize an inter-sessional meeting of the Working Group for the South China Sea in the second half of 2011 to discuss future arrangements for the establishment of the sub-regional Tsunami Warning and Mitigation System within the framework of ICG/PTWS;

Requests the Secretariat of the ICG/PTWS to disseminate the *Outlook of Tsunami Warning and Mitigation System of South China Sea* and provide necessary service in organizing the inter-sessional meeting of the Working Group for the South China Sea.

Financial Implications: None

ANNEX III

SPEECHES

**Mr Abhimanyu Singh
UNESCO Representative to China**

Mr Zhanhai Zhang, Director General of the State Oceanic Administration of China,
Lieutenant Giorgio DE LA TORRE, Head of the Galapagos Office of the Ecuadorian Navy
INOCAR, ICG/PTWS Chair,
Distinguished Delegates,
Ladies and Gentlemen,

On behalf of the Director General of UNESCO, I would like to offer you a warm welcome to this meeting and wish you all the best in your deliberations.

Let me first thank the Government of China for hosting this ICG meeting. The People's Republic of China hosted in Beijing the Eleventh meeting of the former International Tsunami Coordination Group (ITSU) now Intergovernmental Coordination Group ICG/PTWS back in 1987, some 24 years ago! It was also under the auspices of the State Oceanic Administration (SOA), and the former National Research Centre for Marine Environment Forecasts (NRCMEF).

In the meantime the expertise, developed through the years by ITUSU, was essential to get off the ground the much needed tsunami warning systems for the Indian Ocean (and other basins) following the large Indian Ocean tsunami catastrophe in December 2004.

I do not need to remind you that your meeting this week takes place against a backdrop of tsunami disasters over the past few years culminating in the Tohoku earthquake and tsunami in Japan on 11 March this year. As terrible as this event was, we should recognise that the PTWS operated well and according to expectations. The location and magnitude of the earthquake was identified within minutes allowing for timely regional warnings to be issued to the Pacific Ocean countries. The DART (Deep-ocean Assessment and Reporting of Tsunamis) buoys and sea level monitoring stations worked well and the communications systems allowed for near real-time monitoring of the event. The Regional Tsunami Warning Centres issued timely bulletins and kept the National Tsunami Warning Centres of the PTWS well informed and updated on the progress of the tsunami as it crossed the Pacific Ocean.

Since 2004, there have been a number of deadly tsunamis: south Java in 2006; Solomons and Chile in 2007, Samoa/American Samoa/Tonga in 2009; Haiti, Chile and Mentawai in 2010; and most recently the Tohoku tsunami in Japan. What each of these has in common is that they were local, rapid onset events, where tsunami waves arrived on the shore quickly, and in some places before warnings were issued or before people could evacuate to safety. The first waves of the Mentawai tsunami for example arrived on the shoreline within seven minutes of the earthquake. These events act as a reminder for countries with communities living close to potentially tsunamigenic zones to step up their efforts to develop awareness, preparedness and mitigation measures. Communities must learn to recognize the natural warning signs and act immediately to save their lives. Focused research is also required to continue updating our knowledge about subduction zones capable of generating great earthquakes and tsunamis.

Although much progress has been made in implementing tsunami warning systems globally in the last 6 years, the events of Samoa/Tonga, Chile and Japan clearly demonstrate that

there is still much to do and that there is no room for complacency. UNESCO stands ready to support all ICGs in collaboration with partners and is committed to the goal of developing effective end-to-end tsunami warning systems at the regional, national and local level.

Again, on behalf of UNESCO and its IOC, I wish you all a successful twenty fourth meeting of ICG.

Thank you very much!

Lt. Giorgio De La Torre
Chair of the ICG/PTWS

Forty-six years ago, during the fourth session of the IOC Assembly, Member States decided to create the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU). Subsequently, the Thirty-ninth Session of the Executive Council decided to rename ITSU to be the Pacific Tsunami Warning and Mitigation System (PTWS) and to provide its continuity through the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS).

In this connection, and after two years of our last meeting in SAMOA, the official delegations of 16 countries are here in BEIJING, ready to celebrate the twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS-XXIII).

During the next four days, Member States will actively discuss important topics for the system and will take decisions in order to improve the effectiveness of the tsunami warning and mitigation efforts in the Pacific. Among them, the assessment of the PTWS Medium Term Strategy for the period 2009–2014 as well as its Implementation Plan will certainly concentrate our attention, because of the implications related to the adoption and active practice of such important planning tools, during the last two years.

The results and benefits of the current governance and working structure of the ICG/PTWS is another important topic that will be reported and discussed by Member States, which is extremely positive, if we consider the need of continuously improving the decision making process within our system. This assessment is particularly important, because of the occurrence of three tsunamis in the Pacific Ocean, since our last meeting in SAMOA, when the ICG precisely adopted such governance and working structure. In fact, the occurrence of these three tsunamis represents a unique opportunity of improvement for our system, which should be properly implemented by the ICG during this meeting, after a serious and objective discussion of the event's learned lessons.

For this reason and in my position of Chair of the Group, I would like to express in behalf of all Member States, my deep appreciation to the Government of CHINA for hosting this important event, and particularly for the hospitality shown by the people of this wonderful country. To all the Member States represented in this meeting, thank you for your presence, once again you have committed to the common effort of saving lives not only in your own countries but also in the entire Pacific Basin. Dear friends and colleagues, welcome to this new opportunity of improving the effectiveness of our system, welcome to the XXIV Session of the ICG-PTWS.

Mr Zhanhai Zhang
Director General of the State Oceanic Administration of China

Mr Director of the UNESCO Beijing Office,
Mr Chair of the UNESCO-IOC Intergovernmental Coordination Group
for the Pacific Tsunami Warning and Mitigation System,
Distinguished Delegates,
Ladies and Gentlemen,

Good afternoon.

At this time of transition between Spring and Summer, tsunami experts, scholars and government officials from all over the world have convened here in beautiful Beijing and have solemnly gathered for the twenty-fourth session of the Intergovernmental Oceanographic Commission's Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System. I have been entrusted by Chen Lianzeng, Deputy Administrator of the State Oceanic Administration (SOA), to represent the SOA in welcoming to each of the experts and representatives gathered here most warmly and sincerely.

Oceans are the source of life. Our boundless oceans have since time immemorial provided people with an abundant natural resource. At the same time, catastrophic damage inflicted by the oceans also seriously endangers people's livelihoods and personal safety. I am sure that the shocking events of 11 March 2011, when that gigantic earthquake and tsunami struck north eastern Japan remain fresh in everyone's memory. By its very nature, that event demonstrates the extreme necessity for, and importance of, work on tsunami warning and mitigation.

In 1960 UNESCO established its Intergovernmental Oceanographic Commission to organize and coordinate oceanographic research and cooperation within the international community, specifically founding the Tsunami Coordination Group to assist Member States in assessing their tsunami risk and in setting up tsunami early warning systems and disaster emergency response mechanisms, and thenceforward to enhance the major aspects of their work on tsunami early warning and measures to mitigate or protect against such natural disasters.

The Chinese Government has always paid close attention to the development of its activities relating to the oceans and has focused particularly keenly on research into ocean disasters and risk management. As soon as the State Oceanic Administration (SOA) was founded in 1964, it took on board the management and prevention of ocean disasters, the protection of the environment, the legal safeguards concerning the exercising of rights and responsibilities over the oceans, the organization of scientific and technological research into the ocean and other such obligations. The body hosting this session, the National Centre for Oceanic Environmental Forecasting, was established in 1965 and was assigned responsibility at the national level as the centre for oceanic disaster early warnings and work on such warnings. In 2006 it began work to put tsunami early warning into operation. After the massive earthquake and tsunami in Japan, the early warning centre had within twenty minutes accurately issued a tsunami alert for the coasts of the Chinese mainland, including Taiwan. Then, as the subsequent nuclear leak emergency developed, it provided an excellent service to both the general public and government planners.

Ladies and gentlemen, whether it is from the 2004 Indian Ocean earthquake and tsunami to the 2010 Chilean earthquake and tsunami or indeed to this year's gigantic earthquake and tsunami in Japan, every State now has a deeper understanding of the importance and necessity of strengthening international cooperation in addressing ocean disasters. China is very honoured to act as the organizer of this tsunami conference and stands ready to shoulder its due share of duties and responsibilities in the development of worldwide oceanic

affairs. China is willing to strengthen and deepen its dialogue and cooperation with every ocean-bordering nation and to promote actively the building of global tsunami early warning and mitigation systems, in particular for the South China Sea and adjacent areas. We wish to join in the global efforts to safeguard the authority of the United Nations Convention on the Law of the Sea and to continue to uphold the principles of “peace, development and cooperation”, while promoting the harmonious development of the oceans of the world, the scientific development and use of ocean resources, effective conservation of the health of oceanic ecological environments and the adoption of measures to mitigate the impact of ocean disasters. All of this is aimed at attaining the shared international target of harmonious and healthy oceans open to sustainable development, to which we shall make our own contribution, as appropriate.

