

Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies



Intergovernmental Co-ordination Group for the Pacific Warning and Mitigation System

Twenty-second Session

Guayaquil, Ecuador

17–21 September 2007

UNESCO

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Executive Summary

The Twenty-second Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) was held in Guayaquil, Ecuador, 17–21 September 2007 under the Session Chairmanship of Dr Francois Schindel , Past Chairman of the ICG/PTWS. It was attended by 45 participants from 19 ICG/PTWS Member States, Officers from the ICG/CARIBE-EWS, ICG/IOTWS, and ICG/NEAMTWS, and representatives from four organizations, and observers.

The Session reviewed progress during the inter-sessional period from May 2006 to September 2007 as reported by Working Groups in the areas of seismological and sea level monitoring and evaluation, hazard identification, emergency management and resilience, and interoperable systems, and sub-regionally in the Southwest Pacific and on the Central America Pacific Coast. The ICG reviewed the report by the Task Team on Messages and its proposed changes to improve the clarity and timeliness of the PTWC messages, and discussed the next Pacific-wide exercise, Exercise Pacific Wave '08. The ICG further discussed the PTWS and ITIC work plan and budget for 2008 and 2009 in view of the current budget of UNESCO/IOC, and also heard on the progress on the PTWS Medium-Term Strategy.

The ICG reaffirmed that each Member State has the responsibility to issue warnings within its respective territories and of their commitment to open, free and unrestricted sharing of tsunami-relevant real-time observational data as fundamental for a successful early warning.

The ICG concluded as a matter of urgency to: (i) enhance the establishment and maintenance of tsunami warning centres in the regions as a key for faster and locally-relevant early warning response; (ii) implement better methods to rapidly detect near-field earthquakes and possible tsunami; (iii) enhance, update, and modernize the capabilities of the seismic and sea-level monitoring networks; (iv) provide standard operational system description documents; and (v) accelerate the provision of strengthening support to Member States that have not yet sufficient capacity to develop tsunami warning and mitigation systems.

Accordingly, **the ICG approved** eight recommendations on (1) Sea-Level Measurement, Data Collection and Exchange, (2) Working Group on Pacific Emergency Communications; (3) PTWS Operational Users Guide, (4) Pacific-wide Tsunami Exercise, (5) Sub-regional Pacific Tsunami Warning and Mitigation Systems: Northwest Pacific, South China Sea, and Western Pacific Marginal Seas, (6) Pacific Warning And Mitigation System, (7) Improved Strategic Planning And Budgeting (8) Working Group on Rapid Near-Field Recognition of Tsunamigenic Earthquakes and Associated Tsunamis.

The ICG established or continued eight inter-sessional Working Groups. The Working Groups are on (i) Sea-Level Measurements, Data Collection and Exchange; (ii) Interoperability Of Regional, Sub-Regional and National Tsunami Warning and Mitigation Systems in the Pacific, (iii-v) Sub-Regional Working Groups for Tsunami Warning And Mitigation Development (Central American on the Pacific, Southeast Pacific, and Southwest Pacific), (vi) Pacific Emergency Communications, (vii) Rapid Near-Field Recognition of Tsunamigenic Earthquakes and Associated Tsunamis, and (viii) Exercise Pacific Wave '08.

The ICG recommended that the IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) organizes a sea-level design and implementation workshop in 2008, involving similar Working Groups from the other ICGs.

It further recommends that the IOC Executive Council, at its 41st Session, adopts a Resolution which includes its formal authorization of the interim tsunami advisory service for the South China Sea conducted by the PTWC, WC/ATWC and NWPTAC.

The ICG also requested the IOC to convene a scientific-technical conference to review the state-of-art of detecting near-field earthquake and possible tsunami in early 2008.

The ICG endorsed the recommendations of the VIth International Workshop on Tsunami Mitigation: New Insights in Tsunami Research, Preparedness, Warning and Mitigation, co-organized by the IOC and the ICG/PTWS, the IUGG – Tsunami Commission, and the host institution, INOCAR of Ecuador, that was held on 14 September 2007 in Guayaquil, Ecuador prior to the Session.

The ICG elected new Officers for the inter-sessional period, welcoming Mr Michael O’Leary of New Zealand as Chairman, Mr Giorgio de la Torre of Ecuador and Mr Yohei Hasegawa of Japan as Vice-Chairmen,

The ICG decided to organize its Twenty-third Session in 2009 and **accepted** the offer of Samoa to host the Twenty-third Session. **The ICG further accepted** the offer of Japan to host the Twenty-fourth Session in 2011.

Résumé exécutif

La 22e session du Groupe intergouvernemental de coordination du Système d'alerte rapide aux tsunamis et de mitigation dans le Pacifique (GIC/PTWS) s'est tenue à Guayaquil (Équateur) du 17 au 21 septembre 2007, sous la présidence de M. François Schindelé, ex-président du GIC/PTWS. Elle a rassemblé 45 participants de 19 États membres du GIC/PTWS, des membres du Bureau du GIC/CARIBE-EWS, du GIC/IOTWS et du GIC/NEAMTWS, des représentants de quatre organisations et des observateurs.

Les participants ont examiné les progrès accomplis pendant la période intersessions de mai 2006 à septembre 2007, dont ont fait état les groupes de travail dans les domaines du suivi et de l'évaluation sismologiques, de la surveillance du niveau de la mer, de l'identification des aléas, de la gestion des situations d'urgence, de la résilience, et des systèmes interopérables et, au niveau sous-régional, pour le Pacifique du Sud-Ouest et la côte pacifique de l'Amérique Centrale. Le Groupe a examiné le rapport de l'Équipe spéciale sur les messages et les changements qui y sont proposés pour améliorer la clarté et le temps de communication des messages du PTWC et a aussi débattu du prochain exercice à l'échelle de tout le Pacifique (exercice « Vague du Pacifique 2008 »). Il s'est également penché sur le plan de travail et le budget du PTWS et du CIIT pour 2008-2009 compte tenu du budget actuel de la COI, et a aussi été informé de l'état de mise en œuvre de la Stratégie à moyen terme du PTWS.

Le Groupe a réaffirmé que chaque État membre avait la responsabilité d'émettre des alertes sur son territoire et qu'il était résolu à œuvrer pour un partage ouvert, libre et sans restriction des données d'observation en temps réel concernant les tsunamis, comme élément fondamental d'une alerte rapide efficace.

Le Groupe a conclu qu'il était urgent : (i) d'intensifier la mise en place et la maintenance des centres d'alerte aux tsunamis dans les régions comme facteur clé d'une réponse locale plus rapide et plus pertinente aux alertes, (ii) d'appliquer de meilleures méthodes pour détecter rapidement les séismes en champ proche et les tsunamis éventuels, (iii) d'améliorer, actualiser et moderniser les capacités des réseaux de surveillance sismique et de surveillance du niveau de la mer, (iv) de fournir des modèles de descriptifs des systèmes opérationnels, (v) d'accélérer la fourniture d'un appui aux États membres qui n'ont pas encore de capacités suffisantes pour mettre en place des systèmes d'alerte aux tsunamis et de mitigation.

Par conséquent, **le Groupe a approuvé** huit recommandations sur (1) la mesure du niveau des mers, ainsi que la collecte et l'échange de données dans ce domaine, (2) un Groupe de travail sur la communication des urgences dans le Pacifique, (3) un guide opérationnel des utilisateurs du PTWS, (4) l'exercice relatif aux tsunamis à l'échelle du Pacifique, (5) les systèmes sous-régionaux du Pacifique en matière d'alerte aux tsunamis et de mitigation, à savoir : Pacifique du Nord-Ouest, Mer de Chine méridionale et mers bordières du Pacifique occidental, (6) le système d'alerte et de mitigation dans le Pacifique, (7) l'amélioration de la planification et de la budgétisation stratégiques, (8) le Groupe de travail sur la détection rapide en champ proche des séismes tsunamigènes et des tsunamis associés.

Le Groupe a mis en place ou maintenu huit groupes de travail intersessions. Ces groupes de travail ont pour thème (i) les mesures du niveau de la mer, la collecte et l'échange des données, (ii) l'interopérabilité des systèmes régionaux, sous-régionaux et nationaux d'alerte aux tsunamis et de mitigation dans le Pacifique, (iii-v) les systèmes sous-régionaux d'alerte aux tsunamis et de développement de la mitigation (Amérique Centrale-Pacifique, Pacifique du Sud-Est et Pacifique du Sud-Ouest), (vi) les communications d'urgence dans le Pacifique, (vii) la détection rapide en champ proche des séismes tsunamigènes et des tsunamis associés, (viii) l'exercice « Vague du Pacifique 2008 ».

Le Groupe a recommandé que le Groupe de travail de la COI sur les systèmes d'alerte aux tsunamis et aux autres aléas liés au niveau de la mer, et de mitigation (TOWS-WG) organise en 2008 un atelier sur la conception et la mise en place de réseaux d'observation du niveau de la mer, associant des groupes de travail similaires des autres GIC.

Il a en outre recommandé que le Conseil exécutif de la COI adopte, à sa 41e session, une résolution portant autorisation formelle du service consultatif provisoire sur les tsunamis pour la mer de Chine méridionale assuré par le PTWC, le WCATWC et le NWPTA.

Le Groupe a également prié la COI d'organiser au début de 2008 une conférence scientifique et technique pour examiner l'état actuel des connaissances et des techniques en matière de détection des séismes en champ proche et des tsunamis éventuels.

Le Groupe a fait siennes les recommandations du 6e Atelier international sur l'atténuation des effets des tsunamis organisé sur le thème : « Nouveaux aperçus sur la recherche, la préparation, l'alerte et la mitigation concernant les tsunamis » par la COI et le GIC/PTWS, la Commission tsunami de l'UGGI et l'institution hôte, à savoir l'INOCAR (Équateur), qui s'est tenu le 14 septembre 2007 à Guayaquil (Équateur), avant la session.

Le GIC a élu de nouveaux membres du Bureau pour la période intersessions : M. Michael O'Leary (Nouvelle-Zélande), président, et M. Giorgio de la Torre (Équateur) et M. Yohei Hasegawa (Japon), vice-présidents.

Le GIC a décidé d'organiser sa 23e session en 2009 et a accepté l'offre de Samoa de l'accueillir. Il a également accepté l'offre du Japon d'accueillir la 24e session en 2011.

Resumen dispositivo

La 22ª 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 Guayaquil (Ecuador), del 17 al 21 de septiembre de 2007 bajo la presidencia del Dr François Schindelé, ex presidente del ICG/PTWS. Contó con la participación de 45 representantes de 19 Estados Miembros del ICG/PTWS, los miembros de las Mesas del ICG/CARIBE-EWS, el ICG/IOTWS y el ICG/NEAMTWS, y representantes de cuatro organizaciones y observadores.

En la reunión se examinaron los avances logrados durante el periodo transcurrido entre mayo de 2006 y septiembre de 2007, que comunicaran los respectivos Grupos de Trabajo en materia de vigilancia y evaluación sísmológica y del nivel del mar, identificación de riesgos, gestión para casos de emergencia y capacidad de recuperación, y compatibilidad operacional de los sistemas, así como en el plano subregional para el Pacífico sudoccidental y el litoral del Pacífico de América Central. El ICG examinó el informe del Grupo Especial sobre Mensajes y las modificaciones propuestas a fin de mejorar la claridad y puntualidad de los mensajes del PTWC y trató los detalles del próximo ejercicio con cobertura para todo el Océano Pacífico, Pacific Wave' 08. Seguidamente, el ICG debatió el Plan de Trabajo y Presupuesto para 2008 y 2009 del PTWS y del Centro Internacional de Información sobre los Tsunamis, habida cuenta del presupuesto en vigor de la COI de la UNESCO, y recibió un informe sobre los avances realizados en la elaboración de la Estrategia a Plazo Medio del PTWS.

El ICG reafirmó la responsabilidad que cabe a cada Estado Miembro a los efectos de cursar alertas dentro de sus respectivos territorios y su compromiso en materia de acceso libre e irrestricto a la información resultante de las observaciones en tiempo real relacionadas con los tsunamis, como elemento fundamental para el éxito de toda alerta temprana.

El ICG concluyó que era urgente: i) ampliar la creación y mantenimiento de centros de alerta contra tsunamis en las regiones, por ser decisivos para asegurar una respuesta más rápida y eficaz en el plano local en materia de alerta temprana; ii) poner en práctica métodos mejorados que permitan una detección rápida de posibles terremotos de origen cercano y con riesgo de tsunamis; iii) ampliar, actualizar y modernizar las capacidades de las redes de vigilancia sísmica y del nivel del mar; iv) facilitar una documentación descriptiva de los procedimientos operacionales normalizados; y v) acelerar las medidas de fortalecimiento de la ayuda a los Estados Miembros que carecen aún de la capacidad suficiente para diseñar sistemas de alerta y atenuación de los efectos de los tsunamis.

En consecuencia, **el ICG adoptó** ocho recomendaciones, relativas a: 1) Mediciones del nivel del mar, incluido el acopio de datos y su intercambio; 2) Grupo de Trabajo sobre la comunicación de emergencias en el Pacífico 3) Guía de operaciones para usuarios del PTWS; 4) Ejercicio de simulación de tsunami para todo el Océano Pacífico; 5) Sistemas subregionales de alerta y atenuación de los efectos de los tsunamis en el Pacífico, para el sector noroccidental, el Mar de China meridional y los mares secundarios del Pacífico Occidental; 6) Sistema de Alerta y Atenuación del Pacífico; 7) Método mejorado de planificación estratégica y elaboración de presupuestos; 8) Grupo de Trabajo sobre reconocimiento rápido de terremotos tsunamigénicos de origen cercano y fenómenos de tsunami conexos.

El ICG creó o prorrogó el mandato de ocho Grupos de Trabajo entre las reuniones. Son sus temas: i) mediciones del nivel del mar, acopio e intercambio de datos; ii) compatibilidad operacional de los sistemas regionales, subregionales y nacionales de alerta y atenuación de los efectos de los tsunamis; iii-v) Grupos Subregionales de Trabajo sobre sistemas de alerta y atenuación de los efectos de los tsunamis (respectivamente, para el litoral del Pacífico de América Central, el Pacífico sudoriental y el Pacífico sudoccidental); vi) comunicaciones de emergencia en el Pacífico; vii) reconocimiento rápido de terremotos

tsunamigénicos de origen cercano y fenómenos de tsunami conexos; y viii) ejercicio Pacific Wave' 08.

El ICG recomendó que el Grupo de Trabajo de la COI sobre sistemas de alerta contra tsunamis y otros peligros relacionados con el nivel del mar y atenuación de sus efectos (TOWS-WG) organizara en 2008 un taller de diseño y aplicación en materia de nivel del mar, con participación de los grupos de trabajo similares de los demás ICG.

Recomendó además que el Consejo Ejecutivo de la COI adoptara, en su 41ª reunión, una resolución por la que autorice formalmente el servicio asesor provisional sobre tsunamis en el Mar de China meridional a cargo del PTWC, el WC/ATWC y el NWPTA.

Solicitó también que la COI convocara, a principios de 2008, una conferencia científico-técnica con el objeto de determinar los últimos adelantos en materia de detección de terremotos de origen cercano y con riesgo de tsunami.

El ICG aprobó las recomendaciones formuladas por el 6º Taller Internacional sobre Atenuación de los Efectos de los Tsunamis, dedicado a la presentación de nuevos conocimientos en materia de investigación, preparación y alerta y atenuación de los efectos de los tsunamis, organizado conjuntamente por la COI y el ICG/PTWS, la Comisión sobre Tsunamis de la Unión Internacional de Geodesia y Geofísica y la institución anfitriona, el Instituto Oceanográfico de la Armada de Ecuador (INOCAR). El evento tuvo lugar en Guayaquil el 14 de septiembre de 2007, antes de la reunión del ICG.

El ICG eligió a su nueva Mesa para el siguiente periodo entre reuniones, acogiendo como presidente al Sr. Michael O'Leary de Nueva Zelanda y como vicepresidentes al Sr. Giorgio de la Torre de Ecuador y al Sr. Yohei Hasegawa del Japón.

El ICG decidió organizar su 23ª reunión en 2009 y **aceptó** el ofrecimiento de Samoa de realizar dicha reunión en su territorio. **El ICG aceptó además** el ofrecimiento del Japón de acoger la 24ª reunión en 2011.

Рабочее резюме

Двадцать вторая сессия Межправительственной координационной группы по Системе предупреждения о цунами и смягчения их последствий в Тихом океане (МКГ/СПЦТО) состоялась в Гуаякиле (Эквадор) 17-21 сентября 2007 г. Председательские функции в ходе этой сессии выполнял д-р Франсуа Шинделе, бывший председатель МКГ/СПЦТО. На сессии присутствовало 45 участников из 19 государств-членов МКГ/СПЦТО, должностные лица МКГ/САРИБ-СРП, МКГ/СПЦИО и МКГ/СПЦСВАСМ, представители от четырех организаций и наблюдатели.

На сессии был рассмотрен прогресс, достигнутый в межсессионный период с мая 2006 г. по сентябрь 2007 г. и изложенный в докладах рабочих групп МКГ по мониторингу и оценке сейсмических явлений и уровня моря; выявлению опасностей; вопросам управления и обеспечения устойчивости в чрезвычайных ситуациях; операционно-совместимым системам; субрегиональной деятельности в юго-западной части Тихого океана и вдоль тихоокеанского побережья Центральной Америки. МКГ рассмотрела доклад Целевой группы по сообщениям об опасностях и предложенные ею изменения в целях уточнения и повышения своевременности сообщений, распространяемых ПТВЦ. МКГ рассмотрела также рекомендации Целевой группы о проведении учений по цунами в масштабе всего Тихого океана под названием «Тихоокеанская волна-08». Группа обсудила далее план работы и бюджет СПЦТО и ИТИК на 2008 г. и 2009 г. в свете нынешнего бюджета ЮНЕСКО/МОК, а также заслушала информацию о ходе осуществления Среднесрочной стратегии СПЦТО.

МКГ вновь подтвердила, что каждое государство-член несет ответственность за распространение предупреждений на своих соответствующих территориях и имеет обязательство в отношении обеспечения открытого, бесплатного и неограниченного обмена касающимися цунами данными наблюдений в режиме реального времени в качестве важнейшей основы для успешного раннего предупреждения.

МКГ пришла к выводу о необходимости обеспечить в неотложном порядке:

- (i) активизацию создания и эксплуатационного обслуживания в этом регионе центров предупреждения о цунами в качестве важнейшего фактора обеспечения более быстрого распространения ранних сообщений об опасности, важных для местных общин;
- (ii) использование более эффективных методов быстрого обнаружения землетрясений и предупреждения о возможных цунами в ближней зоне;
- (iii) укрепление, обновление и модернизацию потенциала сетей для мониторинга сейсмических явлений и уровня моря;
- (iv) предоставление стандартной документации с описанием оперативных систем и
- (v) более оперативное наращивание поддержки, оказываемой государствам-членам, пока не располагающим достаточным потенциалом для разработки национальных систем предупреждения о цунами и смягчения их последствий.

В связи с этим **МКГ утвердила** восемь рекомендаций по следующим вопросам:

- (1) измерение уровня моря, сбор таких данных и обмен ими;
- (2) Рабочая группа по коммуникациям в чрезвычайных ситуациях в Тихом океане;
- (3) подготовка Оперативного руководства СПЦТО для пользователей;
- (4) проведение учений по цунами в масштабах всего Тихого океана;
- (5) создание субрегиональных тихоокеанских систем предупреждения о цунами и смягчения их последствий: для северо-западной части Тихого океана, Южно-Китайского моря и окраинных морей западной части Тихого океана;
- (6) Система предупреждения о цунами и смягчения их последствий в Тихом океане;
- (7) совершенствование стратегического планирования и бюджетирования;
- (8) Рабочая группа по быстрому выявлению цунамигенных землетрясений и связанных с ними цунами в ближней зоне.

МКГ учредила или приняла решение о продолжении деятельности восьми межсессионных рабочих групп. Это рабочие группы по следующим вопросам: (i) измерению уровня моря, сбору данных и обмену ими; (ii) операционной совместимости региональных, субрегиональных и национальных систем предупреждения о цунами и смягчения их последствий в Тихом океане; (iii-v) субрегиональные рабочие группы по разработке механизмов предупреждения о цунами и смягчения их последствий (для тихоокеанского побережья Центральной Америки, юго-восточной части Тихого океана и юго-западной части Тихого океана); (vi) коммуникациям в регионе Тихого океана в чрезвычайных ситуациях; (vii) быстрому выявлению цунамигенных землетрясений в ближней зоне и связанных с ними цунами и (viii) проведению учений по цунами «Тихоокеанская волна-08».

