



# **Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions**

## **Fifth Session**

Managua, Nicaragua  
15–17 March 2010

# **Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions**

## **Fifth Session**

Managua, Nicaragua  
15–17 March 2010

IOC/ICG-CARIBE EWS-V/3  
Paris, October 2009  
English only<sup>1</sup>

---

<sup>1</sup> Contains an Executive Summary in French, Spanish and Russian.

## TABLE OF CONTENTS

|  | Page       |
|--|------------|
| <b>EXECUTIVE SUMMARY .....</b>   | <b>III</b> |
| <b>RESUME EXECUTIF .....</b>   | <b>IV</b>  |
| <b>RESUMEN DISPOSITIVO .....</b>   | <b>V</b>   |
| <b>РАБОЧЕЕ РЕЗЮМЕ.....</b>   | <b>VI</b>  |
| <b>1. WELCOME AND OPENING.....</b>   | <b>1</b>   |
| <b>2. ORGANIZATION OF THE SESSION .....</b>  | <b>3</b>   |
| 2.1 ADOPTION OF AGENDA.....  | 3          |
| 2.2 DESIGNATION OF THE RAPPOREUR.....  | 3          |
| 2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION .....                                    | 3          |
| <b>3. REPORT ON INTERSESSIONAL ACTIVITIES .....</b>  | <b>4</b>   |
| 3.1 IOC EXECUTIVE SECRETARY'S REPORT .....   | 4          |
| 3.2 CHAIRPERSON'S REPORT .....   | 5          |
| 3.3 CARIBE EWS SECRETARIAT REPORT .....  | 6          |
| 3.4 REPORT OF THE CARIBBEAN TSUNAMI INFORMATION CENTER (CTIC).....                               | 7          |
| 3.5 REPORTS FROM UN AND NON UN ORGANISATIONS .....   | 8          |
| 3.6 STATUS OF OTHER ICGS .....   | 8          |
| 3.7 NATIONAL PROGRESS REPORTS .....  | 10         |
| 3.8 INTERIM ADVISORY SERVICES REPORT (PTWC) .....  | 13         |
| <b>4. WORKING GROUP PROGRESS REPORTS .....</b>   | <b>14</b>  |
| 4.1 WORKING GROUP 1 PROGRESS REPORT:<br>MONITORING AND DETECTION SYSTEMS, WARNING GUIDANCE ..... | 14         |
| 4.2 WORKING GROUP 2 PROGRESS REPORT:<br>HAZARD ASSESSMENT .....                                  | 15         |
| 4.3 WORKING GROUP 3 PROGRESS REPORT:<br>WARNING DISSEMINATION AND COMMUNICATION .....            | 15         |
| 4.4 WORKING GROUP 4 PROGRESS REPORT:<br>PREPAREDNESS, READINESS AND RESILIENCE .....             | 16         |
| <b>5. SPECIAL INVITED LECTURES:<br/>COMMUNITY-BASED TSUNAMI WARNING SYSTEM .....</b>             | <b>16</b>  |
| <b>6. POLICY MATTERS .....</b>   | <b>18</b>  |
| 6.1 ESTABLISHMENT OF A CARIBBEAN TSUNAMI WARNING CENTER .....                                    | 18         |
| 6.2 CARIBBEAN TSUNAMI EXERCISE (CARIBE WAVE 2011) .....  | 18         |
| 6.3 HAITI EARTHQUAKE AND TSUNAMI 12 <sup>TH</sup> JANUARY 2010 .....                             | 19         |

|   | page      |
|---|-----------|
| <b>7. UPDATES TO THE CARIBE EWS IMPLEMENTATION PLAN .....</b> | <b>20</b> |
| <b>8. PROGRAMME AND BUDGET 2012–2013.....</b>                 | <b>21</b> |
| <b>9. NEXT MEETING.....</b>                                   | <b>21</b> |
| 9.1 CONFIRMATION OF DATE AND PLACE OF ICG/CARIBE EWS-VI ..... | 21        |
| 9.2 TARGET DATE FOR ICG/CARIBE EWS-VII .....                  | 21        |
| <b>10. OFFICERS ELECTIONS.....</b>                            | <b>21</b> |
| <b>11. ANY OTHER BUSINESS .....</b>                           | <b>22</b> |
| <b>12. ADOPTION OF DECISIONS AND RECOMMENDATIONS.....</b>     | <b>23</b> |
| <b>13. CLOSURE OF THE MEETING.....</b>                        | <b>23</b> |

## **ANNEXES**

|      |                                   |
|------|-----------------------------------|
| I.   | AGENDA                            |
| II.  | RECOMMENDATIONS                   |
|      | RECOMMENDATION ICG/CARIBE EWS-V.1 |
|      | RECOMMENDATION ICG/CARIBE EWS-V.2 |
|      | RECOMMENDATION ICG/CARIBE EWS-V.3 |
|      | RECOMMENDATION ICG/CARIBE EWS-V.4 |
|      | RECOMMENDATION ICG/CARIBE EWS-V.5 |
| III. | SPEECHES                          |
| IV.  | LIST OF DOCUMENTS                 |
| V.   | LIST OF PARTICIPANTS              |
| VI.  | LIST OF ACRONYMS                  |

## EXECUTIVE SUMMARY

---

The Fifth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-V) was held in Managua, Nicaragua 15–17 March, 2010. The meeting was attended by 55 participants from 17 countries and two regional organizations.

**The ICG reviewed the progress** made during the intersessional period, noted reports and recommendations from its Working Groups and received progress reports on training activities, as well as on the process of nominations of Tsunami Warning Focal Points (TWFP) and Tsunami National Contact (TNC): up to 2 February 2010, 24 Member States have now confirmed tsunami focal point information (both TNC and TWFP).

**The ICG re-elected** Dr Lorna Inniss (Barbados) as Chairperson. **The ICG agreed** to incorporate a third vice-chair and **elected** new vice-chairs for the period 2010–2011, i.e., Mr Francisco Garcés (Venezuela), Ms Christa von Hillebrandt-Andrade (USA) and Ms Frédérique Martini (France).

**The ICG agreed** to address the issue of Member States financial contributions to the CTIC at the ICG/CARIBE EWS-VI.

**The ICG agreed** to allow sufficient time to Member States to include their national programmes into the updated version of the CARIBE-EWS Implementation Plan (IP). In light of this, **the ICG agreed** to establish 30th June 2010 as deadline for a first Draft of the CARIBE-EWS Implementation Plan, and 1<sup>st</sup> August 2010 as deadline for the final version to be published.

**The ICG acknowledged** with appreciation the offer of the Dominican Republic to host the Sixth Session (ICG/CARIBE EWS-VI) and **decided** to hold the ICG-VI in the second half of April 2011.

**The ICG decided** that the Chairperson will serve as the ICG representative at the WMO Region IV meetings.

Based on the reports of two Working Groups and of the six Intra-sessional Working Groups, **the ICG adopted** five Recommendations: (i) Monitoring and Detection Systems, Warning Guidance; (ii) Regional Tsunami Warning Centre; (iii) CARIBE Wave Exercise 2011; (iv) Post-event assessment Haiti earthquake and tsunami 12 January 2010; (v) CARIBE-EWS Budget for the Biennium (2011–2012).

**The ICG decided** to conduct a joint CARIBE Wave 2011 and LANTEX 2011 exercise in the Western Atlantic, Caribbean and Adjacent Regions on March 23rd, 2011. For this purpose, **the ICG endorsed** the establishment of a Task Team which includes the ICG Officers, Technical Secretary of ICG CARIBE-EWS, Manager of Caribbean Tsunami Warning Programme (CTWP), Directors of PTWC and WCATWC and representatives of CEPREDENAC and CDEMA to oversee the exercise. This Task Team will be chaired by the Manager of the CTWP.

## RESUME EXECUTIF

---

La cinquième session du Groupe intergouvernemental de coordination du Système d'alerte aux tsunamis et autres risques côtiers dans la mer des Caraïbes et les régions adjacentes (GIC/CARIBE-EWS V) s'est tenue à Managua (Nicaragua), du 15 au 17 mars 2010. Elle a réuni 55 participants de 17 pays et de deux organisations régionales.

**Le GIC a passé en revue les progrès** accomplis pendant l'intersession, a pris note des rapports et recommandations de ses groupes de travail et a reçu des rapports intérimaires sur les activités de formation ainsi que sur le processus de nomination des points focaux pour l'alerte aux tsunamis (TWFP) et des points de contacts nationaux pour les tsunamis (TNC) : au 2 février 2010, 24 États membres avaient confirmé les données relatives à leurs points focaux pour les tsunamis (TNC et TWFP).

**Le GIC a réélu** Mme Lorna Inniss (Barbade) présidente. **Il a convenu** de se doter d'un troisième vice-président et **a élu** les nouveaux vice-présidents dont les noms suivent pour la période 2010-2011 : M. Francisco Garcés (Venezuela), Mme Christa von Hillebrandt-Andrade (États-Unis) et Mme Frédérique Martini (France).

**Le GIC a décidé** de traiter à sa sixième session (GIC/CARIBE-EWS VI) la question de la contribution financière des États membres au Centre d'information sur les tsunamis dans les Caraïbes (CTIC).

**Le GIC a décidé** de laisser suffisamment de temps aux États membres pour inclure leurs programmes nationaux dans la version actualisée du Plan de mise en œuvre du CARIBE-EWS. En conséquence, **il a convenu** de fixer au 30 juin 2010 la date limite pour la présentation d'un premier projet de Plan de mise en œuvre du CARIBE-EWS, et au 1<sup>er</sup> août 2010 la date limite pour la publication de la version finale.

**Le GIC a exprimé sa reconnaissance** à la République dominicaine pour avoir offert d'accueillir la sixième session (GIC/CARIBE-EWS VI) dont **il a décidé** qu'elle se tiendrait durant la seconde quinzaine d'avril 2011.

**Le GIC a décidé** que sa Présidente le représenterait aux réunions de la Région IV de l'OMM.

S'appuyant sur les rapports de deux groupes de travail et des six groupes de travail intersessions, **le GIC a adopté** cinq recommandations : (i) Systèmes de surveillance et de détection, conseils en matière d'alerte ; (ii) Centre régional d'alerte aux tsunamis ; (iii) CARIBE Wave Exercice 2011 (exercice « Vague des Caraïbes » 2011) ; (iv) Évaluation post-catastrophe : séisme et tsunami du 12 janvier 2010 en Haïti ; (v) Budget du CARIBE-EWS pour l'exercice biennal 2011-2012.

**Le GIC a décidé** de réaliser un exercice conjoint CARIBE Wave 2011 et LANTEX 2011 dans l'Atlantique occidental, les Caraïbes et les régions adjacentes le 23 mars 2011. À cette fin, **il a approuvé** la création d'une équipe spéciale composée des membres du Bureau du GIC, du Secrétaire technique du GIC/CARIBE-EWS, du responsable du Programme d'alerte aux tsunamis dans les Caraïbes (CTWP), des directeurs du PTWC et du WCATWC, ainsi que de représentants du CEPREDENAC et de l'Agence caraïbe de gestion d'urgence des catastrophes (CDEMA). Chargée de superviser cet exercice, cette équipe spéciale sera présidée par le responsable du CTWP.

## RESUMEN DISPOSITIVO

---

La quinta reunión del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y otras Amenazas Costeras en el Caribe y Regiones Adyacentes (ICG/CARIBE EWS-V) se celebró del 15 al 17 de marzo de 2010 en Managua (Nicaragua). Asistieron a ella 55 participantes de 17 países y dos organizaciones regionales.

**El ICG pasó revista a los avances** logrados durante el periodo entre reuniones, tomó nota de los informes y recomendaciones de sus grupos de trabajo y recibió informes sobre los progresos realizados en las actividades de formación, así como sobre el proceso de designación de puntos focales de alerta contra los tsunamis (TWFP) y contactos nacionales sobre tsunamis (TNC): al 2 de febrero de 2010, 24 Estados Miembros han confirmado información relativa a puntos focales sobre tsunamis (TNC y TWFP).

**El ICG volvió a elegir** Presidenta a la Dra. Lorna Inniss (Barbados). **El ICG decidió** incorporar un tercer Vicepresidente y **eligió** a los nuevos Vicepresidentes siguientes para el periodo 2010-2011: Sr. Francisco Garcés (Venezuela), Sra. Christa von Hillebrandt-Andrade (Estados Unidos de América) y Sra. Frédérique Martini (Francia).

**El ICG acordó** examinar la cuestión de las contribuciones financieras de los Estados Miembros al Centro de Información sobre los Tsunamis en el Caribe (CTIC) en la sexta reunión del ICG/CARIBE EWS.

**El ICG decidió** dejar tiempo suficiente a los Estados Miembros para incluir sus programas nacionales en la versión actualizada del Plan de Implementación del CARIBE EWS. Por consiguiente, **el ICG convino** en fijar el 30 de junio de 2010 como plazo para presentar el primer proyecto del Plan de Implementación del CARIBE EWS y el 1º de agosto de 2010 como plazo para presentar la versión definitiva que se publicará.

**El ICG acogió con satisfacción** la propuesta de la República Dominicana de organizar en su territorio la sexta reunión (ICG/CARIBE EWS-VI) y **decidió** celebrar dicha reunión en la segunda quincena de abril de 2011.

**El ICG decidió** que la Presidenta representaría al ICG en las reuniones de la Región IV de la OMM.

Sobre la base de los informes de los dos grupos de trabajo y de los seis grupos de trabajo de la reunión, **el ICG aprobó** cinco recomendaciones sobre: i) los sistemas de vigilancia y detección y las orientaciones sobre alertas; ii) el Centro Regional de Alerta contra los Tsunamis; iii) el ejercicio Caribe Wave 2011; iv) la evaluación posterior al terremoto y el tsunami que se produjeron en Haití el 12 de enero de 2010; y v) el presupuesto del CARIBE EWS para el bienio (2011-2012).

**El ICG decidió** llevar a cabo un ejercicio conjunto Caribe Wave 2011 y LANTEX 2011 en el Atlántico Occidental y el Caribe y regiones adyacentes el 23 de marzo de 2011. Con ese fin, **el ICG respaldó** la creación de un equipo de trabajo integrado, entre otros, por la Mesa del ICG, el Secretario Técnico del ICG de CARIBE EWS, el administrador del Programa de Alerta contra los Tsunamis en el Caribe (CTWP), los directores del Centro de Alerta contra los Tsunamis en el Pacífico (PTWC) y el Centro de Alerta contra los Tsunamis de Alaska y la Costa Occidental (WCATWC), y representantes del Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPREDENAC) y el Organismo para situaciones de emergencia y casos de desastre en el Caribe (CDERA) para supervisar el ejercicio. El administrador del CTWP presidirá el equipo de trabajo.



## РАБОЧЕЕ РЕЗЮМЕ

---

Пятая сессия Межправительственной координационной группы по системе предупреждения о цунами и опасности других бедствий в прибрежных районах Карибского моря и прилегающих регионов (МКГ/КАРИБ-СРП-V) была проведена в Манагуа (Никарагуа) 15-17 марта 2010 г. На этом совещании присутствовало 55 участников из 17 стран и представители двух региональных организаций.

**МКГ рассмотрела прогресс**, достигнутый в межсессионный период, приняла к сведению доклады и рекомендации своих рабочих групп, а также ознакомилась с докладами о ходе проведения мероприятий по подготовке кадров и о процессе назначения координаторов по предупреждению о цунами (КПЦ) и национальных контактов по цунами (НКЦ): по состоянию на 2 февраля 2010 г. Информацию о назначении координаторов по цунами (как НКЦ, так и КПК) подтвердили 24 государства-члена.