Finally, I should like to wish this 24th session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System great success! I hope that you will all have a genuinely fruitful stay here in Beijing.

Thank you.

**Chinese version of the speech
of Mr Zhanhai Zhang**

尊敬的联合国教科文组织北京代表处主任 先生，

尊敬的联合国教科文组织政府间海洋学委员会太平洋海啸预警与减灾系统政府间协调组主席先生，

各位代表，各位女士们、先生们：

大家上午好！

在这春夏之交的季节里，来自世界各地的海啸专家、学者和政府官员聚会在美丽的北京，隆重召开联合国教科文组织政府间海洋学委员会太平洋海啸预警与减灾系统政府间协调组第二十四次会议。我受国家海洋局陈连增副局长委托，谨代表国家海洋局向本次会议的召开表示热烈的祝贺，对各位专家和代表的到来表示诚挚的欢迎和问候！

海洋是生命的起源地。浩瀚的海洋，长久以来给人类提供了丰富的资源。同时，海洋灾害也严重威胁着人类的生命财产安全。相信大家对两个多月前发生在日本东北部触目惊心的 3·11 特大地震海啸仍然记忆犹新。通过这次事件也说明海啸预警与减灾工作是非常必要和重要的。

联合国教科文组织早在 1960 年就成立了政府间海洋学委员会，组织、协调国际社会的海洋科学研究与合作，并专门建立了海啸协调组，帮助成员国评估海啸风险、建立海啸预警系统和灾害应急机制，在海啸预警与防灾减灾工作中发挥了重要作用。

中国政府历来关注海洋事业的发展，对海洋灾害研究、风险管理高度重视。国家海洋局自 1964 年建立之日起，一直肩负着海洋防灾减灾、环境保护、依法维护海洋权益、组织海洋科

技研究等职责。本次会议的承办单位——国家海洋环境预报中心，成立于 1965 年，是负责海洋灾害预警、预报工作的国家级业务中心，于 2006 年开始了海啸预警报的业务化工作。这次日本地震海啸发生后，预报中心在 20 分钟内及时、准确地发布了中国大陆包括台湾沿岸的海啸预警信息，并在其后发生的核泄露应急期间，为政府决策和社会公众提供了很好的服务。

女士们、先生们，从 2004 年的印度洋地震海啸，到 2010 年的智利地震海啸，再到今年的日本特大地震海啸，各国越来越深刻的意识到加强国际合作应对海洋灾害的重要性和必要性。中国很荣幸作为承办方组织此次海啸会议，并愿意承担在世界海洋事务发展进程中应尽的义务和责任，进一步加强与世界各海洋国家的深入交流与合作，积极推动全球，尤其是南中国海等周边地区的海啸预警与减灾系统建设。我们愿与世界各国一道共同维护《联合国海洋法公约》的权威性，坚持“和平、发展、合作”的主题，推动全球海洋的和谐发展，科学开发利用海洋资源，切实保护海洋生态环境健康，积极采取措施减轻海洋灾害，为实现建设和谐、健康和可持续发展的海洋这一国际社会共同的目标，做出自己应有的贡献。

最后，我预祝本届太平洋海啸预警与减灾系统政府间协调组第二十四次会议圆满成功！祝愿大家在北京度过一段美好时光。

谢谢

ANNEX IV

LOOKING BACK, LOOKING FORWARD: SCIENTIFIC, TECHNICAL, OPERATIONAL, AND PREPAREDNESS ASPECTS OF THE SAMOA 2009, CHILE 2010, AND JAPAN 2011 TSUNAMIS, (ICG/PTWS-XXIV WORKSHOP, 24 May 2011)

1. INTRODUCTION

A Technical Workshop was conducted on 24 May 2011 at the Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (Annex I). The Workshop provided an opportunity to share experiences and lessons learned from recent locally-destructive tsunamis and to discuss and elaborate on how effective the PTWS, both as a system and individually as countries, has been in providing early, timely warnings to communities at risk. Outcomes from the Workshop are intended to serve as a catalyst for improving the system. The PTWS Working Groups were requested to take into account the Workshop discussions and outcomes when formulating their Working Group recommendations to the ICG/PTWS-XXIV.

This Report summarizes the Workshop recommendations. During the Workshop, Speakers and Working Group chairs were asked to provide their interventions in the context of the PTWS Medium Term Strategy 2009–2013, and the following questions:

- How well prepared are countries for the next tsunami?
- Are risks known, warnings available, and awareness sufficient for effective response?
- What can be done better technically to strengthen national systems?
- What are warning centre and response operations gaps for local or distant tsunamis?
- Are there science research gaps that need to be addressed in order to improve warnings?
- Are communications systems adequate for alerting and responding?
- Is the current international system of a PTWC-centred Pacific system adequate for warning against tsunamis (both: distant and local /regional), or would a regional approach (PTWS as a system of systems) be more effective?

The PTWS Medium Term Strategy (MTS), 2009–2013, envisions that the PTWS as an “An interoperable tsunami warning and mitigation system based on coordinated Member State contributions that uses best practices and operational technologies to provide timely and effective advice to National Tsunami Warning Centres. As a result, PTWS communities at risk are aware of the tsunami threat, reduce risk, and are prepared to act to save lives.” The MTS builds from the ITSU (PTWS) Master Plan (1999, rev 2004[SC-99/WS/36]) which summarizes the mitigation of tsunami hazards in the Pacific.

The PTWS MTS is comprised of three Pillars supported by four foundational elements. The Pillars are:

- Risk Assessment and Reduction: hazard and risk identification and risk reduction,
- Detection, Warning and Dissemination: rapid detection and warning dissemination down to the last mile,
- Awareness and Response: public education, emergency planning and response.

The supporting foundational elements are:

- Interoperability: free, open and functional exchange of tsunami information,
- Research: enhanced understanding and improved technologies and techniques,
- Capacity Building: training and technology transfer,
- Funding and Sustainability: resources to sustain an effective PTWS.

Within each Pillar, prioritized activities, guided by the PTWS's foundational elements, should be undertaken with the aim of making populations at risk safer.

As the PTWS moves forward in the aftermath of the 2009–2011 events, careful and thoughtful thinking and review are again required to draw out and prioritise the critical, practical, and pro-active recommendations for countries and the PTWS to take action on.

2. LOOKING FORWARD: SUMMARY WORKSHOP RECOMMENDATIONS

Each PTWS Working Group Chair was asked to look forward and make recommendations for action to improve tsunami warning and mitigation of PTWS countries, considering the recent tsunamis in the context of the ITSU Master Plan (rev 2004) and PTWS Medium Term Strategy (2009–2013).

PTWS Working Group and the Task Teams should then align their work plan with the PTWS Medium Term Strategy and PTWS Implementation Plan priorities.

Governance

- A PTWS comprised of the entire Pacific Ocean needs to continue because of the cross-ocean nature of tsunamis; the PTWS was first started because an international system was identified as a requirement after the 1960 Chile tsunami.
- The international system of a PTWS is important. But, strengthening of the national and/or regional components is required as a country's first priority.
- In each country, Tsunami Warning Centre and Disaster Management Offices must work together in a coordinated and seamless manner for effective end-to-end tsunami warning and mitigation. Establishment of Tsunami Coordination Committees of stakeholders, comprising at a minimum scientists, warning centre, disaster management, is a practical and important mechanism for building a strong and sustainable system.
- The PTWS should promote the enhancement of the partnerships between disaster management, warning centres, and science generally in countries, and specifically within PTWS Working Groups and as part of ICG delegations.
- Within the PTWS, Regional Working Groups are essential to address the end-to-end approach in the appropriate manner considering to the specificities of the region (in terms of geography, networks, communications, culture and language, capacities, and governance). Regional organizations can play an important role in facilitating work plans. Active Regional Working Groups are also essential since travel costs and distances often prevent all countries from attending every ICG/PTWS.

Awareness and Response (Working Group 3)

- Tsunami preparedness, through education and awareness and which is pertinent to communities are the key elements and pillar for saving lives, especially for local tsunamis.
- Public awareness and education are required beforehand for quick response – and both must be maintained for decades or longer because of the infrequency of tsunamis.
- The development of community-based tsunami hazard maps, evacuation zones, safe places, and routes (with sign posting), based on historical data and numerical modelling of worst case scenarios, will greatly improve the effectiveness of tsunami response.
- Preparedness through exercise and drills helps to increase readiness and sustain awareness, and should be conducted regularly at the international to community levels. Within organizations, exercises and post-event reviews enable response plans, protocols, and procedures to be tested, reviewed, and where needed, corrected and improved.