МКГ рекомендовала, чтобы Рабочая группа МОК по системам предупреждения и смягчения последствий цунами и других опасных явлений, связанных с изменением уровня моря (РГ-СПЦО), организовала в 2008 г. учебно-практический семинар по планированию и осуществлению работы, связанной с уровнем моря, с участием аналогичных рабочих групп от других МКГ.

Она далее рекомендовала, чтобы Исполнительный совет МОК на своей 41-й сессии принял резолюцию, в которой он официально разрешает обеспечить функционирование временной консультативной службы по цунами для Южно-Китайского моря под руководством СПТЦО, МС/АТВЦ и НВПТАК.

МКГ также просила МОК созвать в начале 2008 г. научно-техническую конференцию по обзору современного состояния дел в области обнаружения землетрясений и возможных цунами в ближней зоне.

Группа одобрила рекомендации шестого Международного семинара по уменьшению последствий цунами: новые достижения в области исследований по цунами, обеспечения готовности к ним, предупреждения о цунами и смягчения их последствий, который был организован совместно МОК и МКГ/СПЦТО, МСГГ – Комиссией по цунами и принимающим эквадорским учреждением – ИНОКАР 14 сентября 2007 г. в Гуаякиле (Эквадор) перед сессией.

МКГ избрала новых должностных лиц на межсессионный период и приветствовала г-на Майкла О'Лири (Новая Зеландия) в качестве своего председателя и г-на Хиорхио де ля Торре (Эквадор) и г-на Йохея Хасегаву (Япония) в качестве заместителей председателя.

МКГ постановила провести свою 23-ю сессию в начале 2009 г. и **приняла** предложение Самоа организовать эту сессию на своей территории. **МКГ далее приняла** предложение Японии провести 24-ю сессию в 2011 г. в этой стране.

1. OPENING

1 On behalf of the City of Guayaquil, Guido Chiriboga, Vice Mayor of Guayaquil welcomed the delegates, wished them a pleasant stay in Ecuador and good results for the session.

2 CPMG-EM Mario Proaño Silva, Director of the Instituto Oceanográfico de la Armada (INOCAR), Ecuador, highlighted the importance of the meeting jointly organised by the IOC Secretariat and INOCAR.

3 Patricio Bernal, Assistant Director-General of UNESCO and Executive Secretary of the Intergovernmental Oceanographic Commission (IOC) expressed his sincere thanks to the Government of Ecuador and the Director of INOCAR for the excellent arrangements for the 22nd session of the ICG/PTWS and the associated 6th International Tsunami Workshop also arranged by INOCAR jointly with the IUGG Tsunami Commission and the IOC Secretariat. He then reminded the meeting participants that the PTWS has existed since 1965, when it was established following tsunamis in Chile and Alaska because there was not a system in place to deliver warning messages to the international community to save lives. Now the system warns countries all over the Pacific against distant tsunamis, but there is an urgent need to also review how the system works for local and regional tsunamis, such as the recent Pisco earthquake and tsunami (15 August 2007, Peru). He recalled that we must also be sure that tsunami warning systems included PTWS, are integrated with National Disaster Management Organizations in order to deliver successful alerts to communities.

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF AGENDA

4 The Past Chairman of the ICG/PTWS, François Schindelé, chaired the meeting, on behalf of the Acting Chairman of the ICG/PTWS, Fred Stephenson, who was not able to attend due to health reasons. Since the retirement of the Chairman Cpt. Rodrigo Nuñez (Chile) in December 2006 the Vice-Chairman Fred Stephenson (Canada) has been the Acting Chairman. The Past Chairman introduced the provisional Agenda prepared by the Secretariat that was approved without comments as in Annex I.

2.2 DESIGNATION OF THE RAPPORTEUR

5 The Group was requested to consider nominating a Rapporteur. Ecuador seconded by Chile nominated Lieutenant Luis Morales (Ecuador) as Rapporteur.

6 **The ICG approved** the proposal and **thanked** Ecuador for providing the Rapporteur.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

7 The Chairman introduced the documentation for the session and the ICG/PTWS Technical Secretary introduced technical and logistic arrangements. The Group then reviewed the provisional Timetable as in IOC/PTWS-XXII/2 Prov. Rev. 2 and approved the provisional timetable.

8 The Chairman recalled that all Working Groups should review their progress and make recommendations to the ICG/PTWS as to whether they should continue under their current terms of reference or with new terms of reference, or dissolve having completed their activities.

9 He then invited Member States to consider constituting intra-session Working Groups as needed to conduct the detailed work of the session. Following the advice provided by their

respective Chairs the **ICG decided** to hold intra-sessional meetings of the following Working Groups:

- Working Group on Sea Level
- Working Group on Resilience Building and Emergency Management, System Interoperability

10 As well, the **ICG decided** to establish the following intra-sessional Working Groups:

- PTWS Task Team on Messages, with the following Member States: USA, Australia
- Exercise Pacific Wave 08, with the following Member States: Australia, Chile, China, Ecuador, Japan, New Zealand, Nicaragua, Peru, USA (Chair)
- South China Sea region, with the following Member States: China, Indonesia, Japan, Malaysia (Chair), Viet Nam
- Southwest Pacific, with the following Member States: Australia, France, New Zealand (Chair), Samoa, SOPAC
- Central America Pacific Coast, with the following Member States: Nicaragua (Chair), El Salvador
- Southeast Pacific Coast, with the following Member States: Ecuador (Chair), Chile, Colombia, Peru
- Programme and Budget, with the following Member States: Australia, Japan, New Zealand, USA (Chair)

3. REPORT ON INTERSESSIONAL ACTIVITIES

3.1 IOC EXECUTIVE SECRETARY'S REPORT

11 The IOC Executive Secretary introduced his report by inviting Member States to consider specific arrangements to address sub regional needs in the Pacific Tsunami Warning System. He highlighted the strong scientific and technical basis of ITSU through its more than 40 years experience that, however, failed to convince responsible authorities to develop a system in the Indian Ocean before December 2004. He then encouraged delegates to deliberate on the following issues:

- How the ICG/PTWS will meet the challenges of the near-field sources, when time available to issue a warning is very short?; in this respect, which lessons do Member States learn from the Pisco-Peru, the Solomon Islands and the Tonga earthquakes and tsunamis?
- How will ICG/PTWS improve and extend its network of seismic and sea level stations to detect and verify tsunamis?
- How will Member States strength their own national systems, to prepare and warn their populations in case of tsunami, and ultimately other coastal hazards?
- Which new technologies can be applied for tsunami warning?
- Are ICG/PTWS Member States planning to deploy additional DART buoys?
- How will ICG/PTWS increase Member States' commitment with the system?

12 He indicated that, recognising the US strong leadership on DART buoys, the ICG/PTWS should take ownership of the DART buoy system and the intergovernmental process that supports it, including securing long-term sustainability of this system.

13 The IOC Executive Secretary encouraged Member States to apply the lessons learnt from the Indian Ocean Tsunami of 2004, and to use the window of opportunity opened by the global response to this disaster. The PTWS should not wait for another big tsunami to come to fill the gaps and complete the observing networks, developing an end-to-end system. In that sense, he suggested that the pending Review of the PTWS could be seen as an opportunity to further strength the PTWS capabilities to respond to Member States requirements.

14 Finally he underlined the International Tsunami Information Centre as a major asset for UNESCO. IOC is very proud of the excellent work ITIC has been performing, particularly in the area of public awareness, and the contribution it does to develop national capabilities for tsunami risk assessment. He emphasized that preparedness and readiness is the most essential prerequisite and will drive the technical sub-system. He highlighted that ITIC played a key role in IOC's work towards developing the Indian Ocean Tsunami Warning and Mitigation System (IOTWS).

15 USA highlighted the need of resources to develop the system recalling that this is a global priority that still has some attention from national authorities. It agreed on the need to respond to near field requirements, which were not initially addressed in the design of the ICG/PTWS.

3.2 ICG/PTWS CHAIRMAN'S REPORT

16 The Chairman gave lecture of the message prepared by the ICG/PTWS Chairman (a.i.), Fred Stephenson. In his report the Chairman (a.i) provided a summary of the main activities and results following ICG/PTWS-XXI and presented scope and directions for the future. He also addressed co-operation with other ICGs and reminded delegates that the PTWS is the only system that is delivering regional warnings to its Member States. He also recalled that the PTWS regional warning centres are providing tsunami advisory information services to other ICGs. He called on Member States to integrate new software tools and graphic information products into warning and dissemination processes so that only coastal areas which are at risk need to take action. He recalled that approximately 40 years have passed since the first session of the ICG/ITSU. At that time there were only six Member States. Today the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) has 30 Member States, as well as the involvement of some Pacific Island Countries in free association with Australia or New Zealand.

17 In his message the Chairman (a.i) called on delegates to concentrate on governance issues by re-considering the role of Working Groups and Task Teams in support of the ICG. Are they as effective as they can be? Are they adequately supported by Member States? He highlighted the need, as demonstrated by the 2006 Tonga Earthquake, for the PTWS to place high priority on information to media and development of warning products. He highlighted the need of addressing local or near field events, reminding delegates of system monitoring gaps in the South West Pacific and Central America. He thanked Ecuador and the organisation committee and expressed appreciation to Captain Rodrigo Nuñez in his role of elected Chairperson before retiring in late 2006 and Emilio Lorca, ITIC Associate Director, also retired.

18 USA expressed that, while recognising the leadership of PTWS, the Group needs to consider that the new systems set in other basins (i.e. IOTWS, NEAMTWS, CARIBE EWS) could provide lessons that will help to strengthen the PTWS.

19 Chile pointed out that the existing systems have failed because end-to-end communications did not succeed, not necessarily because of absence of monitoring systems. He made reference to the 1960 Chilean and the 2004 Indian Ocean tsunamis as examples. The recent earthquake and tsunami in Peru could have resulted in a catastrophe because of communication problems. He emphasized that increased coordination and tsunami drills to test communications systems are urgently required.

20 In support of the interventions of USA and Chile, the IOC Executive Secretary recalled the standard setting function of the UN system. He emphasized that the IOTWS has changed the standards by improving the mechanisms of delivering and by assuming that the responsibility of delivering a warning is being supplemented by working on the end-to-end system. The ICGs need to consider how messages are best delivered to the population. The Chairman referred to the need to improve PTWS capacity building and public awareness activities as a way of improving responses.

3.3 ICG/PTWS SECRETARIAT'S REPORT

21 The interim ICG/PTWS Secretary, Laura Kong, reported on ICG/PTWS Structure and Terms of Reference for the Secretariat, PTWS Membership, activities, and status of implementation of recommendations of previous ICG/PTWS sessions. She also provided an outlook of the work plan and budget.

22 She reported that the ICG/PTWS encompasses 46 countries out of which there are 30 Member States with designated Tsunami National Contacts (TNC): Australia, Canada, Chile, China, Colombia, Cook Islands, Costa Rica, Democratic People's Republic of Korea, Ecuador, El Salvador, Fiji, France, Guatemala, Indonesia, Japan, Malaysia, Mexico, New Zealand, Nicaragua, Papua New Guinea, Peru, Philippines, Republic of Korea, Russian Federation, Samoa, Singapore, Thailand, Tonga, United States of America and Viet Nam. The most recent memberships have been Malaysia and Viet Nam (2005), and Papua New Guinea and Tonga (2006). Countries expressing interest in ICG/PTWS activities, but which have not yet formally designated a TNC or Tsunami Warning Focal Point (TWFP) are Brunei, Cambodia, Honduras, Kiribati, Niue, Panama, Solomon Islands, Tokelau, and Vanuatu.

23 She provided a detailed list of activities performed by the interim Secretariat including:

- Attendance to meetings
- Hosting of Visits to Hawaii
- Maintain a current list of operational contact points (TNC and TWFP) and facilities for the PTWS and make it available on request to all Member States
- Initiate and support training activities to enhance and enrich tsunami warning in the Pacific.

24 The IOC Executive Secretary reminded the participants that IOC works as a single Secretariat and all staff is under the authority of the Executive Secretary and the authority of the Director-General. This includes secondments, which are staff detached to UNESCO to perform as UN staff. With respect to budget, he reported that IOC Member States decided to propose to the UNESCO's General Conference at its 23rd Assembly to keep the IOC budget structure and proportions unchanged, to avoid jeopardising any particular programme. The implications of this decision are that tsunami has a very low planned amount in the Regular Budget 2008–2009, to perform and deliver in the four existing ICGs. This calls for an increased extra budgetary support for IOC's work on tsunami.

25 Chile intervened about the structure of the ICG where most of the officers are retired. In the future, he emphasized the need to retain the Past Chairman as an important asset to secure continuity and transmission of experience.

26 USA asked for the amount planned by UNESCO for IOC. The IOC Executive Secretary reported that the IOC initial proposal requested an increase of \$ 250,000 plus one additional staff in Bangkok. However, due to the reasons explained above, the tsunami programme, including the ICG/PTWS, will be receiving a very small contribution; considering that only a total of \$ 50,000 would be available for the tsunami programme in 2008–2009. In other terms, for the biennium 2008–2009, the IOC Member States decision is that Regular Budget for ICG/PTWS is

very small, and that will happen unless the UNESCO General Conference in October 2007 decides differently.

27 Australia expressed that it does appreciate the efforts of IOC and of the Secretariat of ICGs and support the location of Secretariats in regions, to facilitate effective implementation and focus on regional issues.

3.4 IOC TSUNAMI CO-ORDINATION UNIT REPORT

28 The Head of the Tsunami Unit, Peter Koltermann, reported on the Unit's activities and support provided for the ICGs. He informed that the Unit also assists the newly formed Working Group on Tsunami and Other Hazards Related to Sea Level Warning and Mitigation Systems (TOWS-WG) established by the IOC 24th Assembly in 2007. Together the Unit provides and has access to a wide variety of expertise in tsunamis, seismology, oceanography, communication and telecommunication, tsunami warning centre operations, computing and programming, legal affairs and general management.

29 He then informed the session that to ensure a consistent development, the Unit on the advice of the ICGs, is pursuing the documentation of the state of a TWS, and the needs for its future development through an evolving Implementation Plan, the documentation of a particular system's mandate, operations, responsibilities and performance through its concepts of Operations Plan, and the definitions of its communications and product development and delivery structure through its Communications Plan. In all, these plans will provide for the stakeholders of the systems a general outline to adapt these instruments to their needs and requirements. Also, and through the International Tsunami Information Centre (ITIC) in Hawaii, USA, the Unit has been organizing and assisting in capacity-building programmes and activities to numerous Member States, drawing on its long-standing expertise and valuable resources.

30 He underlined that in the past only the ITSU has received funds from the IOC regular budget. These had been earmarked for capacity-building purposes of the PTWS's ITIC, and supplemented by extra-budgetary resources from Member States, also earmarked for ITSU. While the present budget for the IOC will be set by the forth-coming General Conference of UNESCO, the IOC Assembly, at its 24th session, proposes a budget for tsunami activities of \$ 50,000 for the biennium 2008–2009. This will be available to all four regional and the global activities requested from the Secretariat by Member States. Any other activity will have to be funded from extra-budgetary funds to be raised by the Unit itself.

31 Mr Koltermann indicated that the Unit also documents the management, development, and achievements as presented to IOC's parent bodies, and serves as a depository, mainly through IOC's ITIC, for the documentation of standards, rules and procedures as requested and developed by ICGs.

32 Australia expressed appreciation for the coordination role played by the Tsunami Unit. It asked if a regular mechanism, such as a Newsletter, is planned to collect and disseminate useful information from among all ICGs. In his reply Mr Koltermann informed the session that producing a Newsletter is high on the Unit's agenda and that also a two-year summary of IOC tsunami activities is planned for the end of 2007. The IOC Executive Secretary added that an evaluation tool for assessments is also required, with a benchmark set by the PTWS's Exercise Pacific Wave 06.

3.5 ITIC REPORT

33 The ITIC Director, Laura Kong, reported on its staffing, activities, and outlook on its work plan and budget. Activities reported covered an overview of tsunami warning centre coordination and capacity building and awareness activities. A summary of ITIC Products and Services was also provided. She also introduced document IOTWS-II/6: *A Regional Tsunami*

Information Centre: Roles and Functions for the Implementation of an Effective Tsunami Warning and Mitigation System, which was provided to the 2nd International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean, as a generalized description and value of a regional tsunami information centre (RTIC). She referred to the budget presented for a fully-resourced RTIC, noting that currently the ITIC does not have adequate resources to fully meet its mandate to serve all PTWS Member States, and also to assist globally.

34 The ITIC Director thanked the Government of Chile for supporting the ITIC Associate Director since 1998 and informed the Group on their offer to continue to support the ITIC Associate Director. The ITIC Director also thanked the Government of Japan and its Japan Meteorological Agency for supporting the secondment of one staff to the ITIC since April 2007 to support the technical coordination and capacity building in tsunami warning operations.

35 The USA stated that in view of the financial status of ITIC and the difficulty in finding resources to fund capacity-building activities, Member States should consider self funding and providing 'virtual' secondments to support ITIC activities.

36 Ecuador expressed concern on risk assessment developments in the region. ITIC Director indicated that ITIC is not in a position to develop risk assessment under the current budget. She referred to the Past Chairman, who in his role of Chair of WG3 indicated that risk assessment is a long-term effort that requires national involvement and most often multi-lateral cooperation. Long-term seismotectonic research studies are required to develop credible risk assessments.

37 The Russian Federation intervened and reported on the long-term successful cooperation established between the PTWS and the IUGG Tsunami Commission through the jointly organized Tsunami Scientific Symposium that is a good opportunity to develop risk assessment capacities. He informed the participants that the next meeting of the IUGG Tsunami Commission will be hosted by the Russian Federation in Novosibirsk in 2009.

3.6 PTWC REPORT

38 The PTWC Director, Chip McCreery, reported on PTWC activities during the intersessional period including tsunami events and products issued by PTWC, summarising the warnings and advisories issued by PTWC since September 2005. He also reported on recent progress and improved capabilities of the operational warning system and its associated components. He informed the session on future planned improvements and challenges.

39 He then reported progress on coverage and quality of monitoring capabilities as the global seismic network has added eight new stations and 23 new telemetry links. As well, sea level measurements include now 29 Pacific deep ocean gauges and upgraded coastal gauges. PTWC has also improved analysis capabilities. However gaps remain, as highlighted by the Solomon Islands and Pisco, Peru, events in 2007.

40 Dr McCreery reported that modelling capacities for tsunami forecast have improved due to the availability of numerical models and data from the deep-ocean buoys. Numerical modelling software developed at NOAA/PMEL is being transferred to enable operational tsunami wave forecast models, including SIFT (Short-term Inundation Forecasting of Tsunamis) and inundation models. He showed several examples of recent earthquakes and associated tsunamis where the forecasted and the actual reading of tsunami waves fit well.

41 Canada asked if the examples of tsunami modelling presented by the Director of PTWC were developed during the events. PTWC Director clarified that some of the work is done in real time but that a lot of the work is done after the event. Responding to a question of the Republic of Korea, he indicated that based on pre-calculated scenarios and on real time DART data,

PTWC is able to run models that forecast travel time and expected tsunami wave heights for a set of forecasted points in about five (5) minutes.

42 Indonesia commented that Member States' response to the 12 September 2007 event could be improved. He noted that East African countries had time to monitor the event and did not evacuate coastal communities. PTWC Director acknowledged that there is a need to review procedures for issuing tsunami watches, to take into account sea level data and available forecast modelling.

43 The USA indicated that wave forecasting and inundation estimates would help countries to more clearly determine whether an evacuation is needed. It noted however, that operational tools are still being developed. Presently, some techniques look very promising for severity of tsunami forecast, which PTWS may want to consider as part of warning criteria. Canada commented on the high value of deep-ocean observations to constrain the modelling. It also indicated that when possible, Standby Inundation Models (SIMs) through SIFT appears to be very useful for local decision-making.

3.7 REPORT OF THE DIRECTOR OF EARTHQUAKE AND TSUNAMI OBSERVATIONS DIVISION OF THE JAPAN METEOROLOGICAL AGENCY

44 Yohei Hasegawa, representing the Japan Meteorological Agency (JMA) offered an outline of JMA's National Tsunami Warning Service. He described JMA's seismometer network comprising 182 stations and reported that JMA has been using tsunami simulation models for eight years. Scenarios for 100,000 tsunamigenic earthquakes have been calculated in advance. JMA has 66 tsunami forecast regions and two types of tsunami forecasts: tsunami warning and tsunami advisory. A network of around 100 sea level gauges is used to confirm if a tsunami has been generated. JMA also issues national warnings for distant tsunamis and exchanges information with PTWC in the framework of PTWS. JMA also provides NWPTA service for the north-western Pacific region including the South China Sea and an international tsunami information service for the Indian Ocean. Since 2005 JMA has issued 31 advisories for the Pacific and 17 for the Indian Ocean.