**МКГ вновь избрала** д-ра Лорну Иннис (Барбадос) Председателем. **МКГ решила** включить третьего заместителя Председателя и **избрала** новых заместителей Председателя на период 2010-2011 гг., а именно г-на Франциско Гарсеса (Венесуэла), г-жу Кристу фон Ильбрандт-Андрад (США) и г-жу Фредерик Мартини (Франция).

**Группа решила** рассмотреть на шестой сессии МКГ/КАРИБ-СРП вопрос о финансовых взносах государств-членов в Карибский центр предупреждения о цунами (КЦПЦ).

**МКГ решила** предоставить государствам-членам достаточно времени для включения их национальных программ в обновленный вариант Плана осуществления КАРИБ-СРП (ПО). В свете этого **Группа решила** установить на 30 июня 2010 г. конечный срок для первого проекта ПО-КАРИБ-СРП, а на 1 августа 2010 г. – конечный срок для опубликования заключительного варианта.

**МКГ приняла** с признательностью предложение Доминиканской Республики принять у себя шестую сессию (МКГ/КАРИБ-СРП-VI) и **постановила** провести шестую сессию МКГ во второй половине апреля 2011 г.

**МКГ постановила**, что Председатель будет выступать в качестве представителя МКГ на совещаниях региона IV ВМО.

На основе докладов двух рабочих групп и шести сессионных групп **МКГ приняла** пять рекомендаций: (i) Системы мониторинга и обнаружения, указания по предупреждению; (ii) региональный центр предупреждения о цунами; (iii) Учения «Карибская волна 2011»; (iv) Оценка последствий землетрясения и цунами на Гаити, произошедших 12 января 2010 г.; (v) Бюджет КАРИБ-СРП на двухлетний период (2011-2012 гг.).

**МКГ постановила** провести совместные учения «Карибская волна 2011» и «ЛАНТЕКС 2011» в регионах Западной Атлантики, Карибского и прилегающих морей 23 марта 2011 г. Для этой цели **МКГ одобрила** учреждение Целевой группы, в состав которой войдут должностные лица МКГ, технический секретарь МКГ КАРИБ-СРП, руководитель Карибской программы предупреждения о цунами (КППЦ), директора ПТВЦ и Центра предупреждения о цунами для западного побережья и Аляски (ЦПЦ-ЗПА), а также представители Координационного центра по предотвращению стихийных бедствий в Центральной Америке (СЕПРЕДЕНАК) и Карибского агентства по реагированию в случае бедствий (КДЕМА), которые будут наблюдать за этими учениями. Эта Целевая группа будет проводить свою работу под председательством руководителя Карибской программы предупреждения о цунами (КППЦ).

## 1. WELCOME AND OPENING

- 1 The Fifth Session of the IOC Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS IV) was held at the Hotel Hilton Princess, Managua, Nicaragua 15–17 March, 2010.
- 2 The Session was opened on Monday 15 March under the Chairmanship of Dr Lorna Inniss, Chair of the ICG/CARIBE-EWS.
- 3 Mr Peter Koltermann, Head of the Tsunami Unit of the Intergovernmental Oceanographic Commission of UNESCO, welcomed all participating delegations, organizations, observers and personalities invited to the Opening Ceremony. He kindly thanked the Government of Nicaragua for hosting the meeting. He welcomed specially the delegation from Haiti and expressed his sympathy and condolences over the national disaster associated with the 12 January 2010 earthquake and tsunami. He remarked that all of the ICG participants are willing to support Haiti in these difficult times.
- 4 During his intervention, he recalled that the lessons learned from the Indian Ocean tsunami on December 26, 2004 are manifold. He stressed that the most important are: to identify the hazard, be aware of the risks, and be well prepared. These lessons are repeated again and again: Samoa and Tonga on 29<sup>th</sup> September 2009, Solomon Islands on 2<sup>nd</sup> January 2010, Haiti on 12<sup>th</sup> January 2010, and Chile on 27<sup>th</sup> February 2010. In each case people lost their lives and livelihoods.
- 5 Mr Koltermann emphasized that both identification of risks and community preparedness are extremely important. He stated that in addition to the technical preparation by operational agencies, the warning centres and the disaster management authorities, educating people is the most effective way to minimize the loss of life. Education first happens at home, and soon at school. Therefore, educating children is an appropriate investment into a community's future.
- 6 He recalled that the huge earthquake and tsunami off the coast of Chile in 1960 led to the establishment of the Pacific Tsunami Warning System PTWS by IOC. For almost forty years nobody acted about the well-known risks in other oceans. After the Indian Ocean Tsunami in 2004, IOC was mandated to develop the Tsunami Warning Systems, this time for the Indian Ocean, the Caribbean and the European Seas. These are end-to-end systems, nationally owned, coordinated between governments and assisted by IOC.
- 7 Since 2005, the CARIBE-EWS progress has been good, but takes time. It took 5 years from Chile, 22 May 1960, to have the PTWS operational in 1965. In the Indian Ocean, it took again five years. CARIBE EWS is supposed to be operational, that is independent, autonomous from the interim service provided by the existing PTWS, in 2010. Mr Koltermann indicated that this date has to be revisited.
- 8 Today 17 countries from the 28 represented in the CARIBE-EWS are assembled here and there are 55 participants. That is a very good sign of the importance that governments of the region attribute to the ICG.
- 9 Finally, Mr Koltermann wished to all the participants a successful meeting in the name of the new Director General of UNESCO, Ms Irina Bukova and the new Executive Secretary of IOC, Ms Wendy Watson-Wright.
- 10 Dr Lorna Inniss, (Barbados), Chairperson of the ICG/CARIBE-EWS, welcomed participants to the ICG/CARIBE EWS-V on behalf of the two ICG Vice-chairs, and expressed her appreciation for the hospitality of the Government of the Republic of Nicaragua.
- 11 She recalled two events among many, which may have indirectly contributed to the presence of the ICG/CARIBE EWS in Managua. She referred to the Great Managua

Earthquake of 1972 and the 1992 earthquake and tsunami, and commended the Government of Nicaragua for the commitment and dedication shown in building greater resilience in its population against future events. Dr Inniss recalled that at the opening ceremony of the ICG IV meeting in Martinique in 2009, the plenary acknowledged the absence of the colleagues from Honduras following the earthquake there. She expressed her satisfaction of having the opportunity to hear from Honduras experiences and the lessons learned at the ICG/CARIBE EWS-V.

- 12 She extended a special welcome to the Haiti delegation and, on behalf of all the Member States and observers of the ICG, she noted the strong commitment to work with Haiti to build an effective warning and mitigation system for future events. She conveyed special concerns also for the population of Chile and mentioned that, as they begin the daunting task of rebuilding, ICG/CARIBE EWS renews its purpose to utilize the many lessons and best practices learned from them and other states in the Pacific.
- 13 Dr Inniss expressed that ICG/CARIBE EWS is glad to have a system in place, even if improvements in all areas are definitely still necessary. She stated that as in 2009 with the Honduras earthquake, the Caribbean Tsunami Early Warning System was triggered this year with the Haiti earthquake, and the call from ICG IV for monitoring of the system's performance was very ably taken up by the United Nations. She referred to the post-event assessment report that will recommend improvements to be implemented in preparation for any future alerts. In this regard, she invited the plenary to join her in her gratitude towards the Tsunami Unit for an excellent year of technical and administrative support to the countries of the Wider Caribbean Region.
- 14 Likewise, she drew attention to a number of excellent partnerships which have been emerging among the Member States of the ICG CARIBE EWS. In this respect, she noted that the diversity of the region presents a challenge to the construction and maintenance of all aspects of a multi-hazard warning system. However, in the last five years, the rich have been partnering with the poor, the strong helping the weak, the technically competent transferring technology to the technically challenged. These partnerships have been forged in monitoring and detection systems, in assistance with communications, and in the all-important area of public education and awareness.
- 15 Ms Ligia Calderon, Head of Territorial Monitoring of the National System for Disaster Prevention, Mitigation and Response in Nicaragua (SINAPRED on behalf of Coronel Ramón Arnesto Soza, SINAPRED's Executive Secretary) gave a warm welcome to participating delegations, organizations and observers. She described SINAPRED's mission and its current activities, placing emphasis on the efforts undertaken to build development scenarios for the country, and to promote a culture of risk prevention in the community by working together with various specialized actors and civil society.
- 16 Mr Alejandro Rodríguez, Executive Secretary of the National Institute for Territorial Studies (INETER) also welcomed the participants and conveyed his satisfaction of having the opportunity of hosting the ICG/CARIBE EWS in Managua. He noted that INETER is the technical and scientific institution related to disaster management in Nicaragua, and stressed its important role in the dissemination of basic scientific information that is essential to improve disaster risk management strategies, promote economic development in the country and reduce vulnerability to natural disasters.

## 2. ORGANIZATION OF THE SESSION

### 2.1 ADOPTION OF AGENDA

17 The Chairperson introduced this Agenda Item and informed the Plenary that the agenda was prepared by the Secretariat and the Officers taking into account the Recommendations and instructions given at ICG/CARIBE EWS-IV, as well as the IOC Rules of Procedures.

18 She informed that no new items were suggested by Member States in the statutory preparatory phase, which is up to 20 days before the opening of the meeting. However, and in view of the recent earthquake and tsunami in Haiti on January 12th 2010, it was suggested to add a new Agenda item under 6.3.

19 She introduced the Agenda to the meeting for comments from delegates, as contained in Document ICG/CARIBE EWS-V/1 Prov. Provisional Agenda (English, French and Spanish).

20 **The ICG approved** the Agenda. The Agenda of the Session is available in [Annex I](#). The List of Participants is available in [Annex V](#) to this report.

### 2.2 DESIGNATION OF THE RAPPORTEUR

21 The Chairman invited nominations for Rapporteurs for the present session to work together with the Secretariat to produce a balanced report reflecting all relevant discussions and decisions of the meeting.

22 USA was proposed to provide an English language Rapporteur and Nicaragua proposed to provide a Spanish language Rapporteur.

23 The Chair informed the Session that, as per established practices for subsidiary bodies, there is not a line by line approval of the report but only of the Decisions and Recommendations.

24 **The ICG approved** the proposals and thanked USA and Nicaragua for providing the Rapporteurs.

### 2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

25 The Chairman noted that interpretation was available in French, English and Spanish. She informed the Plenary that in order to facilitate the proceedings of the meeting a Timetable (Doc. ICG/CARIBE EWS-V/1 Prov. Add) was prepared by the Secretariat in coordination with the Officers and the local organising committee. She then presented the Timetable for comments.

26 The Chairman recalled Member States that according to IOC Circular Letter No. 2323 the Fifth Session would elect the officers for the CARIBE-EWS, namely one Chairperson and two Vice-chairpersons, for the next biennium. Nominations should be accepted until the end of the first day of proceedings at the ICG/CARIBE-EWS V. It was also informed that no candidatures had been received in advance at the Office of the IOC Executive Secretary. The Chairman informed that the Technical Secretary to receive submissions was Mr Cesar Toro from the IOC Secretariat.

27 **The ICG approved** the Timetable.

28 In order to smooth the working in plenary, as well as to facilitate and promote the exchange of information, delegates were requested to decide on the establishment of Intrasessional Working Groups.

29        **The ICG approved** the establishment of six IntraseSSIONal Working Groups as follows:

- Updates to the CARIBE EWS Implementation Plan: This working group updated the CARIBE EWS Implementation Plan, in particular with National information of activities, investments (assets) and plans. The group prepared a Draft Recommendation for the plenary that was reviewed under Agenda item 7.
- -Post Event Assessment Haiti Earthquake and Tsunami on 12th January 2010: This group reviewed the report Technical Series 90 with a view to check the information presented and expand the conclusions and lessons learned. The group prepared a Draft Recommendation for the plenary that was reviewed under Agenda item 6.3.
- -CARIBE WAVE 2011: This group reviewed the document ICG/CARIBE EWS-V/10 and prepared an action plan and a timeline for the proper organisation of the proposed CARIBE WAVE 2011 exercise. A Draft Recommendation was prepared by the group and discussed under Agenda item 6.2.
- -Programme and Budget for 2012-2013: This group was called to produce an estimate of the amount of resources that Member States would be investing in the tsunami warning systems for the period 2012-2013. However, considering the information available, the group decided to revise the current budget and to estimate needs for 2011-2012, both from UNESCO/IOC regular budget and from other sources. Secretariat provided guidance on the feasibility of regular budget programme.
- -Elections Committee: This Committee was in charge of receiving nominations and ensuring that they were consistent with IOC election procedures.
- Recommendations: This group revised the Draft Recommendations submitted by Member States or by IntraseSSIONal Working Groups, to align their format, style and keep them action-oriented, checking also with the Secretariat their financial implications.

### 3.        **REPORT ON INTERSESSIONAL ACTIVITIES**

#### 3.1        IOC EXECUTIVE SECRETARY'S REPORT

30        The Head of IOC Tsunami Unit, Mr Peter Koltermann, presented the report of the Executive Secretary on her behalf. He referred to the approved IOC Budget and Programme for 2010-2011, a technical mission requested by Dominican Republic to strengthen cooperation in marine sciences and disaster risk reduction, and the signature of a Memorandum of Cooperation with CTBTO for real time seismic data provision. He also reported on the activities of UNESCO and its IOC in the aftermath of the Haiti earthquake.

31        During his intervention, Mr Koltermann reported that the new Executive Secretariat of the IOC, Mme. Wendy Watson-Wright took office on January 1<sup>st</sup>, 2010, and that she conveyed her best wishes and apologies for not being able to attend the meeting, hoping to do so next time.

32        Mr Koltermann recalled that the IOC Secretariat has been following-up the decisions and recommendations of ICG/CARIBE EWS -IV and the resolutions of the 25th Assembly of the IOC in June 2009.

33        The Regular budget for the biennium 2010 – 2011 was approved by the UNESCO General Conference in October 2009. It has increased the funds for the work of the Tsunami Unit, but nevertheless that accounts for only ca. 15% of the total funds required for a streamlined work-plan of the Tsunami Unit that responds only to Member States requirements.

For the first time in this budget, two staff posts of the Tsunami Unit have been enclosed in the staffing table of the Regular Programme. To enhance the regional presence, IOC is establishing or recruiting National Officers for the JTIC in Jakarta, Indonesia and for the UNESCO Office in Apia, Samoa to assist in the regional implementation of tsunami activities.

34 The negotiations for the next biennial Programme and Budget 2012 – 2013 have started this month. Mr Koltermann encouraged Member States to consider which programme activities or staffing needs of the Tsunami Unit they wish to see considered in this process.

35 Responding to the Resolution IOC-XXV/13, the Secretariat has negotiated with the CTBTO a MoU between UNESCO and the Secretariat of the CTBTO that not only formalizes the availability of CTBTO data for tsunami warning purposes but requires both CTBTO and IOC to jointly develop training programmes and technical support for tsunami warning centres, recognizing the mandates of each organization. The UN General Assembly in 2009 acknowledged the implications of vandalism affecting the DART buoys, part of the tsunami warning systems.

36 Mr Koltermann indicated that the Secretariat is redesigning the tsunami web site for providing more and timely information to Member States, with a secure area for information on TNCs and TWFPs.

37 The Secretariat, on request by Haiti and the Dominican Republic, scheduled a Technical Mission to assess the capacity and capability of these countries in the areas covered by the IOC mandate. After the Haiti earthquake, the part concerning Haiti was postponed, and the other part for the Dominican Republic evidently focused on the implications of the Haiti earthquake on early warning issues. The mission to Haiti will be scheduled together with the Government of Haiti in the very near future.