Risk Assessment and Reduction (Working Group 1)

- There is an urgent priority to identify the largest potential tsunami sources and provide the best estimated parameters for inundation modelling. This is because the last three large tsunamigenic earthquakes were not expected in the short term. Research on historical and paleo-tectonic earthquakes and tsunamis is still needed.
- Internationally-coordinated and national post-tsunami field surveys are necessary in order to collect the data that will improve mitigation, e.g., understand impacts, assess hazard and risk, calibrate numerical models, and improve warning.
- Coordination of international tsunami survey teams, at the request of the affected country, is important especially to respect that response, saving lives, and public safety should take highest priority. Pre-event planning, such as through bi-lateral or regional agreements, is essential for success since the days immediately after a destructive tsunami are extremely hectic and logistics and communications will be less than ideal.
- Due to the many different modelling softwares being utilized, a report giving an overview of software available, their advantages and disadvantages (limitations), and applicability for different scenarios, is needed. Benchmarking standards should be endorsed globally.
- Development of building design standards for safe use of tall buildings for vertical evacuation is desirable. In places where there is no time to escape inland and to higher ground from a local tsunami, these buildings can serve as temporary vertical refuges. Coastal areas prone to tsunami flooding should be designated as non-build zones for critical infrastructure or schools, hospitals, and first responder facilities.

Detection, Warning, and Dissemination (Working Group 2)

- Detection, warning and dissemination all need to be improved, particularly for regional and local events. Sensitivity analyses should be conducted to identify network detection gaps. New geophysical and oceanographic data types and better and faster methods of earthquake source characterisation, along with

tsunami wave forecast products, need to be implemented. More robust and affordable communication systems for rapid alert notification, especially in geographically remote locations, are needed.

- Improvement and expansion of the sea level and seismic networks is still needed. Denser networks result in faster detection, analysis, and threat assessment message issuance.
- For local tsunamis, faster warnings are required. Pre-calculating impacts for near-shore scenarios should be done for all vulnerable coasts.
- Warning Centres, supported by their national or regional/international agencies, should invest in efforts to use and understand forecast models to enable more effective alerting (e.g., implement warnings using terminology based on assessments of threat level by coastal zones). Training must be an important part of the process of moving to a threat level based system.
- Because forecasts will guide tsunami response, impact estimation, and public safety advice, the various forecast models in use need to be rigorously compared to give confidence in their validity. See Recommendation under Working Group 1.
- Member States are encouraged to collaborate on the development of inundation modelling tools for response and evacuation planning, and interoperable forecast tools and products for warning. The collaboration can be in the form of joint workshops and training, joint development of compatible forecast products, comparisons of forecast products, or other information sharing.
- PTWS post-event assessments after major tsunami events must be conducted in order to continue to monitor the effectiveness of the system in terms of accuracy, robustness, timeliness, and usefulness of the international, basin-wide system and its products.

ANNEX V

**REPORT OF TASK TEAM ON ENHANCING PTWS
TSUNAMI WARNING PRODUCTS**

(IOC/ICG-PTWS-XXIII/3)

Charles McCreery (Task Team Chair)

Summary Report and Recommendations of the PTWS Task Team
on Enhancing Tsunami Warning Products

1. INTRODUCTION

During the Twenty-second and Twenty-third sessions of the ICG/PTWS, the PTWC Director reported on operational enhancements that are now permitting the PTWC to provide more timely and accurate assessments of tsunami threat, and asked Member States for input on how PTWC can improve its services. In response, Recommendation ICG/PTWS-XXIII.1 (Annex III) established a Task Team on Enhancing Tsunami Warning Products under Working Group on Detection, Warning and Dissemination (WG2) to review current capabilities, obtain customer feedback, consider best practices, and develop recommendations to improve existing or create new products, and improve dissemination for more effective, functional, and timely delivery.

On 1 March 2011, at the PTWS WG2 Meeting held in Wellington, New Zealand, a meeting of its Task Team on Enhancing Tsunami Warning Products was held (see PTWS WG 2 Report ANNEX for March Task Team report). Dr Charles McCreery, PTWC Director, was appointed Task Team Chair and all WG2 members that were present attended the Task Team meeting. At this Task Team meeting, the Chair presented several ideas regarding changes to PTWC products, based upon enhanced capabilities of PTWC in terms of its speed of response and growing ability to forecast impacts.

To follow-up on these discussions, a further meeting was held in Honolulu, Hawaii on 11 and 13 April 2011 to coordinate any proposed changes between PTWC and the NWPTAC (ANNEX II). The last day of the meeting discussed the conduct of Exercise Pacific Wave 2011 (PACWAVE 11) and the coordination between PTWC and NWPTAC. This three-day meeting was attended by the PTWC and ITIC Directors, the Japan Meteorological Agency's Senior Coordinator for International Earthquake and Tsunami Information, Chairs of the PTWS Southwest Pacific and South China Sea Working Groups, the Deputy Director of the Indonesian Meteorological, Climatological, and Geophysical Agency, and the PTWS Exercises/PACWAVE 11 Co-Chairs. The Chairs of PTWS Working Group 1 (Tsunami Risk Assessment and Reduction), Working Group 3 (Awareness and Response), and a representative from the IOC Tsunami Unit joined by teleconference for initial and summary discussions, and provided input by e-mail to notes.

This Report summarizes of the meeting discussions on Enhancing Tsunami Warning Products and provides a proposal to the ICG/PTWS for going forward (ICG/PTWS-XXIV Agenda item 4.1).

The Report on PACWAVE 11 planning is provided in a separate ICG/PTWS-XXIV Working Document (Agenda item 4.2).

2. BACKGROUND

Over the past decade, PTWC has gone from ingesting data from only about 10 seismic stations outside of Hawaii to over 300 stations now. In addition, its seismic data processing capabilities have become faster and more accurate due to a combination of a better

information technology (IT) and communications infrastructure as well as improved science and techniques of its implementation. Within about the past five years, especially since the 2004 Indian Ocean tsunami, the quantity, quality, and timeliness of sea level observations available to PTWC have also increased dramatically. Notably, data are now being received from 38 deep-ocean tsunami gauges in the Pacific that provide measurements of tsunami waveforms unaltered by non-linear effects near the coast. Lastly, numerical forecast models have been implemented at PTWC over the past several years that have demonstrated, in recent tsunamis, that they are capable of providing more detailed and precise guidance on the expected level of tsunami impacts than is possible under PTWC's current PTWS warning procedures and criteria that are based only on limited historical data and general properties of tsunami generation, propagation and impact. While the predictive capabilities of the forecast models are not perfect, they should be accurate enough to greatly reduce the number of areas warned unnecessarily, while also providing general guidance on the expected levels of impact to areas that are threatened.

3. TASK TEAM RECOMMENDATIONS

As a result of the PTWC improvements, the Task Team makes four recommendations.

1. *PTWC will lower its current initial warning threshold from magnitude 7.6 to magnitude 7.1 in order to provide some advance notice of potential local tsunamis.* A decade ago, when PTWC's initial bulletin was disseminated 30 minutes to an hour after the earthquake, it could not be effective against local tsunamis generated by smaller earthquakes. Now, however, with a response time of 10 minutes or less for many earthquakes, it would be possible to provide advance notice for some local tsunamis. A magnitude 7.1 threshold is already being used by PTWC for potential destructive local tsunamis in the Indian Ocean and Caribbean Sea.
2. *PTWC will begin using tsunami forecast models to classify the level of threat for sections of coast around the Pacific. Five levels of tsunami threat will be established, and supplemental products will be issued.* The current procedures, putting areas within 1000 km of the epicentre in a warning for earthquakes with magnitudes of 7.6 to 7.8, and putting areas within three hours of impact in a warning and within three to six hours in a watch, would be abandoned in place of a classification scheme of warning threat for particular sections of coast that is generally in line with the recommendations put forth by the Inter-ICG Task Team on Tsunami Watch Operations of the UNESCO/IOC Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG). Based on tsunami forecast model guidance, for each pre-defined section of coast there would be the possibility of four levels of threat and one level of potential threat.
3. *PTWC will revise its suite of text and graphical products to accommodate the changes proposed above, to provide more information, and to make the dissemination of that information more effective. An experimental products phase, with sufficient feedback opportunity and training on the new products, will occur before the final changeover.*
4. *A Task Team on PTWS Experimental Products should be created, or the current Task Team on Enhancing Tsunami Warning Products should be continued.* The Task Team will provide PTWC with guidance during the inter-sessional period regarding details on the development, implementation, and evaluation of these changed procedures and products.