45 Mr Hasegawa described a new technique for issuing early warning of local earthquakes in Japan based on P-waves only which allows an estimate of hypocentres within seconds.

46 Canada asked about the level of accuracy of JMA's amplitude forecast. Mr Hasegawa replied that as they assume the most dangerous situation. This is because from the viewpoint of disaster management it needs to respond very quickly for near sources where pre-calculated scenarios may not exactly replicate the true source characteristics.

3.8 NATIONAL PROGRESS REPORTS

47 National Reports were presented in Plenary and are available as written National Reports from the PTWX-XXII website. Altogether, 20 countries provided National Reports for ICG/PTWS-XXII. Several additional reports were received after the session and are also posted to the website. Additionally, short interventions were provided by a number of countries during the session.

48 Australia reported that the main focus of activity in Australia, during the inter-sessional period since ICG/PTWS hosted by Australia in May 2006, has been on the enhancement of the existing Australian Tsunami Alert Service (ATAS) and implementation of the first stage of the new Australian Tsunami Warning System (ATWS). The ATWS is co-managed by the Australian Bureau of Meteorology (Bureau), Geoscience Australia (GA) and Emergency Management Australia (EMA). On 16 July 2007 the Joint Australian Tsunami Warning Centre (JATWC), which is operated by the Bureau of Meteorology and Geoscience Australia, came into operation. By the end of 2007 they will be using modelling scenarios to provide stratified warnings. Real

time sea level data monitoring from the Australian observing networks is being progressively extended in the region, with 23 sea level stations now reporting in real time and available on the Global Telecommunication System (GTS) in the agreed CREX code. Australia's first deep-ocean tsunami buoy was successfully deployed in April 2007 in the SW Pacific to the SE of Australia, with the assistance of the National Oceanic and Atmospheric Administration (NOAA) of the US under a bilateral MOU. With funding from AusAID, the Bureau with support from EMA and SOPAC has commenced a project to help SOPAC Member Countries assess their ability to receive, disseminate and respond to tsunami warnings. In total 14 countries will be visited by a team of experts, with the first visit to Tonga being completed in June 2007. Geoscience Australia, with funding from AusAID and support from SOPAC, has undertaken a preliminary tsunami hazard risk assessment for countries in the SW Pacific.

49 Canada reported on the expansion of the PTWS service to the Atlantic coast of Canada. Canada has established expected tsunami heights for its entire West coast and is experimenting with GPS positioning for tsunami warning. Stage 1 of Neptune Canada (www.neptunecanada.ca) is presently underway to lay an 800 km ring of powered fibre optic cable on the seabed over the northern part of the Juan de Fuca tectonic plate, a 200,000 sq km region in the northeast Pacific off the coasts of British Columbia, Washington and Oregon. Proposed for the network are tsunami-meter instruments, which include bottom pressure recorders (BPRs) at all six nodes, plus three (3) additional BPRs near the ODP1027 node, forming an array for inversion of propagating tsunami and other gravity wave signals, for real-time tsunami warning, and for studies of the properties of these waves in the ocean and on continental shelf. NEPTUNE Canada will also include continuously operating ocean bottom seismographs. Three broadband seismic observatories will be deployed in a large triangle and four short period instruments will be deployed on the Juan de Fuca Ridge. Data flow and processing will be integrated with routine processing of data from the Canadian National Seismograph Network operated by the GSC of NRCan.

50 China expressed that its government gives a high priority to the development of tsunami monitoring capacity and mitigation efforts. In 2005, China put in place a national contingency plan for tsunamis. Now, all the coastal provinces have also set up their individual tsunami contingency plans. If a tsunami is forecast to hit the Chinese coast, the National Marine Environment Forecasting Center will issue a tsunami warning. This will trigger the local governments to take appropriate actions to deal with the emergency situations according to the local contingency plans. China is attentive to the threat of potential tsunamis in the South China Sea that may affect the coastal communities and has kept on enhancing its capability on tsunami monitoring. In this regards, the State Oceanic Administration of China has planned to deploy two (2) tsunami buoys in the South China Sea in the near future. China expects to further cooperation with countries around the South China Sea and also international organisations to mitigate the potential threat of tsunamis to this region.

51 Colombia reported progress as well as failures during the intersessional period. During the recent Peru event, and for the first time in decades, Colombia could not respond adequately to a tsunami bulletin issued by PTWC. This was due to a combination of circumstances some of which may also have occurred in nearby countries: the mass media had access to the PTWC bulletins at the same time the National Focal Point had and they disseminated erroneous interpretations of its contents. Colombia lacked timely communication with neighbouring countries and access to data from appropriate tide gauges; national authorities reacted under media pressure, giving priority to saving lives, without further evaluations being available. Colombia would see it as convenient step that the text of PTWC messages could be made more categorical in its reservations (recipients, local evaluations, etc.) and express appreciation for the initiative and efforts to create and build up a sub regional cooperation group of South America countries for tsunami warning and mitigation, which will certainly help to prevent such failures in the future.

- 52 Ecuador also commented on the South America regional needs and specifically on the existing gaps in the sea level measurement network, seismic monitoring network, and the sharing of this information among neighbouring countries. It stressed the need of strengthen capabilities of detection for local or near field tsunamis. Ecuador is looking to further develop the capabilities of South East Pacific countries for local and near field tsunamis.
- 53 France reported on recent activities in French Polynesia. It includes 15 fully operational sirens installed in French Polynesia. The total number of sirens will be 120. These sirens are local transmission independent, equipped with Inmarsat mini-C Satellite detector. These sirens are electronic equipment, 136 dB (A), with possibility of solar panel power supply. They will be operated by High-Commissariat Departments, located in Tahiti. The first sirens were implemented recently in the Australes archipelago. The Marquesas Islands are now equipped, and two more are installed in Tahiti: France is also undertaking numerical simulations and using TREMORS station and computation of Mm. France is developing a tsunami warning and mitigation programme for the region of New Caledonia, Loyalties islands, Wallis and Futuna. The first component that will be implemented in 2007 and 2008 is a network of sirens, similar to the one's implemented in French Polynesia. The second component will be a network of real-time sea-level stations for monitoring the tsunami activity along the French territories and neighbouring countries coasts. This network will be implemented in the next two years. France also reported that the Warning and Emergency Plan (Plan de secours spécialisé tsunami) is in progress and will be in place before the end of 2007.
- 54 Indonesia provided an update on the status of the Indonesian TEWS (InaTEWS) components. InaTEWS is established by the Government of Indonesia and supported by various donor countries and international organizations, included: Germany, China, Japan, France, USA, UNESCO etc. The system is developed involving 16 National institutions with core operational role for BMG, in relation with BPPT and Bakosurtanal, Dept of Kominfo, Dept of Interior Affairs, LIPI, ITB, Bakornas PB, under the coordination of State Ministry of Research and Technology. InaTEWS consist of land monitoring system (seismic and GPS), sea surface monitoring system (buoys and tide gauges), situation centre included dissemination and tsunami database system, public awareness and preparedness and capacity building. The full operation of the system is targeted to be reached by the end of 2008. Indonesia reported plans to have 22 tsunameters, one of this already installed and going under functioning test. Indonesia plans to have 80 tide gauges by the end of 2008, 30 of which will be installed by the end of 2007. It reported on the last earthquake generated tsunami, on 12 September 2007, known as the Bengkulu earthquake, with Mw 8.0 initially reported as Mw 7.9. This earthquake generated a tsunami with a height of 4 meters measured at one of Bengkulu coastal area by a post earthquake-tsunami survey team. The tsunami was also recorded at Padang tide gauges 45 minutes after the earthquake occurrence. This earthquake was the first one located by InaTEWS after upgrading the processing system which enables BMG to measure magnitude up to 7.9 and the modification of issuing the warning from automatic processing to interactive processing. BMG issued a warning within 5 minutes of the earthquake origin time earthquake.
- 55 Japan reported that there had been six tsunamigenic earthquakes around Japan and three distant ones among which the Japan Meteorological Agency (JMA) issued national tsunami warnings for six events. Significant improvements have been achieved in the tsunami warning service of JMA. The Earthquake Early Warning technique was applied for the prompt issuance of tsunami warning. The CMT solutions had become utilized for re-evaluation of tsunami estimation in ten minutes after the earthquake. Japan emphasized its contribution to the PTWC by dispatching a seismological expert to the ITIC.
- 56 The Republic of Korea recalled that it has been a member of PTWS since 1968, 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, and participated in meetings actively. KMA continued its participation in the meeting after ICG/ITSU changed its name to ICG/PTWS in 2005. After the ICG/PTWS-XXI in Melbourne,

many advances have been made on the earthquake and tsunami mitigation system in Korea. KMA strengthened the Korea National Seismographic Network (KNSN) and tsunami warning system. It also installed a cable-type ocean bottom seismometer and a borehole type seismometer in 2006. Many inland type seismometers and accelerometers were also installed in 2006. Therefore, KMA is currently operating a seismic network composed of 12 broad-band seismometers, 27 short-period seismometers, 86 accelerometers and an earthquake analysis system. The one-stop earthquake & tsunami analyzing and broadcasting (warning) system that disseminates warning messages to the relevant organizations has been improved continuously. The Republic of Korea is currently exchanging seismic data with Japan. KMA is keen to share seismic data with other countries. KMA has been working to assure the promptness and accuracy of the announcements of tsunami information. In fact, detailed and rapid tsunami information for people residing in the areas of possible tsunami inundation is essential to mitigate tsunami hazards. For this reason, KMA has been executing simulated tsunami preparedness drills to evaluate the tsunami warning and notification system each year. KMA executed drills twice in 2006 and once in 2007. KMA also participated in the international tsunami drill titled 'Exercise Pacific Wave 06' held by the ICG/PTWS on 17 May 2006. Lastly, KMA's earthquake division was promoted onto bureau level and the Director-General for Earthquake was newly designated for the first time in the Republic of Korea.

57 Peru commented on communication problems at the time of tsunami, including the public telecommunication facilities. Peru is committed to increasing national capabilities for communications (satellite), increased tide gauges monitoring network (one every 200 kilometres), siren towers and support training on tsunami modelling.

58 The Russian Federation reported that they have purchased broadband seismometers for three stations, which will be installed and operational this year. They intend to install two sea-level monitoring platforms and work is underway on communications but this depends on availability of funds.

59 Samoa reported that it has one seismic station. This will be further strengthened within the framework of Australia's project to enhance Southwest Pacific capabilities. Samoa completed an exercise and is planning a national test of the system in October 2007, including identification of evacuation sites.

3.9 REPORTS FROM OTHER TSUNAMI WARNING AND MITIGATION SYSTEMS

60 Dr Gustave Malave, Vice-Chair CARIBE/EWS, provided an overview on ICG/CARIBE-EWS, membership and activities. It comprises 24 Member States and held its 2nd session in Cumana, Venezuela, 10–14 March 2007. The ICG does have four Working Groups: Monitoring and Detection Systems, Warning Guidance; Hazard Assessment; Warning, Dissemination and Communication; Preparedness, Readiness and Resilience. The system targets tsunamis and other threats, such as hurricanes. Recently, seismic monitoring has increased in the region, reducing gaps in coverage; as well, regional workshops in seismology have been carried out. There has not been progress in sea level measurements however the Group is looking at ways of improving this. Seven DART buoys have been deployed by the United States in the Caribbean and North West Atlantic. Dr Malave indicated that the Group agreed that modelling studies are required to investigate inundation risk and training is required to that end. He stressed the need for community preparedness. A Tsunami Warning Centre in the region is planned for 2010 and ICG/CARIBE EWS-III will be held in Panama, 12–14 March 2008.

61 The USA suggested combining some activities with ICG/PTWS to improve efficiencies. Dr Malave agreed with this proposal.

62 Mr Rick Bailey, Vice-Chair IOTWS, provided a status report of the activities of ICG/IOTWS. He reported that since 26 December 2004 there has been much activity at national level to develop the IOTWS. An interim advisory service is provided to IOTWS by PTWC and

JMA, while it defines a set of interoperable Regional Tsunami Watch Providers (RTWPs). The ICG has six Working Groups, one Steering Group to guide its activities and a Secretariat based in Perth. The Implementation Plan is used to monitor the status of the system. The observational network is expanding and there has been coordination of the modelling efforts, including several training activities. Issues facing the IOTWS include integration of ongoing and future national efforts, transition phase from the interim warning service to a sustainable RTWPs scheme and national responses to warnings.

63 The IOC Executive Secretary enquired if the current Australian warning system is based on PTWC/JMA advisories. Mr Bailey replied that Australia use its own analysis but monitor the information released from PTWC, JMA, Indonesia and elsewhere. Following a question from the USA, Mr Bailey pointed out that an ICG/IOTWS Task Team is looking into the transition phase foreseen to start by the end of 2008.

64 Mr Bailey indicated that the IOTWS is very grateful to the USA for the financial resources dedicated to help building the Indian Ocean effort and expressed that with the phasing out of the USAID support to the IOTWS the group would need to factor it into the IOTWS work plan.

65 Prof. Stefano Tinti, Chair of the ICG/NEAMTWS reported that three sessions of the ICG/NEAMTWS have been held in Rome (November 2005), Nice (May 2006) and Bonn (February 2007). The NEAMTWS comprises the Mediterranean and connected seas such as the Black Sea. An Action Plan was formulated in 2006 and an Implementation Plan was established in 2007. The Mediterranean faces moderate tsunamis with short travel times. A decision matrix is needed to classify local, regional and basin-wide tsunamis. While the seismic network is well established in Europe, the coastal sea level network is under development and is identified as a weak point in the system. There have been discussion on whether the system should be multi hazard for sustainability and the conclusion is that this should be considered. Several activities are planned for 2007, including the ICG/NEAMTWS-IV session in Lisbon in November 2007. A sea-level workshop is scheduled for October 2007 in UNESCO, Paris, France.

66 Japan commented that the PTWS does have regional warning centres through PTWC, JMA and ATWC, and the Indian Ocean is planning watch providers through RTWPs. He asked if NEAMTWS has had discussions about the structure of its warning system. Prof. Tinti replied that NEAMTWS is still in early stages of development, with a number of centres in Europe involved in seismological monitoring but no similar structure for sea level data. Answering a question from the the Russian Federation he indicated that meteorological tsunamis as well as tectonic, volcanic and landslide tsunamis are being considered.

67 The Head of UNESCO/IOC Tsunami Unit asked Prof. Tinti on the expected role of the European Union. Prof. Tinti replied that funding for research is becoming available from the European Commission. As well, some coordination is been developed through the Directorate-General Environment, Directorate A - Communication, Legal Affairs and Civil Protection.

3.10 REPORT FROM UN ORGANISATIONS

68 Mr Edgar Cabrera, Chief, Ocean Affairs Division, WMO, provided a summary of WMO activities related to tsunami early warning. He recalled that the Global Telecommunication System (GTS) links the National Meteorological and Hydrological Services (NMHS) of 187 countries and territories. Mr Cabrera gave a description of how the GTS works and described the planned WMO Information System (WIS) for exchange of data, as well as the different telecommunication technologies used by WMO. He then described the headers used in the GTS tables and the traffic flow through the system. He explained the technical arrangements for distributing TWS messages to NHMSs. He also reported that in the Indian Ocean the GTS has been upgraded through UN Indian Ocean Flash Appeal funding. He further described WMO's role in other ocean related hazards.

69 The USA commented that without WMO's support for the GTS we would find it impossible to get wide dissemination of warnings around the globe.

3.11 REPORTS FROM NON-UN ORGANISATIONS

70 Ms Paula Dunbar, NOAA NGDC Tsunami Program Manager, on behalf of the IUGG Tsunami Commission provided a summary report of IUGG activities for the past two years which included workshops on tsunami hazard mitigation and the IUGG-XXIV General Assembly. She reported that a workshop on tsunami preparedness, mitigation and response was held prior to ICG/PTWS-XXII, which resulted on some technical recommendations. The IUGG formed three Working Groups after the 2004 Indian Ocean Tsunami to work on field survey, instrumental data and satellite data. Liaison contacts for these groups within each ICG have been identified.

71 The USA consulted how the IUGG partnerships would continue now that there are four ICGs. Ms Dunbar responded that the IUGG should consider this fact and reaffirmed the willingness of IUGG to cooperate. The USA commented that there were practical benefits by holding the workshop in dates close to the formal ICG session, among these that funding was available for smaller countries to come to the workshop and stay on for the ICG.

72 Mr Noud Leedners, representing the Community Risk Programme of SOPAC, provided a summary of SOPAC activities. SOPAC coordinates regional tsunami related issues through its multi-hazard regional "Early Warning Strategy". It contributes to vulnerability assessments as the main regional data collection agency and repository of PIC near shore bathymetric and topographic and other remotely sensed data. He indicated that there is a need to conduct an analysis of monitoring gaps to allow effective early detection of regional tsunami events.

73 Dr Prih Harjadi of Indonesia reported on ASEAN activities. ASEAN consists of 10 countries and do have a sub committee on meteorology, climatology and geophysics (SCMG). The ASEAN Earthquake Information Centre (AEIC) is co-located with the Meteorological and Geophysical Agency (BMG), Indonesia. At the end of 2004, the SCMG established a Technical Task Force to look into the exchange of tsunami warnings between the ASEAN countries. It has been discussed that the role of the Technical Task Force for the SCMG should be merged with the AEIC. Dr Harjadi noted that SCMG and IOC have been cooperating on capacity building activities.

74 Ms Paula Dunbar made a summary report on the activities of the World Data Centre (WDC). The WDC is hosted by NOAA in Boulder, Colorado. WDC has produced several reports on tsunami data management and tsunami hazard assessment. WDC is committed to the free and open exchange of data. WDC databases are available online. She noted that there are gaps in the coastal tide data archive. She also reported that a tsunami waves and water level workshop was organised in conjunction with the IUGG-XXIV meeting. As well, and in collaboration with ITIC, WDC developed the Tsunami Travel Time (TTT) software tool.

75 Japan noted that recently JMA checked and compiled Japanese tsunami records from 1927 to 2003 by looking through JMA-owned data and available scientific literature. Japan offered this data to WDC for updating the existing Tsunami Catalogue. These records will be also provided to Novosibirsk Tsunami Laboratory so that the two databases are consistent.

4. TWS IMPLEMENTATION PROGRESS REPORTS

4.1 SEISMOLOGICAL OBSERVATIONS

5.1.1 Working Group 1: Seismic Measurements, Data Collection and Exchange

76 Dr Charles McCreery, Director of PTWC, reported on the intersessional activities of PTWS-XXI Working Group 1 (WG1) on Seismic Measurements, Data Collection and Exchange on behalf of its Chair, Dr Stuart Weinstein. He noted that there had been no meetings of WG1 during the intersessional period and that the 26 recommendations that WG1 had previously identified and presented to the Group at ICG/PTWS-XXI were still relevant. He noted that incremental progress had been made on some of the recommendations. He presented a summary of the document IASPEI New Manual of Seismological Observatory Practice developed by the International Union of Geodesy and Geophysics (IUGG) International Association of Seismology and Physics of the Earth's Interior (IASPEI) and recommended it be adopted by the ICG as a reference document for standard practice. Lastly he noted that WG1's TOR had been fulfilled and recommended it be dissolved.

77 **The ICG decided** to dissolve WG 1 on Seismic Measurements, Data Collection and Exchange. It did not take a decision on the IASPEI New Manual of Seismological Observatory Practice.

5.1.2 CTBTO Report on Use of Network by PTWC and JMA

78 Dr Charles McCreery reported on the use of CTBTO data. He explained that there are 50 primary stations on the network which can be used to supplement the Global Seismic Network (GSN). An important feature of the CTBTO network is that many of the installations are arrays rather than individual stations. There is also a network of 120 auxiliary stations from which data can be requested from CTBTO, and 11 hydro acoustic stations. Dr McCreery noted that this is an important contribution to the tsunami warning effort.

79 Australia asked about the procedure for obtaining CTBTO data through IOC. The Head of the Tsunami Unit explained that following CTBTO rules and decisions, CTBTO Member States can access data from CTBTO through their established national contact. For tsunami warning, an IOC Member State that is also a member of CTBTO can request data for tsunami warning purposes, been a recognised tsunami warning centre operator, as confirmed by IOC through UNESCO.