38 After the Haiti earthquake, the Secretariat was involved in the negotiations of the OCHA Flash Appeal and succeeded in presenting a proposal, together with the Government of Haiti, to strengthen disaster resilience of the population of Haiti by rebuilding and strengthening Haiti's Warning Services for Coastal Hazards. At present, discussions take place with Member States and other donors to secure funding for this proposal, and with other organizations to link all efforts covered by the Flash Appeal to provide a timely and adequate implementation. Together with CTBTO there are also concrete plans to reconcile Haiti's capability to receive and disseminate seismic data for tsunami warning purposes. The Secretariat was also involved in the Post Disaster Needs Assessment (PDNA) of the UN to assess and develop a long-term plan for Haiti's recovery. Mr Cesar Toro, the IOC/CARIBE Secretary, joined the UNESCO Office in Port-au-Prince in early March to discuss and develop Haiti's response to the Flash Appeal.

39 The Tsunami Unit organized as part of an assessment of the Haiti earthquake and tsunami a post-event questionnaire for CARIBE-EWS to collect information about this event and evaluate the performance of the CARIBE-EWS. The advance copy of the report (IOC Technical Series 90) was made available to Member States two weeks before the meeting.

### 3.2 CHAIRPERSON'S REPORT

40 Dr Lorna Inniss (Barbados) presented the report of the Chairperson to the meeting. She referred to her activities of representation and promotion of the ICG/CARIBE EWS in several meetings during the intersessional period. She stressed the importance of her participation at the Global meeting of ICGs for Tsunamis Warning Systems where critical issues were discussed towards the objective of building a global system. Three Inter-ICG Task Teams (Tsunami Watch Operations, Sea Level and Disaster Management and Preparedness) were established by the IOC Assembly following a recommendation issued in this meeting.

- 41 Dr Inniss reported likewise on the special invitation to ICG Chairs to meet with French Senators in June 23rd 2009. During this meeting the Chair presented the components of the CARIBE EWS and strong collaboration and technical assistance was agreed to by France.
- 42 During her statement, Dr Inniss indicated that training opportunities were identified in the region during the First Meeting of the PTWS Regional Working Group on Tsunami Warning and Mitigation in Central America. She emphasized that some Member States in Central America are members of two ICGs, and therefore she recommended linking relevant initiatives of these two ICGs. She stated that varying expertise in different components enable sub-regional collaboration.
- 43 As critical issues for the ICG/CARIBE EWS, the Chair highlighted the need of looking at working groups functioning and membership, and strongly encouraged Member States to nominate representatives for the four WGs. She informed that new Chairs for WGs 3 and 4 would need to be nominated during the meeting.
- 44 She made also reference to the importance of the updates to the Implementation Plan, the performance evaluation of the system in the Haiti event and the decision regarding the hosting of ICG/CARIBE EWS VI.
- 45 Dr Inniss mentioned some important recommendations for national integration. She stated that Focal Points working alone are not ideal in a multi-hazard EWS. Therefore, national teams led by TNC and TWFP are more functional (ocean science, seismic, MET, disaster management, coastal sectors, fisheries, ports). Moreover, national system inventories and drills will help to determine deficiencies and weaknesses.
- 46 Bermuda commented that the questionnaire sent for the post-event performance of the CARIBE EWS was very useful to structure their national post-event report.
- 47 Mr Bill Proenza, Head of United States delegation, stressed the importance of the cooperation among ICGs and made reference to his participation in the last meeting of the ICG NEAMTWS. He noted the importance of recognizing similarities among ICGs and stressed the importance of the collaboration between ICGs.

### 3.3 CARIBE-EWS SECRETARIAT REPORT

- 48 The Technical Secretary for ICG/CARIBE EWS, Mr Bernardo Aliaga, introduced the report of the Secretariat. He referred to document ICG/CARIBE EWS-V/8 "ICG CARIBE EWS-IV Recommendations Status Report".
- 49 Regarding Recommendation ICG/CARIBE EWS IV.1 (Monitoring and Detection Systems, Warning and Guidance), Mr Aliaga reported that Working Group 1 provided a detailed account of operating sea level stations in the north east Caribbean. WG 1 also reported that one new station was installed in Limon (Costa Rica), and that there are concrete plans to install one in Curacao, the East Coast for Dominican Republic (Punta Cana) and North Coast of Dominican Republic (Puerto Plata). Seismic data exchange has continued to improve in the intersessional period.
- 50 In respect to Recommendation ICG/CARIBE EWS IV.2 (Hazard Assessment), Mr Aliaga stated that TOWS-2 decided to establish three Task Teams, none of them dealing directly with modelling. TOWS proposed to establish three inter-ICG Task Teams devoted respectively to sea level, preparedness, and tsunami watch operations, with a view to facilitate coordination of activities, development of common requirements and standards, and sharing of best practices. Mr Aliaga mentioned that very little progress has been made in bathymetry, and that WG 2 made little progress in the intersessional period.

- 51 Regarding Recommendation ICG/CARIBE EWS IV.3 (Warning, Dissemination and Communication), Mr Aliaga reported that Officers and WG Chairs addressed EMWIN issues in a conference call which included EMWIN Manager Bill Johnson. As a result, a task force was defined to investigate USA OFDA funding options for a NOAA proposal to hold a workshop to address EMWIN needs and provide training for several Caribbean countries. Furthermore, Mr Aliaga informed that SOPs are progressing well within the framework of the ODFDA/CDEMA TCHWS project. On the other hand, no communications tests have been reported in the intersessional period.
- 52 Considering Recommendation ICG/CARIBE EWS IV.4 (Preparedness, Readiness and Resilience), Mr Aliaga informed that two initiatives are in place to respond to this recommendation: a) A TsunamiReady Summit in Mayagüez, Puerto Rico (USA) beginning May 2010, and b) Three tsunami community preparedness examples would be presented at ICG-V: Mayagüez (Puerto Rico, USA), Masachapa and Corinto (Nicaragua). Mr Aliaga noted that a report about the experience of Colombia (Tumaco) was scheduled but the speaker was not able to attend the meeting.
- 53 In respect to the Recommendation ICG/CARIBE EWS IV.6 (CARIBE EWS Budget for the Biennium 2012-2013), Mr Aliaga recalled that ICG-V was expected to revisit the Implementation Plan. Moreover, funding has been made available for training activities and WG meetings (Seismic Networks Operators training and WG1 meeting in February 2010, ComMit training in May 2010).
- 54 The United States highlighted the importance of EMWIN as an alternative to GTS considering that it enables choosing the warning information to be received at a minimum cost. The U.S. delegate remarked that a big change is occurring in the EMWIN system and there will be an overlap period when the old and the new satellites will operate concurrently. The U.S. expressed its willingness to support countries during the transition period. In this regard, the delegation requested to make a brief presentation on EMWIN to supplement the report under Agenda item 4.3.
- 55 The United States enquired about the completion of the IOC Marine ATLAS, and Chair stated that data are being gathered in an effort to complete it.

### 3.4 REPORT OF THE CARIBBEAN TSUNAMI INFORMATION CENTER (CTIC)

- 56 The Technical Secretary for ICG/CARIBE EWS, Mr Bernardo Aliaga reported on the development of the procedures to establish the CTIC. The Government of Barbados made a formal offer to UNESCO to host CTIC. The Secretariat discussed with UNDP implementation options for CTIC under the Italian cooperation project entitled: "Enhancing Resilience to Reduce Vulnerability in the Caribbean". Mr Aliaga reported that this project has an implementation delay and that UNDP required the following points to be noted:
- (i) Confirmation that other countries will support the CTIC;
  - (ii) Whereas the project Enhancing Resilience to Reduce Vulnerability in the Caribbean will provide critical seed funding, this will of course be for a limited period and clearly there must be a strategy to consider sustainability beyond the 2 to 3-year period;
  - (iii) Given CDEMA's mandate and recent activity under the Tsunami and Coastal Hazards project, the ICG may wish to discuss about CDEMA's role in CTIC.
  - (iv) Agree that the core personnel are to be recruited and administered under IOC/ UNESCO or UN processes.
- 57 Honduras asked how CTIC would be maintained and funded. The Chairman recalled that ICG-IV recommended that Member States identify funding for CTIC activities within their annual regular budgets (Recommendation ICG/CARIBE EWS IV.6). She mentioned that



regional organizations as CDEMA could provide indirect financial contributions. She recalled also that France has made an offer to collaborate in the establishment of a Tsunami Information Centre. Besides, voluntary direct financial contributions are welcomed from countries that are benefiting from the Centre.

- 58           **The ICG agreed** to address the issue of Member States financial contributions to the CTIC in the ICG/CARIBE EWS-VI.

### 3.5      REPORTS FROM UN AND NON UN ORGANISATIONS

- 59            The Chairman indicated that the ICG has been successful in developing a wide and inclusive partnership policy. Several UN and non-UN organisations have accepted to become Permanent Observers to the ICG. In December 2009, The Coordinating Centre for the Prevention of Natural Disasters in Central America (CEPREDENAC) was incorporated as Permanent Observer of the ICG/PTWS and of the ICG/CARIBE EWS. During this Agenda Item a short oral presentation was made by Mr Carlos Alfredo Puac, Coordinator of the Programme, Scientific and Technical Department of CEPREDENAC.

- 60            Mr Puac placed emphasis on the initiatives of CEPREDENAC regarding the implementation of early warning systems in Central America, and presented the three working areas of CEPREDENAC: preparedness and response, scientific and technical, and territorial management.

- 61            The current projects of CEPREDENAC were also mentioned. Mr Puac described the Central American Probabilistic Risk Assessment (CAPRA), a GIS-based platform for risk analysis, where probabilistic techniques are applied to the analysis of earthquakes, tsunamis and other natural hazards. Furthermore, the Disaster Inventory System – (DesInventar) was also cited as an important initiative in the region.

- 62            Mr Puac also noted recent activities undertaken with the support of the Government of Taiwan with the purpose of analyzing the possibility of establishing a multi-hazard regional warning centre.

- 63            He commented that CEPREDENAC is working on a project proposal that is going to be presented individually to different countries.

### 3.6      STATUS OF OTHER ICGS

- 64            This Agenda item was introduced by the Head of IOC Tsunami Unit, Mr Peter Koltermann. He summarized recent progress in the four Tsunami Warning Systems coordinated by the IOC Secretariat.

- 65            Mr Koltermann informed that the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) will meet on 14 – 16 April, 2010 in Banda Aceh, Indonesia. The conclusions of the 6th Session (Hyderabad, India, 7–9 April 2009) have been presented at the last IOC Assembly. Mr Koltermann mentioned the main initiatives undertaken after the last ICG meeting:

- The implementation of the Guidelines for “Tsunami Risk Assessment and Mitigation for the Indian Ocean: Knowing Your Tsunami Risk - and What to Do About it”. Working Group 3, in cooperation with the Secretariat, conducted a regional workshop on Risk Assessment in Bangkok in November 2009, which was attended by over 50 participants from 13 countries. In association with Geosciences Australia, Working Group 3 and the Secretariat have also published a tsunami hazard map for the Indian Ocean.

- The main intersessional activity of the year was the IOWave09 Exercise held on 14th October 2009, to coincide with World Disaster Reduction Day. This was the first ocean-wide exercise of its kind in the Indian Ocean, and was held in 2 stages: a tabletop exercise was held on 14th September with the main exercise conducted on 14th October. 20 Member States took part in the tabletop exercise, while 18 participated at some level in the main exercise. 5 countries conducted the exercise down to community evacuation level to test their end-to-end Standard Operating Procedures (SOP). The exercise as a whole was successful and allowed participating countries and agencies to critically assess their SOPs and internal and external communications. The report is available for consideration.
- Capacity building efforts have continued, particularly in the development of SOPs for tsunami warning and emergency response with support from UNESCAP and UNDP. Efforts to develop capacity in mitigation, preparedness and response at the national and community levels continues to be a challenge but several initiatives taken by Working Group 6 in 2009 will start to see results in 2010.
- As the IOTWS matures and evolves, the focus of the ICG moves towards maintaining a sustainable, operational system. Sustainability will also address the need to restructure the Working Groups and revise their terms of reference to refocus on future challenges.

66 Mr Koltermann recalled that the ICG PTWS last met in Samoa in February 2009. The new Regional Working Groups, covering Central America, the South East Pacific, the Southwest Pacific and the South China Sea have been very active. The three Technical Working Groups on Tsunami Risk Assessment and Reduction, on Detection and Warning Dissemination and on Tsunami Awareness and Response still need more support from Member States by nominating experts and developing their work plans.

67 The response to the Chilean Earthquake and Pacific-wide tsunami will certainly raise some issues that the PTWS Working Groups will have to address and reflect. An assessment of the Chile earthquake and tsunami has been started with distributing the post-event questionnaire for PTWS to collect information about this event. The Report collating the responses will be available in time for the IOC Executive Council in June 2010.

68 The ICG/NEAMTWS-VI Meeting in Istanbul, Turkey on 11-13 November 2009 was attended by over 80 participants from 17 member countries and 2 observer countries. Two countries were participating for the first time. The session elected the ICG/NEAMTWS officers for the next two intersessional periods: François Schindelé from France (Commissariat à l'Energie Atomique - CEA) as Chairman, and Maria Ana Baptista from Portugal (Instituto Superior de Engenharia - ISEL) and Ahmet Cevdet Yalciner from Turkey (Middle East Technical University - METU) as Vice-Chairpersons. The next ICG/NEAMTWS session will take place on 23-25 November 2010 in Paris at UNESCO/IOC.

69 In 2009, 21 sea level stations have started contributing to NEAMTWS through the IOC Sea Level Monitoring Facility by providing 1-min data in real time ([www.ioc-sealevelmonitoring.org](http://www.ioc-sealevelmonitoring.org)). France has undertaken some tests to use the Global Telecommunication System (GTS) for sea level data transmission in the NEAM region. There has been no significant improvement with respect to new installation of deep-ocean instrumentation for tsunami-monitoring. Some sea level stations in Israel, Cyprus, Malta and Ukraine would become operational after February 2010.

70 Most of the European and Mediterranean countries have dense national seismic networks but further efforts have to be undertaken to encourage the sharing of data in North Africa and the Middle East. Potential improvements may come thanks to the Orpheus Data Centre initiative and other European Commission-funded projects.

- 71 As of 30 September 2009, Member States have nominated 23 TNCs (57% of ICG/NEAMTWS members) and 23 TWFPs (57%).
- 72 The candidate Regional Tsunami Watch Centres from France, Greece, Italy, Portugal and Turkey, and the data collection and backup centre in Germany are launching a programme of communication exercises for 2010.
- 73 ICG/NEAMTWS-VI established a Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and Connected Seas (NEAMTIC) at the IOC Secretariat. The NEAMTIC will collect and disseminate information on international warning activities for tsunamis and other sea-level related hazards particularly in the NEAM region, foster identification and exchange of best practices in preparedness for tsunamis and other sea-level related hazards, and act as an information resource for the development and distribution of awareness, educational and preparedness materials, and will collect data of tsunami events.
- 74 At the invitation of the Lebanese Government, a tsunami preparedness assessment mission was carried out in Lebanon on 30 September – 2 October 2009 with the Geophysical National Center, National Council for Scientific Research. A similar mission was conducted in Egypt on 18-23 November 2009 in cooperation with the National Institute for Oceanography and Fisheries (NIOF) and the National Research Institute for Astronomy and Geophysics (NRIAG).
- 75 ICG/NEAMTWS-VI confirmed the importance of the multi-hazard approach for the NEAMTWS, especially in relation to storm surges that affect Members States around the North-eastern Atlantic. It will improve the prediction of coastal inundation, focus existing warning practices for different sea-level related hazards and advance hazard and risk mapping. In relation to the multi-hazard approach the ICG/NEAMTWS called for strengthened cooperation with the World Meteorological Organization (WMO), the European Commission (EC), especially regarding the Flood Directive, and the European Space Agency (ESA).
- 76 Mr Koltermann further indicated that the Third Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-II) will be held in Lisbon, Portugal on May 5-6, 2010. It will review i.a. the reports of the three inter ICG Task Teams addressing commonalities of the four tsunami warnings systems. The Task Teams are addressing common activities, requirements and standards for sea level, preparedness, and tsunami watch operations.
- 77 Panama wanted to know if the IOC Secretariat had received their details for NTC and TWPF, as they belong to both Pacific and Caribbean ICGs. Mr Aliaga responded that official Focal Points information has not been received only from Cuba, Brazil, Guyana and St. Kitts and Nevis.