4. IMPLEMENTATION DETAILS

Details of the proposed changes and their implementation by PTWC are provided in the outline below.

1. PTWC will develop procedures for using its tsunami forecast models (RIFT, SIFT, AFTM) in an experimental mode and targeting introductory use of the models for the PACWAVE 11 Exercise.
 - a. Motivation and Purpose:
 - Reduce the area of coast that is warned unnecessarily.
 - Provide estimation for multiple levels of impacts.
 - Provide threat levels to more finely divided sections of coast.
 - b. Provide for the following five levels of tsunami threat:
 - No threat or only small sea level changes.
 - Coastal and Marine threat (expected maximum amplitude is 0.5 – 1.0 m.).
 - Land threat (expected maximum amplitude is 1.0 – 3.0 m.).
 - Major land threat (expected maximum amplitude is > 3.0 m.).
 - Potential threat. Standby as still evaluating. This is provided as a ‘heads up’ that there may be a threat. It should be available before impact. Currently, it is termed a ‘watch’ and issued at least three hrs in advance of the first wave arrival, but the proposal is to make it available as soon as possible.
 - c. Provide threat information by forecast segments:
 - Information to consist of threat level and arrival time estimate.
 - Segments every ~100–300 km depending on location. (NWPTAC uses forecast points, so the PTWC and NWPTAC will need to coordinate on forecasts provided. Forecasts by each will provide range and complement each other. In case of differences, most conservative estimate should be used for greatest safety).
 - For islands, use island groups. Subdivide only if islands are too far apart. Also, for very small islands, for coastal forecast, note that the deep ocean value is applicable, as Green’s Law is not applicable.
 - Countries, territories, or other major political entities will be separated.
 - d. Staging of threat level messages as event evolves (for country locations before wave arrival). Describes when and what information is included in messages sent as time evolves.
 - The initial message is based on the preliminary seismic parameters and is a conservative application of the forecast. It goes to all countries and cautions that even areas outside the current threat area could be upgraded – provides the potential threat level. (To be issued usually in 5–10 min.).
 - The second message is based on updated seismic analysis (magnitude and Centroid Moment Tensor, CMT) and conservative application of forecast only. (to be issued usually at ~30 min). It may also provide the earliest reading(s) of any tsunami waves.
 - The third and later forecast messages are based on sea-level observation(s) and sea level observations(s)-constrained model forecast (to

be issued at ~1 hour and continuing every hour or more frequently if needed).

- e. Reduction of threat levels (for country location after wave arrival) :
 - Based on observations after first wave arrival and impact. Usually downgrade one threat level at a time.
 - Will not go all the way to No Threat level, e.g., will leave at Coast and Marine Threat level. No Threat Cancellation to be issued since local can continue for several more or many hours. It should be the authority of national and local authorities to evaluate when the threat has completely passed for their jurisdictions.
2. PTWC will develop procedures for issuing alerts for potential local tsunamis.
 - a. Establish criteria for the local tsunami threat:
 - Establish earthquake magnitude threshold to greater than 7.0 (same as for the Indian Ocean and Caribbean Sea).
 - Hypocenter Depth < 100 km (same).
 - Under or near the sea (same). Note: If the computed epicentre is on land but not too far from the sea, then the judgement of the analyst is applied in determining an earthquake's tsunamigenic potential. Considerations include the accuracy of the epicentral computation as well as the potential size of the entire rupture zone which can have lateral dimensions of 100 km or more for great earthquakes.
 - b. Areas of Threat:
 - Threat-based – very conservative application of the numerical forecast for any marine and/or land threat.
 - c. Levels of Tsunami Threat:
 - Same threat levels as above.
3. PTWC Message Products.
 - a. Text products:
 - Reorganization of content:
 - Narrative section with most critical information (feasibility and usefulness of multiple languages?)
 - Tabular section:
 - a. ETAs, forecast, observations.
 - b. Earthquake parameters (include earthquake fault type after CMT available, e.g., "strike-slip", "normal fault" or "shallow thrust"?)
 - Public or private
 - GTS text message is public.
 - Web can be public and/or private.
 - Fax, e-mail (will contain threat maps – including CMT with beach ball, also include descriptor of "strike-slip" or "normal fault" or "shallow thrust", other parameters – strike, slip, rake, dip), SMS private.

- Possibly PTWC W-phase CMT can be provided to technical centres that can use this kind of information.
- b. Website – public and/or private:
 - Text Products
 - Map or Maps
 - Travel time
 - Historical earthquakes
 - Historical tsunamis
 - Propagation forecast
 - Coastal forecast (private or public to be decided later)
 - Sea level gauges
 - Table or Tables
 - ETAs (1ST arrival, 1ST wave over threshold, maximum wave, last significant wave).
 - Coastal forecast values (private or public to be decided later).
 - Observations
 - Map of Coastal and Deep Ocean Gauges
 - a. Maximum wave amplitudes
 - b. Waveforms
 - Table of maximum wave amplitudes
- c. E-mail (text plus some of the above-mentioned graphical products) – private.

5. IMPLEMENTATION TIMELINE

The following timeline is proposed for the coordinated implementation of enhanced tsunami warning products by PTWC and NWPTAC:

2011

May: ICG/PTWS XXIV in Beijing

Report under item 4.1. ENHANCING PTWS TSUNAMI WARNING PRODUCTS

- PTWC to propose new enhanced products.
- Discussion and Member States approve or request changes.
- PTWS Exercises Task Team briefs Member States on PACWAVE 11.
- If approved, PTWC to implement interim procedures (experimental products) for use during PACWAVE 11. Feedback from PACWAVE 11 used to finalize PTWC procedures and products for operations.

Create PTWC Experimental Products Task Team, or continue Enhancing Tsunami Warning Products Task Team.

Terms of Reference:

- Develop evaluation methodology to be used in PACWAVE exercises in coordination with the PTWS Exercises Task Team.
- Provide feedback to PTWC on its experimental products, and further improvements.
- Recommend and report to ICG/PTWS-XXV on the implementation of the PTWC products.

Members:

- Regional WG Chairs.
- WG 1, WG 2, WG 3 Chairs.
- Directors of National Tsunami Warning Centres (NTWCs) from interested Member States.
- PTWC and NWPTAC, as ex-officio members.
- ITIC, as ex-officio member.

9 and 10 November: PACWAVE 11

November to ICG/PTWS-XXV – Experimental phase

PTWC:

Before PACWAVE 11:

- Continue to Issue messages in the existing format and same content.
- PTWS Users Guide updated to include enhanced PTWC products for PACWAVE 11:
 - Explain: Threat levels, Forecasts, Local tsunami threat, Format.
 - Explain: Staging, Graphics, and Dissemination.
 - Examples of messages and products.

During PACWAVE 11:

- New message format.
- New Threat Levels.
- Supplemental forecast information (RIFT propagation and coastal).
- After PACWAVE 11 (in 'shadow' mode).
- Continue with 'old' products using normal communications methods.
- Continue with interim procedures and experimental products made available in another communications method (to issue by e-mail through rest of inter-session period).

NWPTAC (JMA) – Before, during, and after PACWAVE 11

- Continue to issue messages in the existing format and same content.
- Investigation for the improvement of NWPTA.

2012

9 Feb (due 90 days after PACWAVE 11)

PACWAVE 11 Evaluation Questionnaire.

- Member States and TWFPs comment and evaluate interim PTWC procedures and experimental products through PACWAVE 11 evaluation questionnaire.

May (six months after PACWAVE 11)

PTWS Exercise Task Team, PTWS Experimental Products Task Team Meeting (PTWC-JMA Coordination Meeting included) and PTWS Steering Committee.

- Task Team analysis of the Evaluation Questionnaire responses from MS.
- PTWC provides report on its implementation issues and feedback for new procedures/products.
- PTWC to finalize procedures and experimental products for operations
- Plan another PACWAVE (in 2012 or 2013) exercise using PTWC experimental products before official changeover. This exercise should be used to validate the new PTWC products and procedures.
- NWPTAC reports the status of the investigation for their enhanced product.
- PTWS Steering Committee to endorse new PTWC products and procedures, and ask that PTWC finalize its products and procedures operations for final approval at ICG/PTWS-XXV and changeover shortly afterward.

May – ICG/PTWS-XXV

- PTWC New Enhanced Tsunami Products Workshop: Training to inform Member States on new products; done by each Region in coordination with Regional WG.