80 The USA asked if the Working Group has identified specific stations in the CTBTO network that are important for tsunami purposes. Dr McCreery suggested that each warning centre should identify which stations are relevant to them.

5.1.3 FDSN/IRIS Report – Global Seismic Network

81 The Chairman Dr Schindelé recalled that the Group invited FDSN to collaborate with the relevant intersessional working groups established by ITSU-XX. It also called on Member States to cooperate with FDSN to establish new seismic stations and to contribute to the FDSN network.

82 Mr Masahiro Yamamoto, Senior Tsunami Advisor of the Tsunami Unit provided a description of the Global Seismic Network (GSN) under FDSN. There are 16 seismic networks participating in FDSN. The GSN provides seismic data to the seismic community for a variety of uses including research and operational needs. There is good cooperation between the international seismic communities through FDSN. He stressed that further collaboration with FDSN and CTBTO is required for the establishment of a reliable and sustainable tsunami warning system.

83 Japan informed the session that seven STS-2 stations of JMA have been newly registered for the IRIS seismic network. Their real-time seismic waveform data are available from the IRIS server through Internet.

4.2 SEA-LEVEL OBSERVATIONS

4.2.1 Working Group 2 Report: Sea-Level Measurement, Data Collection and Exchange

84 Dr Rick Bailey, Chairman of WG2, reported on intersessional activities of the group, which did not meet during the intersessional period. He informed that activities closely related to the mandate of WG2 are being conducted in the other ICGs. He provided an update on the status of the observational network and noted that sea level metadata is crucial. An XML metadata schema is under review by ICG/IOTWS WG2 and this has been passed to PTWS for consideration. He commented that network design is also crucial, including the GLOSS network and tsunameters, with due consideration to national plans on network design. He commented on the need to exchange information on new technologies, and to review the IOC Manual on Sea Level Measurements. He further stressed that there is an effort to standardise data exchange through the WMO CREX code. Other issues concerning data latency and real time satellite communications have also been addressed. Dr Bailey also described some of the tools available to download and display sea level data through Internet.

85 He then reported that following a recommendation of a joint meeting of ICG/PTWS WG2 and ICG/IOTWS WG2, held during ICG/PTWS-XXI in Melbourne, Australia, a standard data transmission frequency of 5-min for data recorded at 15 second intervals is being considered for all coastal stations within one hour tsunami travel time from a Pacific tsunami source.

86 Canada consulted about methodologies to remove the tidal signal from sea level data. WG2 Chairman replied that this is not desirable for tsunami warning purposes. In response to a related question from Samoa Dr Bailey confirmed that the data is available in real time.

87 The Russian Federation indicated that the 2006 and 2007 Kuril Islands tsunamis were recorded by more than 100 sea-level gauges that enabled detailed examination and comparison of the two events. The difference between the two tsunamis associated with different earthquake mechanisms was clearly demonstrated by the DART buoy measurements, i.e. flood wave propagating oceanward for the first event and landward for the second event. The analysis showed that both events were high-frequency and a sampling interval of 1 min. (or better) is crucial to measure such events; a 2-4 minute sampling is not enough to measure high frequency tsunamis (i.e. tsunamis generated by earthquakes with small source areas).

88 The USA requested what are the recommendations regarding the International Tsunami Partnership (ITP) in the Pacific? Assuming the discussion about standards is run through GLOSS, PTWS should address strategic issues. The WG2 Chairman responded that regional design needs to stay yet at the regional level, while the standards may be discussed at a more global level (i.e. DBCP or JCOMM). The USA suggested that these issues could be discussed at the First JCOMM Scientific and Technical Symposium on Storm Surges (Seoul, Rep. of Korea, 2–6 October 2007) and commented that sea level network needs to be addressing several needs and be multipurpose to be sustainable. Dr Bailey responded that deployment of multiple use sea level gauges is definitely the right approach.

89 An intrasessional meeting took place to review intersessional activities, address some the issues discussed in plenary and develop and propose an intersessional Work Plan.

90 **The ICG approved Recommendation ICG/PTWS XXII.1.**

4.2.2 Global Sea-Level Observing System (GLOSS) Report

91 This Agenda Item was introduced by Mr Bernie Kilonsky, University of Hawaii Sea Level Center, on behalf of Global Sea Level Observing System (GLOSS). He summarized the report of the Tenth meeting of GLOSS Group of Experts (GE-GLOSS-X), and the activities of GLOSS to improve sea-level network monitoring in the Pacific. He indicated that GLOSS is available to provide technical assistance on collection, processing, and distribution of sea level data in support of tsunami and hazards warning. GLOSS encourages high frequency transmission of data for tsunami purposes. The 'Delayed-mode' Data Assembly Centre, where high frequency data are stored, is operated by the British Oceanographic Data Centre (BODC). BODC archives high frequency data from GLOSS core stations. GLOSS is currently looking at the possibility of posting station's metadata in a website, in coordination with the IOC/IODE Programme Office in Ostend, Belgium.

92 He demonstrated the services being provided by the GLOSS network in the Indian Ocean with the example of the earthquake and tsunami in Padang, Southern Sumatra, Indonesia, on 6 March 2007. In this case, 42 minutes after the earthquake the tsunami was registered in the Padang (Telu Bayuk) GLOSS Station, that do sample every minute and report every 15 minutes. Forty-one (41) minutes after wave arrival the records show a high peak, with the highest after two hours.

93 Mr Kilonsky explained that to improve the situation in the Pacific Ocean, 5-minute data transmission frequencies are available through the GOES East and West satellites, and stations are being considered for upgrade priority through the University of Hawaii Sea Level Centre. Priority will be assigned for coastal stations within one hour tsunami travel time from a Pacific tsunami source.

4.2.3 Deep-Ocean Tsunami Detection Network Report

94 To introduce this item the USA provided a summary on the existing and planned deep-ocean systems for detecting and evaluating tsunamis, including the plans by the United States, Australia and Malaysia for the deployment of the DART (Deep-ocean Assessment and Reporting of Tsunamis) network and its operational use in tsunami wave forecasting. It also reported on the outcomes of the Second Meeting of the Tsunameter Partnership (6–7 September, Jakarta, Indonesia).

95 ICG/NEAMTWS Chairman, Dr Tinti, asked the rationale behind the North Atlantic DART location. The USA responded that the logic is risk locations in the Caribbean based on historic and potential tsunamis. The concept is a distributed array that will provide one hour time-lag for tsunami events to be recorded.

96 France asked on the Tonga offshore DART buoy and suggested modifying the position of the buoy. The USA responded that this is in process and specific location could be adjusted.

97 The Russian Federation recalled both the Lisbon 1755 and Newfoundland 1929 tsunami events in the North Atlantic and asked if a new DART will cover the Northern part of the Atlantic Ocean. The USA responded that this might happen in the future.

98 Malaysia enquired about the difference between DART-I and DART II devices. The USA informed that DART II uses a two ways communications device, it can be remotely activated and all the data is available in GTS. DART-I instead triggered automatically by a threshold wave-height value.

99 Peru enquired about the dates for deployment of the DART buoy planned to be deployed off Pisco, Peru. The USA informed the audience that it will be shipped and installed in October 2007, while the specific location is yet to be refined. Peru asked about the recent tsunami in

Padang, Indonesia, and the 2-hour cancellation time: based on PTWC experience, how many hours can a TNWC wait for final cancellation? Director PTWC responded that cancellation does not necessarily means all clear for all coasts in view of local variations and local trapping energy processes.

100 The USA commented that there is a strategy for the maintenance and sustainability of the USA-deployed DART buoys. Also, Republic of Korea and the Russian Federation have discussed about it with the United States, as well as Australia. However, a coordinated strategy at the ICG/PTWS to provide ships and other resources for securing sustainability of the system is absent. In response to this concern the Chairman proposed to charge WG2 to discuss this issue.

101 Chile requested information on who to contact and what are the mechanisms in order to get real time information from GLOSS and DART stations? GLOSS representative indicated that the data is downloadable from GOES and directly available through GTS. The list of GTS headers is available for all stations. Access to GTS is available through the National Meteorological and Hydrological Services (NMHS). Australia explained that this was also an issue at the ICG/IOTWS and informed that the Tsunami Unit have a role in providing this information to Member States. The Head of the Tsunami Unit reported that NHMS can request headers and put the info in the routine GTS tables, including the information about the timing out of the sea-level information. Director PTWC indicated that GTS is the most reliable way of getting DART and sea level data.

102 Canada asked about the eventual limitations of GOES to handle sea-level data. GLOSS indicated that GOES cost is zero and has the capability of getting short messages. METEOSAT have download limitations (one minute window) and INMARSAT is being explored by IOC. The IOC Executive Secretary informed that the Secretariat is working, through GLOSS, to improve timing for sea level data transmission and to get communications links that are reliable, affordable and constant.

103 Director PTWC explained how DART data is used for tsunami forecast. He clarified that location of DART buoys is relevant because the data provides an indication of the direction of the energy. As well, deep water measures enable constraining the model and providing then a more accurate forecast. The Chairman asked about the amplitude forecast. The Director of PTWC indicated that the estimates so far are not very accurate. This is a complex task for the future that also involves the issue of how to disseminate the information available from these models to Member States. **The ICG agreed** that this may be an issue to be explored by WG5.

104 The Russian Federation enquired more details about the triggering mechanism of DART buoys. PTWC Director explained that DART-II are activated or triggered by earthquakes then, because of the time delay, under some conditions there is a risk of missing the tsunami wave. PTWC is asking PMEL to workout a solution. The Russian Federation asked if the cable deep ocean pressure system available in Japan is available for other Member States. Japan responded that this data is available only to PTWC because that data is not open, even for domestic purposes.

4.2.4 Sea Level Station Metadata and Data Facilities Report

105 This Agenda item was introduced by the interim ICG/PTWS Secretary, Laura Kong. She demonstrated different tools available for display of sea-level data and metadata in the Indian Ocean, Mediterranean and Caribbean Sea. She suggested that it may be relevant to also collect this information for the Pacific Ocean and make it available to PTWS Member States.

4.3 PREPAREDNESS, EMERGENCY RESPONSE, AND OTHER RELATED MATTERS

5.3.1 TSUNAMI HAZARD AND RISKS

4.3.1.1. Working Group 3: Tsunami Hazard Identification and Characterization

106 This item was introduced by the Chairman of Working Group 3, François Schindelé. He reported that the Working Group met on 2 May 2006 in Melbourne, Australia, in the premises of the Australian Bureau of Meteorology. No meetings or formal activities of the Working Group took place during the intersessional period. He then provided an update on the information available with regard to the activities identified by WG3 in May 2006.

107 On numerical modelling, most of Member States are currently using different numerical model codes (as TIME or TUNAMI) to perform tsunami hazard assessment. The review of models that are currently being used or being developed, as well as the identification of related documentation (inputs, outputs etc.) has already been done by a NEAMTWS Working Group. This document will be available on the IOC web page by the end of 2007. As well, the scenario of Pacific events used for modelling are largely described in papers or reports. Inundation charts are available in most countries, for numerous harbours and coastal cities, and new inundations charts will be prepared during the next coming years.

108 With respect to the International Tsunami Data Base (ITDB), he indicated that recent studies show that it needs to be reviewed to become as reliable as possible. Dr Schindelé recommended that every Member State perform similar studies and provides to NGDC and ITIC all new historical tsunami data to make the ITDB as complete as possible.

109 On post-tsunami surveys, he stressed that new and recent tsunami data are absolutely critical to improve tsunami hazard assessment and knowledge. However, most of observations and data are not reported for moderate events.

110 WG3 recommended to the ICG to consider as a best practice guidance document IOC/PTWS-XXII/Inf. 4 'Standard, Criteria, and Procedures for NOAA Evaluation of Tsunami Numerical Models' (Synolakis, Bernard, Titov et al., March 2007, NOAA Technical Memorandum OAR PMEL-135). It includes benchmark tests for validating and verifying computational tools for predicting coastal effect of tsunamis. He noted that the IOTWS Working Groups 3 and 4 are discussing similar topics and encouraged regional cross-sharing discussions between the PTWS and IOTWS in order to develop a systematic and consistent approach.

111 Australia suggested that after event field surveys should be coordinated and contingency plans should be developed. This suggestion was seconded by several Member States.

4.3.1.2 Global Historical Tsunami Database Project Report

112 This Agenda item was introduced by Ms Paula Dunbar from NOAA/National Geophysical Data Center (NOAA/NGDC) and Dr Viacheslav K. Gusiakov from Novosibirsk Tsunami Laboratory (NTL).

113 They recalled that there are currently two global historical tsunami databases maintained separately by the World Data Center USA (WDC/NOAA, Boulder, Colorado, USA) and the Novosibirsk Tsunami Laboratory (NTL/ICMMG, Novosibirsk, Russian Federation). At the IOC/PTWS-XXI session in 2005, a new plan for merging these databases was discussed. A decision was made that the databases would continue to be maintained independently, but efforts would be focused on bringing the two databases into agreement by beginning with verification of the most deadly tsunami events. WDC/NOAA prepared a list of "significant" tsunami events based on the data in both databases and provided the list to NTL/ICMMG. The

initial list contained 281 tsunami events. Since that time, WDC/NOAA and NTL/ICMMB have been working on the quality-control of their respective databases. Based on the quality-control effort, the WDC/NOAA database now contains 308 significant tsunami events.

114 Japan reported on the Japan Meteorological Agency (JMA) work on the verification of the Japanese historical tsunami data for providing WDC/NOAA and NTL/ICMMB.

115 Ms Dunbar reported that the biggest challenge that WDC/NOAA faced in the quality-control of the database was obtaining the original source documents.

116 WDC/NOAA and NTL/ICMMG will continue verification of the significant tsunami events and comparison of source materials and expand the verification to include all tsunami events that caused maximum run up >1 meter.

117 Dr Viacheslav K. Gusiakov delivered a copy of the new Tsunami Database prepared by NTL/ICMMG to ITIC for distribution of one copy to each PTWS Member State.

118 The USA noted that while for several years there has been an effort on solving the discrepancies no significant progress has been achieved. In his view PTWS should address this and find an alternate solution. In response to this, Ms Dunbar indicates that NGDC thinks that there is real progress particularly for significant events. Dr Gusiakov indicated that there are differences in interpretation of data and information missing from Member States. The Russian Federation indicated that for events in South America the difference in estimated run ups among both catalogs is considerable.

119 The IOC Executive Secretary pointed out that this is a very useful tool that is yet to be finalized pending agreement on specific details. This shall not preclude having a common agreed database available to all Member States at any given time, regardless of the need of permanent qualitative improvement. This implies that dedicated resources for getting this minimum service should be sought.

120 The Chairman suggested that these definitions could be entrusted to the subregional Working Groups established by ICG/PTWS.

4.3.2 Working Group 4: Resilience Building and Emergency Management

121 This Agenda item was introduced by Canada, on behalf of the Chairman of Working Group 4, Mr Fred Stephenson. It reported that the Working Group met on 2 May 2006 in Melbourne, Australia, in the premises of the Australian Bureau of Meteorology. No meetings or formal activities of the Working Group took place during the intersessional period. It then referred to a document prepared by Mr Stephenson containing comments on status of the activities identified in May 2006, mainly addressing best practices. In its report, Mr Stephenson reported that only four countries have completed the comprehensive assessment questionnaire prepared by Working Group 4. With respect to tsunami signs he suggested that the ICG/PTWS may accept that there are several similar formats and that individual Member States in the Pacific and elsewhere will select the format that best meets their requirements based on cultural or regional considerations or other reasons.

122 Mr Stephenson suggested that the challenges faced by small Pacific Island and Small Island countries in the Caribbean and the Indian Ocean, in developing and maintaining the capacity needed to respond effectively to infrequent, hazardous events is equivalent. In that sense, a plan of action addressing Small Islands could be developed or coordinated globally through the recently formed IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG).

123 He also noted that the Regional Association V (South-West Pacific) of the World Meteorological Association (WMO RA-V), at its 14th Meeting in May 2006, endorsed EMWIN and RANET to be included in its Regional Meteorological Telecommunication Network (RMTN), as complementary systems to the GTS. In that respect, he highlighted the efforts of RANET through the USA, Australia, and New Zealand to enable downstream communications to resource challenged communities. The NOAA EMWIN system is also to be noted as an underutilized communications method for the receipt of tsunami warnings and other weather information by non-NMHSs.

124 He further noted the availability of public awareness materials at the ITIC and encouraged Member States to take advantage of these and to customize them for local use. He indicated that funds have not been readily available to enable widespread distribution, and requested Member States to consider contributions to the ITIC for duplication and development of materials to support Member States.

125 In closing his report, Mr Stephenson recommended that a new intersessional Working Group, with appropriate Terms of Reference, be formed to determine Member States requirements for emergency communications, and to identify available or planned technologies which could be used by Member States both within the region and across regions to develop or enhance reliable and timely end-to-end communications in the event of tsunami or other ocean hazards.

126 Samoa informed that EMWIN is not available in the wider Pacific but just in some areas. He also recalled the approval of document "EMWIN and RANET, Complementary systems to the WMO GTS. RA-V Document, 2006" (RA V/WG-PIW-04/Doc. 5.2(4)).

127 The USA requested information about Tsunami Teacher translations in order to assess if new funds are required to develop more languages. The Head of the Tsunami Unit reported that with support from the Indian Ocean Flash Appeal, Chile, France, Norway, Peru, Spain, Thailand and USA (Puerto Rico) Tsunami Teacher will be available in English, French, Spanish, Thai, Indonesian and Bangladeshi.

128 An intrasessional group composed by Canada, Samoa, SOPAC and ITIC was formed to discuss draft Terms of Reference for the proposed Working Group on emergency communications.

129 **The ICG approved** Recommendation ICG/PTWS-XXII.2.

4.4 WARNING CENTRE OPERATIONS

4.4.1 Working Group 5: Interoperability and Regional, Sub-Regional and National Tsunami Warning and Mitigation Systems in the Pacific

130 This Agenda item was introduced by the Chairman of Working Group 5, Dr Charles McCreery. He reported on the actions taken on the recommendations of PTWS-XXI, noting the development of the Users Guide to be discussed under Agenda item 4.4.2, the proposed changes in messages to be discussed under Agenda item 4.4.3, and the Pacific Tsunami exercises to be discussed under Agenda item 4.4.4

131 He recalled that the PTWS conducted two meetings with the goal of improving coordination and capacities for tsunami warnings. These were the PTWS Tsunami Warning Centre Coordination Meeting (IOC/INF-1232, January 2007), which brought together warning centres representing 9 countries, and the PTWS Tsunami Warning Operations Seminar (IOC/INF-1233, April 2007), which brought together national meteorological services and disaster management offices from 27 Pacific Island and South China Sea Region countries.

132 The PTWS Tsunami Warning Centre Coordination Meeting convened international and national tsunami warning centres to discuss coordination issues in monitoring, evaluation, information sharing, alert dissemination, and cancellation of warnings. It also considered the current content of messages and made recommendations on how to improve them for the different user groups.

133 The PTWS Tsunami Warning Operations Seminar, co-sponsored by the IOC/PTWS, WMO/RA-V, SOPAC, and SPREP, and involving ASEAN, sought to build partnerships for action planning in tsunami warning and mitigation by focusing and bringing together the key national and regional stakeholders.

4.4.2 PTWS Communications Plan

134 This Agenda item was introduced by Mr Yosuke Igarashi from JMA, Japan. He expressed that the Users Guide (former Communications Plan) was prepared following the PTWS Tsunami Warning Centre Coordination Meeting where it was agreed to propose the name Users Guide to more accurately reflect the target audience of the Guide and the guidance nature of its information. He then explained that the Users Guide is driven by the intention of having a clear document, readable and friendly that will be used as a primary means for the interpretation of communications services provided by PTWC and JMA.

135 WG5 has reviewed the document and recommends approval of the PTWS Operational Users Guide with inclusion of sessional comments. The Group was invited to provide further input on additional Annexes or other information needed to be included in the Operational Users Guide.

136 The PTWS Users Guide is intended for use by national Tsunami Warning Focal Points (TWFP) as customers receiving the advisories from the (interim) tsunami warning centres. It includes a summary of the operational procedures, networks of instruments, criteria for reporting and issuing tsunami alerts, recipients of the information and methods for message transmission. Annexes provide explanatory and background information on technical evaluation methods and other guidance, in order to assist customers in understanding the products that are issued.

137 The PTWC, WC/ATWC, JMA, and ITIC have agreed to be responsible for the preparation and revision of the PTWS Users Guide. The PTWS Secretariat will be responsible for the dissemination of the PTWS Users Guide and the issuance of changes thereto.