### 3.7 NATIONAL PROGRESS REPORTS

- 78 Delegates made short presentations on main actions and status of their national tsunami and other coastal hazards warning systems. Bermuda, Barbados, British Virgin Islands (UK), France, Honduras, Jamaica, Nicaragua, Panama, United States and Venezuela presented National Reports.
- 79 British Virgin Islands (UK) reported that they have installed sirens with the support of PRSN. Besides they have acquired five strong motion sensors (each island will have a sensor). Public awareness programmes have been conducted in schools and governmental institutions. Furthermore, funding for two radio stations has been obtained. They reported constant communication with PRSN and PTWC.
- 80 Barbados indicated that their information regarding TNCs and TWFP remains the same. The delegate mentioned that they do not have access to GTS but are working on making

contacts to overcome this difficulty. Two current projects conducted with CDEMA were mentioned - one focusing on earthquake resilience in the Caribbean, including a multi-approach awareness system, and other focusing on the elaboration of communication protocols. It was also stated that Barbados has been able to bring on board the private sector, and has initiated steps to cooperate with cell phone companies to deliver warning messages. Barbados has also undertaken preparedness measures in schools, where children and teenagers received information about tsunamis and responded remarkable well in assessments.

- 81 Bermuda stated that another TWFP was added. The delegate informed that they have little local tsunami risks but have SOP's in place for distant tsunamis. Bermuda is the location of a USGS GSN station, a CTBTO infrasound station (IS51), and a tsunami capable NOAA sea-level station (Station ID: 2695540). Likewise, Bermuda indicated that they will participate in the CARIBE Wave Exercise 2011. It was reported that during Hurricane Bill, in the morning of August 22, 2009, some cell phone companies sent messages to the public by their own initiative. Some messages arrived two hours after being issued. In this respect, Peter Koltermann mentioned that SMS are not reliable as cell phone providers cannot give priority to any message.
- 82 France reported that the emergency procedures are under construction. A VSAT terrestrial hub has been installed for the Martinique Observatory (it will be the mirror of the one installed in Guadeloupe). Following the recommendations of the IOC, one real-time sea-level gauge will be installed in eastern Guadeloupe (la Desirade island) in March 2010, one sea-level gauge will be installed in north western Guadeloupe (close to the city of Deshaies) before the end of 2010. Furthermore, France reported that funding is pending to strengthen the seismological monitoring network and the sea-level monitoring network in the Lesser Antilles (InterReg IV project). It is a collaborative project between the Martinique and Guadeloupe observatories (FWI), the SHOM (French Navy), Météo-France (French Meteorological Service), the "Conseil Général de la Martinique" (Martinique General Council, CGMA) and the Seismological Research Center (The University of the West Indies, Trinidad and Tobago). Besides, Lidar campaigns (IGN for land cover and SHOM for shallow water) are planned in 2010 and 2011 to obtain high resolution topography, coastlines and bathymetry (0-30m) in Martinique and Guadeloupe. A European project for shallow water bathymetry in the Lesser Antilles could be lead by the University of Antilles Guyane (UAG). A national organization for all the TWS in which France is participating is under definition.
- 83 U.S. asked what is France's mechanism of real time tide gauge data transmission. France replied that the GOES satellite system will be used for all new real time tide gauges stations.
- 84 U.S. asked what is France's timeline for completion of real time tide sea level stations. France answered that they intend to be ready by end of 2011.
- 85 Honduras reported that they are installing new seismic stations. Together with the National University of Honduras, new stations are going to be installed in the Fonseca Gulf. In addition, procedures to issue warnings for earthquakes, tsunamis and other hazards are being defined. Several projects are being conducted through DIPECHO VI funding. Likewise, they plan to place more emphasis on tsunami issues for the operative plans for 2014 as communities are becoming more vulnerable to coastal hazards. In this line, National Emergency Committees are to be reinforced and risk management should be included in the education programmes. A workshop on early warning is going to be held in Puerto Cortez. In response to a question from the floor, Honduras informed that the tide gauge installation in La Ceiba is not yet complete.
- 86 Jamaica reported that the information of their TNC and TWFP remains the same. Besides, PTWC test messages are received and acknowledged. The delegate of Jamaica reported that they count on a 24/7 monitoring system. Nevertheless, Jamaica does not have

SOPs for tsunamigenic events and does not have data on bathymetry, but coastline data is being obtained.

- 87 Nicaragua reported that the national seismic network has been strengthened and seismic hazard maps have been developed for coastal communities. Furthermore, cooperation has been established with the German Technical Cooperation (GTZ) to conduct a project in the area of the Fonseca Gulf. On the other side, INETER is planning to install three real time sea level stations. The delegate mentioned as well that participative risk assessment and preparedness approaches have been implemented. In response of a question about the possibility of a tsunami in the Managua Lake, one representative indicated that there is a publication about local volcanoes erupting and producing tsunamis in Managua Lake.
- 88 Panama reported that they have advanced in negotiations for the creation of a tsunami centre. A high level meeting is planned to discuss funding options for equipment for this centre. The delegate stressed that acquiring equipment is an important step and informed that tide gauges are now available. In this regard, SINAPROC is acquiring equipment for establishing tsunami early warning systems. They also informed that they are planning to produce a video on tsunami hazard for public education and publish a monthly magazine. Panama noted that the events in Chile and Haiti showed that Panama is not yet prepared and asked Member States for technical support. The probability of including the Canal Authority as a tsunami focal point is being analysed. The Chair suggested that ICG would be very interested in recognizing the Panama Canal as TsunamiReady.
- 89 United States recalled that the CTWS will be developed in a phased approach and reported that in the first phase (FY 2009), the U.S. hired a Manager, Caribbean Tsunami Warning Program, to be located at the University of Puerto Rico in Mayaguez. Dr Christa von Hillebrandt-Andrade officially entered on duty with NOAA/NWS at the University of Puerto Rico Campus at Mayagüez on February 1, 2010. The U.S. noted as well that an EMWIN training is being prepared.
- 90 To the question of how many countries are using EMWIN, USA responded that a survey is being conducted to obtain this information. Mr Proenza stressed that the greatest reliability in transfer of data has been achieved and the U.S. is working towards implementing a new technology. In addition, he recalled that many countries in the Caribbean do not have access to GTS in a location accessible to NTC and TWFP. Thus, EMWIN is a good alternative.
- 91 Peter Kolterman asked when PTWC will stop providing coverage for the Caribbean. The U.S. responded that the U.S. is planning to establish the CTWC in a phased approach, and the PTWC will continue providing the interim tsunami services to the region in the meantime. Trinidad and Tobago asked about the costs, reliability and requirements of the EMWIN system. U.S. responded that the EMWIN system is the most reliable in U.S. Upgrades are minimal cost for maximum benefit (\$1000 for each new receiver) and no recurring costs as with GTS.
- 92 Nicaragua asked about EMWIN licensing. The United States answered that there is an initial fee and the software licence is included in this fee.
- 93 Honduras asked if the ICG has considered a single global tsunami warning centre instead of multiple tsunami warning centres, to which the U.S. replied that multiple warning centres eliminate the possibility of a single point of failure.
- 94 Venezuela reported on its activities regarding tsunami issues. Research on tsunami impacts in the Caribbean Sea in coasts of Venezuela is being undertaken. A system of real time and oceanographic monitoring is being established. The Simon Bolivar satellite has started operations and 80% of the data of the FUNVISIS seismologic network has been migrated to the satellite. The Venezuelan system of protected marine areas has been strengthened through the establishment of 14 working committees to complement the process of coastal zones integrated

management system and the preparation of a project proposal to be submitted to the Global Environment Facilities Trust Fund. Besides, several initiatives have been undertaken for education and preparation.

- 95 National Reports are available at:  
[http://www.iocunesco.org/index.php?option=com\\_oe&task=viewEventDocs&eventID=562](http://www.iocunesco.org/index.php?option=com_oe&task=viewEventDocs&eventID=562)

### 3.8 INTERIM ADVISORY SERVICES REPORT (PTWC)

- 96 Mr Jason Tuell, NWS Chief of Meteorological Services, on behalf of the Director of the NOAA Pacific Tsunami Warning Center (PTWC) Dr Charles McCreery, presented the report on the intersessional activities of PTWC (ICG/CARIBE EWS-V/11) in its role as the Interim Advisory Services provider for the CARIBE-EWS. He noted that during the intersessional period, PTWC responded to more than 500 global earthquakes, issued Observatory Messages for 36 earthquakes in the Caribbean and 16 earthquakes in the Atlantic. Moreover, the PTWC issued Caribbean Tsunami Bulletins for 4 of these earthquakes: 3 Tsunami Information Statements and 1 Local Tsunami Watch.

- 97 Mr Tuell referred to the Local Tsunami Watch issued for Haiti on January 12<sup>th</sup> 2010. He noted that an initial tsunami bulletin was issued 10 minutes after the earthquake (7.3 Mw). A local watch supplement (magnitude corrected to 7.1 Mw) was issued 61 minutes after the earthquake, followed by a cancellation 112 minutes after the earthquake. The basis for the cancellation were the low probability of major and widespread tsunami, and small sea level readings in the Santo Domingo station (12 cm, crest -to- through) and Caribbean DART (1 cm, crest-to- through). Furthermore, it was noted that the message dissemination was done through GTS, AFTN, EMWIN, fax, email and RANET.

- 98 Mr Tuell gave preliminary results of communications tests conducted on November 26, 2009 and February 20, 2010. In general, based on the analysis presented in the IOC Technical Series 90, most Member States appear to be receiving Tsunami Bulletins from PTWC in a timely way, but communication tests are currently not verified or confirmed. Mr Tuell indicated that some designated methods of communication are probably obsolete and need to be removed.

- 99 He then highlighted some actions to improve the service. He encouraged Member States to respond in a timely and comprehensive way and re-confirm TWFP contact information. In addition, he stated that fax and email success or failure for tests or bulletins can be automated, provided that the appropriate technology is available. Another important step would be the implementation of a website with current TWFP information which is password protected for each Member State. This website would be useful to validate current TWFP information and maintain a master list.

- 100 Dominican Republic asked if countries need to confirm if tsunami warnings are received. Mr Tuell explained that countries should confirm only test messages. In addition, PTWC informed Member States that they will start sending monthly test messages that should be acknowledged.

- 101 Haiti asked if PTWC identified exact points of tsunami inundation during the January 12, 2010 earthquake. Mr Tuell reported that inundation parameters were not identified during the earthquake but before. Besides, it was stated that efforts are currently being done to identify inundation areas by using earthquakes parameters.

- 102 Peter Koltermann stated that many Caribbean countries have limited bandwidth and simple text message warnings at present are better than large messages containing graphics.

#### **4. WORKING GROUP PROGRESS REPORTS**

##### **4.1 WORKING GROUP 1 PROGRESS REPORT: MONITORING AND DETECTION SYSTEMS, WARNING GUIDANCE**

- 103 This agenda item was presented by Ms Christa von Hillebrandt-Andrade (USA), Chairman of Working Group 1. Ms von Hillebrandt-Andrade made a brief introduction of the WG 1. She explained the purpose and functions of the WG, and showed the list of all the participants and observers.
- 104 She reported on the meeting in Mayagüez, Puerto Rico (4-5 February, 2010) and thanked the PRSN for its support in the organization of the meeting which was held after the CARIBE EWS Seismic Network Operators Workshop (1-3 February, 2010).
- 105 Dr McNamara from the U.S. Geological Survey reported on the current distribution of the seismic stations. He mentioned also the stations that are not contributing real time data to PRSN, and informed that in the PRSN website there is a tool to identify all the stations that are contributing. He reported that Colombia has started contributing data.
- 106 Dr McNamara gave a presentation on seismic network capability modelling. The measures of network capability include: minimum detectable earthquake magnitude, earthquake detection time and earthquake location error. A comparison was made between existing stations currently contributing to an international system in real-time and all existing stations in the region. Network capability of the current real-time system, across the region, does not currently meet the standards as established by Working Group 1. However, the capability modelling demonstrates that by including all existing stations in the region and installing a few additional stations an international system would meet these standards. Significant national seismic networks that are not currently contributing to the system are Mexico (SSN of UNAM), Cuba and Venezuela (FUNVISIS). In addition, coverage gaps occur in Haiti, Honduras, Jamaica and Belize.
- 107 Ms von Hillebrandt-Andrade made reference to the core stations sea level network. She noted differences in the funding status of the stations. Moreover, she mentioned that there is a new real time station in Costa Rica and other in Dominican Republic and the plans of the U.S. to install 10 additional sea level stations over the next three years and the need of integrating the 10 stations installed by the Caribbean Community Climate Change Center.
- 108 During her presentation, Ms von Hillebrandt-Andrade made a description of the IOC Sea Level Observation Facility website.
- 109 Ms von Hillebrandt-Andrade noted that there are insufficient resources on GOES to assign 5 minute time slots for the planned CARIBE EWS sea level stations and recommended that guidelines be developed to assign high rate slots and also recommended that other communication alternatives be identified.
- 110 She noted that it is clear that observational deficiencies still exist and therefore, the WG intends to address these limitations in the Implementation Plan. Ms von Hillebrandt-Andrade further noted that the inventory of the current stations should be also included in the Implementation Plan.
- 111 Besides, Ms von Hillebrandt-Andrade highlighted that it is important to seek the necessary technical assistance in order to count on a structured process to repair stations in case of failure and increase the capabilities of observation.

112 **The ICG approved [Recommendation ICG/CARIBE-EWS V.1.](#)**

#### 4.2 WORKING GROUP 2 PROGRESS REPORT: HAZARD ASSESSMENT

- 113 This agenda item was introduced by Mr Aurelio Mercado, Chair of Working Group 2.
- 114 Mr Mercado reported that Community Tsunami Model (ComMit) workshop for the Caribbean Region is being held in Mayaguez, Puerto Rico, during May 3-7, 2010, sponsored by IOC/UNESCO. The National Center for Tsunami Research of NOAA will be sending three of its staff members as teachers.
- 115 Mr Mercado indicated that IOC/UNESCO sponsored the visit of WG2 vice-chair, Dr Narcisse Zahibo, to Haiti with the purpose of acquiring data about the tsunami that accompanied the January 12, 2010, 7 Mw earthquake, and provide technical advice on coastal hazards to Haitian authorities.
- 116 Under the sponsorship of the U.S. National Tsunami Hazard Mitigation Program (US-NT-HPM), a complete revision of the tsunami inundation maps (published in 2003) is being carried out for the whole island of Puerto Rico. This is being done using NOAA's MOST tsunami model with high resolution computational cells (30 x 30 meters) using recently acquired LIDAR topography and bathymetry. These maps will reflect not only the same set of locally potentially tsunamigenic faults around the island as in 2003, but also include credible worst case scenarios for regional and far-field tsunamis. The U.S. Virgin Islands will follow as soon as the Digital Elevation Model for the islands is finished late this year.
- 117 Venezuela, between 2006 and 2007, initiated the tectonic interpretation of the Venezuelan shelf by high resolution shallow seismic profiling at Lago Maracaibo, Litoral Central, and Golfo de Cariaco. The first acquisition of inland corings for the study of pre-historic and historic earthquakes, has been carried out. In addition, marine corings have been done off Cumana (Sucre State) for paleo-tsunami studies. Finally, modelling is being done of known paleo-tsunamis using the El Pilar source in Eastern Venezuela. This modeling effort is done with the help of the Norwegian Geophysics Institute.
- 118 In the French speaking Caribbean high-resolution bathymetric LIDAR surveys have, and are, being carried out, which will allow for much better inundation mapping.
- 119 Barbados requested that the requirements for a high resolution bathymetry programme be added to the list of tasks. Besides, Barbados acknowledged the willingness of the Government of France in achieving this objective.