2013

Mars (tentative)

PTWS Experimental Products Task Team Meeting (PTWC-JMA Coordination Meeting included), PTWS Exercises Task Team.

- NWPTAC propose enhanced NWPTA product and procedures if the necessity is identified.
- Planning for PACWAVE that will use NWPTAC enhanced new products in experimental mode.

From April to May (tentative)

ICG/PTWS-XXV

- PTWC new products and procedures approved; implementation date agreed.
- NWPTAC (JMA) proposes enhanced new tsunami warning products based upon the conclusions of the PTWS Experimental Products Task Team Meeting tentatively scheduled for March of 2013.
- Discussion and Member States approve or request changes for NWPTAC.
- NWPTAC to implement interim procedures (experimental products) for use during next PACWAVE exercise. Feedback from PACWAVE used to finalize NWPTAC procedures and products for operations.

ANNEX VI

LIST OF PARTICIPANTS

ICG Officers

Lt Giorgio DE LA TORRE
Chair

Researcher
Instituto Oceanográfico de la Armada
del Ecuador
Instituto Oceanográfico de la Armada
Base Naval Sur, Vía a Pto. Marítimo
Ecuador
Tel: 593-4-2481300 / 593-9-6342814
Email: gdtorre@inocar.mil.ec

Ms Filomena NELSON
Vice-Chair
Principal Disaster Management Officer
Disaster Management Office
Ministry Of Natural Resources &
Environment
Apia, Samoa
Tel: 685 20856
Fax: 685 23176
Email: filomena.nelson@mnre.gov.ws

MEMBER STATES

Australia

Mr Rick BAILEY
Head of Delegation
Project Director
Bureau of Meteorology, Melbourne
700 Collins Street
Docklands
GPO Box 1289
Melbourne VIC 3001
Australia
Tel: 61 3 9669 4103
Fax: 61 3 9669 4660
Email: R.Bailey@bom.gov.au

Mr Daniel JAKSA
Co-Director, Joint Australian Tsunami
Warning Centre
Geoscience Australia
Cnr Jerrabomberra Ave and Hindmarsh
Drive
Symonston
Canberra ACT 2609
Australia

Tel: +61 (0)2 6249 9685
Fax: +61 (0)2 6249 9984
Email: Daniel.Jaksa@ga.gov.au

Mr Tony LEGGETT
Coordinator of Australian National
Meteorological and Oceanographic Centre
Operations Centre
Bureau of Meteorology, Melbourne
700 Collins Street
Docklands
GPO Box 1289
Melbourne VIC 3001
Australia
Tel: +61 (0)3 9669 4033
Email: t.leggett@bom.gov.au

Canada

Dr Garry ROGERS
Head of Delegation
Scientist
Natural Resources Canada, Geological
Survey of Canada
9860 West Saanich Road
Sidney V8L 4B2
British Columbia
Canada
Tel: 01 250 363 6450
Fax: 01 250 363 6565
Email: grogers@nrcan.gc.ca

Chile

Captain Patricio CARRASCO
Head of Delegation
Director
Hydrographic and Oceanographic Service
of the Chilean Navy
Valparaíso
Chile
Tel: +56 32 22 66 502
Fax: +56 32 22 66 542
Email: director@shoa.cl

Lt. Commander Miguel VÁSQUEZ
Head of Oceanography Department
Hydrographic and Oceanographic Service
of the Chilean Navy
Errázuriz 254, Playa Ancha,

Valparaíso,
Chile
Tel: 56-32-2266670/56-32-2266671
Fax: 56-32-2266542
Email: mvasquez@shoa.cl

China

Dr Zhanhai ZHANG
Head of Delegation
Director-General Dept. of International
Cooperation
State Oceanic Administration
1, Fuxingmenwai Avenue
100860 Beijing
Beijing
China
Tel: 86-10-68060086
Fax: 86-10-68048051
E-mail: zhangzhanhai@pric.gov.cn

Mr Li BAOHUI
Deputy Director
Department for Marine Disaster Warning
National Marine Environmental
Forecasting Center
China
E-mail: libh@nmefc.gov.cn

Li DAHUI
Research Professor, China Earthquake
Network Center
China Earthquake Administration
China
Email: ldh@seis.ac.cn

Ms Jianxi DONG
National Marine Environmental
Forecasting Center / State Oceanic
Administration
100081 Beijing
China
China
Email: djx@nmefc.gov.cn

Dr Long JIANG
Research Associate
National Marine Environmental
Forecasting Center / State Oceanic
Administration
100081 Beijing
China
Email: jiangl@nmefc.gov.cn

Mr Hing-Yim MOK
Senior Scientific Officer
Hong Kong Observatory
The Hong Kong Observatory
134A Nathan Road
Hong Kong, China
Hong Kong
Tel: +(852) 2926 8451
Fax: +(852) 2311 9448
Email: hymok@hko.gov.hk

Mr Yafeng YANG
Program Officer
State Oceanic Administration
1, Fuxingmenwai Avenue
100860 Beijing
Beijing
China
Tel: 86-10-68048051
Email: yyf@soa.gov.cn

Dr Fujiang YU
Deputy Director
National Marine Environmental
Forecasting Center / State Oceanic
Administration
100081 Beijing
China
Tel: +86 10 62105732
Fax: +86 10 62173620
Email: yufj@nmefc.gov.cn

Mr Lianda ZHAO
Scientist
National Marine Environmental
Forecasting Center / State Oceanic
Administration
100081 Beijing
China
Tel: +86 10 62173615
Fax: +86 10 62173620
Email: zld@nmefc.gov.cn

Ecuador

Cmd. Jorge CARDENAS AMORES
Head of Delegation
Director
Instituto Oceanográfico de la Armada del
Ecuador
Ave. 25 de Julio, (Avenida de la Marina)
via Puerto Nuevo
Base Naval Sur 5940
Guayaquil

Guayas
Ecuador
Tel: 593-04-481300 / 593 04 481100
Fax: 593-4-2485166
Email: jcardenasa@hotmail.com

Ing Jorge ESPINOZA AMAGUAÑA
Asesor
Secretaría Nacional de Gestión de
Riesgos
Av. Francisco de Orellana y Justino
Cornejo Mz. 106
Ed. del Gobierno zonal de Guayaquil 5to
Piso
Guayaquil
Guayas
Ecuador
Tel: 593-04-2-684215
Fax: 593-04-2683869
Email: jespinoza@snriesgos.gob.ec

Blg Maria Lourdes IDROVO
Asesora
Secretaría Nacional de Gestión de
Riesgos
San Cristobal - Galápagos
Puerto Baquerizo Moreno
San Cristobal -Galápagos
Ecuador
Tel: 5935 2520116
Email: midrovo@snriesgos.gob.ec

France

Dr François SCHINDELÉ
Head of Delegation
International expert
CEA/DIF/DASE
Bruyères le Châtel
91297 ARPAGON Cedex
France
Tel: +33 1 69 26 50 63
Fax: +33 1 69 26 70 85
Email: francois.schindele@gmail.com

Dominique REYMOND
Geophysicist in charge
Laboratoire de Géophysique,
Commissariat à l'Energie Atomique
(CEA/DASE/LDG),
CEA/DASE/LDG
98713 Papeete
French Polynesia
Tel: (689) 82 80 25

Fax: (689) 83 50 37
Email: reymond.d@labogeo.pf

Indonesia

Dr Wandono WANDONO
Head of Delegation
Head of Earthquake and Tsunami
Warning Division
Meteorological Climatological and
Geophysical Agency
Jakarta 10720
Indonesia
Tel: +62 21 6546316
Fax: +62 21 6546316
Email: wandono@bmkg.go.id

Japan

Mr Takeshi KOIZUMI
Head of Delegation
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
Email: t-koizumi@met.kishou.go.jp

Mr Tomoaki OZAKI
Senior Coordinator for Tsunami Forecast
Modeling
Japan Meteorological Agency, Tokyo
1-3-4 Otemachi Chiyoda-ku
100-8122
Tokyo, Japan
Tel: +81 3 3212-8341ex. 4839
Fax: +81 3 3215 2963
Email: tozaki@met.kishou.go.jp

Malaysia

Dr Mohd Rosaidi CHE ABAS
Head of Delegation
Director of Geophysics & Tsunami
Division
Marine Meteorological & Oceanography
Department Malaysia
Malaysian Meteorological Department
Jalan Sultan
46667 Petaling Jaya
Selangor, Malaysia
Tel: 603-79678000