138 The USA asked if the authors of the Users Guide have looked at the WMO Tropical Cyclone Programme that provides very clear guidelines for many of the issues touched by this Guide. The *Tropical Cyclone Guides* have been in use for a long time; it works and has proven to be useful. PTWC Director responded that when preparing the Users Guide the group was not looking at the *Tropical Cyclone Guides* but he welcomed the suggestion.

139 The USA proposed that the Working Group continue working on the document, request users' feedback, identify government representatives to integrate the Working Group, collect more information of similar documents including the *Tropical Cyclone Guides* and present a document for official adoption at ICG/PTWS-XXIII. The IOC Executive Secretary requested this to be given absolute priority. In the discussions that ensued the Chairman proposed to organise the process in order to get this approved. Head of the Tsunami Unit offered the services of the Secretariat in order to respond to this task. The IOC Executive Secretary indicated that the Secretariat will take action on this important issue.

140 **The ICG approved Recommendation ICG/PTWS-XXII.3.**

4.4.3 PTWS Task Team on Messages Report

- 141 The Chairman of Working Group 5, also chairman of the Task Team, Dr Charles McCreery introduced this Agenda item. He provided a summary of input gathered through various meetings and the Task Team recommendations for improving the content, understanding, and timeliness of messages. Input for the Task Team was gathered during the ITSU Training Programme (ITP-Hawaii, October 2006), PTWS Tsunami Warning Centre Coordination Meeting (IOC/INF-1232, January 2007), PTWS Tsunami Warning Operations Seminar (IOC/INF-1233, April 2007), PTWS Officers Meeting (April 2007), and several PTWC-JMA coordination meetings (April–July 2007).
- 142 To avoid and minimize confusion of multiple messages to the same user, Tsunami Warning Centres (TWC) should issue consistent information about each event. However, it is recognized that messages are received by different user groups (warning centres, emergency or disaster management offices, media, public), each of which has different response responsibilities during a tsunami event. Therefore, while the intended target of international TWC messages are the designated official national Tsunami Warning Focal Points (TWFP), these messages are also read—and interpreted—by a number of different groups that may not have specialized interpretation knowledge of official tsunami messages. The result has been increased confusion that is counter-productive to effecting an efficient and knowledgeable public safety action.
- 143 Dr McCreery described in his presentation a number of specific issues that had been raised by users, including message terminology, observatory messages and alert levels. As well, consistency of terms, use of graphical products, cooperation between warning centres and the inclusion of earthquake depth information. Other issues that had been raised included a proposed change of name from “bulletin” to “statement” or “message”, and a proposed change to the structure and format of messages. Dr McCreery presented examples of the proposed changes to the tsunami information statement and warning messages. He also described a questionnaire for receiving feedback after cancellation of the watches/warnings. He provided some recommendations for establishing a process for implementing significant changes to message substance or structure. He concluded by commenting on the need for global coordination in tsunami messages.
- 144 Australia agreed with the Task Team chair that a rapid procedure was needed to implement changes, and that coordination is needed among ICGs. He suggested changing the order of severity on the messages, with local tsunamis listed before regional tsunamis. Canada enquired about how alert levels would be incorporated in the messages. Dr McCreery commented that PTWC would like to do this but noted there are limitations in operational forecasts in absence of inundation models. PTWC would not be comfortable doing this at the moment as this information is not yet available.
- 145 Colombia, supported by Ecuador agreed that the messages could be improved and tailored to users. Colombia informed that during the Peru event on 15 August 2007, media workers did not understand the message: journalist understood “a wave is coming”. Ecuador exemplified the relevance of appropriate messages with the case of remote communities such as Galapagos Island. Ecuador strongly recommended that some information should be provided only to local and national authorities. The format of the message should also be revised to include instructions to national authorities. PTWC Director said that any message delivered through the GTS is immediately accessible to the media and PTWS has no control on that. PTWC Director agreed that it is possible to develop some instructions to further clarify the messages.
- 146 Japan indicated that PTWC's information received in Japan is very important for distant tsunamis. It proposed that earthquake parameters should be at the top of the message because this is very important information.

- 147 Canada indicated that the Task Team should provide guidance to Member States on how to translate the message to the press and the population. New Zealand expressed its readiness to endorse the changes but suggested a timelier manner to deal with changes to the PTWS Users Guide.
- 148 The Chairman of ICG/NEAMTWS, Dr S. Tinti, suggested distributing this information at ICG/NEAMTWS-IV in Lisbon, Portugal, 19–21 November 2007. He further suggested to develop a web-based bulletin service with access restricted only to Member States. Dr McCreery recalled that PTWS had this discussion several years ago and did conclude that Internet was not available to all Member States; now that Internet is widely accessible PTWC is considering using it but there are still some technical problems to overcome.
- 149 The IOC Executive Secretary stressed that the function of the ICG is to provide guidance. In his view Regional Warning Centres, the Secretariat including ITIC and the Working Groups are the machines to get the system working. If the ICG need to introduce changes in between sessions then it should establish a system with clear delegation of mandate to some of the governance structures of PTWS. Any change to Manuals and Guides need to be clearly explained and —as defined— agreed under the appropriate procedures. Messages should be clear, with a lexicon and standard syntax. Summarising, the IOC Executive Secretary suggested that ICG/PTWS need to improve documenting of procedures while keeping flexible operation for dealing with urgent issues. PTWC Director asked if that means that ICG/PTWS charges a Working Group to develop these procedures.
- 150 The USA suggested a change in the order of Annexes in order to make clear that the first ones to be able to understand the messages are the TWFP. Member States do need to teach media and the public, but the most important thing is to get the information to the people that can react and need to respond, that is the emergency managers.
- 151 Australia stated that the message is responding to many users with different level of information, both highly technical and at the same time using plain language. There are legal implications in each country that should be taken into account at the national level.
- 152 The Chairman commented that the cancellation is for PTWC to issue. He suggested that ITIC should prepare a report on these matters. In his view, the top of the message should report on the tsunami event and then the message should include earthquake parameters.
- 153 The IOC Executive Secretary indicated that in his view operational centres should not be disturbed by media as their primary task is to concentrate on the evaluation of the event. In that sense, an outreach effort is required to make press and media in general to understand how the system work and who to call to get appropriate information.
- 154 The meeting then adjourned and when resumed, the IOC Executive Secretary described a proposed agreed process for the approval and update of the PTWS Users Guide. The USA proposed that when available the final version should be electronically available and protected. The Secretariat confirmed that an electronic protected document will be available. On the languages versions of the Users Guide, the Group was reminded that PTWS had reviewed this matter before and concluded that for operational use there should be only one language (English).
- 155 **The ICG agreed** that for operational use there should be only ONE language of the PTWS Users Guide (English), while translated versions of it could be made available for non-operational purposes.

4.4.4 PTWS Exercises

- 156 ITIC Director, Dr Laura Kong, introduced this Agenda item. She provided a summary of Exercise Pacific Wave 06 (EPW06), including lessons learned and next steps. She also introduced Information Document IOC/PTWS-XXII/Inf. 6 which summarizes recent tsunami events, including timelines of message issuances, event notes, and lessons learned. She recalled that the ITIC currently maintains a webpage containing collated information for each significant tsunami event. ITIC is also coordinating with WDC/NGDC to capture all the relevant event and related hazard and historical information in one place. She invited comments from the Group on the kinds of post-event summaries, analysis, and lessons learned that Member States consider to be useful and valuable, as well as ways in which this information should be gathered, conveyed, and disseminated to Member States and the public. She indicated that a related Tsunami Questionnaire (IOC, WDC, USGS) is available for download in the ITIC website. As well, PTWC and WC/ATWC are developing a webpage to capture event information and feedback is requested from Member States.
- 157 The EPW06 Task Team Vice-Chairman Dr Charles McCreery recalled that scientists often conduct International Tsunami Surveys to the affected area in order to gather information on the tsunami wave arrival (eyewitness observations), its run up and inundation, physical impact to coastlines and structures, and other perishable data.
- 158 ITIC's Director explained that IOC Manuals and Guides 37 contains a Post-Tsunami Survey Field Guide (First Edition) to assist scientists and governments in conducting surveys. The ITIC Director noted however that this Guide is now outdated in terms of technologies and methods; most of international Tsunami Survey scientists commonly do not use IOC Manuals and Guides, 37, preferring their own methods, guidelines, and formats.
- 159 The IOC Executive Secretary indicated that an update of this Guide could be implemented but in coordination with the scientific community, through IUGG. He suggested to approve updating the Guide in cooperation with the tsunami scientists. He also reported that IOC received several requests for this Guide in 2006. The Chairman of NEAMTWS, Dr Stefano Tinti, commented that this is a global issue that goes beyond the PTWS. He reported that ICG/NEAMTWS decided to rely on the existing Guide and discussed also about the structure of databases. He indicated that IOC should provide guidance on these matters.
- 160 The USA commented that it appears that a number of different documents help to do this but probably there is a need to revise and structure. A lot of issues should be worked at a global level including preparing a response team for field surveys available when a tsunami occurs.
- 161 Australia inquired if the Task Team perhaps could consider and evaluate the possibility of different level exercises with different timings. Samoa commented on the communications mechanisms, namely that EMWIN is faster than facsimiles (Fax), at least in the case of Samoa.
- 162 An exchange of views ensued on the regular communications tests run by PTWC. Very often Member States do not respond to all tests and this is weakening the system. The IOC Executive Secretary indicated that a non-response within a certain time, i.e. 5 minutes, should be recorded as a failure and the PTWS should be informed to take actions to remedy.
- 163 **The ICG approved Recommendation ICG/PTWS XXII.4.**

5. SUB-REGIONAL PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEMS

5.1 NORTHWEST PACIFIC, SOUTH CHINA SEA, AND OTHER WESTERN PACIFIC MARGINAL SEAS

164 This Agenda item was introduced by the interim ICG/PTWS Secretary, Laura Kong. She summarized the present arrangements, as agreed by the 39th IOC Executive Council in 2006, which requested to NWPTAC and PTWC through IOC Resolution EC-XXXIX.8 *"to continue to provide interim tsunami advisory information for the South China Sea region, at least until the next meeting of PTWS"*. She recalled that an interim service for the South China Sea has been available since 1 April 2006 by NWPTAC and PTWC at the request of Member States. She reported that the Government of Japan has offered to support the NWPTAC to cover the South China Sea region on a long-term basis if so needed.

165 This issue was discussed in the intra-sessional Working Group chaired by Mr Saw Bun Liong (Malaysia). China, Indonesia, Japan, and Viet Nam participated in the discussions.

166 The Secretariat further noted the still-considerable challenges for implementing a timely local tsunami warning services for the South China Sea region, namely the need for real-time data sharing and denser instrumental networks.

167 China, representing the Working Group, reported the conclusion. It indicated that it is recognized that large earthquakes occurring in the subduction zone near the Manila Trench have the potential of generating destructive tsunamis which may affect countries around the South China Sea. During the past couple of years, significant progress has been made in building up tsunami monitoring capabilities in countries such as Indonesia and Malaysia. In China, a plan is also in place to deploy two tsunami buoys in the South China Sea. So, it is time to think about building up a sub-regional tsunami warning system by pulling up the necessary resources and enhancing regional cooperation. A lot is required to be done in order to achieve this goal. In the meantime, a number of countries around the South China Sea have expressed their needs for continuation of the interim tsunami advisory service provided by PTWC and NWPTAC and this service will be reviewed after a sub-regional tsunami warning system is set up by countries bordering the South China Sea. PTWC and NWPTAC have kindly agreed to continue to provide this service. The intrasessional Working Group drafted a recommendation for IOC Executive Council to formally approve this interim service at its next session in June 2008.

168 For general information, in the northern part of the South China Sea, Hong Kong of China is already providing real time data from two tide gauge stations, namely Shek Pik and Quarry Bay, on the GTS. Those who are interested can retrieve these data from the GTS.

169 **The ICG approved Recommendation ICG/PTWS XXII.5.**

5.2 SOUTHWEST PACIFIC OCEAN, INCLUDING WORKING GROUP REPORT

170 Dr Ken Gledhill, New Zealand, Chairman of the Working Group introduced this Agenda item. The Working Group held one formal meeting during the intersessional period, and various other meetings and activities contributed to the Working Group objectives. Issues highlighted at the Working Group meeting included the monitoring and coordination of current and future aid-funded projects related to its objectives, instrumentation gaps and network planning, and the coordination of donor contributions to instrumentation networks.

171 Pacific Island Country (PIC) challenges include the need for clarity in-country on who is in charge of the tsunami early warning system, the various communications challenges all PICs

are facing, ensuring that outreach tools are utilised, and that interoperability exists between warning centres. An additional challenge is to build relationships between the warning authorities and the local and international media.

5.3 CENTRAL AMERICA PACIFIC COAST, INCLUDING WORKING GROUP REPORT

172 This Agenda item was introduced by the Chairman of the Working Group, Dr Wilfried Strauch, Nicaragua, who reported on the status of implementation of a tsunami warning system in the region.

173 The USA requested information on sea level monitoring in the region. Dr Strauch reported that there are a few sea level stations in the region but several gaps still remain. RONMAC failed completely and there are some initiatives looking to recuperate some of the stations installed through RONMAC. The USA highlighted the need of having a clear inventory on the existing sea level monitoring network in the region and the gaps to be filled. He also commented on the importance of coordinating with ICG/CARIBE EWS as several Central America Member States are members of both PTWS and CARIBE EWS.

174 Following a question from the IOC Executive Secretary, Dr Strauch reported that the main communication system used in the region for data exchange is through Internet. The IOC Executive Secretary suggested to have an strategic analysis of what has happened in the region and how to solve the gaps, on seismic monitoring and on sea level monitoring.

175 The IOC Executive Secretary recommended defining more precisely the working mechanisms of ICG/PTWS, particularly through Working Groups. In his view, ICG/PTWS needs to organise better, define tasks and timelines and review progress and take decisions at its governing body meetings. A Working Group to achieve a task has to receive resources from Member States otherwise it will not be able to deliver.

6. PTWS STRATEGIC PLAN

6.1 WORKING GROUP REPORT ON THE MEDIUM TERM STRATEGY FOR THE PTWS

176 This Agenda item was introduced by the Chairman on behalf of the Working Group Chairman, Mr Fred Stephenson. He recalled that the PTWS Medium-Term Strategy should build upon the *ITSU Master Plan* to identify short-to-medium term (5 years) priorities and strategies to enhance ICG/PTWS. He summarized the document delivered by the Working Group and invited comments from Member States.

177 The USA proposed to add a strategy for funding in the document. Australia seconded by New Zealand and USA proposed establishing a Steering Committee to develop a basic document containing key concepts and visions. This document should then guide the writing of the Medium-Term Strategy and be eventually utilized for building an Implementation Plan as in the ICG/IOTWS. This proposal was taken forward under item 8 below and its associated Recommendation [ICG/PTWS-XXII.6](#).

178 An intrasessional Working Group was convened for this purpose with the task of ensuring consistency between the actions and recommendations of the ICG and the content of the PTWS Medium-Term Strategy.

6.2 PTWS IMPLEMENTATION PLAN

179 The Chairman invited the Group to discuss and consider necessary actions that the ICG/PTWS should take to develop a PTWS Implementation Plan.

180 This issue was also discussed by the intraseessional Working Group established under item 6.1 above and was included as an action for the Steering Committee established by Recommendation ICG/PTWS-XXII.6.

7. PTWS CAPACITY BUILDING, INFORMATION SERVICES, EDUCATION

7.1 INTERNATIONAL TSUNAMI (ITSU) TRAINING PROGRAMME

181 ITIC Director, Dr Laura Kong, introduced this Agenda item. She summarized the capacity-building activities under the ITSU Training Programme (ITP) implemented in the Pacific, Indian Ocean, and Caribbean, both ITP-Hawaii and ITP-International, that have been carried out under cooperation and collaboration of Member States and the IOC/UNESCO, USAID, USGS, WMO, and other international organizations.

182 She provided an overview of capacity-building activities over the past two years, summarised the ITIC Mission and explained how the elements of the PTWS fit together. She recalled the Working Groups reporting to ICG/PTWS-XXII and noted the synergy with the Indian Ocean and the Caribbean systems, emphasising the need to work with regional organisations such as ASEAN, CDERA and CEPREDENAC. She then emphasised the need for an end-to-end system. End-to-end systems comprise “upstream” and “downstream” components. All components must adhere to agreed standards to ensure products quality. She highlighted some of the current gaps in the end-to-end system. The next few years will concentrate on how to issue timely warnings and how to prepare for an event. The ITSU Training Programme (ITP) is still ongoing, focusing on Standard Operating Procedures (SOPs) for tsunami warning and emergency response. At an international level, ITP has focused on seismology and end-to-end tsunami warning.

183 ITIC Director reported that eight one-week trainings have been carried out mainly in the Indian Ocean. A roundtable was conducted in Malaysia in April 2006 and a PTWS training on tsunami warning operations was held in April 2007, also in Malaysia. Capacity-building programmes on Standard Operating Procedures (SOPs) have been run in Indonesia. Funds are available to do SOP training in Vietnam and the Philippines. Numerical modelling training has also been carried out, mostly for Indian Ocean countries. She concluded by looking at how the PTWS would evolve in the next five years, with national and sub regional tsunami warning centres evolving.

184 The IOC Executive Secretary indicated that training is ITIC’s most important contribution to the global effort in an end-to-end tsunami warning systems. ITIC has been for example instrumental in capacity-building activities for emergency preparedness. In thirty years ITIC has developed a toolkit to help emergency authorities around the world. He noted that UNESCO/IOC is not alone in this effort. We collaborate with a large range of other institutions, for example the IFRC, ISDR and UNDP. There is a huge challenge in terms of capacity building and knowledge needs to be transferred to those who need it. Considering this important role, ITIC, should not be overloaded with the ICG/PTWS Secretariat function. He announced that the Secretariat function for the PTWS will continue to be provided by the Tsunami Unit from Paris.

185 Peru thanked the ITIC Director for her interest in training Member States; he recommended that video conference courses could be held to train more people at a lower cost.

186 Samoa noted with appreciation the support of donors for capacity-building efforts.

187 Indonesia expressed its thanks and appreciation to the ITIC Director, to IOC and UNESCO for several activities related to capacity building such as:

- Sending experts to BMG in several missions to improve the capability of the InaTEWS Operational Procedure

- Helping in developing the Standard Operation Procedure for the InaTEWS Centre
- Facilitating and supporting training of BMG staff and GFZ engineers to PTWC
- Facilitating and supporting training of BMG staff to JMA
- Sending experts for tsunami drills
- Facilitating Indonesian staff to joint trainings and workshops conducted abroad in coordination with other international organizations.

188 Indonesia indicated their hopes that these activities will still be possible to be carried out in the future to secure the operation of InaTEWS.

189 Japan informed that several capacity building programs were carried out in Japan in 2006 and 2007. In November 2006 BMG officials visited JMA and attended operational exercises for tsunami warning service. JMA organized, with ODA funding, a seminar on tsunami disaster mitigation in March 2007 with participants from Indonesia, Malaysia, Myanmar, Sri Lanka and Thailand. The International Institute of Seismology and Earthquake Engineering (IISEE) implemented, as one of the JICA training courses, a Tsunami Disaster Mitigation Course from October 2006, which had participants from Indonesia, Malaysia and Thailand.

190 The Chairman encouraged Member States to support capacity-building activities reported by ITIC and make contributions to the IOC Trust Fund to that end, as well as to consider organising training in their country.

7.2 NATIONAL TSUNAMI CAPACITY ASSESSMENTS

191 This Agenda item was introduced by the interim ICG/PTWS Secretary, Dr Laura Kong. She reported that only 11 countries have completed the questionnaire prepared by the Secretariat.

192 Australia will report on their efforts to conduct Tsunami Capacity Assessment with Pacific Island Countries that started in 2007.

193 Australia informed Member States on the ongoing tsunami capacity assessments in the Pacific Islands, funded by AusAID. The first assessment was carried out in Tonga in May 2007. The objective of the project is to help SOPAC complete their assessments. Other partners involved in this effort are Emergency Management Australia and SOPAC. Fourteen countries are targeted. The IOC questionnaire developed for the Indian Ocean assessment missions was modified and simplified for its use in the Pacific Islands. There are 100 questions on the questionnaire, which is quite daunting, but these were grouped into 9 key topics. A large team from Australia, New Zealand and SOPAC visited Tonga and a full cross section of Tongan organisations was involved. The preliminary findings concluded that there are many strengths in the system, including monitoring systems. The main identified needs are improved community awareness, high level governance and development of specific skills. Technical needs include deeper understanding of risk, system improvements, 24x7 operations and more effective de-briefing after an event. Their recommendations included risk-based public awareness building, capacity-development training, development of an emergency plan including 24x7 operations, better use of existing tools and GIS training. The outcomes of the mission were: improved understanding of capacity; development of working relationships; exchange of information; and access to sea-level data in real time for the Tongans. Australia is now collating the questionnaire response, confirming in country contacts for the remaining 13 countries, and scheduling the next assessment missions.