#### 4.3 WORKING GROUP 3 PROGRESS REPORT: WARNING DISSEMINATION AND COMMUNICATION

- 120 There was no report from WG3 to ICG-V. However, Barbados made a statement regarding some activities of WG 3.
- 121 Barbados acknowledged that significant progress has been made in the following areas: (1) Definition of protocols for the dissemination of warnings; and (2) independent methods of communication being maintained by countries. Barbados recommended that the action items be explained to assist countries for completion of their protocols. Barbados expressed that they are satisfied of the work carried out by CDEMA, especially the USAID/OFDA funded project which produced a model protocol. Barbados expects that the model protocol be replicated for the French and Spanish speaking countries.
- 122 Under this agenda item there was a presentation solicited from United States that addressed EMWIN developments in the Caribbean Region and the planned transition of the GOES system.



123 Mr Bill Proenza, Head of U.S. delegation, started his presentation on ENWIM by mentioning that it is an efficient tool for continued timely information and warnings for supporting tsunami response and resilience. He noted that EMWIN is a proven U.S. National Weather Service warning and information distribution system in active use under the GOES-12 (East) & GOES-11 (West) umbrellas. He stressed that it is designed to be an economical and portable multi-hazard warning and information system.

124 Mr Proenza explained that the broadcast coverage includes the entire Americas. Likewise, EMWIN provides immediate information via GOES from all NWS offices (WFOs, NHC, Tsunami Warning Centers). In addition, Mr Proenza explained EMWIN hardware requirements, made a comparison between EMWIN and GTS and described EMWIN benefits.

125 Complete presentation on EMWIN is available at:  
[http://www.iocunesco.org/index.php?option=com\\_oe&task=viewEventDocs&eventID=562](http://www.iocunesco.org/index.php?option=com_oe&task=viewEventDocs&eventID=562)

#### 4.4 WORKING GROUP 4 PROGRESS REPORT: PREPAREDNESS, READINESS AND RESILIENCE

126 This Agenda item was introduced by Mr Juan Luis Guzman, on behalf of the WG Chair Julie Leonard (USA), who could not attend the meeting due to engagements in Haiti. Mr Guzman stated that WG 4 had not had the opportunity to actively work since the last ICG-V and requested to hold a presentation on preparedness initiatives in Venezuela.

127 Chair encouraged other members of WG 4 to submit an activity report to the ICG-V.

128 Barbados wished to acknowledge the significant progress that has been made in the implementation of the actions under the chairmanship of Julie Leonard, USAID/OFDA and highly encouraged ICG to nominate a new chair to ensure continuity and momentum.

129 The ICG Chair called the attention of the plenary on the difficulties in engaging participants of WGs, and she encouraged WG participants to reinforce their involvement, especially regarding the CARIBE EWS Implementation Plan. Besides, she noted that even if funding might be limited, significant progress can be made by efficient communication of WG chairs and participants through email. In this regard, she asked the plenary to propose improvement measures for the WGs performance in the Caribbean.

#### 5. SPECIAL INVITED LECTURES: COMMUNITY-BASED TSUNAMI WARNING SYSTEM

130 The Chairman referred to the Recommendation ICG/CARIBE EWS-IV.4, which urges Member States to consider the recommendations of the “Best Practices on Tsunami and Coastal Hazards Community Preparedness and Readiness in Central America and the Caribbean” workshop, held in August 2008 in Panama. One of the recommendations of the above mentioned workshop requests that a representative of each of the following communities: Masachapa (Nicaragua), Tumaco (Colombia) y Mayaguez (Puerto Rico) be invited to make a presentation to the ICG/CARIBE-EWS on the development of their community-based warning systems

131 Following all stated, a presentation was made by representatives of Masachapa and Mayaguez. The experience of Tumaco was scheduled but the speaker was not able to attend the meeting.

132 Ms Marcia Sanchez from the Red Cross in Nicaragua, informed that this institution is implementing a series of projects on tsunami awareness-raising and early warning in three coastal communities (Masachapa, Corinto and Realejo) in the Pacific coast of Nicaragua.

Besides, she stated that initiatives especially in San Rafael del Sur and Masachapa are supported by COSUDE. Mr Norlan Romero, DIPECHO Project Coordinator, explained that DIPECHO VI is co-sponsoring some of the initiatives undertaken in Corinto and Realejo.

- 133 The main objective of the projects is to reduce tsunami vulnerability through the implementation of an early warning system in Nicaragua. The projects include mainly: (1) developing of hazard maps together with a local technical institution; (2) defining routes of evacuation with the support of local institutions and active participation of members of the community; (3) development of contingency plans with participative methodologies, resources inventory and final elaboration of the plans were done with active participation of community members; (4) conduction of a communication campaign, including the distribution of awareness materials (calendars, stickers, caps, fans), a spot in television and jingles in the radio; (5) development of the initiative "Security at the School in Masachapa and Madroñal" and (6) design, installation and implementation of an early warning system in Corinto and Realejo.
- 134 The lessons learnt from the projects include that participation of members of communities, together with political willingness are essential to improve early warning systems in the country. The use of accessible methodologies and following the principle of learning by doing increases the risk awareness among the public.
- 135 Dr Víctor Huérfano, Interim Director and Associate Researcher of the PRSN, introduced the U.S. TsunamiReady Program. He explained that it is a "grass roots" program that promotes tsunami hazard readiness and aims at improving public safety during tsunami emergencies. The program requires collaborative efforts between government, academia and the public.
- 136 Concretely, the TsunamiReady Program creates minimum standard community guideline for adequate tsunami readiness, improves community pre-planning for tsunami disasters and encourages consistency in educational materials and response. It recognizes communities that have adopted TsunamiReady guidelines. During his intervention, Mr Huerfano explained briefly the components of the Tsunami Ready Program. In Puerto Rico, 9 of 44 coastal municipalities have been designated TsunamiReady.
- 137 Ms Paula Dunbar, Hazards Program Manager of NOAA, on behalf of Susan McLean, Director WDC for Geophysics and Marine Geology, presented the World Data Center and its functions for data archive and exchange.
- 138 She informed that the long term archive has grown from 6 gigabytes in 2005 to 1,222 gigabytes today. The archive consists of: global historic tsunami event and run-up, significant earthquake and volcanic eruptions databases, damage photos, tsunami deposits database, tsunami reference database, bottom pressure recorder (BPR) data as collected by DART buoys (online), High resolution global tide-gauge data.
- 139 Ms Dunbar presented the global historic event databases, which contain information such as the date, location, magnitude, deaths, and damage for all tsunami source events, tsunami runups (locations that observed tsunami effects), destructive and tsunamigenic earthquakes and volcanic eruptions. The databases are all stored in Oracle and integrated. The data are available on-line (<http://www.ngdc.noaa.gov/>) and can be searched by attribute (e.g. event, runup, location, date, deaths, etc).
- 140 In short, Ms Dunbar explained that WDC/NGDC manages the U.S. tsunami data archive which has global coverage and is essential for tsunami forecast and warning, inundation modelling, and hazard assessment. It is also required for tsunami research, preparedness, mitigation and education. In addition,, WDC/NGDC actively supports technology transfer, the development of tsunami warning systems and collaborates nationally and internationally in all aspects of U.S. tsunami activities.

141 Mr Claudio Martinez from the National Meteorology Office (ONAMET) in the Dominican Republic presented the recent activities of the ONAMET Tsunami Warning Unit (UATO) and the post-assessment work of this institution in Haiti.

142 Mr Martinez reported that UATO was created in September 2005 and in March 2008 a sea level gauge was installed with the technical support of PRSN. He explained that ONAMET has developed a Manual for Operative and Technical Procedures and a web site which offers the possibility of accessing tsunami forecasts. Besides, data are monitored through PRSN, CISON (ITIC) and DART buoys network. Mr Martinez noted that the first tsunami warning was issued after the 12<sup>th</sup> January earthquake in Haiti and evacuation in San Pedro de Macoris was produced. It was cancelled approximately two hours later based on the cancellation message received from the PTWC.

143 Besides, Mr Martinez reported on the post-assessment activities carried out in Haiti. The assessment was conducted in zones where a tsunami was detected, in cooperation with Mr Hermann M. Fritz, Associate Professor of the Georgia Institute of Technology, School of Civil and Environmental Engineering. Some effects of the impact of the wave were documented in pictures and statements of some residents that witnessed the arrival of the wave were documented in video.

## 6. POLICY MATTERS

### 6.1 ESTABLISHMENT OF A CARIBBEAN TSUNAMI WARNING CENTER

144 The Chairman introduced this topic recalling that, according to Recommendation ICG/CARIBE EWS-II.3, the ICG decided to establish a Caribbean Tsunami Warning Center to be located in the region. Also, through Recommendation ICG/CARIBE EWS-II.12, it agreed to actively plan to take over the full responsibility for the system with a Caribbean Tsunami Warning Center in the region at least by 2010.

145 Jamaica requested a status report on CTWC implementation. U.S. indicated that the first phase is already achieved and it encompasses that U.S. will establish CTWC at the University of Puerto Rico in Mayaguez pending congressional funding approval.

146 The US addressed the following concerns of member states:

147 Venezuela asked if the CTWC will focus only on U.S. territories and if individual countries should work towards developing their own warning centres. U.S. responded that they are committed to serve the entire region.

148 Jamaica and France asked if the level of funding is sufficient to autonomously operate the centre, or Member States would be obliged to contribute funds and staff to the CTWC. U.S. responded that U.S. is not currently seeking funds and staff contributions from Member States.

149 Trinidad and Tobago expressed concern that the educational aspect of the CTWC mission may overlap CTIC functions. U.S. responded that there is no intended overlap despite educational components of CTWC.

150 **The ICG approved [Recommendation ICG/CARIBE-EWS-V.2](#).**

### 6.2 CARIBBEAN TSUNAMI EXERCISE (CARIBE WAVE 2011)

151 The Chairman introduced this topic recalling that it was suggested by the ICG/CARIBE EWS Officers, the Technical Secretariat and the Chairman of WG1 that the ICG-V be requested to approve the initiative of having a CARIBE WAVE exercise in 2011, and be provided a document with an outline of the activities, responsible and calendar (ICG/CARIBE-EWS-V/13).

152 The Chairman recalled that every year the U.S. National Tsunami Hazard Program (U.S. NTHP) conducts a tsunami exercise. In March 2009 they run an exercise focused on Caribbean US territories. In year 2010 the exercise is focused on North Eastern USA and in 2011 will again focus on the Caribbean. The intention is to try to have a joint exercise USA+ICG/CARIBE EWS in 2011.

153 Ms von Hillebrandt-Andrade informed that the ICG CARIBE EWS is proposing to hold a tsunami exercise, CARIBE Wave 2011, on March 23, 2011. The scenario will be based on the November 18, 1867 earthquake and tsunami for which wave heights of up to 10 meters were reported in the Eastern Caribbean. This tsunami warning exercise will be patterned after the Exercise Pacific Wave 08 and the LANTEX Atlantic and US Caribbean 2009 and 2010 Exercises of the National Tsunami Hazard Mitigation Program, NOAA.

154 She explained that this tsunami exercise is being conducted to assist tsunami preparedness in the Caribbean. This exercise will provide simulated tsunami warning, watch and advisory messages from the PTWC and WC/ATWC triggered by a hypothetical earthquake located in the Virgin Islands Basin at 18.0 N, 65.0 W. This scenario will be based on the November 18, 1867 earthquake and tsunami. The earthquake of magnitude 7.3 generated waves which impacted primarily the Northeastern Caribbean and the Eastern Caribbean islands with heights of 6.0 meters in St. Thomas, 7.6 m in St. Croix and 7.6 m in Guadeloupe.

155 The objectives of CARIBE WAVE'11 will be to:

- Ensure message transmission from PTWC and WC/ATWC to the Tsunami Warning Focal Points.
- Test tsunami response plans for those Caribbean Emergency Management Offices (EMOs) that have developed plans, and provide a catalyst for EMOs that have not developed one.
- Coastal EMOs to review, discuss, and evaluate the various communication alternatives for receiving and disseminating tsunami messages.
- Coastal EMOs to review, discuss, and evaluate potential response actions and challenges.
- Identify processes to issue local all-clear notices.

156 The exercise manual will be available in Spanish, English and French. It will include suggested actions as well as a description of the scenario, the time table, travel times and expected wave heights, figures and samples of the messages that would be issued for such an event and an evaluation questionnaire.

157 A special task team will be formed to coordinate the exercise; it is proposed that the members of this team will be: Chair of CARIBE EWS; Chairs of Working Group 1, 2, 3 and 4; Manager Caribbean Tsunami Warning Program; Director Pacific Tsunami Warning Center; Director West Coast/Alaska Tsunami Warning Center and the Technical Secretary ICG CARIBE EWS.

**The ICG approved [Recommendation ICG/CARIBE-EWS-V.3](#).**

### 6.3 HAITI EARTHQUAKE AND TSUNAMI 12<sup>TH</sup> JANUARY 2010

158 One of the most severe earthquakes in more than 100 years hit the Caribbean state Haiti at 21:53 UTC (16:53 local time). With a magnitude of Mw 7.0, very shallow (10 km depth) and located close to the capital Port au Prince, it caused severe destruction and casualties. The tsunami warning system for the Caribbean CARIBE-EWS went into action.

159 This recent event provided ICG/CARIBE EWS with an opportunity to evaluate the performance of the system and to identify those components that worked properly and, most importantly, those that did not work in an appropriate manner and are in need of further attention. The Secretariat therefore designed a post-event assessment questionnaire to evaluate the performance of the CARIBE EWS and to provide a benchmark of the present status of the system.

160 The Secretariat reported on the responses received from Member States, summarized in document IOC Technical Series 90.

161 The results of the discussions of the intrasessional working group were presented by Mr Narcisse Zahibo (France). The Working Group recommended:

- to strengthen Haiti's national capacities for coping with tsunamis and other coastal hazards impacts,
- to build a crisis management center in Haiti that is earthquake and hurricane resistant, has an autonomous power supply, operates 24/7 using a real-time satellite communication system and has adequate human and material resources,
- to assist Haiti to establish a national plan for risk management and reduction that includes development of seismic and hurricane-proof construction standards, tsunami inundation maps, tsunami evacuation plans and zones, redundant warning communication systems, education of the population on the dangers of tsunamis (through radio, music, cultural aspects) and that the first tsunami alert be based on the severity of the felt earthquake.

162 **The ICG approved [Recommendation ICG/CARIBE-EWS-V.4](#).**

## 7. UPDATES TO THE CARIBE-EWS IMPLEMENTATION PLAN

163 This agenda item was introduced by the ICG/CARIBE EWS Technical Secretary. He referred to document ICG/CARIBE EWS-III/13, CARIBE EWS Implementation Plan, currently IOC Technical Series 73 "Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE EWS) Implementation Plan".

164 The Chairman opened the floor for comments from the intrasessional Working Group and then from Member States. She invited Member States to make available to the Secretariat their national implementation plans as soon as possible.