Fax: 603-79550964
Email: rosaidi@met.gov.my

New Zealand

Mr David COETZEE
Head of Delegation
Manager, Operations
Ministry of Civil Defence & Emergency
Management
PO Box 5010
Wellington, New Zealand
Tel: +64 (4) 495 68068/+64 (4) 495 6806
Fax: +64 (4) 473 9596
Email: david.coetzee@dia.govt.nz

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
Email: K.Gledhill@gns.cri.nz

Peru

Commander Atilio ASTE
Head of Delegation
Head of Oceanography
Direction of Hydrography and Navigation
of the Navy's war in Peru
Roca Street Countless
Lima
Lima
Peru
Tel: 511-01-4202122
Email: aaste@dhn.mil.pe

Republic of Korea

Mr Yonghae OH
Head of Delegation
Earthquake monitoring Division
Korea Meteorological Administration
45 Gisangchung-gil Dongjak-gu
Seoul 156-720
Korea Rep
Tel: 82-2-2181-0782
Fax: 82-2-831-8746
Email: ooh@korea.kr

Mr Myeongsu KIM
Korea Meteorological Administration
Earthquake Monitoring Division,

45 Gisangchung-gil Dongjak-gu
Seoul 156-720
Korea Rep
Tel: 82-2-2181-0794
Fax: 82-2-831-8746
Email: Olympus97@korea.kr

Russian Federation

Mr Igor P. KUZMINYKH
Head of Delegation
Deputy Head
Central Design Office for
Hydrometeorological Instrument
Production , Scientific Production
Association "Typhoon"
4 Pobeda Street Obninsk
Kaluga Region, 249038
Russian Federation
Tel: (+7 084 39) 6 23 03
Fax: (+7 084 39) 6 44 53
Email: kuz@ckb.obninsk.org

Dr Tatiana IVELSKAYA
Chief
Sakhalin Tsunami Warning Center,
Federal Service of Russia for
Hydrometeorology and Environmental
Monitoring
78, Zapadnaya Str,
Yuzhno-Sakhalinsk, 693000
Russian Federation
Email: tanya.iveliskaya@gmail.com

Mr Alexander V. NIKOLAEV
State Institution of the Kamchatka
Administration for Hydrometeorology and
Environmental Monitoring,
Tsunami Warning Center
12, Molchanov St.
Petrovsk-Kamchatsky, 683602
Russian Federation
Tel: +7(41522) 58444
Email: tsunami@kammeteo.ru

Mr Lev RYZHKOV
Tsunami Warning System Supervisor
Federal Service for Hydrometeorology and
Environmental Monitoring, Moscow
Novovagankovsky Per., 12
Moscow, 123995
Russian Federation
Tel: +7 499 795 20 36
Fax: +7 499 795 20 90
Email: icedep@mcc.mecom.ru

Ms Tatiana P. SCHERBININA
State Institution of the Primoriye
Administration for Hydrometeorology and
Environmental Monitoring,
Tsunami Warning Center
Postal Address: 3, Mordovtsev St.
Vladivostok, 690600
Russian Federation
Tel: + 7(4232) 220574
Email:
Tatyana.Scherbinina@primpogoda.ru

Samoa

Ms Filomena NELSON
Principal Disaster Management Officer
Disaster Management Office
Ministry Of Natural Resources &
Environment
Apia, Samoa
Tel: 685 20856
Fax: 685 23176
Email: filomena.nelson@mnre.gov.ws

United States of America

Dr Charles (Chip) MCCREERY
Head of Delegation
Director PTWC
RH Hagemeyer Pacific Tsunami Warning
Center
91-270 Fort Weaver Rd, HI 96706
United States
Tel: 808-689-8207 x301
Fax: 808-689-4543
Email: charles.mccreery@noaa.gov

Ms Paula DUNBAR
Physical Scientist
NOAA/NGDC/NDC
325 Broadway E/GC3
Boulder, CO 80305-3328
United States
Tel: 303-497-6084 Fax: 303-497-6513
Email: paula.dunbar@noaa.gov

Dr Laura KONG
Director ITIC
UNESCO IOC 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
Email: l.kong@unesco.org;
laura.kong@noaa.gov

Ms Jennifer LEWIS
International Analyst
National Weather Service
NWS-NOAA
1325 East West Hwy
Silver Spring MD 20109
United States
Tel: 301-713-0645x109
Email: Jennifer.Lewis@noaa.gov

Dr Vasily TITOV
Leader Center for Tsunami Research
NOAA Pacific Marine Environmental
Laboratory
NOAA/PMEL, 7600 Sand Point Way NE,
Bldg. 3, Seattle, WA 98115
Seattle WA 98115
United States
Tel: +1 (206) 526 4536 Email:
vasily.titov@noaa.gov

Mr Bill WARD
Environmental Scientific and Services
Division Chief
National Weather Service,
Pacific Region HQ
Grosvenor Center, Mauka Tower
737 Bishop Street, Suite 2200
Honolulu Hawaii HI 96813-3201
United States
Tel: +18085326415
Fax: +18085325569
Email: bill.ward@noaa.gov

Vietnam

Dr NGUYEN Hong Phuong
Head of Delegation
Professor, Deputy Director
Vietnam Earthquake Information and
Tsunami Warning Center,
Institute of Geophysics, Vietnam Academy
of Science and Technology
18 Hoang Quoc Viet street, Cau Giay
District
Hanoi
Vietnam
Tel: (84-4) 39940320
Fax: (84-4) 37914593
Email: phuong.dongdat@gmail.com

Observers

Yang CHAO
President
Proteus solutions limited
Hairun international B4D, chaoyang
Beijing
China
Tel: 86-13901039623
Email: yangallio@hotmail.com

Mr Robert LAWSON
Director International Tsunami Buoy
Program /SAIC
Science Applications International
Corporation, San Diego
4025 Hancock Street, San Diego, CA
San Diego California 92110
United States
Tel: 1-858-826-1166
Fax: 1-858-826-1521
Email: lawsonra@saic.com

Mr J. Austin TURNER
Second Secretary - Science and
Technology Officer
Embassy of the United States of America
100600 Beijing
China
Tel: 8610-8531-4792
Fax: 8610-8531-3939
Email: turnerja2@state.gov

UNESCO/IOC Secretariat

Mr Bernardo ALIAGA
Programme Specialist
Tsunami Unit
Intergovernmental Oceanographic
Commission of UNESCO
1 rue de Miollis
75732 cedex 15
France
Tel: +33 1 45 68 39 80
Fax: +33 1 45 68 50 10
E-mail: b.aliaga@unesco.org

Mr Tony ELLIOTT
Head of ICG/IOTWS Secretariat,
Programme Specialist

Intergovernmental Oceanographic
Commission of UNESCO
IOC/UNESCO Perth Regional Programme
Office
c/o Bureau of Meteorology
PO Box 1370, West Perth
1100 Hay Street
Perth WA 6872
Australia
Tel: +61 8 9226 0191
Fax: +61 8 9226 0599
E-mail: t.elliott@unesco.org

Mr Rajendra PRASAD
National Programme Officer for DRR &
Tsunami Warning
Intergovernmental Oceanographic
Commission of UNESCO
c/o SPC - SOPAC Division
Mead Rd, Suva, Fiji
Suva
Tel: 679-3381377
Fax: 679-3370040
E-mail: r.prasad@unesco.org

Mr Wenxi ZHU
Head, IOC-UNESCO Regional Secretariat
for WESTPAC
Intergovernmental Oceanographic
Commission of UNESCO
c/o The Department of Marine and
Coastal Resources (DMCR)
Ministry of Natural Resources and
Environment
9th Fl. Government Complex B, Lak Si,
Bangkok 10210
Thailand
Tel: +66 2 141 1287
Fax: +66 2 143 9245
E-mail: w.zhu@unesco.org

Local Secretariat (NMFEC)

Lu ZHANG
Foreign Secretary
Operational Technology Division
National Marine Environmental
Forecasting Center (NMEFC)
Phone: +86-15801636186
Fax: +86-010-62105726
Email: zhangl@nmefc.gov.cn

ANNEX VII

LIST OF ACRONYMS

AFTN	Aeronautical Fixed Telecommunication Network
AusAID	Australian Agency for International Development
BMKG	Agency for Meteorology Climatology and Geophysics of Indonesia
BoM	Bureau of Meteorology
CEPREDENAC	Coordination Centre for Prevention of Natural Disasters in Central America
CHS	Canadian Hydrographic Service
CISN	California Integrated Seismic Network
COMET	Cooperative Program for Operational Meteorology, Education and Training
CPPS	Permanent Commission for the South East Pacific
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization
CTIC	Caribbean Tsunami Information Centre
CTIC	Caribbean Tsunami Information Center
CTWC	Caribbean Tsunami Warning Centre
CTWC	Caribbean Tsunami Warning Center
DART	Deep-ocean Assessment and Reporting of Tsunamis
DIPECHO	Disaster Preparedness ECHO
DMO	Disaster Management Organisations
EMWIN	Emergency Managers Weather Information Network
ETA	Estimated Time of Arrival
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSC	Geological Survey of Canada
GTS	Global Telecommunication System
ICG	Intergovernmental Coordination Group
ICG/CARIBE-EWS	Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System
ICG/PTWS	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System
INOCAR	Instituto Oceanográfico de la Armada
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange

	Programme
IOTWS	Ocean Tsunami Warning and Mitigation System
ITIC	International Tsunami Information Centre
ITST	International Tsunami Survey Team
ITSU	Tsunami Warning System in the Pacific
JATWC	Joint Australian Tsunami Warning Centre
JMA	Japan Meteorological Agency
JTIC	Jakarta Tsunami Information Center
KMA	Korea Meteorological Administration
KNSN	Korea National Seismographic Network
MCDEM	Ministry of Civil Defence & Emergency Management
MOST	Method of Splitting Tsunami
MTS	Medium-Term Strategy
NDMO	National Disaster Management Office
NMEFC	National Marine Environmental Forecasting Center
NOAA	National Oceanic and Atmospheric Administration
NRCMEF	National Research Centre for Marine Environment Forecasts
NTWC	National Tsunami Warning Centre
NWPTAC	Northwest Pacific Tsunami Advisory Center
NZAid	New Zealand Agency for International Development
PACWAVE	Pacific Wave
PEP	Programme Execution Plan
PTWC	Pacific Tsunami Warning Center
PTWS	Pacific Tsunami Warning and Mitigation System
PWLN	Permanent Water Level Network
RANET	Response Assistance Network
RTSP	Real Time Streaming Protocol
RTSPs	Regional Tsunami Services Providers
SCS	South China Sea
SHOA	Hydrographic and Oceanographic Service of the Navy
SNAM	Sistema Nacional de Alerta de Maremoto
SOA	State Oceanic Administration of China
SOP	Standard Operating Procedure
SOPAC	Secretariat of the Pacific Community
SPC	Secretariat of the Pacific Community
SWP	South West Pacific
TIC	Tsunami Information Centre

TNC	Tsunami National Contact
ToT	Training of Trainers
TOWS-WG	Working Group on Tsunamis and Other Hazards Related to Sea Level Warning and Mitigation Systems
TT	Task Team
TTT	provides Tsunami Travel Time
TWFP	Tsunami Warning Focal Point
TWS	Tsunami Warning System
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-OCHA	United Nations Office for the Coordination of Humanitarian Affairs
USAID	United States Agency for International Development
WCATWC	West Coast and Alaska Tsunami Warning Center
WCATWS	West Coast and Alaska Tsunami Warning System
WDC/NGDC	World Database Centre/National Geophysical Data Center
WESTPAC	IOC Sub-Commission for the Western Pacific
WG	Working Group

In this Series	Languages
Reports of Governing and Major Subsidiary Bodies , which was initiated at the beginning of 1984, the reports of the following meetings have already been issued:	
1. Eleventh Session of the Working Committee on international Oceanographic Data Exchange	E, F, S, R
2. Seventeenth Session of the Executive Council	E, F, S, R, Ar
3. Fourth Session of the Working Committee for Training, Education and Mutual Assistance	E, F, S, R
4. Fifth Session of the Working Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S, R
5. First Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions	E, F, S
6. Third Session of the <i>ad hoc</i> Task team to Study the Implications, for the Commission, of the UN Convention on the Law of the Sea and the New Ocean Regime	E, F, S, R
7. First Session of the Programme Group on Ocean Processes and Climate	E, F, S, R
8. Eighteenth Session of the Executive Council	E, F, S, R, Ar
9. Thirteenth Session of the Assembly	E, F, S, R, Ar
10. Tenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific	
11. Nineteenth Session of the Executive Council, Paris, 1986	E, F, S, R, Ar
12. Sixth Session of the IOC Scientific Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S
13. Twelfth Session of the IOC Working Committee on International Oceanographic Data Exchange	E, F, S, R
14. Second Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Havana, 1986	E, F, S
15. First Session of the IOC Regional Committee for the Central Eastern Atlantic, Praia, 1987	E, F, S
16. Second Session of the IOC Programme Group on Ocean Processes and Climate	E, F, S
17. Twentieth Session of the Executive Council, Paris, 1987	E, F, S, R, Ar
18. Fourteenth Session of the Assembly, Paris, 1987	E, F, S, R, Ar
19. Fifth Session of the IOC Regional Committee for the Southern Ocean	E, F, S, R
20. Eleventh Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Beijing, 1987	E, F, S, R
21. Second Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Arusha, 1987	E, F
22. Fourth Session of the IOC Regional Committee for the Western Pacific, Bangkok, 1987	E only
23. Twenty-first Session of the Executive Council, Paris, 1988	E, F, S, R
24. Twenty-second Session of the Executive Council, Paris, 1989	E, F, S, R
25. Fifteenth Session of the Assembly, Paris, 1989	E, F, S, R
26. Third Session of the IOC Committee on Ocean Processes and Climate, Paris, 1989	E, F, S, R
27. Twelfth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Novosibirski, 1989	E, F, S, R
28. Third Session of the Sub-Commission for the Caribbean and Adjacent Regions, Caracas, 1989	E, S
29. First Session of the IOC Sub-Commission for the Western Pacific, Hangzhou, 1990	E only
30. Fifth Session of the IOC Regional Committee for the Western Pacific, Hangzhou, 1990	E only
31. Twenty-third Session of the Executive Council, Paris, 1990	E, F, S, R
32. Thirteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, New York, 1990	E only
33. Seventh Session of the IOC Committee for the Global Investigation of Pollution in the Marine Environment, Paris, 1991	E, F, S, R
34. Fifth Session of the IOC Committee for Training, Education and Mutual Assistance in Marine Sciences, Paris, 1991	E, F, S, R
35. Fourth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1991	E, F, S, R
36. Twenty-fourth Session of the Executive Council, Paris, 1991	E, F, S, R
37. Sixteenth Session of the Assembly, Paris, 1991	E, F, S, R, Ar
38. Thirteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Baja California, 1991	E, F, S, R
39. Second Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1992	E only
40. Twenty-fifth Session of the Executive Council, Paris, 1992	E, F, S, R
41. Fifth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1992	E, F, S, R
42. Second Session of the IOC Regional Committee for the Central Eastern Atlantic, Lagos, 1990	E, F
43. First Session of the Joint IOC-UNEP Intergovernmental Panel for the Global Investigation of Pollution in the Marine Environment, Paris, 1992	E, F, S, R
44. First Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1992	E, F, S
45. Fourteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 1992	E, F, S, R
46. Third Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Vascoas, 1992	E, F
47. Second Session of the IOC Sub-Commission for the Western Pacific, Bangkok, 1993	E only
48. Fourth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Veracruz, 1992	E, S
49. Third Session of the IOC Regional Committee for the Central Eastern Atlantic, Dakar, 1993	E, F
50. First Session of the IOC Committee for the Global Ocean Observing System, Paris, 1993	E, F, S, R
51. Twenty-sixth Session of the Executive Council, Paris, 1993	E, F, S, R
52. Seventeenth Session of the Assembly, Paris, 1993	E, F, S, R
53. Fourteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Tokyo, 1993	E, F, S, R
54. Second Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1993	E, F, S
55. Twenty-seventh Session of the Executive Council, Paris, 1994	E, F, S, R
56. First Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Melbourne, 1994	E, F, S, R
57. Eighth Session of the IOC-UNEP-IMO Committee for the Global Investigation of Pollution in the Marine Environment, San José, Costa Rica, 1994	E, F, S
58. Twenty-eighth Session of the Executive Council, Paris, 1995	E, F, S, R
59. Eighteenth Session of the Assembly, Paris, 1995	E, F, S, R
60. Second Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E, F, S, R