194 The IOC Executive Secretary reported on a very recent initiative by the Secretariat on the Pacific South American coast, related to the Pisco (Peru) tsunami event. From this event Member States were able to see the weakness in their system very quickly. There had been a

few coordination meetings and an initial assessment mission would be carried out. The global aim is to acquire improved capability and sub-regional coordination, which will involve a lot of planning and resources.

7.3 TSUNAMI NEWSLETTER AND TSUNAMI BULLETIN BOARD

195 The ITIC Director Dr Laura Kong, reported under this Agenda item that the email list-server Tsunami Bulletin Board (TBB) is available with a membership of 320. No media or public access is allowed. It is a forum for science and early results. It is not peer reviewed and there is no censorship. Warning messages from PTWC and WC/ATWC are posted to the Bulletin Board.

196 She also informed that the *Tsunami Newsletter* has been published for 10 years now, presently 4 times a year. It has a circulation of 350 hard copies and 350 electronic copy subscribers. She encouraged Member States to contribute articles to the newsletter and requested views on the continuation or not of the hardcopy version.

197 The USA commented that it would make sense to distribute the newsletter exclusively by electronic means, in view of budget constraints. Samoa indicated that Samoa had no problem with bandwidth but other Pacific Island States might have problems to access only electronic versions. The Russian Federation considered that hard copies should still be distributed to libraries.

198 The IOC Executive Secretary commented that he understood the dilemma. He thought it should be possible to have a hybrid solution. Many people still value paper copies. He suggested that at the national level someone should be tasked to print out hard copies if they want to, at their own expense given the fact that international postage is a major burden for this kind of publications. On the question of internet availability he noted that the internet is a backstop for emergency warning. With this in mind ICG/PTWS may look at improving Internet access in SIDS. There are technical alternatives using satellite technology.

199 The Chairman commented that the newsletter also contains technical information; for example listing of past tsunami events.

200 The USA invited Member States to consider funding the hard copy of the Tsunami newsletter. Dr Laura Kong informed that total cost is about \$ 2,000 per issue.

7.4 TSUNAMITEACHER, PACIFIC ISLAND TSUNAMI AWARENESS KIT, AND OTHER ELECTRONIC RESOURCES

201 The ITIC Director, Dr Laura Kong, listed tsunami awareness materials available from ITIC. These include the *Great Waves* publication which is available in French, Spanish, Chinese and Thai as well as English. Other publications include *Tsunami Warning!*, Tsunami Safety Poster/Flyer and *Tsunami Glossary*, translated into several languages. Many of these documents can also be downloaded from the ITIC website. *TsunamiTeacher* is a consolidated training and information resource, also available free of charge.

202 She described some other information tools available to keep governments informed. SMS alerts from PTWC are available from the RANET service. The Real Time Earthquake Display (RTED) California Integrated Seismic Network (CISN) tool is available on the internet. The TideTool sea-level display developed by PTWC is available free of charge. She described a sea-level station web service which allows displaying station's metadata. The IODE sea-level monitoring station tool ODINAfrica is available from the IODE website. The Global Historical Database developed by Dr Gusiakov is available offline. Tsunami Travel Time Software is available to governments and warning centres. The ITIC Director concluded by requesting feedbacks from Member States on what type of information is required.

203 The representative of SOPAC informed that they have developed a tsunami awareness kit available on the Pacific Disaster Net website. It is now being distributed around the Pacific Island States. The Pacific Disaster Net is designed to be a comprehensive database for disaster related information. It is open source designed and a relay service is available to transfer warnings to a wider audience through RANET.

204 Samoa enquired if the information available through the ITIC is faster than the one available from the National Earthquake Information Centre. PTWC Director, Dr Chip McCreery, replied that there is a protocol worked out depending on where the warning centre and earthquake is located. He noted that the parameter information can change over time as more data comes in.

205 China enquired if they can get multiple copies of for example *TsunamiTeacher* to distribute to schools. ITIC's Director replied that for numbers less than about 100 this can be provided, but if thousands are required ITIC will request them to make DVD copies by themselves.

7.5 PUBLICATIONS

206 ITIC's Director, Dr Laura Kong, provided under this Agenda item a summary of recent publications available from ITIC. Member States were invited to provide information and share examples with the Group of their efforts. She highlighted the continued need of resources to support the printing and distribution of materials through contributions to the IOC Trust Fund or through the printing of materials by Member States themselves to be distributed to PTWS Member States.

8. SESSIONAL WORKING GROUP REPORTS

207 Working Group 2 on Sea Level. On behalf of the Group, Australia reported that issues discussed included metadata, tsunameter network rationale, network design, monitoring tools, observing network requirements to support proposed changes to warnings and inter-basin system coordination. The meeting considered the issue of metadata and discussed the proposed PTWC XML schema which had also been reviewed by ICG/IOTWS WG2 at an intersessional meeting in Jakarta in September 2007. The Working Group agreed on the metadata schema in principle and requested Members States to review the schema document and provide comments to the Working Group 2 by 31st October 2007.

208 The Working Group recommended that TOWS-WG organise a sea level design and implementation workshop in 2008, involving similar Working Groups from other ICGs, to:

- Identify warning system data requirements
- Review techniques and guidelines for network design
- Undertake sensitivity analyses
- Review and finalise standards for metadata, data collection and reporting
- Develop common performance metrics.

209 The Working Group also recommended TOWS-WG to consider resources and organisational arrangements required to support development and implementation of tools and procedures to provide operational monitoring of the status of the sea level observing network for all ICGs.

- 210 Working Group on Resilience Building and Emergency Management, System Interoperability. Canada reported on the discussions of the group, which included its recommendation under Recommendations ICG/PTWS-XXII.6 below.
- 211 PTWS Task Team on Messages. The PTWC Director reported the changes proposed by the Task team to the PTWS Operational Text Products. PTWC, NWPTAC, WC/ATWC, ITIC and IOC will first be consulted on any proposed changes. If consensus is achieved, then a service change notice will be composed and sent at least 30 days in advance. Implementation of the changes will be on an interim basis until they can be formally approved by the next session of the ICG.
- 212 Australia asked how products delivered to the Indian Ocean will be handled. The PTWC Director replied that the Indian Ocean is independent of this process.
- 213 Exercise Pacific Wave 08. The PTWC Director reported on the outcome of the sessional working group. It was suggested to hold the exercise in the 3rd quarter of 2008, to practice a single Pacific-wide tsunami originating off the northern coast of Japan, and to conduct the exercise in real-time rather than in compressed time as it was the case at the Pacific Wave 06.
- 214 To further plan the exercise, to carry out the exercise, and to collect and compile results, an intersessional Task Team is recommended with the following members: Mr Geoff Crane (Australia), Mr Lev Ryzhkov (Russian Federation), Mr Mike O'Leary (New Zealand), Mr Yohei Hasegawa (Japan), Mr Augusto Zegarra (Peru), and Mr Charles McCreery (USA) as Chairman. The Task Team will be charged with identifying date and time of the exercise, no later than 1st January 2008, and with preparing and distributing the exercise manual to Member States no later than 1st April 2008. Mr. Crane volunteered to convert the Pacific Wave 06 Manual into a Pacific Wave 08 Manual with PTWC providing the exercise messages for the new scenario. Mr Ryzhkov volunteered to collect and compile the results of the exercise.
- 215 South China Sea Region. China reported that the Sessional Working Group recommended requesting PTWC and NWPTAC to continue providing interim advisory services. The service will be reviewed after a sub-regional system for the region is set up. No Intersessional Working Group is proposed.
- 216 Southwest Pacific. New Zealand reported that the Sessional Working Group looked into the way forward and considered what the design of the Southwest Pacific system should be. It also considered its relationship with SOPAC. It noted that donor coordination remains an issue. The main recommendation is that the Working Group should continue in the intersessional period but with revised Terms of Reference.
- 217 The representative of SOPAC asked how this Sessional Working Group coordinates into the four thematic areas proposed by the Programme and Budget committee. The Programme and Budget Sessional Working Group chair replied that he did not know how the Working Groups would fit into the thematic areas but they will try to organise the groups logically.
- 218 Central America–Pacific Coast. Nicaragua reported that the Sessional Working Group proposes to continue the work of the Working Group in the intersessional period with the objective of establishing an interim Tsunami Warning System in Central America.
- 219 Southeast Pacific. Chile reported on behalf of the Sessional Working Group, which comprised Colombia, Ecuador, Peru and Chile. He noted that the region is highly seismic with most of the tsunamigenic earthquakes occurring in this area. He noted that all of the coastal sea level stations in South America report at intervals of 1–3 hours, which is useless for local and or/regional tsunamis. They need to be upgraded to higher transmission rates, considering they use GOES satellite facilities. Only one DART buoy is deployed in the region, off northern Chile. With a coastline of about 8,000 km it is evident that the region needs an upgrade of

monitoring systems, communications and capacity building. Member States will work a proposal towards this end.

220 The USA inquired if all Working Groups who have briefed the meeting have worked using their own funds.

221 Chile responded that first they needed to get organised and then will look for support in improving the systems. Ecuador commented that the first step is to be recognised by the ICG. The group already works together closely. They will also need some funding and they will look for these from various sources. Chile added that they are already organised under the umbrella of the Permanent Commission of South East Pacific (CPPS). GLOSS informed the session that the GLOSS group of experts is willing to help improving the status of sea level reporting in this region like to help.

222 New Zealand responded that New Zealand Aid (NZ Aid), AusAID and other institutions funded all the work of the Southwest Pacific Working Group.

223 Users Guide. Japan reported that the Task Team had productive discussions. They agreed on the finalisation process as follows:

1. The IOC Secretariat will review the Users Guide in four weeks after what it will be circulated to the Member States for comments
2. Member States would be given four weeks to submit their comments to the IOC Secretariat
3. The IOC Secretariat will finalise the User's Guide within four weeks, taking into consideration Member States' comments. The Secretariat may consult PTWC and JMA during this process
4. The Users Guide will be finalised and published by the end of 2007.

224 **The ICG approved** Recommendation ICG/PTWS-XXII.6.

9. PROGRAMME AND BUDGET FOR 2008–2009

225 The USA, as Chair of the Sessional Working Group on Programme and Budget 2008–2009, introduced this Agenda item. It noted that there was a case for change in how ICG deals with Programme and budget matters. The recommendation of the group is to introduce in the executive structure a Steering Committee comprising the officers, elected and ex-officio, and sessional and intersessional Working Group chairs. Meetings would be held “virtually” by email correspondence and teleconferencing, with one face to face meeting coordinated by the Chair.

226 The goals of the Steering Committee would be to develop the Medium-Term Strategy and Implementation Plan, to formulate a governance model, and to develop a strategy for funding activities. The immediate charge would be to make available to the IOC Executive Secretary a work plan and budget by 3 November 2007. Intersessional Working Groups would be defined by four thematic areas, namely: monitoring; assessment; interoperability; and awareness.

227 Australia seconded by Canada supported the proposal of the Sessional Working Group as a way forward for the ICG/PTWS.

228 **The ICG approved** Recommendation ICG/PTWS XXII.7

10. DATES AND PLACE FOR ICG/PTWS-XXIII, TARGET DATE AND PLACE FOR ICG/PTWS-XXIV

229 The interim ICG/PTWS Secretary, Dr Laura Kong, introduced this Agenda item. She announced that the Government of Samoa has sent an official letter of invitation to host ICG/PTWS-XXIII in 2009. Samoa confirmed that they will provide the necessary facilities to host the session. With respect to dates, and considering the need of having the session in advance of the IOC Assembly, Samoa noted that February coincides with the tropical cyclone season in Samoa.

230 The USA commented that they would prefer a two-year cycle and would like the session to be held after September 2009.

231 The Russian Federation noted that the Tsunami Symposium will be held in Novosibirsk, Russia, in August 2009 and would prefer the session to be held after this. They therefore seconded the suggestion of USA.

232 The Chairman reminded delegates that the IOC Assembly will be held in June 2009 and it is important for the ICG/PTWS to report to its parental body.

233 The Russian Federation enquired if it would be possible to hold a joint ICG/PTWS and ICG/IOTWS meeting. The Chairman replied that this was a matter for the Member States and the ICGs to decide.

234 The IOC Executive Secretary commented that the key element of the system is to have a well established Implementation Plan, including routine maintenance and tests of performance of the PTWS. Improving the system through the coordinated work of its Member States and its Working Groups is possible on condition of an agreed oversight mechanisms. In that sense, ICG/PTWS sessions are very important to assess progress and take corrective measures if needed. He noted that for him the highlight of this particular session was the progress reported by Indonesia, in getting warnings out for the last tsunami event not late than 5 minutes after the event.

235 The USA agreed to schedule ICG/PTWS-XXIII for February 2009 but requested a contingency plan to be in place in case of tropical cyclone activity.

236 **The ICG agreed** to hold ICG/PTWS-XXIII in Samoa in February 2009.

237 The Chairman requested Member States on the possible dates and place for ICG/PTWS-XXIV. Japan announced that the Government of Japan would like to host the session. Considering the ICG/PTWS-XXI decided that the ICG sessions should be held biennially, **the ICG agreed** to hold ICG/PTWS-XXIV in 2011 thanking the Government of Japan for its kind offer to host it.

11. ELECTION OF OFFICERS

238 The Chairman recalled that the IOC election rule states that a Primary Subsidiary Body should elect its own chairperson and vice chairpersons. He informed the session that the present Chairman had retired and the acting chairman would be retiring within the next year.

239 The interim ICG/PTWS Secretary summarised the duties and responsibilities of the officers and outlined the election procedure. She reported that three nominations were received by the Secretariat:

240 Chair: New Zealand nominated Mr Mike O'Leary, seconded by Canada and France,

241 Vice Chairs: Japan nominated Mr Yohei Hasegawa, seconded by Malaysia and Canada and Ecuador nominated Mr Giorgio De la Torre, Seconded by Chile and Peru.

242 The candidates were elected by acclamation.

243 **The ICG elected** Mr Mike O’Leary (New Zealand) as Chairman and Mr Yohei Hasegawa (Japan) and Mr Giorgio de la Torre (Ecuador) as Vice Chairmen.

12. OTHER BUSINESS

244 Canada proposed the creation of a new Working Group on rapid near-field recognition of tsunamigenic earthquakes and associated tsunamis. He proposed that the objectives of the group would be to:

- Facilitate the exchange of information on rapid near-field detection techniques being used, evaluated or proposed by Member States
- Compile and disseminate information on rapid near-field detection techniques being used, evaluated or proposed by Member States
- Provide guidance and advice to Member States considering using techniques for rapid near-field detection.

245 The Russian Federation seconded this proposal and noted that far field and near field techniques can be completely different. Australia also supported the proposal and indicated this as a very important initiative. New Zealand also supported this proposal from Canada.

246 Colombia supported the proposal and suggested that the Working Group should meet and report in the intersessional period.

247 The USA supported the proposal commenting that this is also a global issue and should be considered at a global level.

248 The IOC Executive Secretary considered this to be a critical issue and thanked Canada for the proposal. He agreed with the USA comment and suggested holding a global workshop on this topic open to all Member States.

249 Japan also seconded Canada’s proposal and indicated its willingness to join the Working Group.

250 The representative of WMO informed the session that on the question of accessing data available on the GTS, the National Meteorological Centres have the responsibility of meeting their national users' requirements, and are therefore the point of contact. He confirmed that the GTS in Region V does include a number of satellite-based data distribution systems, including ISCS operated by USA (a relatively large dish is required for reception), as well as EMWIN.

251 He also reported a workshop planned for early December in Bangkok, Thailand, on the exchange of tsunami-related data and warnings on the GTS, which would be sponsored by NOAA. The workshop will review collection and exchange of sea-level data, seismic information, tsunami watch and warning through GTS. A similar exercise would be useful for the Pacific, may be in two phases in view of the considerable area involved.

252 **The ICG approved** Recommendation ICG/PTWS XXII.8.

13. ADOPTION OF SUMMARY REPORT AND RECOMMENDATION

253 Based on the reports of the intersessional and intrasessional Working Groups and the discussions in plenary, **the ICG adopted** eight Recommendations.

14. CLOSURE

254 The Chairman closed the Twenty-second Session of the IOC Intergovernmental Co-ordination Group for the Pacific Warning and Mitigation System at 20:30 on Thursday 20 September 2007.

255 The Chairman extended its deep appreciation to the Government of Ecuador, the Director of the Instituto Oceanografico de la Armada del Ecuador (INOCAR) and the personnel of INOCAR for the excellent host arrangements for its Twenty-second Session. He also thanked the Delegates and Representatives for their active participation in the session and extended his appreciation to the local organizing committee.

256 On behalf of the Group Dr Chip McCreery and Dr Laura Kong offered a gift to Dr Francois Schindel  for his long-standing contributions to ITSU and then ICG/PTWS. The IOC Executive Secretary praised the former ITSU and the actual ICG/PTWS for its tremendous efforts in setting a system that has worked for decades. This work need to be continued and to operate for centuries, which is the biggest challenge for the system. PTWS is moving in the right direction and Guayaquil is a benchmark on this process. He thanked the Government of Ecuador, INOCAR, support staff and translators.