165 Barbados stated that the series of 19 recommendations of WG 1 should be included in the CARIBE EWS Implementation Plan. Besides, she recommended that the four thematic areas should remain as priority areas for focus during 2010-2011

166 Jamaica acknowledged and supported the recommendation by the delegate of Barbados and further noted that presentation made by the chair of Working Group 1 in particular the gaps in seismic stations and sea level tide gauges. In this regard, Jamaica urged that the Implementation Plan reflect the future implementation and upgrading of sea level stations and gauges as a priority for the Implementation Plan for 2010-2011.

167 **The ICG agreed** to allow sufficient time for Member States to include their national programmes to the CARIBE EWS Implementation Plan. In light of this, **the ICG agreed** to establish 30<sup>th</sup> June 2010 as deadline for a first draft of the CARIBE EWS Implementation Plan and August 1<sup>st</sup> as deadline for the final version to be published.

## 8. PROGRAMME AND BUDGET 2012–2013

168 The Chairman offered the floor to the Chairman of the intrasessional working group established under Agenda item 2.3 to deliver the conclusions and recommendations of the group.

169 Mr Israel Matos, Chairman of the Programme and Budget Intrasessional Working Group reported that there is limited information about Member State's funding for the implementation of the CARIBE EWS.

170 Barbados proposed to spend USD 40,000 in 2010-2011 in implementing the following programmes: (1) Public Education and Awareness Programme; (2) Participating in the CARIBE WAVE Exercise; (3) Completion of SOPs; (4) National consultation for the design of an effective early warning system.

**The ICG agreed** to request Member States to provide the Secretariat with detailed budget information to complete with as much details as possible the budget available for implementing the CARIBE EWS.

171 **The ICG approved** [Recommendation ICG/CARIBE-EWS-V.5](#).

## 9. NEXT MEETING

### 9.1 CONFIRMATION OF DATE AND PLACE OF ICG/CARIBE EWS-VI

172 The Chairman introduced this item. She recalled that at ICG/CARIBE EWS-IV there were no offers for hosting the Sixth session. As well, she recalled that the group agreed to target March 2011 for the Sixth Session.

173 The Chairman opened the floor for Member States considering hosting the Sixth Session of the ICG/CARIBE EWS in March 2011. With this information Delegates were requested to confirm date and place for ICG/CARIBE EWS-VI.

174 United States stated that the ICG/CARIBE EWS-VI should be held after March 23, 2010, which is the date of the CARIBE WAVE Exercise. Usually one month is needed to produce the report of the exercise.

175 Bermuda recommended not overlapping with the WMO Hurricane Meeting and season.

176 Dominican Republic offered to host the meeting in April 2011.

177 **The ICG acknowledged** this offer with appreciation and agreed to hold the ICG-VI in Dominican Republic in the second half of April 2011.

### 9.2 TARGET DATE FOR ICG/CARIBE EWS-VII

178 **The ICG agreed** March 2012 as a target date for the Seventh Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards for the Caribbean and Adjacent Regions – ICG/CARIBE EWS and invited offer from Member States.

## 10. OFFICERS ELECTIONS

179 The Chairman of the Intrasessional Elections Commission, Mr Gustavo Malave (Venezuela), introduced this Agenda item. He informed attending delegates that elections

should follow the established IOC Rules of Procedure and briefly reviewed procedure to be followed.

180 The ICG was requested to elect one (1) Chairperson and two (2) Vice-chairpersons to act as Officers of the IOC Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions for the two-year intersessional period (2010–2011).

181 Mr Malavé noted that there was only one candidate for each of the three positions to be filled, including the position of Chairperson. Dr Lorna Inniss (Barbados) was re-elected by acclamation as Chairperson. Ms Christa von Hillebrandt-Andrade (USA) and Dr Francisco Garces (Venezuela) were elected as Vice-Chairs of the ICG/CARIBE EWS for 2010-2011.

182 Jamaica wished to note the diversity of countries represented in the ICG/CARIBE EWS and proposed that ICG include a third vice-chair.

183 Haiti supported this proposal and suggested the election of a French-speaking vice-chair in order to ensure that the three official languages of the ICG/CARIBE EWS are represented at the leadership level.

184 Panama expressed concern of placing emphasis on language issues considering that if Brazil eventually joins the ICG/CARIBE EWS, one vice-chairmanship representing Portuguese language should be included.

185 Barbados, Costa Rica, Honduras and USA agreed to support the proposal for the expansion of the ICG vice-chairmanship but not particularly based on language issues. It was argued that an additional vice-chair should be incorporated for administrative reasons rather than cultural or language aspects. The expansion of the officers committee should facilitate the implementation of the ICG programme and gain more diversity in the leadership.

186 Venezuela proposed that ICG establishes an experimental vice-chairmanship in order to define and evaluate the criteria under which this person should be elected in next elections.

187 Costa Rica supported this proposal, arguing that it ensures that all Member States have the opportunity to present candidates.

188 **ICG agreed** to incorporate a third vice-chair and to re-open the period for nominations until 14:00, Wednesday 17 March, 2010.

189 Mr Malavé noted that there was only one candidate for the third vice-chair position, and thus Frédérique Martini (France) was elected by acclamation as vice-chair 2010-2011.

190 Chairs for Working Groups 1, 2 and 4 were also elected: Emilio Talavera from Nicaragua (WG 1); Rafael Mojica from USA (WG 3) and Dimas Alonso Mercado from Honduras (WG 4).

## 11. ANY OTHER BUSINESS

191 Under this Agenda item, it was discussed how to foster collaboration between ICG/CARIBE EWS and the WMO Hurricane Committee. The issue was raised considering that on this occasion, there was a conflict in the dates of the two meetings, and some ICG participants are also delegates for some WMO activities.

192 Considering the importance of giving effective attention for both issues in the entire region, some delegates proposed to have a joint meeting ICG/CARIBE EWS–WMO Hurricane Committee.



193           Trinidad and Tobago supported the proposal of a joint meeting, arguing that ICG and WMO Hurricane Committee have several commonalities.

194           USA supported the argument that more collaboration would be useful, but did not support the plan of a joint meeting. They argued that, even if there are similarities in the initiatives, there are several differences that could be difficult to handle in a common meeting. USA noted that more collaboration was possible by having ICG representatives at WMO Region IV meetings and inviting a WMO representative to ICG/CARIBE EWS meetings.

195           Chair summarized that there was no objection of having representation as observer at the WMO Region IV meetings. Therefore, a representative would need to be designated. This representative would be in charge of elaborating a report containing the issues that affect ICG/CARIBE EWS.

196           **ICG decided** that Chair will be the representative to WMO Region IV meetings.

## **12.   ADOPTION OF DECISIONS AND RECOMMENDATIONS**

197           Based on the reports of the Working Groups and discussions at the Plenary Sessions, the ICG adopted five Recommendations.

## **13.   CLOSURE OF THE MEETING**

198           The ICG/CARIBE EWS Chairman thanked the Government of Nicaragua for hosting the meeting. Vice-chair, Mr Malave, thanked the Local Organizing Committee for the excellent facilities provided for the organization of the meeting

199           The Fifth Session of the IOC Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions was closed at 18.00 hrs on Wednesday, 17 March 2010.



## ANNEX I

### AGENDA

#### **1. WELCOME AND OPENING**

- 1.1 HEAD OF TSUNAMI UNIT, INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION OF UNESCO
- 1.2 DR LORNA INNIS: DEPUTY DIRECTOR, COASTAL ZONE MANAGEMENT UNIT CZMU - BARBADOS, ICG/CARIBE EWS CHAIR
- 1.3 WELCOME ADDRESS BY NATIONAL AUTHORITIES

#### **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 CHAIRMAN'S REPORT
- 3.3 CARIBE EWS SECRETARIAT REPORT
- 3.4 REPORT OF THE CARIBBEAN TSUNAMI INFORMATION CENTER (CTIC)
- 3.5 REPORTS FROM UN AND NON UN ORGANISATIONS
- 3.6 STATUS OF OTHER ICGS
- 3.7 NATIONAL PROGRESS REPORTS
- 3.8 INTERIM ADVISORY SERVICES REPORT (PTWC)

#### **4. WORKING GROUP PROGRESS REPORTS**

- 4.1 WORKING GROUP 1 PROGRESS REPORT: MONITORING AND DETECTION SYSTEMS, WARNING GUIDANCE
- 4.2 WORKING GROUP 2 PROGRESS REPORT: HAZARD ASSESSMENT
- 4.3 WORKING GROUP 3 PROGRESS REPORT: WARNING, DISSEMINATION AND COMMUNICATION
- 4.4 WORKING GROUP 4 PROGRESS REPORT: PREPAREDNESS, READINESS AND RESILIENCE

#### **5. ESPECIAL INVITED LECTURES: COMMUNITY-BASED TSUNAMI WARNING SYSTEM**

- 5.1 TUMACO, COLOMBIA
- 5.2 MAYAGUEZ, PUERTO RICO, UNITED STATES (TSUNAMI READY)
- 5.3 MASACHAPA, NICARAGUA

#### **6. POLICY MATTERS**

- 6.1 ESTABLISHMENT OF A CARIBBEAN TSUNAMI WARNING CENTER

6.2 CARIBBEAN TSUNAMI EXERCISE (CARIBE WAVE 2011)

6.3 HAITI EARTHQUAKE AND TSUNAMI 12TH JANUARY 2010

**7. UPDATES TO THE CARIBE-EWS IMPLEMENTATION PLAN**

**8. PROGRAMME AND BUDGET FOR 2012–2013**

**9. NEXT MEETING**

9.1 CONFIRMATION OF DATE AND PLACE OF ICG/CARIBE EWS-VI

9.2 TARGET DATE FOR ICG/CARIBE EWS-VII

**10. OFFICERS ELECTIONS**

**11. ANY OTHER BUSINESS**

**12. ADOPTION OF DECISIONS AND RECOMMENDATIONS**

**13. CLOSE OF THE MEETING**

## ANNEX II

### RECOMMENDATIONS

#### Recommendation ICG/CARIBE EWS-V.1

#### **MONITORING AND DETECTION SYSTEMS, WARNING GUIDANCE**

The Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions,

**Noting** the report of Working Group 1 Monitoring and Detection Systems, Warning Guidance;

**Recalling** the Recommendation ICG/CARIBE EWS IV.1 on Monitoring and Detection Systems, Warning Guidance which urged Member States and Other Stakeholders to provide funding for observational networks and communication systems;

**Having reviewed** the status and capabilities of the seismic and sea level stations in the region contributing data to the CARIBE EWS;

**Endorses** the updated core network of seismic and sea level stations;

**Welcomes** the IOC efforts to establish a web site with current Tsunami Focal Points information;

**Requests** the PTWC to conduct monthly communications tests with the Tsunami Focal Points, who should confirm receipt of these test messages in a timely fashion;

**Notes** that the core observing networks are not fully implemented and priority should be placed on (a) ensuring that those observing stations that are not currently contributing to the CARIBE EWS be integrated into the system on a priority basis and (b) funding the acquisition, installation and operation of the stations required to fill the gaps of the core network;

**Instructs** the WG1 to develop a three year plan to carry out the sea level and seismic training activities and be presented to the IOC Tsunami Unit to help in the coordination of activities and the identification of funding;

**Requests** each Tsunami National Contact to identify the point of contact for seismic, sea level and other observational data required by the CARIBE EWS to carry out its mission and inform on plans to operate observational systems that could contribute to the CARIBE EWS;

**Recommends** the IOC Executive Secretary to prepare an agreement that can be used between the tsunami warning centers and the regional seismic and sea level data operators to facilitate the exchange of data for tsunami warning purposes;

**Instructs further** WG1 to review the station requirements addressed in Doc. ICG/CARIBE-EWS V/13 to improve the sustainability and capability of the core seismic and sea level stations;

**Recognizes** the need for evaluating and implementing new technologies to improve the monitoring and detection capabilities of the CARIBE EWS;

**Instructs** WG1 to work with WG2 to evaluate the needs and state of the science in GPS monitoring for applications in Tsunami Warning System;

**Urges** member states to upgrade and/or install GPS stations for high rate data and consider the collocation of these stations with seismic and sea level stations;

**Acknowledges** that sea level data are essential for the detection and forecasting of tsunamis, given the short onset time of tsunamis in the region and affirms sea level station operation requirements necessitate that these data be transmitted to the region within 5 minutes to the extent technically feasible;

**Invites** the United States to identify the number of slots available on GOES for the high speed transmission rates, recognizing that the demand for high speed transmissions exceeds current capabilities;

**Further invites** the United States to work with the ICG CARIBE EWS, the Caribbean Tsunami Warning Programme (CTWP) and the Tsunami Warning Centers (TWC) to establish a procedure that can be used as a guidance to evaluate requests for high rate (less than 15 minute) slots;

**Recommends** that alternatives for robust high rate transmissions of sea level data be explored by WG1;

**Recognizes** the success of tsunami forecasting models used to advise governments on actions to be taken for the Samoa and Chile Earthquakes,

**Requests** that WG1 in consultation with WG2 prepare a report for ICG VI on the tsunami forecasting capabilities of the region;

**Recognizes** the unintentional and intentional damage to tsunameters (DART) and other data buoys reported by the US for its systems in the Caribbean and adjacent regions, and recognizes the importance of these data for the detection and forecasting of tsunamis;

**Calls** upon the IOC Member States to work in cooperation with regional fisheries management organizations, other relevant organizations, including the Food and Agriculture Organization of the United Nations, and the World Meteorological Organization, to adopt, as appropriate, measures to protect ocean data buoy systems moored in areas beyond national jurisdiction from actions that impair their operation.

---

Financial Implications: None

#### Recommendation ICG/CARIBE EWS-V.2

### **REGIONAL TSUNAMI WARNING CENTRE**

The Intergovernmental Coordinating Group for the establishment of Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions,

**Recalling** Recommendation ICG/CARIBE EWS IV.6 which approved the criteria for a Regional Tsunami Warning Centre as identified in the Working Group 1 report on the “Technical, Logistical, and Administrative Requirements of a Regional Tsunami Warning Centre for the CARIBE EWS”, (Doc. ICG/CARIBE-EWS IV/13);

**Aware** that gaps in the seismic, sea level observing networks, impediments to data exchange and ineffective communication systems will compromise the effectiveness of regional warning services;

**Underscores** the importance of Member States' support to the development of monitoring and observing capacity in accordance with the criteria identified in the "Technical, logistical and administrative requirements of a Regional Tsunami Warning Centre for the CARIBE EWS" in support of a Caribbean Tsunami Warning Centre;

**Acknowledges** the interim services provided by the Pacific Tsunami Warning Center (PTWC) to Members States of Caribbean and Adjacent Regions which provided essential tsunami warning products following the Haitian earthquake on 12 January 2010;

**Encourages** Member States to consider establishing a Regional Tsunami Warning Center;

**Welcomes and appreciates** Venezuela's efforts and technical advances for the establishment of a Caribbean Tsunami Warning Center;

**Welcomes and appreciates** Nicaragua's efforts and technical advances for the establishment of a Caribbean Tsunami Warning Center;

**Welcomes and appreciates** the United States efforts for establishing a Caribbean Tsunami Warning Program at the University of Puerto Rico, Mayaguez in Puerto Rico, USA and hiring its Manager as the first step of the U.S. phased contribution to the establishment of a Caribbean Tsunami Warning Center; and

**Welcomes** further consideration of potential Member State contributions to a Regional Tsunami Warning Center at ICG-VI.