61.	Third Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1995	E only
62.	Fifteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Papete, 1995	E, F, S, R
63.	Third Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1995	E, F, S
64.	Fifteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange	E, F, S, R
65.	Second Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E only
66.	Third Session of the IOC Sub-Commission for the Western Pacific, Tokyo, 1996	E only
67.	Fifth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Christ Church, 1995	E, S
68.	Intergovernmental Meeting on the IOC Black Sea Regional Programme in Marine Sciences and Services	E, R
69.	Fourth Session of the IOC Regional Committee for the Central Eastern Atlantic, Las Palmas, 1995	E, F, S
70.	Twenty-ninth Session of the Executive Council, Paris, 1996	E, F, S, R
71.	Sixth Session for the IOC Regional Committee for the Southern Ocean and the First Southern Ocean Forum, Bremerhaven, 1996	E, F, S,
72.	IOC Black Sea Regional Committee, First Session, Varna, 1996	E, R
73.	IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Fourth Session, Mombasa, 1997	E, F
74.	Nineteenth Session of the Assembly, Paris, 1997	E, F, S, R
75.	Third Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1997	E, F, S, R
76.	Thirtieth Session of the Executive Council, Paris, 1997	E, F, S, R
77.	Second Session of the IOC Regional Committee for the Central Indian Ocean, Goa, 1996	E only
78.	Sixteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Lima, 1997	E, F, S, R
79.	Thirty-first Session of the Executive Council, Paris, 1998	E, F, S, R
80.	Thirty-second Session of the Executive Council, Paris, 1999	E, F, S, R
81.	Second Session of the IOC Black Sea Regional Committee, Istanbul, 1999	E only
82.	Twentieth Session of the Assembly, Paris, 1999	E, F, S, R
83.	Fourth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1999	E, F, S, R
84.	Seventeenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Seoul, 1999	E, F, S, R
85.	Fourth Session of the IOC Sub-Commission for the Western Pacific, Seoul, 1999	E only
86.	Thirty-third Session of the Executive Council, Paris, 2000	E, F, S, R
87.	Thirty-fourth Session of the Executive Council, Paris, 2001	E, F, S, R
88.	Extraordinary Session of the Executive Council, Paris, 2001	E, F, S, R
89.	Sixth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, San José, 1999	E only
90.	Twenty-first Session of the Assembly, Paris, 2001	E, F, S, R
91.	Thirty-fifth Session of the Executive Council, Paris, 2002	E, F, S, R
92.	Sixteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Lisbon, 2000	E, F, S, R
93.	Eighteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Cartagena, 2001	E, F, S, R
94.	Fifth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2001	E, F, S, R
95.	Seventh Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Mexico, 2002	E, S
96.	Fifth Session of the IOC Sub-Commission for the Western Pacific, Australia, 2002	E only
97.	Thirty-sixth Session of the Executive Council, Paris, 2003	E, F, S, R
98.	Twenty-second Session of the Assembly, Paris, 2003	E, F, S, R
99.	Fifth Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Kenya, 2002 (* Executive Summary available separately in E, F, S & R)	E*
100.	Sixth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, St. Petersburg (USA), 2002 (* Executive Summary available separately in E, F, S & R)	E*
101.	Seventeenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
102.	Sixth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
103.	Nineteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Wellington, New Zealand, 2003 (* Executive Summary available separately in E, F, S & R)	E*
104.	Third Session of the IOC Regional Committee for the Central Indian Ocean, Tehran, Islamic Republic of Iran, 21-23 February 2000	E only
105.	Thirty-seventh Session of the Executive Council, Paris, 2004	E, F, S, R
106.	Seventh Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2005 (* Executive Summary available separately in E, F, S & R); and Extraordinary Session, Paris, 20 June 2005	E*
107.	First Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Perth, Australia, 3-5 August 2005	E only
108.	Twentieth Session of the Intergovernmental Coordination Group for the Tsunami Warning System in the Pacific, Viña del Mar, Chile, 3-7 October 2005 (* Executive Summary available separately in E, F, S & R)	E*
109.	Twenty-Third Session of the Assembly, Paris, 21-30 June 2005	E, F, S, R
110.	First Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Rome, Italy, 21-22 November 2005	E only
111.	Eighth Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Recife, Brazil, 14-17 April 2004 (* Executive Summary available separately in E, F, S & R)	E*
112.	First Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions (ICG/CARIBE-EWS), Bridgetown, Barbados, 10-12 January 2006	E only
113.	Ninth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Cartagena de Indias, Colombia, 19-22 April 2006 (* Executive Summary available separately in E, F, S & R)	E S*

114.	Second Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Hyderabad, India, 14–16 December 2005	E only
115.	Second Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology, Halifax, Canada, 19–27 September 2005 (Abridged final report with resolutions and recommendations)	E, F, R, S
116.	Sixth Session of the IOC Regional Committee for the Western Indian Ocean (IOCWIO), Maputo, Mozambique, 2–4 November 2005 (* Executive Summary available separately in E, F, S & R)	E*
117.	Fourth Session of the IOC Regional Committee for the Central Indian Ocean, Colombo, Sri Lanka 8–10 December 2005 (* Executive Summary available separately in E, F, S & R)	E*
118.	Thirty-eighth Session of the Executive Council, Paris, 20 June 2005 (Electronic copy only)	E, F, R, S
119.	Thirty-ninth Session of the Executive Council, Paris, 21–28 June 2006	E, F, R, S
120.	Third Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Bali, Indonesia, 31 July–2 August 2006 (*Executive Summary available separately in E,F,S & R)	E*
121.	Second Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Nice, France, 22–24 May 2006	E only
122.	Seventh Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 16–18 March 2005 (* Executive Summary available separately in E, F, S & R)	E*
123.	Fourth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-IV), Mombasa, Kenya, 30 February-2 March 2007 (* Executive Summary available separately in E, F, S & R)	E*
124.	Nineteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Trieste, Italy, 12–16 March 2007 (* Executive Summary available separately in E, F, S & R)	E*
125.	Third Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Bonn, Germany, 7–9 February 2007 (* Executive Summary available separately in E, F, S & R)	E*
126.	Second Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Cumaná, Venezuela, 15–19 January 2007 (* Executive Summary available separately in E, F, S & R)	E*
127.	Twenty-first Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Melbourne, Australia, 3–5 May 2006 (* Executive Summary available separately in E, F, S & R)	E*
128.	Twenty-fourth Session of the Assembly, Paris, 19–28 June 2007	E, F, S, R
129.	Fourth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Lisbon, Portugal, 21–23 November 2007 (* Executive Summary available separately in E, F, S & R)	E*
130.	Twenty-second Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Guayaquil, Ecuador, 17–21 September 2007 (* Executive Summary available in E, F, S & R included)	E*
131.	Forty-first Session of the Executive Council, Paris, 24 June–1 July 2008	E, F, R, S
132.	Third Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Panama City, Panama, 12–14 March 2008 (* Executive Summary available separately in E, F, S & R)	E*
133.	Eighth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 17–20 April 2007 (* Executive Summary available separately in E, F, S & R)	E*
134.	Twenty-third Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Apia, Samoa, 16–18 February 2009 (*Executive Summary available separately in E, F, S & R)	E*
135.	Twentieth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Beijing, China, 4–8 May 2009 (*Executive Summary available separately in E, F, S & R)	E*
136.	Tenth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Puerto La Cruz, Bolivarian Republic of Venezuela, 22–25 October 2008 (*Executive Summary available separately in E, F, S & R)	E, S*
137.	Seventh Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VII), Sabah, Malaysia, 26–29 May 2008 (*Executive Summary available separately in E, F, S & R)	E*
138.	Ninth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, France, 10–12 June 2009 (* Executive Summary available separately in E, F, S & R);	E*
139.	Fifth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Athens, Greece, 3–5 November 2008 (* Executive Summary available separately in E, F, S & R)	E*
140.	Fourth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Fort-de-France, Martinique, France, 2–4 June 2009 (* Executive Summary available separately in E, F, S & R)	E*
141.	Twenty-fifth Session of the Assembly, Paris, 16–25 June 2009	E, F, R, S
142.	Third Session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology, Marrakesh, Morocco, 4–11 November 2009	E, F, R, S
143.	Ninth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 22–24 April 2009 (* Executive Summary available separately in E, F, S & R)	E*
144.	Fifth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Managua, Nicaragua, 15–17 March 2010 (* Executive Summary available in E, F, S & R)	E*
145.	Sixth Session of the IOC Regional Committee for the Central and Eastern Atlantic Ocean, Accra, Ghana, 28–30 March 2010 (* Executive Summary available in E, F, S & R)	E*
146.	Forty-second Session of the Executive Council; Paris, 15, 19 & 20 June 2009	E, F, R, S
147.	Forty-third Session of the Executive Council; Paris, 8–16 June 2010	E, F, R, S
148.	Sixth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Istanbul, Turkey, 11–13 November 2009 (* Executive Summary available separately in Ar, E, F, S & R)	E*
149.	Seventh Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Paris, France, 23–25 November 2010 (* Executive Summary available separately in Ar, E, F, S & R)	E*
150.	Sixth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Santo Domingo, Dominican Republic, 26–29 April 2011 (* Executive Summary available in E, F, S & R)	E*

151.	Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Beijing, China, 24–27 May 2011 (*Executive Summary in E, F, S & R included)	E*
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