ANNEX I

AGENDA

- 1. WELCOME AND OPENING**
 - 1.1. MR GUIDO CHIRIBOGA: VICE MAYOR, GUAYAQUIL, ECUADOR
 - 1.2. CPFGE-EM MARIO PROAÑO SILVA: DIRECTOR, INSTITUTO OCEANOGRÁFICO DE LA ARMADA (INOCAR), ECUADOR
 - 1.3. DR PATRICIO BERNAL: ASSISTANT DIRECTOR GENERAL OF UNESCO AND EXECUTIVE SECRETARY INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)
- 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 INTERSESSIONAL ACTIVITIES**
 - 3.1 IOC EXECUTIVE SECRETARY'S REPORT
 - 3.2 ICG CHAIRMAN'S REPORT
 - 3.3 ICG SECRETARIAT'S REPORT
 - 3.4 IOC TSUNAMI CO-ORDINATION UNIT REPORT
 - 3.5 ITIC REPORT
 - 3.6 PTWC REPORT
 - 3.7 REPORT OF THE DIRECTOR OF EARTHQUAKE AND TSUNAMI OBSERVATIONS DIVISION OF THE JAPAN METEOROLOGICAL AGENCY
 - 3.8 NATIONAL REPORTS
 - 3.9 REPORTS FROM OTHER TSUNAMI WARNING AND MITIGATION SYSTEMS (ICG/TWSs)
 - 3.10 REPORTS FROM UN ORGANISATIONS
 - 3.11 REPORTS FROM NON UN ORGANISATIONS
- 4. TWS IMPLEMENTATION PROGRESS REPORTS**
 - 4.1 SEISMOLOGICAL OBSERVATIONS
 - 4.1.1 Working Group 1: Seismic Measurements, Data Collection and Exchange**
 - 4.1.2 CTBTO Report on Use of Network**
 - 4.1.3 FDSN/IRIS Report - Global Seismic Network**
 - 4.2 SEA-LEVEL OBSERVATIONS
 - 4.2.1 Working Group 2 Report: Sea-Level Measurements, Data Collection and Exchange**
 - 4.2.2 GLOSS Report**
 - 4.2.3 Deep-Ocean Tsunami Detection Network Report**

- 4.2.4 Sea Level Station Metadata and Data Facilities Report**
- 4.3 PREPAREDNESS, EMERGENCY RESPONSE, AND OTHER RELATED MATTERS
 - 4.3.1 Tsunami Hazard and Risks**
 - 4.3.1.1 *Working Group 3: Tsunami Hazard Identification and Characterization*
 - 4.3.1.2 *Global Historical Tsunami Database Project Report*
 - 4.3.2. Working Group 4: Resilience Building and Emergency Management**
- 4.4 WARNING CENTRE OPERATIONS
 - 4.4.1 Working Group 5: Interoperability and Regional, Sub-Regional and National Tsunami Warning and Mitigation Systems in the Pacific**
 - 4.4.2 PTWS Communications Plan**
 - 4.4.3 PTWS Task Team on Messages Report**
 - 4.4.4 PTWS Exercises**
- 5. SUB-REGIONAL PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEMS**
 - 5.1 NORTHWEST PACIFIC, SOUTH CHINA SEA, AND WESTERN PACIFIC MARGINAL SEAS
 - 5.2 SOUTHWEST PACIFIC OCEAN, INCLUDING WORKING GROUP REPORT
 - 5.3 CENTRAL AMERICA PACIFIC COAST, INCLUDING WORKING GROUP REPORT
- 6. PTWS STRATEGIC PLAN**
 - 6.1. WORKING GROUP REPORT ON THE MEDIUM TERM STRATEGY FOR THE PTWS
 - 6.2. PTWS IMPLEMENTATION PLAN
- 7. PTWS CAPACITY BUILDING, INFORMATION SERVICES, EDUCATION, AND AWARENESS TOOLS**
 - 7.1 INTERNATIONAL TSUNAMI (ITSU) TRAINING PROGRAMME
 - 7.2 NATIONAL TSUNAMI CAPACITY ASSESSMENTS
 - 7.3 TSUNAMI NEWSLETTER AND TSUNAMI BULLETIN BOARD
 - 7.4 TSUNAMITEACHER, PACIFIC ISLAND TSUNAMI AWARENESS KIT, AND OTHER ELECTRONIC RESOURCES
 - 7.5 PUBLICATIONS
- 8. SESSIONAL WORKING GROUP REPORTS**
- 9. PROGRAMME AND BUDGET FOR 2008-2009**
- 10. DATES AND PLACE FOR ICG/PTWS-XXIII, TARGET DATE AND PLACE FOR ICG/PTWS XXIV**
- 11. ELECTION OF OFFICERS**
- 12. OTHER BUSINESS**
- 13. ADOPTION OF SUMMARY REPORT AND RECOMMENDATIONS**
- 14. CLOSURE**

ANNEX II

RECOMMENDATIONS

Recommendation ICG/PTWS-XXII.1

SEA-LEVEL MEASUREMENT, DATA COLLECTION AND EXCHANGE

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Recognizing the need for operational systems to monitor the health and status of contributing systems,

Recognizing the importance of standardization in sea-level data collection, exchange and communication to ensure the interoperability of the tsunami warning system,

Recognizing the need to design and implement the PTWS sea-level observing network to meet the requirements for effective tsunami warning,

Decides to continue the intersessional Working Group 2 on Sea-Level Measurement, Data Collection and Exchange with Terms of reference agreed at PTWS-XXI, Recommendation ICG/PTWS-XXI.2;

Noting the parallel efforts by the other related Working Groups under the other ICGs,

Recommends that the Working Group on Tsunamis and Other Ocean Hazards Warning and Mitigation Systems (TOWS-WG) organise in 2008 a sea-level design and implementation workshop, involving similar Working Groups from the other ICGs, to:

- Identify warning system data requirements
- Review techniques and guidelines for network design
- Undertake sensitivity analyses
- Review and finalise standards for metadata, data collection and reporting
- Develop common performance metrics;

Requests the TOWS Working Group to consider resources and organisational arrangements required to support development and implementation of tools and procedures to provide operational monitoring of the functionality of the sea level observing network for all ICGs.

Financial implications: None

Recommendation ICG/PTWS-XXII.2

WORKING GROUP ON PACIFIC EMERGENCY COMMUNICATIONS

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Recalling that an effective system means all persons in vulnerable coastal communities are prepared to respond appropriately, and in a timely manner upon recognition that a potentially destructive tsunami may be approaching,

Recognizing the importance of reliable and timely warnings in the event of tsunami as the key enabler for people to be able to respond,

Noting there is wide range of technologies with potential application to early warning, including the WMO GTS, AFTN, EMWIN, RANET, and satellite, radio, siren, mobile, and traditional methods of alert dissemination,

Further noting that a number of Pacific communications initiatives are already ongoing but not yet tsunami warning specific,

Having considered the high interest from Member States to enhance their tsunami warning dissemination services as expressed during the intersessional period previous and during the ICG/PTWS-XXII,

Expressing the need to share these technologies widely in order to enable Member States to implement robust and redundant communications systems for rapid dissemination of early alerts,

Decides to establish an Inter-sessional Working Group on Pacific Emergency Communications with the following Terms of Reference:

1. To encourage Member States to develop arrangements for the transmission and receipts of tsunami warnings 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;

Recommends:

1. That the Group be composed of Canada, Chile, Ecuador, New Zealand, Nicaragua, Samoa, USA, PTWS communication providers, and through nomination by the countries, National Tsunami Warning Focal Points and the emergency managers from interested Member States, and representatives from non-PTWS countries as observers;
2. That the ICG/PTWS Secretariat amends the National Report Template to specifically include Warning Dissemination Arrangements;

Further recommends that this work be carried out by email and other appropriate means, and that the Chairperson of the Group, that will be defined by the end of October 2007, provide a status report at the time of the Officers meeting in early 2009.

Recommendation ICG/PTWS-XXII.3

PTWS OPERATIONAL USERS GUIDE

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Recalling that the PTWS Communications Plan serves as a reference document for national Tsunami Warning Focal Points (TWFPs) who are receiving the advisories provided by the Richard H. Hagemeyer Pacific Tsunami Warning Center (PTWC) and the Northwest Pacific Tsunami Advisory Center (NWPTAC) operated by the Japan Meteorological Agency (JMA),

Acknowledging that at the Tsunami Warning Centres' Coordination Meeting held in January 2007, it was agreed that the Communications Plan should be revised and renamed into the Operational Users Guide due to its nature of the information contained in the document,

Recognizing that the West Coast/Alaska Tsunami Warning Center (WC/ATWC) part is newly included in the Guide,

Appreciating highly that the International Tsunami Information Center (ITIC), PTWC, WC/ATWC and NWPTAC prepared the draft "Operational Users Guide for the Pacific Tsunami Warning and Mitigation System",

Noting that the Guide consists of 6 chapters and presently 7 annexes: chapters 1 and 2 describe the PTWS governance and institutional context; chapters 3 to 6 detail, after an overview of the operational responsibilities in chapter 3, the operations of each of the three centres, namely the PTWC, WC/ATWC and NWPTAC, and that the content of these four chapters, including the correspondent annexes, are produced by the operating agencies under their full and exclusive responsibility, and will be updated at their behest and under their sole responsibility,

Reaffirming the necessity and usefulness of this document to fully understand the operations and products of the PTWC, WC/ATWC and NWPTAC so that the recipients make the best use of those products for national tsunami warning operations,

Recognizing that the Guide will become an official publication of the IOC through its adoption by the ICG/PTWS,

Approves in principle the draft Guide, subject to a formal finalization process;

Requests the IOC Secretariat including its ITIC to proceed with the formalization process in order to consult Member States on parts of the Guide where they might have comments to improve it, as follows:

- (i) IOC internal finalization period of four weeks for language, layout etc., followed by making the document available to Member States through all Tsunami National Contacts (TNCs) of the PTWS by 22 October 2007
- (ii) Four weeks for comments on the PTWS Users Guide by Member States
- (iii) Final editorial period of four weeks for incorporating the comments from Member States
- (iv) The final document will be published by 26 December 2007 in the IOC Tsunami Technical Report Series, in a Handbook/Manual format, easy to update;

Encourages Member States to contribute to the finalization by reviewing the draft and if any, by submitting their comments during the process (ii) above,

Requests the IOC Secretariat that the Guide should be published in printed and electronic form on the IOC website to be updated when required, and updates should be fully documented and officially communicated to Member States;

Further establishes a PROCESS FOR CHANGES TO PTWS OPERATIONAL TEXT PRODUCTS;

Recognizing the need by PTWC, NWPTAC, and WC/ATWC to modify their international text products in response to Member State concerns and suggestions as well as to meet other requirements related to changes in procedures, protocols, and standardization,

Aiming to facilitate the implementation of such changes in a timely manner and to notify Member States in advance as well as recognizing the authority of the ICG to finally approve them, the following process is recommended,

Decides that the formal process for making substantive changes to the international products of the Centres operating for the PTWS will be:

- (i) The technical units (PTWC, NWPTAC, WC/ATWC, ITIC and the PTWS Secretariat) will first be consulted regarding any proposed changes
- (ii) If consensus is achieved among the technical units, then a Service Change Notice regarding the changes will be composed and sent, at least 30 days in advance, over all normal operational communication methods to the Member States advising them of the change and its implementation date
- (iii) Implementation of the changes will be on an interim basis until they can be formally approved by the next session of the ICG;

Agrees that changes that are implemented according to this process will be documented in the PTWS Operational User's Guide and clearly labelled as an interim measure, until they are fully approved by the ICG;

Further agrees that this process applies to substantive changes in the text products, such as changes in product formats, changes in product terms or definitions, or changes in procedures that affect product content. Minor changes to products, such as language that must be added or changed on a one-time basis to accommodate unusual situations during events, are not part of this process and are only the responsibility of each Centre.

Financial implications: None

Recommendation ICG/PTWS-XXII.4

PACIFIC-WIDE TSUNAMI EXERCISE

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Noting that the Indian Ocean tsunami of 26 December 2004 brought to the attention of the world the urgent need to be more prepared for such events,

Understanding that simulating scenarios and learning lessons from such exercises is an effective way to improve preparedness,

Recognizing that the PTWS requires regular testing and review,

Recommends that the second end-to-end tsunami exercise be carried out for the Pacific Ocean during the third quarter of 2008, with a final report of results written before the next ICG Session;

Decides that a Task Team be formed to design and carry out the exercise and bearing in mind the following elements:

- (i) Membership of the Task Team for organizing the exercise should include representatives from PTWC, WC/ATWC, NWPTAC, Australia, New Zealand, Peru, Republic of Korea, the Russian Federation, and ITIC
- (ii) The exercise should simulate each country being put into a warning situation requiring decision-making and be taken to the step just prior to public-notification
- (iii) The scenario to be exercised will be a destructive tsunami generated off the northeast coast of Japan and crossing the Pacific. It will be simulated with notification by PTWC and other warning centres such as WC/ATWC and the NWPTAC to the designated contact points and national emergency authorities of the Member States responsible for tsunamis
- (iv) The scenario will be conducted in real time
- (v) Member States be strongly encouraged to participate
- (vi) Due care be taken so as not to inadvertently alarm the public; a most conservative approach may be best, considering this will only be the second such Pacific-wide exercise
- (vii) Member States share information about the Pacific Wave 06 exercise as well as past National or Sub-National tsunami exercises prior to this exercise
- (viii) Participating Member States be required to share information regarding the procedures applied and lessons learned during the exercise
- (ix) The details of the exercise, as well as its set of outcomes and performance measures be defined in advance, taking into consideration when possible, the results of the Member State assessments; outcomes and performance measures should be collected using a standard instrument and at a minimum include:
 - a. How each Member State received the warning (e.g., GTS, fax, e-mail)?
 - b. Elapsed time between when the bulletin is issued and when it is received and recognized
 - c. What assessment tools are applied for decision-making about evacuations?
 - d. How the public would be notified and instructed?
 - e. Elapsed time until the public would be notified and instructed
 - f. Summary of each Member State's National Emergency Plan for tsunamis, including any chapters on exercises
 - g. Feedback from stakeholders regarding their performance and the performance of the information providers
 - h. Media response;
- (x) ICG/PTWS National Contacts will be responsible for collecting results of their Member State and providing them to the Task Team by 1st December 2008
- (xi) A formal letter announcing the exercise and providing its details should be composed by the Task Team and sent by the IOC as a Circular Letter to TNC and TWFP no later than 1st January 2008

This exercise is the second exercise in a pattern of recurring exercises to be conducted by the ICG/PTWS;

Requests that resources be made available from the IOC and Member States to facilitate organizational and follow-up meetings, and a contractor to help facilitate the debriefing process and quickly assemble the report.

Financial implications: US\$ 5,000 in 2008

Recommendation ICG/PTWS-XXII.5

SUB-REGIONAL PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEMS: NORTHWEST PACIFIC, SOUTH CHINA SEA, AND WESTERN PACIFIC MARGINAL SEAS

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Recalling that Pacific Tsunami Warning and Mitigation System (PTWS) covers the Pacific Ocean, the Southern Ocean regions of the Pacific and all attached seas, including the Philippine Sea, East China Sea, Yellow Sea, Sea of Okhotsk, Bering Sea, South China Sea, Java Sea, Arafura Sea, Sulawesi Sea, Mindanao Sea, Sulu Sea, Celebes Sea, Bismarck Sea, Solomon Sea, Coral Sea, and Tasman Sea,

Reaffirming that the Richard H. Hagemeyer Pacific Tsunami Warning Center (PTWC) is the primary operational centre for the PTWS and the West Coast and Alaska Tsunami Warning Centre (WC/ATWC) is the backup to the PTWC,

Reaffirming further that the Northwest Pacific Tsunami Advisory Center (NWPTAC) operated by the Japan Meteorological Agency (JMA) covers the north western Pacific areas for providing regionally-tailored tsunami advisories as a regional centre of the PTWS,

Noting that the South China Sea region is threatened by tsunamis generated on the Manila Trench for which dense real-time seismic and sea level networks and data sharing are required,

Encouraging countries of the region to support the required monitoring requirements for issuing timely warnings for local tsunamis, and the further development of national centres and appropriate regional centres to support data and early information sharing to countries of the region to enable them to provide tsunami safety guidance to their coastal populations,

Recalling that the former ICG/ITSU, now ICG/PTWS, during its twentieth session, requested the PTWC and the NWPTAC to provide an interim tsunami advisory service for the South China Sea,

Appreciating highly that, upon the request of the Group, the PTWC, WC/ATWC and NWPTAC started interim tsunami advisory service for the South China Sea in April 2006,

Noting that the IOC Executive Council, during its thirty-ninth session, requested PTWC and NWPTAC to continue to provide interim tsunami advisory information for the South China Sea region, at least until the PTWS-XXII session,

Recognizing that a number of Member States around the South China Sea region expressed their needs for continuation of interim international tsunami advisory service for the region,

Requests that the PTWC, WC/ATWC and NWPTAC continue the interim tsunami advisory service for the South China Sea under the framework of PTWS, and that this service will be

reviewed after a sub-regional tsunami warning system for South China Sea has been set up among countries around the South China Sea;

Recommends to the IOC Executive Council to adopt, at its forty-first session in 2008, a Resolution which includes its formal authorization of the interim tsunami advisory service for the South China Sea conducted by the PTWC, WC/ATWC and NWPTA.

Financial implications: None

Recommendation ICG/PTWS-XXII.6

PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEM

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Recalling the Reports of ITSU-XX and PTWS-XXI and their work plans,

Noting the coordinating role of the Intergovernmental Oceanographic Commission,

Reaffirming that the PTWC, NWPTAC and WC/ATWC of the ICG/PTWS provide interim coverage for the CARIBE-EWS and IOTWS,

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

Welcoming the presence of representatives of all other ICGs,

Recalling its commitment to an open, free and unrestricted sharing of tsunami-relevant real-time observational data in accordance with the UNESCO/IOC Oceanographic Data Exchange Policy and without prejudice to the sovereignty of Member States,

Acknowledging with gratitude the invitation of the Government of Ecuador and INOCAR to host this 22nd Session of the PTWS in Guayaquil,

Accepting the invitation of the Government of Samoa to host the 23rd Session of the ICG in 2009,

Noting the offer of the Government of Japan to host the 24th Session of the ICG in 2011,

Having reviewed the progress since its last session in Melbourne, Australia,

Concludes that:

- (i) A Programme and Budget should assist the ICG/PTWS in addressing its activities in the forth-coming biennium
- (ii) Efforts need to be made to enhance the establishment and maintenance of tsunami warning centres in the regions
- (iii) Capabilities to rapidly detect near-field earthquakes and possible tsunami need urgent action by Member States of the regions under risk
- (iv) Efforts are required to enhance, update and modernize the capabilities of the seismic and sea-level monitoring networks,
- (v) The updating process of operational routines and products need to be formalized

- (vi) Member states not having sufficient capacity to develop tsunami early warning and mitigation systems should be given support to accelerate this process,

Decides to/that:

- (i) Establish an ICG Structure and Governance that includes a Steering Committee, accountable to the ICG, empowered to streamline practices and make binding decisions on PTWS issues during intersessional periods
- (ii) Establish an ICG Steering Committee with membership from
- a. Elected Officers (Chair and Vice Chairs),
 - b. Current intersessional Working Group Chairs
 - c. Other members representatives by invitation
- (iii) Charge the Steering Committee to:
- a. Develop a Medium Term Strategy including performance measures
 - b. Develop an Implementation Plan 2008–2009
 - c. Formulate Governance Model
 - d. Develop a Strategy for Funding PTWS Activities
 - e. Develop an ITIC work plan that focuses on the priorities of the Medium-Term Strategy
 - f. Evaluate the need for provisional intersessional Working Groups as required in the following areas:
 - a. Monitoring
 - b. Assessment
 - c. Interoperability
 - d. Awareness
 - e. Regional
- (iv) The Steering Committee will develop provisional terms of reference within six months;

Agrees to establish sub-regional Working Groups for the Southeast Pacific Region, the Southwest Pacific Region, and the Central American Pacific Coast to address the particular regional requirements with the respective terms-of-reference given as in Annex to this Recommendation;

Agrees also to request the IOC Executive Secretary to convene a scientific-technical conference to review the state-of-art of detecting near-field earthquake and possible tsunami in early 2008;

Decides to:

- (i) publish the PTWS Operational Users Guide as a standard document of the system, and a process of its formalization as in Recommendation ICG/PTWS-XXII.2
- (ii) submit to the 41st Executive Council of IOC in 2008 a recommendation to formally authorize the interim tsunami advisory service provided for the South China Sea,
- (iii) convene a new Working Group to review and promote Pacific Emergency Communications and Technologies,

- (iv) continue the Working Group on Sea Level measurements, data collection, and exchange,
- (v) continue the Working Group on Interoperability of regional, sub-regional and national tsunami warning systems in the Pacific
- (vi) convene a new Working Group on rapid near-field recognition of tsunamigenic earthquakes and associated tsunamis.

Financial implications: None

Annex to Recommendation ICG/PTWS-XXII.6

Terms-of-reference for the Sub-Regional Working Group on Tsunami Warning and Mitigation in the Southeast Pacific Region

1. to evaluate capabilities of countries in the South East pacific Region for providing end-to-end tsunami warning and mitigation services,
2. to ascertain requirements from countries in the Southeast Pacific Region 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, and their interoperability in accordance with ICG/PTWS requirements,
5. to improve the education programs with a regional criteria based on the regional social, cultural and economical reality,
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 representatives from Colombia, Ecuador, Peru and Chile, with a chairperson and a vice-chairperson who will be defined by the end of October 2007.

Terms-of-reference for the Sub-Regional Working Group on Tsunami Warning and Mitigation in the Southwest Pacific Region

1. to evaluate capabilities of countries in the Southwest Pacific Region for providing end-to-end tsunami warning and mitigation services,
2. to ascertain requirements from countries in the Southwest Pacific Region for the tsunami warning and mitigation services,
3. to 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 in the region, and the interoperability of these systems in accordance with ICG/PTWS requirements,

5. to facilitate capacity building and the sharing of tsunami information in the region, including the effectiveness of ICG/PTWS services and the free and open exchange of data,
6. to support the further development of the virtual centre of expertise in a multi-hazards context within SOPAC in line with the regional Early Warning Strategy,
7. to facilitate the inclusion of tsunami hazard and response information into curricula, and development and dissemination of educational materials,

The Group will be composed of representatives from member countries of SOPAC as members and observers including France and chaired by the Representative of New Zealand, with vice-chairpersons from Fiji and Samoa. SOPAC, with assistance of Australia and New Zealand could be asked to consider supporting the activities of the Group by providing logistics and secretarial services.

**Terms-of-reference
for the Sub-Regional Working Group on Tsunami Warning and Mitigation
on 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 emitting 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 representatives from Nicaragua, El Salvador, Guatemala, Costa Rica, representatives of Honduras and Panama (as soon as they finalized the formal procedure of joining ICG/PTWS), and chaired by the representative from Nicaragua.