---

Financial Implications: None

#### Recommendation ICG/CARIBE EWS-V.3

##### **CARIBE WAVE EXERCISE 2011**

The Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions,

**Recalling** the successful planning and execution of the LANTEX 2009 and 2010 Western Atlantic exercises;

**Acknowledging** the frequency of seismic and tsunami events at the global and regional levels, and the devastating impacts following the Haiti and Chile earthquakes and tsunamis;

**Recognizing** the tremendous vulnerability to life from tsunamis in the Region;

**Acknowledging further** the opportunities for partnerships with other bodies that coordinate and execute region-wide exercises;

**Understanding** the importance of testing and refinement of warning systems and national protocols;

**Recommends** conducting a joint CARIBE Wave 2011 and LANTEX 2011 exercise in the Western Atlantic, Caribbean and Adjacent Regions on March 23<sup>rd</sup>, 2011;

**Decides** the establishment of a Task Team which includes the ICG Officers, Technical Secretary of ICG CARIBE-EWS, Manager of Caribbean Tsunami Warning Programme (CTWP),

Directors of PTWC and WCATWC and representatives of CEPREDENAC and CDEMA to oversee the exercise. This Task Team will be chaired by the Manager of the CTWP;

**Urges** Member States to establish their own national task teams to determine the scope of their national participation and testing;

**Agrees** to the scenario, objectives and reviewed timelines for the exercise, as prescribed in the ICG V document, including the preparation of the CARIBE Wave 2011 Manual in Spanish, English and French;

**Decides** further that ICG VI meeting be held on a date following the exercise and conclusion of the preliminary report.

---

Financial implications: None

#### Recommendation ICG/CARIBE EWS-V.4

##### **POST-EVENT ASSESSMENT HAITI EARTHQUAKE AND TSUNAMI 12 JAN 2010**

The Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions,

**Recognizing** the urgency to assist Haiti after the tragic 12 January 2010 earthquake;

**Recalling** the collapse of the operational capacity of Haiti government agencies and emergency response systems, and the extensive damage to built environment;

**Considering** the increased probability of additional damaging earthquakes on adjacent segments of the Enriquillo fault to the east and the west and Septentrional fault to the north;

**Acknowledging** that already before 12 January event Haiti had one of the most vulnerable populations in the world;

**Noting** the need for a reinforcement of capacity building through improved earthquake monitoring, building standards and tsunami warnings in Haiti;

**Bearing in mind** that the first tsunami message was issued by the PTWC 10 minutes after the earthquake, but was only accessed by civil protection services two days after the earthquake, due to the collapse of the power supply and the internet network. If the tsunami had been devastating, the populations would have been without any warning product;

**Urges** its Member States to contribute:

- (i) to strengthen Haiti's national capacities for coping with tsunamis and other coastal hazards impacts,
- (ii) to build a crisis management center in Haiti that is earthquake and hurricane resistant, has an autonomous power supply, operates 24/7 using a real-time satellite communication system and has adequate human and material resources,
- (iii) to assist Haiti to establish a national plan for risk management and reduction that includes development of seismic and hurricane-proof construction standards, tsunami inundation maps, tsunami evacuation plan and zones, redundant warning communication systems,

education of the population on the dangers of tsunamis (through radio, music, cultural aspects) and that the first tsunami alert is the felt earthquake.

---

Financial Implications: None

Recommendation ICG/CARIBE EWS-V.5

**CARIBE-EWS BUDGET FOR THE BIENNIUM (2011–2012)**

The Intergovernmental Coordination Group for Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions,

**Recognizing** the establishment of a Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions;

**Noting** the need for continuous funding for building and maintaining the CARIBE EWS;

**Recalling** the decisions and results of ICG/CARIBE EWS IV, Recommendations ICG/CARIBE EWS-IV.7 and IOC Resolutions XXIII.13 and XXIV.13;

**Emphasizing** the need for enhancing a Tsunami Warning System in a multi-hazards approach;

**Acknowledging** that Member States and other UN bodies and organizations are willing to assist in the establishment of a Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions;

**Acknowledging further**, the ICG/CARIBE EWS Implementation Plan;

**Bearing in mind** that almost all Member States use common communication systems (GTS/EMWIN) that can be used as the backbone communication system for tsunami warnings;

**Calls on** the recommendations of the previous four sessions of the ICG in Barbados, Venezuela, Panama and Martinique;

**Decides** to update the CARIBE-EWS Implementation Plan for the establishment of the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions;

**Urges** the IOC Secretariat and Member States to look for financial resources to implement the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions. IOC has been allocated \$60K to ICG-CARIBE to support the interim Secretariat and Capacity building.

---

Financial Implications: USD 60,000 (IOC Regular Programme)

## ANNEX III

### SPEECHES

#### **A. Address of the Head of the Tsunami Unit, Mr Peter Koltermann**

15 March 2010

Estimada Sra Calderon, representante de Coronel Jose Arnesto Soza, Secretario Ejecutivo de SINAPRED,  
Dr Rodriguez, director de INETER, Excelencias,  
Señoras y señores,  
estimados colegas

Muchas gracias por convocar al Grupo Intergubernamental de Coordinación del Sistema Alerta contra Tsunamis de la región Caribe en Managua, Nicaragua.

The look from my hotel window to the hills in the distance, the volcano cones in the far at sun rise or sunset, is very tempting. Maybe there is a chance to explore more of your country. For now we enjoy your pleasing company and your wonderful hospitality.

Lives are the most valuable asset we have, losing lives by neglect, ignorance, or carelessness should never happen. Loosing livelihoods, that is people's ability to lead the life they care for, should also not happen.

Both do happen when natural disasters strike - earthquakes, storm surges, hurricanes, floods or tsunamis. The lessons learnt from the Indian Ocean tsunami on December 26, 2004 are manifold. The most important one: identify the hazard, be aware of the risks, and be well prepared. These lessons are repeated again and again: Samoa and Tonga on 29 September 2009, Solomons Islands on 2 January 2010, Haiti on 12 January 2010, Chile on 27 February 2010. In each case people lost their lives and livelihoods. The message is on the wall.

At this point I would especially welcome our friends from Haiti. All of us have been deeply moved by the events of the 12 January 2010; all of us share your burden and are here to help you.

How should we prepare for these disasters, meet the challenge of the hazards and minimize the risk? A tsunami strikes a wide area of the coast, but not all areas are at the same risk. Identifying the areas most at risk focuses efforts, makes the necessary preparation manageable. In short: the unknown threat has to become individualized, personal.

In those areas identified at high risk it is on the community level where the preparation starts: which parts of the community are prone to the impact of the tsunami wave, are the buildings strong enough, the roads clear for evacuation, and where are people evacuated to? Does everyone know what to do and where to go?

Besides the technical preparation by operational agencies, the warning centres, the disaster management authorities, educating people, educating everyone is the most effective way to minimize the loss of life. Let's make the ominous threat less threatening by talking about it, and about how to respond. Education first happens at home, and soon at school. So educating children is an appropriate investment into a community's future.

It is not supposed to be impolite by starting with the IOC of UNESCO. The huge earthquake and tsunami off the coast of Chile in 1960 led to the establishment of the Pacific Tsunami Warning System PTWS by IOC. For almost forty years nobody acted about the well-known risks in other oceans. After the Indian Ocean Tsunami in 2004 again IOC was mandated to develop the Tsunami Warning Systems, this time for the Indian Ocean, the Caribbean and the European



Seas. These are end-to-end systems, nationally owned, coordinated between governments, assisted by IOC.

Since 2005 you are working on the Tsunami Warning System for the Caribbean, CARIBE-EWS. Progress has been good, but takes time. It took 5 years from Chile, 22 May 1960, to have the PTWS operational in 1965. In the Indian Ocean it again took five years. Your system plans to be operational, that is independent, autonomous from the interim service provided by the existing PTWS, in 2010. That date, the sun-set date of the interim cover, has to be revisited.

Today 16 countries from the 28 represented in the CARIBE-EWS are assembled here, there are 61 participants. That is a very good sign of the importance of your work, and the importance your governments attribute to the ICG. Haiti is another wake-up call. Let's us show we listened.

I wish you, also in the name of the new Director General of UNESCO, Ms Irina Bukova and the new Executive Secretary of IOC, Mme. Wendy Watson-Wright all a successful fifth Meeting of your ICG.

Muchas gracias.

## **B. Address of the Chairperson of the ICG/CARIBE EWS, Dr Lorna Inniss**

15 March 2010

Ms Ligia Calderon, representative of Coronel Arnesto Soza, Head of SINAPRED,  
Head of INETER Mr Alejandro Rodriguez, and our host for this meeting,  
Mr Peter Koltermann, Head of the Tsunami Unit of the IOC in Paris,  
Vice Chairs of the ICG, Mr Israel Matos (USA) and Mr Gustavo Malave (Venezuela),  
Heads of Delegation and other Delegates of the Member States of the ICG,  
Observers to the ICG,  
Representatives of UN organizations,  
Members of the Media,  
Ladies and Gentlemen,

I have the distinct honour, as the current Chair of the Caribbean Intergovernmental Coordination Group, and on behalf of our two Vice Chairs, to welcome you to this fifth session here in the beautiful city of Managua. We appreciate the gracious hospitality of the Government of the Republic of Nicaragua through the Local Organizing Committee, facilitating our arrival at this beautiful location. Mr. Rodriguez, please convey our sincere gratitude to your Government for hosting this meeting. We have a challenging agenda this week, and the salubrious surroundings here I am sure will help us to achieve our objectives.

Permit me to reflect for a moment on two events among many, which may have indirectly contributed to our presence here in Managua. I think of the Great Managua Earthquake of 1972 and the 1992 earthquake and tsunami, and while we empathize with those affected by these terrible events, I must also commend the Government of Nicaragua for the commitment and dedication shown in building greater resilience in its population against future events. And one direct consequence of hosting such a meeting is that we, the representatives of other ICG member states, have the unique opportunity of learning from you in Nicaragua (the veterans of major events) how we should develop and/or improve our national warning components and preparedness.

I recall that at the opening ceremony of the ICG IV meeting in Martinique last year, we acknowledged the absence of our colleagues from Honduras following the earthquake there. We

are glad that you are with us and we look forward to hearing from you about your experiences and the lessons learned.

Today, we also extend a special welcome to our colleagues from Haiti. In writing this speech, it seemed to me that no words have yet been created that convey our feelings as we watched the events of January 12<sup>th</sup> unfold. But if I may be forgiven for being somewhat presumptuous and speak on behalf of all the Member States and observers of the ICG, please know that, as a group, our thoughts are with you and your families and friends in Haiti, and we are all strongly committed to working with you to build an effective warning and mitigation system for future events. We also think of the population of Chile today as we begin our work this week. As they too begin the daunting task of rebuilding, we renew our purpose to utilize the many lessons and best practices which we learned from them and other states in the Pacific.

There are still those who say that we have not yet established a warning system in the Caribbean. I hope that we do not share that view. While improvements in all areas are definitely necessary, we are glad that we have a system in place. As in 2009 with the Honduras earthquake, the Caribbean tsunami early warning system was triggered this year with the Haiti earthquake, and the call from ICG IV for monitoring of the system's performance was very ably taken up by the United Nations, and we are pleased to have a post-event assessment report to review, permitting us to recommend and implement improvements in preparation for any future alerts. I believe that you would wish to join me in expressing our thanks to Peter Koltermann and his very competent team at the Tsunami Unit, particularly our technical Secretary Bernardo Aliaga, for what has been, in my view, an excellent year of technical and administrative support to the countries of the Wider Caribbean Region. Peter, we in the region are reaping the rewards of your team's seemingly tireless efforts on our behalf, and I promise you that the attention of the region has been drawn to your work during the last five years.

Ladies and Gentlemen:

Before I conclude, I wish to draw to your attention to a number of excellent partnerships which have been emerging among the Member States of the ICG CARIBE EWS. And in this context, I wish to acknowledge the Members States from other ICGs present at this meeting. It bodes well for the construction of a strong, harmonized global warning system.

But the diversity of our region presents a challenge to the construction and maintenance of all aspects of a multi-hazard warning system. Our Member States include a few of the world's largest countries, geographically, technically and based on size of the economy. At the other end of the spectrum, there are a number of Member States, including my own, of very small size, technical capacity and means. And we have a large number of states between these two extremes.

But in the last five years, I have observed the rich partnering with the poor, the strong helping the weak, the technically competent transferring technology to the technically challenged. These partnerships have been forged in monitoring and detection systems, in assistance with communications, and in the all-important area of public education and awareness. But just as remarkable, in my view, is the determination of those who have been devastated by earthquakes and tsunamis, like Nicaragua, Colombia and Puerto Rico. They stand ready to demonstrate their best practices to those of us who have not lived through such an experience. They are saving us from the constant threat of complacency. And I hope that all members of the ICG join with me today in applauding the strong feeling of brotherhood and camaraderie which we have built, right along with the technical components of the warning system. It is programmes such as ours that save lives, yes, but we can stand confident today that we are also ultimately contributing to the goal of world peace.

Distinguished Delegates, Ladies and Gentlemen: On behalf of the two Vice Chairs: Mr. Israel Matos and Mr. Gustavo Malave I welcome you to the fifth session of the ICG for the Caribbean and Adjacent Regions.

Thank you.

## ANNEX IV

### LIST OF DOCUMENTS

#### Working Documents

| Doc. No.                     | Document title   |
|------------------------------|--|
| ICG/CARIBE EWS-V/1 Prov.     | Provisional Agenda (English, French and Spanish)   |
| ICG/CARIBE EWS-V/1 Prov. Add | Provisional Timetable (English only)   |
| ICG/CARIBE EWS-V/2 Prov.     | Provisional annotated agenda (English/only)  |
| ICG/CARIBE EWS-V/3           | Draft Summary Report (to be prepared after the session) (English/Spanish)  |
| ICG/CARIBE EWS-V/4Rev        | Provisional List of Documents (English only)   |
| ICG/CARIBE EWS-V/5           | IOC Executive Secretary's Report (English only)  |
| ICG/CARIBE EWS-V/6           | Chairman's Report (English)  |
| ICG/CARIBE EWS-V/7           | ICG CARIBE EWS Secretariat's report (English/Spanish)  |
| ICG/CARIBE EWS-V/8           | ICG CARIBE EWS-IV Recommendations Status Report (English)  |
| ICG/CARIBE EWS-V/9           | Working Group I Report (English/Spanish)   |
| ICG/CARIBE EWS-V/10          | Proposal Caribe Wave Exercise 2011. Caribbean Tsunami Exercise   |
| ICG/CARIBE EWS-IV/13         | Working Group 1: Technical, logistical and administrative requirements of a Regional Tsunami Warning Centre for the CARIBE EWS   |
| ICG/CARIBE EWS-IV/14         | ITIC's Report of Tsunami signage   |
| IOC/TOWS-WG-I/3              | Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), First Meeting, UNESCO Headquarters, Paris, France, 3–4 April 2008 |
| IOC/TOWS-WG-II/3             | Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Second Meeting, UNESCO Headquarters, Paris, France, 27 March 2009 |
| IOC Technical Series 78      | CARIBE EWS Implementation Plan (English only)  |
| ICG/CARIBE EWS-II/11         | Communications Plan for the Interim Tsunami Advisory Information Service to the Caribbean Sea and Adjacent Regions (English only)  |

IOC Technical Series 90

Tsunami and other Coastal Hazards Warning  
System for the Caribbean and Adjacent Regions  
(CARIBE EWS), 12 January 2010 Haiti  
Earthquake and Tsunami Event—Post-Event  
Assessment of CARIBE EWS Performance