Recommendation ICG/PTWS-XXII.7

IMPROVED STRATEGIC PLANNING AND BUDGETING

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Noting Resolution EC-XXXIX.8 (2006), establishing the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) and the IOC Medium-Term Strategy for 2008-2013,

Further noting the commitment of the United States Government to the Intergovernmental Oceanographic Commission of UNESCO, and specifically the ICG/PTWS by supporting

operation of the Pacific Tsunami Warning Center (PTWC), the West Coast/Alaska Tsunami Warning Center (WC/ATWC), and the International Tsunami Information Center (ITIC),

Recalling that the Pacific Tsunami Warning System has been an operational tsunami warning system for over 40 years,

Recognizing that the ICG/PTWS Member States are supporting technical assistance and training as part of international efforts to establish a fully functional global tsunami forecast and warning system,

Recognizing the ongoing need for strengthening of the Pacific Tsunami Warning and Mitigation System requires improved ICG business practices for strategic planning and programme budgeting that is more responsive and timely,

Appreciating the continued financial support of the United States in providing products and services of the PTWC, WC/ATWC to all ICG/PTWS Tsunami Focal Points and the in kind contribution of Japan in providing products and services for Focal Points in the North West Pacific and the South China Sea,

Further appreciating the financial support of the United States by providing the Director and hosting the IOC International Tsunami Information Center,

Expressing thanks to the Government of Japan for the secondment of a JMA expert to the ITIC,

Expressing thanks to the Director of SHOA – Chile for providing the ITIC Associate Director,

Appreciating the contributions of Japan, Russian Federation, and the United States to a global tsunami database,

Acknowledging that 2008–2009 Biennium financial support from UNESCO is uncertain at this time and may provide minimal support to the ICG priority objectives and intersessional activities,

Accepting that planning and performance-based budget development, including a PTWS 2008–2013 Medium Term Strategy, will not be adopted by the conclusion of the ICG/PTWS-XXII,

Reaffirming the important role of effective intersessional Working Groups and the continuity of participation from nationally identified stakeholders in planning, budgeting and implementation,

Calls on Member States to support and participate in intersessional activities of the ICG, including active engagement in the technical working groups and collaboration with the International Tsunami Information Center (ITIC) to leverage capacity building efforts;

Decides to establish an ICG Steering Committee as described in Recommendation ICG/PTWS-XXII.5 and **requests** the IOC Executive Secretary to:

- (i) advocate for PTWS budgets and plans;
- (ii) provide secretariat support, including,
 - a. regular communication through electronic newsletters and ICG/PTWS website
 - b. organization, management, and distribution of IOC and ICG relevant documents
 - c. assistance with workshops and meetings;
- (iii) establish within the special account of IOC a holding sub-account to receive contributions in support of ICG/PTWS activities;

- (iv) solicit Member State official nominations for representing them in the intersessional Working Groups. The solicitation shall clearly state that costs associated participation are the responsibility of the Member State;
- (v) strengthen coordination of regional planning and budgeting activities of the ICG/PTWS through the Working Group of the Tsunami and Other Ocean Hazards Warning and Mitigation Systems (TOWS) including facilitation to leverage project and programme resources with other international and intergovernmental agencies.

Financial implications: US\$ 25,000 from IOC resources, US\$ 30,000 from extrabudgetary sources to be identified

Recommendation ICG/PTWS-XXII.8

WORKING GROUP ON RAPID NEAR-FIELD RECOGNITION OF TSUNAMIGENIC EARTHQUAKES AND ASSOCIATED TSUNAMIS

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System,

Acknowledging there is an emergence of new techniques and technologies that may result in rapid near-field recognition of tsunamigenic earthquakes and associated tsunamis,

Noting significant support from Member States during the Session, and as evidenced in the formation of sub-regional Working Groups for the South West Pacific, South East Pacific Coasts, Central America Pacific Coast which have a focus on the rapid detection and evaluation of potentially tsunamigenic local earthquakes,

Recognizing the desirability of sharing progress in these promising technologies amongst Member States,

Decides to establish an intersessional Working Group on rapid near-field recognition of tsunamigenic earthquakes and associated tsunamis with the following Terms of Reference:

1. To facilitate the exchange of information on rapid near-field detection techniques being used, evaluated or proposed by Member States,
2. To compile and disseminate information on rapid near-field detection techniques being used, evaluated or proposed by Member States,
3. To provide guidance and advice to Member States considering using techniques for rapid near-field detection;

Recommends that:

- (i) the Group will be composed of Member States and other interested countries, and be chaired by the representative from Canada,
- (ii) discussions will be conducted mainly through electronic means,
- (iii) it shares its progress regularly throughout the inter-session period through the ITIC and its mechanisms for technical coordination.

Financial implications: none

ANNEX III

LIST OF DOCUMENTS

Agenda Item	Reference	Title
Working documents		
2.1	IOC/PTWS-XXII/1 Prov./rev.2	Provisional Agenda [17 Sept 2007]
2.3	IOC/PTWS-XXII/1 Add.prov./rev.2	Provisional Timetable [17 Sept 2007]
2.3	IOC/PTWS-XXII/2 rev.2	Annotated Agenda [17 Sept 2007]
2.3	IOC/PTWS-XXII/2 rev.2	Annotated Agenda [17 Sept 2007]
13	IOC/PTWS-XXII/3	Summary Report
	IOC/PTWS-XXII/4	List of Documents
	IOC/PTWS-XXII/5	List of Participants [16 September 2007]
1	IOC/PTWS-XXII/6	Welcome Speeches
3.1	IOC/PTWS-XXII/7	IOC Executive Secretary's Report
3.2	IOC/PTWS-XXII/8	ICG Chairman's Report [14 Sept 2007]
3.3	IOC/PTWS-XXII/9	ICG Secretariat's Report
	IOC/PTWS-XXII/9.1	Summary Report, including work plan and budget
	IOC/PTWS-XXII/9.2	Summary of IOC, ITSU, PTWS Resolutions and Recommendations [Sept. 2007]
	IOC/PTWS-XXII/9.3	PTWS Member States [Sept 2007] PowerPoint Presentation
3.4	IOC/PTWS-XXII/10	IOC Tsunami Co-ordination Unit Report [17 September 2007]
3.5	IOC/PTWS-XXII/11	ITIC Report
	IOC/PTWS-XXII/11.1	Summary Report, including work plan and budget
	IOC/PTWS-XXII/11.2	ITIC Products and Services [Sept 2007]
	IOTWS-II/6	A Regional Tsunami Information Centre: Roles and Functions for the Implementation of an Effective Tsunami Warning and Mitigation System [April 2005] (PPT Presentation)
3.6	IOC/PTWS-XXII/12	PTWC Report (PPT Presentation)
3.7	IOC/PTWS-XXII/13	JMA Report (PPT Presentation)
3.8	IOC/PTWS-XXII/14	National Reports
	IOC/PTWS-XXII/14	Summary of National Reports [12 October 2007]
	IOC/PTWS-XXII/14.1	Australia
	IOC/PTWS-XXII/14.2	Canada
	IOC/PTWS-XXII/14.3	Chile
	IOC/PTWS-XXII/14.4	China
	IOC/PTWS-XXII/14.5	Colombia
	IOC/PTWS-XXII/14.6	Cook Islands
	IOC/PTWS-XXII/14.7	Costa Rica
	IOC/PTWS-XXII/14.8	Ecuador
	IOC/PTWS-XXII/14.9	El Salvador
	IOC/PTWS-XXII/14.10	Fiji
	IOC/PTWS-XXII/14.11	France
	IOC/PTWS-XXII/14.12	Guatemala
	IOC/PTWS-XXII/14.13	Indonesia
	IOC/PTWS-XXII/14.14	Japan

Agenda Item	Reference	Title
	IOC/PTWS-XXII/14.15	Democratic Republic of Korea
	IOC/PTWS-XXII/14.16	Malaysia
	IOC/PTWS-XXII/14.17	Mexico
	IOC/PTWS-XXII/14.18	New Zealand
	IOC/PTWS-XXII/14.19	Nicaragua
	IOC/PTWS-XXII/14.20	Papua New Guinea
	IOC/PTWS-XXII/14.21	Peru
	IOC/PTWS-XXII/14.22	Philippines
	IOC/PTWS-XXII/14.23	Republic of Korea
	IOC/PTWS-XXII/14.24	Russian Federation
	IOC/PTWS-XXII/14.25	Samoa
	IOC/PTWS-XXII/14.26	Singapore
	IOC/PTWS-XXII/14.27	Thailand
	IOC/PTWS-XXII/14.28	Tonga
	IOC/PTWS-XXII/14.29	United States of America
	IOC/PTWS-XXII/14.30	Viet Nam
3.9	IOC/PTWS-XXII/15	Reports from Other Tsunami Warning and Mitigation Systems (ICG/TWSs)
	IOC/PTWS-XXII/15.1	ICG/CARIBE-EWS (PPT presentation)
	IOC/PTWS-XXII/15.2	ICG/IOTWS (PPT presentation)
	IOC/PTWS-XXII/15.3	ICG/NEAMTWS (PPT presentation)
3.10	IOC/PTWS-XXII/16	Reports from UN Organizations
	IOC/PTWS-XXII/16.1	WMO [19 September 2007] (PPT presentation)
	IOC/PTWS-XXII/16.1 add	GTS/WIS data exchange support to TWS [20 September 2007]
3.11	IOC/PTWS-XXII/17	Reports from non UN organizations
	IOC/PTWS-XXII/17.1	ASEAN
	IOC/PTWS-XXII/17.2	IUGG-Tsunami Commission (PPT presentation)
	IOC/PTWS-XXII/17.2 add.	6th Intl Workshop Summary and Recommendations
	IOC/PTWS-XXII/17.3	SOPAC
	IOC/PTWS-XXII/17.4	SPREP
	IOC/PTWS-XXII/17.5	World Data Center-A, Solid Earth Geophysics – Tsunamis (PPT presentation)
4.1.1	IOC/PTWS-XXII/18	WG 1: Seismic Measurements, Data Collection and Exchange (PPT Presentation)
4.1.2	IOC/PTWS-XXII/20	CTBTO Report on Use of Network (delete by PTWC and JMA) (PPT Presentation)
4.1.3	IOC/PTWS-XXII/19	FDSN/IRIS Report - Global Seismic Network (PPT Presentation)
4.2.1	IOC/PTWS-XXII/21	WG 2: Sea-Level Measurements, Data Collection and Exchange (PPT Presentation)
4.2.2	IOC/PTWS-XXII/22	GLOSS Report (PPT Presentation)
4.2.3	IOC/PTWS-XXII/23	Deep-Ocean Tsunami Detection Network Report (PPT Presentation)
4.2.4	IOC/PTWS-XXII/24	Sea Level Data and Station Metadata Project
	IOC/PTWS-XXII/24.1	Sea Level Station Metadata XML Schema
	IOC/PTWS-XXII/24.2	PTWC Sea Level Station Web Service
	IOC/PTWS-XXII/24.3	PTWC Tide Tool operations decode and display
	IOC/PTWS-XXII/24.4	ODINAFRICA Sea Level Facility
4.3.1.1	IOC/PTWS-XXII/25	WG 3: Tsunami Hazard Identification and Characterization [14 September 2007]
4.3.1.2	IOC/PTWS-XXII/26	Global Historical Tsunami Database Project
	IOC/PTWS-XXII/26.1	WDC/NOAA Summary and Status Report of the Integrated Tsunami Database (ITDB) Project [16 September 2007] PPT Presentation - NOAA/NGDC/WDC
	IOC/PTWS-XXII/26.2	PPT Presentation - Gusiakov
4.3.2	IOC/PTWS-XXII/27	WG 4: Resilience Building and Emergency Management
4.4.1	IOC/PTWS-XXII/28	WG 5: Interoperability and Regional, Sub-Regional and

Agenda Item	Reference	Title
		National Tsunami Warning and Mitigation Systems in the Pacific (PPT Presentation)
4.4.2	IOC/PTWS-XXII/Inf.3	PTWS Operational Users Guide [Dec 2007]
4.4.3	IOC/PTWS-XXII/29	PTWS Task Team on Messages Report (PPT Presentation)
	IOC/INF-1244	Exercise Pacific Wave '06 Final Report [01 May 2007]
5.1		Northwest Pacific, South China Sea, and Western Pacific Marginal Seas
5.2	IOC/PTWS-XXII/30	Southwest Pacific Ocean PTWS-XXII Working Group Report (PPT Presentation)
5.3	IOC/PTWS-XXII/31	Central America Pacific Coast, including Working Group Report
6.1	IOC/PTWS-XXII/32	Working Group Report on the Medium Term Strategy for the PTWS
6.2		PTWS Implementation Plan
7.1	IOC/PTWS-XXII/11.2, Section 1.3.6	International Tsunami (ITSU) Training Programme (PPT Presentation)
7.2	IOC/PTWS-XXII/33	National Tsunami Capacity Assessments
7.3	IOC/PTWS-XXII/11.2, Section 3.5 and 4.2.3	Tsunami Newsletter and Tsunami Bulletin Board (PPT Presentation) (Newsletter, TBB, Awareness, TWC Info Tools)
7.4	IOC/PTWS-XXII/11.2, Section 4.2	TsunamiTeacher, Pacific Island Tsunami Awareness Kit, and Other Electronic Resources (PPT Presentation) (Newsletter, TBB, Awareness, TWC Info Tools)
7.5	IOC/PTWS-XXII/11.2, Section 4.1	Publications (PPT Presentation) (Newsletter, TBB, Awareness, TWC Info Tools)
8.	IOC/PTWS-XXII/34	Sessional Working Groups Reports
	IOC/PTWS-XXII/34.1	Sea Level (PPT Presentation)
	IOC/PTWS-XXII/34.2	Southeast Pacific (PPT Presentation)
	IOC/PTWS-XXII/34.3	Southwest Pacific (PPT Presentation)
	IOC/PTWS-XXII/34.4	Central America Pacific Coast (PPT Presentation)
9	IOC/PTWS-XXII/35	Programme & Budget (PPT Presentation)
10	IOC/PTWS-XXII/36	Dates and Place for ICG/PTWS-XXIII
13	IOC/PTWS-XXII/37	Summary of Recommendations [21 Sept 2007]
INFORMATION DOCUMENTS		
3.5	IOC-IV.5 (1965)	Establishment of ITIC
	IOC-X.23 (1977)	ITIC Mission, Mandate, Functions and Activities
	EC-XXI.4 (1988)	Amendment to ITIC Mandate
	IOC/PTWS-XXII/Inf.1	Information for Visitors for PTWS-XXII
	IOC/PTWS-XXII/Inf.2	List of PTWS Tsunami National Contacts [18 December 2007]
4.1	IOC/PTWS-XXII/Inf.4	IASPEI New Manual of Seismological Observatory Practice (available for purchase)
4.2	IOC Manuals and Guides 14	Manual on Sea Level Measurement and Interpretation, Volume IV: An Update to 2006
4.3.1	IOC/PTWS-XXII/Inf.5	Standard, Criteria, and Procedures for NOAA Evaluation of Tsunami Numerical Models (Synolakis, Bernard, Titov et al., March 2007, NOAA Technical Memorandum OAR PMEL-135)
4.3.2	IOC/PTWS-XXII/Inf.6	EMWIN and RANET, Complementary systems to the WMO GTS [RA-V Document, 2006]
4.3.2.1	IOC/PTWS-XXII/Inf.7	Tsunami Databases Update Form (draft) [Sep 2007]

Agenda Item	Reference	Title
4.3.2.1	IOC/PTWS-XXII/Inf.8	Tsunami Questionnaire (draft) [Sep 2007]
4.4.4	IOC/PTWS-XXII/Inf.9	Summary of Events 2006-2007 [as of 17 September 2007]
	IOC/ITSU-XX/3	Summary Report, ICG/ITSU-XX [03 Nov 2005]
	IOC/ITSU-XX/3s	Summary Report, ICG/ITSU-XX, Abstracts, Resolutions and Recommendations [03 Nov 2005]
	IOC/PTWS-XXI/3	PTWS XXI - Summary Report [1 May 2007]
	IOC/PTWS-XXI/20	ITSU-XX and PTWS-XXI Action Items [01 June 2007]
	IOC/PTWS-XXI/3/Annex VIII	International Tsunameter Partnership [Draft Feb 2006]
4.3.1.2	IOC/PTWS-XXI/3/Annex IX	GHTDB Report [May 2006]
	IOC/EC-XXXIX/3	IOC 39th Executive Council Summary Report, PTWS Excerpts [June 2006]
6.1	IOC/INF-1124	ITSU Master Plan [April 1999]
7.2	IOC/PTWS-XXI/Inf.7	QUESTIONNAIRE: Assessment of Requirements and Capacity for an Effective and Durable National Tsunami Warning and Mitigation System
7.4	IOC Manuals and Guides 47	IOC TsunamiTeacher
4.4.4	IOC/INF-1244	Exercise Pacific Wave '06 Final Report [01 May 2007]
	IOC-XXIV/3	IOC-XXIV-13 (ICGs) and XXIV-14 (Tsunamis and Other Ocean Hazards) Resolutions [June 2007]
4.4	IOC/INF-1232	PTWS Tsunami Warning Centre Coordination Meeting Summary Report
5.1, 7.1	IOC/INF-1233	IOC PTWS Seminar on Tsunami Warning Operations: Protocols, Procedures and Best Practices for Monitoring, Evaluation and Alerting the Public [April 2007]
3.1	IOC/CL 2239	Follow-up to the 24th IOC Assembly and 34th General Conference of UNESCO [25 July 2007]

ANNEX IV

LIST OF PARTICIPANTS

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ANNEX V

LIST OF ACRONYMS

ADRC	Asian Disaster Reduction Centre
ASEAN	Association of South East Asian Nations
CPPT	Centre Polynésien de Prévention des Tsunamis
CTBTO	Comprehensive Nuclear Test Ban Treaty Organization
DART	Deep-ocean Assessment & Reporting of Tsunamis
DHN	Dirección de Hidrografía y Navegación
FDSN	Federation of Digital Broadband Seismographic Networks
GEOSS	Global Earth Observation System of Systems
GLOSS	Global Sea level Observing System
GOES	USA geostationary weather satellite
GPS	Global Positioning System
GSN	Global Seismic Network
GTDB	Global Tsunami Data Base
GTS	Global Telecommunication System (WMO)
HTDB	Historical Tsunami Data Base
IASPEI	International Association of Seismology & the Earth's Interior
IAVCEI	International Association Of Volcanology & Chemistry of the Earth's Interior
IBC	International Bathymetric Charts
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System
ICG/ITSU	International Coordination Group for the Tsunami Warning System in the Pacific
ICG/NEAMTWS	Intergovernmental Coordination Group for the Tsunami Early Warning
ICG/PTWS	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System
IFRC	International Federation of Red Cross & Red Crescent Societies
IHO	International Hydrographic Organization
INMARSAT	French Mobile Satellite Communications Network
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data & Information Exchange
IOTWS	Indian Ocean Tsunami Warning & Mitigation System
IRIS	Incorporated Research Institutions for Seismology
ISDR	International Strategy for Disaster Reduction
ITDB	Integrated Tsunami Data Base
ITIC	International Tsunami Information Centre
IUGG	INTERNATIONAL UNION OF GEODESY & GEOPHYSICS
JCOMM	Joint Technical Committee for Oceanography & Marine Metrology
JMA	Japan Meteorological Agency

NGDC	National Geophysical Data Center
NOAA	National Oceanic & Atmospheric Administration (USA)
NTHMP	National Tsunami Hazard Mitigation Program
NTL/ICMMG	Novosibirsk Tsunami Laboratory of the Institute of Computational Mathematics & Mathematical Geophysics
NWPTAC	Northwest Pacific Tsunami Advisory Center
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PIC	Pacific Island Countries
PMEL	Pacific Marine Environmental Laboratory
PTWS	Pacific Tsunami Warning and Mitigation System
RANET	<u>Radio Internet</u>
SHOA	Servicio Hidrografico y Oceanografico de la Armada de Chile (Naval Hydrographic & Oceanographic Service of the Armada of Chile)
SMD	Samoa Meteorology Division
SMS	Short Message Service
SOPAC	Pacific Applied Geosciences Commission
TBB	Tsunami Bulletin Board
TREMORS	Tsunami Risk Evaluation from seismic MOment through a Real-time System
TTT	Tsunami Travel Time
TWS	Tsunami Warning System
UHSLC	University of Hawaii Sea Level Centre
UN	United Nations
UNESCO	United Nations Educational, Scientific & Cultural Organization
USGS	U.S. Geological Survey
WC/ATWC	West Coast/Alaska Tsunami Warning Center
WESTPAC	IOC Sub-Commission for the Western Pacific
WMO	World Meteorological Organization

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2. Seventeenth Session of the Executive Council	E, F, S, R, Ar
3. Fourth Session of the Working Committee for Training, Education and Mutual Assistance	E, F, S, R
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
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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
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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), Mombassa, 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*