## Information Documents

| Doc. No.                   | Document title  |
|----------------------------|---|
| --                         | Information for participants (venue, hotels, airport,bus) (see website)   |
| ICG/CARIBE EWS-V/Inf. 1    | List of Caribbean National Contacts updated 18 February 2010 (not posted in the website)  |
| --                         | IOC Assembly Resolution XXIII-13 (English/Spanish)  |
| ICG/CARIBE EWS-III/3       | Summary Report of the Third Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-III) (English with Executive Summaries in Spanish and French) |
| ICG/CARIBE EWS-IV/3        | Summary Report of the Fourth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-IV) (English with Executive Summaries in Spanish and French) |
| IOC/CL/2323                | Letter of Invitation to ICG/CARIBE-EWS-V (English/Spanish/French)   |
| ICG/CARIBE EWS-II/12       | A Caribbean Tsunami Information Center: Roles and Functions for the Implementation of an Effective Tsunami and Coastal Hazards Warning and Mitigation System (English only)   |
| IOC/INF-1202.rev (Dec. 08) | National Report Format (English Only)   |
| --                         | Working Group 2 Report  |
| --                         | Working Groups Fact Sheets  |

ANNEX V

LIST OF PARTICIPANTS

**I. OFFICERS OF THE ICG/CARIBE EWS**

***Chair ICG***

Dr Lorna INNIS  
Deputy Director  
Coastal Zone Management Unit  
Bay Street, St Michael BB11156  
Barbados  
Tel. (246) 246 228 5950  
Fax (246) 246 228 5956  
E-mail: linniss@coastal.gov.bb

***Vice-Chair ICG***

Mr Israel MATOS  
Meteorologist in Charge  
NOAA/ National Weather Service  
Weather Forecast Office  
Carretera 190 N°. 4000 Carolina, P.R., San Juan,  
Puerto Rico 00979  
USA  
Tel: (787) 253-4501 Ext. 222  
Fax: (787) 253-7802  
E-mail: israel.matos@noaa.gov

***Vice-Chair ICG***

Dr Gustavo Malave  
President in Charge  
Petroregional del Lago, S.A  
Av. Libertador, Edificio Centro Petrolero  
Torre Lama Piso  
Maracaibo – Estado Zulia  
Venezuela  
Tel: 58 (0261) 806 1012  
E-mail: MALAVEG@PDVSA.COM

**2. ICG/CARIBE-EWS MEMBER STATES**

**BARBADOS**

Ms Judy R. THOMAS  
Director  
Department of Emergency Management  
#30 Warrens Industrial Park  
St Michael  
Barbados  
Tel: 246 421 8134  
Fax: 246 421 8612  
E-mail: jthomas@barbados.gov.bb

Dr Lorna INNIS  
Deputy Director  
Coastal Zone Management Unit  
Bay Street, St Michael BB11156  
Barbados  
Tel. (246) 246 228 5950  
Fax (246) 246 228 5956  
E-mail: linniss@coastal.gov.bb  
(also ICG/CARIBE-EWS Chair)

**BERMUDA**

Dr Jerome AUCAN  
Researcher  
Bermuda Institute for Ocean Sciences (formerly  
Bermuda Biological Station for Research, Inc.)  
17 Biological Lane St. Georges GE-01  
Bermuda  
E-mail: jerome.aucan@bios.edu

**BRITISH VIRGIN ISLAND (UK)**

Mr Jasen PENN  
Emergency Communication Officer  
Disaster Management  
3 Wailing Road  
Roadtown  
Virgin Island UK  
Tel: 284-468-9665  
Fax: 284-494-2024  
E-mail: japenn@us.gov

**COSTA RICA**

Mr Sigifredo PEREZ  
Jefe Departamento de Operaciones  
Comision Nacional de Emergencia  
San José, Pavas. Frente al aeropuerto Tobias  
Bolaños  
San Jose  
Costa Rica  
Tel: 506 2210-2732  
Fax: 506 2296-3644  
E-mail: sperez@cne.go.cr

## **DOMINICA**

Ms Thesser DE ROCHE  
Geologist/Programme Officer  
Ministry of National Security, Immigration and  
Labour  
Roseau  
Dominica  
Tel: 1 767 448 7777  
E-mail: thessa\_deroche@yahoo.com

## **DOMINICAN REPUBLIC**

Mr Claudio MARTINEZ  
Oficina Nacional de Meteorologia  
Encargado Unidad de Tsunami  
meteorologist  
1153 santo domingo  
d.n  
Dominican Republic  
Tel: 1 829 779 0818  
E-mail: claudiomartin85@hotmail.com

## **EL SALVADOR**

Ms Jeniffer LARREYNAGA  
Seismology Specialist  
Servicio Nacional de Estudios Territoriales  
San Salvador  
El Salvador  
Tel: 503 2267 9595  
Fax: 503 2267 9520  
E-mail: jlarreynaga@marn.gob.sv

## **FRANCE**

Prof. Steve TAIT  
Director Volcanologic and Seismologic  
Observatoires  
Institut de Physique du Globe de Paris  
4 Place Jussieu  
Paris 75005  
Tel : 33 (0)623571204  
Fax : 33 (0)1 44 27 24 81  
E-mail : tait@ipgp.jussieu.fr

Dr Marie-Paule BOUIN  
Seismologist  
Observatoire Volcanologique et Sismologique de  
la Guadeloupe / IPGP  
Le Houëlmon  
97113 Gourbeyre  
Guadeloupe, F.W.I  
France  
Tel: 590 (0) 590 99 11 33  
Fax: 590 (0) 590 99 11 34  
E-mail : bouin@ipgp.fr

Dr Valerie CLOUARD  
Directeur  
Observatoire Volcanologique et Sismologique de  
Martinique / IPGP  
Morne des Cadets  
97250 Fonds Saint-Denis  
Martinique F.W.I  
France  
Tel: +596 (0) 596 78 41 44  
Fax : + 596 (0) 596 55 80 80  
E-mail : clouard@ipgp.jussieu.fr

LCL. Philippe COVA  
ETAT- Major-De - Zone  
Rue  
Victor Sèvere  
Bp 647-648  
Fort de France 97262"  
Tel: 00 596 (0) 596 393 937  
Cel : 00 596 (0) 696 33 16 25  
Fax: 00 596 (0) 596 393 936  
E-mail:  
philippe.cova@martinique.pref.gouv.fr

Prof. Narcisse Zahibo  
Professor  
97159 Pointe a Pitre  
Guadeloupe  
Tel : + 590 590 483107  
Fax : + 590 590 48 31 05  
E-mail : narcisse.zahibo@univ-ag.fr

## **HAITI**

Ms Yvrose JEAN  
Directrice General  
Service Maritime et de Navigation d'Haiti  
SEMANAH  
Email: zyvrou@hotmail.com

Ms Marie Carmel OSCAR  
Conseiller Technique  
SEMANAH  
Blvd La Saline  
Pap, Haiti  
Tel: (509)3449-3220 3585-8495  
E-mail: carosma@hotmail.com

Mr Gerard METAYER  
Port au Prince  
Tel 509 37135936  
E-mail: gerard\_metayer@yahoo.fr

Mr Ronald SEMELFORT  
Centre National de Météorologie  
Aéroport International de Port-au-Prince  
Tel: 50937332885  
Email: ronasem@yahoo.fr

## HONDURAS

Mr Dimas Alonso MERCADO  
Comision Permanente de Contingências  
Edificio COPECO, carretera a Mateo  
Comayaguela, M.D.C  
Honduras  
Tel: +504 2290606 ext. 401  
Fax: +504 2290623  
E-mail: [alonzoaguadesastres@yahoo.com](mailto:alonzoaguadesastres@yahoo.com)

Mr Manuel RODRIGUEZ  
Professor  
11101 Tegucigalpa  
Honduras  
Tel: 504 33 906886

## JAMAICA

Mr Ronald Jackson  
Office of Disaster Preparedness and Emergency  
Management  
2-4 Haining Road  
Kingston  
Jamaica  
Tel: 876-906-9299  
Fax: 876-754-3229  
E-mail: [rjackson@odpem.org.jm](mailto:rjackson@odpem.org.jm)

Mr Lyndon Brown  
Head Earthquake Unit  
University of West Indies (Mona)  
Tel: (876) 927-2586 |  
Fax: (876) 977-3575  
E-mail: [lyndon.brown@uwimona.edu.jm](mailto:lyndon.brown@uwimona.edu.jm)

## NICARAGUA

Ms Angelica MUNOZ  
Director General de Geofísica  
Instituto Nicaraguense de Estudios Territoriales  
Frente a Hospital Metropolis  
Apdo. Postal 2110  
Managua Nicaragua  
Tel: 505 224 92761  
Fax: 505 224 91082  
E-mail: [angelica.munoz@gf.inter.gob.ni](mailto:angelica.munoz@gf.inter.gob.ni)

Mr Alex CASTELLON  
Responsable de la Unidad SIG  
Instituto Nicaraguense de Estudios Territoriales  
Frente a Hospital Metropolis  
Apdo. Postal 2110  
Managua Nicaragua  
E-mail: [alex.castellon@gf.ineter.gob.ni](mailto:alex.castellon@gf.ineter.gob.ni)

Ms Ana IZAGUIRRE  
Contact Nacional  
SINAPRED  
Edificio SINAPRED, Rotonda Colon 50 m al  
norte, frente a la Avenida Bolívar  
Managua Nicaragua  
E-mail: [aizaguirre8@gmail.com](mailto:aizaguirre8@gmail.com)

Dr Alejandro RODRIGUEZ  
Director  
Instituto Nicaraguense de Estudios Territoriales  
Frente a Hospital Metropolis  
Apdo. Postal 2110  
Managua Nicaragua  
Tel: (505) 249-2746  
Fax: (505) 249-1890  
E-mail: [alejandro.rodriguez@ineter.gob.ni](mailto:alejandro.rodriguez@ineter.gob.ni)

Mr Norlan ROMERO  
Coordinador Operativo de Proyecto DIPECHO  
IV  
Cruz Roja Nicaraguense  
Managua  
Nicaragua  
Tel: +505 265-1428  
Fax: +505 2651643  
E-mail: [norlanr@hotmail.com](mailto:norlanr@hotmail.com)

Ms Márcia Sanchez  
Responsable de Proyectos  
Cruz Roja Nicaraguense  
Telf: +505 265-1428  
Fax: + 505 2651643  
E-mail: [planes\\_proyrcn@humanidad.org.ni](mailto:planes_proyrcn@humanidad.org.ni)

Mr Emilio TALAVERA  
Director de Sismología  
Instituto Nicaraguense de Estudios Territoriales  
Frente a Hospital Metropolis  
Apdo. Postal 2110  
Managua Nicaragua  
Tel: 505 224 92761 ext 115  
Fax: 505 224 91082  
E-mail: [emilio.talavera@gf.ineter.gob.ni](mailto:emilio.talavera@gf.ineter.gob.ni)

## PANAMA

Mr Arnulfo SANCHEZ  
Direccion General de Recursos Marinos y  
Costeros de la Autoridad Maritima de Panama  
Edificio 5534  
Diablo Heights  
P.O. Box 8062  
Panamá 7  
Tel: 507 232-5528 / 5553  
Fax: (507) 232-5527  
E-mail: [arnulfosanchez@hotmail.com](mailto:arnulfosanchez@hotmail.com)



## USA

Mr Xavier William "Bill" PROENZA  
Head of Delegation  
NOAA National Weather Service  
Regional Director, Southern USA  
819 Taylor St., 10<sup>th</sup> Floor  
Fort Worth, Texas.  
United States  
Cell: 817-978-1000  
Tel 817 918 1000  
Fax: 817-978-4187  
E-mail: [bill.proenza@noaa.gov](mailto:bill.proenza@noaa.gov)

Ms Allison ALLEN  
Oceanographer  
NOAA  
NOAA National Ocean Service, SSMC 4 Station  
7442  
1305 East West Highway  
Silver Spring, Maryland 20910  
Tel: 301-713-2890 Ext. 166  
Fax: 301-713-4437  
E-mail: [allison.allen@noaa.gov](mailto:allison.allen@noaa.gov)

Ms Paula DUNBAR  
Physical Scientist  
NOAA/National Geophysical Data Center.  
325 Broadway. 80303-3328 Boulder, CO  
United States  
Tel: 303-497-6084  
Fax: 303-497-6513  
E-mail: [paula.dunbar@noaa.gov](mailto:paula.dunbar@noaa.gov)

Dr Victor HUERFANO  
Interim Director  
PRSN  
Mayaguez Puerto Rico 00681  
United States  
Tel 1 787 8338433  
Fax 1 787 2651684

Dr Daniel MCNAMARA  
Seismologist  
U.S. Geological Survey  
Box 25046, Stop 966  
Denver Federal Center  
Denver Colorado CO 80225  
United States  
Tel: 303-273-8550  
Fax: 303-273-8600  
E-mail: [mcnamara@us.gov](mailto:mcnamara@us.gov)

Prof. Aurelio MERCADO  
Professor/ Marine Advisor, Director Coastal  
Hazards Center  
University of Puerto Rico  
Department of Marine Sciences  
359 Blvd. Alfonso Valdes  
Physics, Geology and Marine Sciences Building  
– Office F-420  
Mayaguez 00680

Puerto Rico  
Tel: 787 265 5461  
Fax: 787 265 5461  
E-mail: [aurelio.mercado@upr.edu](mailto:aurelio.mercado@upr.edu)

Ms Christa Glee VON  
HILLEBRANDT- ANDRADE  
Manager NOAA NWS Caribbean Tsunami  
Warning Program  
Mayagüez, PR. USA – 00680  
Tel: 1 787 833 8433  
Fax: 1 787 265 1684  
E-mail: [christa@prsn.uprm.edu](mailto:christa@prsn.uprm.edu)

## VENEZUELA (Bolivarian Republic of)

Mr Francisco GARCES  
Presidente de FUNVISIS  
Av. Guaicaipuro con calle Tiuna, prolongación  
calle Mara,  
El LLanito  
Caracas- 1070  
Venezuela.  
Tel: 58 212 257 5153  
Fax: 58 212 257 9977  
E-mail: [fgarces@funvisis.gob.ve](mailto:fgarces@funvisis.gob.ve)

Mr Franck AUDEMARD  
Jefe Departamento de Ciencias de la Tierra  
FUNVISIS  
Av. Guaicaipuro con calle Tiuna, prolongación  
calle Mara,  
El LLanito  
Caracas- 1070  
Venezuela.  
Tel: 58 212 257 7672  
Fax: 58 212 257 9977  
E-mail: [faudemard@funvisis.gob.ve](mailto:faudemard@funvisis.gob.ve)

Mr Juan Luis GUZMAN  
Instructor de Prevencion  
FUNVISIS  
Av. Guaicaipuro con calle Tiuna, prolongación  
calle Mara,  
El LLanito  
Caracas- 1070  
Venezuela.  
Tel: 58 4168214391  
E-mail: [jguzman@funvisis.gob.ve](mailto:jguzman@funvisis.gob.ve)

Ms Gloria ROMERO  
Head of the National Seismological Service  
FUNVISIS  
Av. Guaicaipuro con calle Tiuna, prolongación  
calle Mara,  
El LLanito  
Caracas- 1070  
Venezuela.  
Tel: 58 2 122575153  
Fax: 58 2122579860  
E-mail: [gromero@funvisis.gob.ve](mailto:gromero@funvisis.gob.ve)

## **TRINIDAD AND TOBAGO**

Ms Desiree JOSEPH  
Mitigation Manager  
4A Orange Gove Road  
Tacarigua  
Trinidad and Tobago  
Tel: 868 640 1285  
Fax: 868 640 8988  
E-mail: [djoseph@mns.gov.tt](mailto:djoseph@mns.gov.tt)

Mr Marlon NOEL  
Assistant Director  
Trinidad and Tobago Meteorological Services  
Piarco Airport  
Trinidad and Tobago  
Tel: 1 868 669 5465  
Fax: 1 868 669 4009

## **3. OTHER IOC MEMBER STATES**

### **KUWAIT**

Dr Muna HUSAIN  
Professor  
Environment Public Authority  
Al Surrah P.O. Box 221  
45703  
Surrah  
Kuwait  
Tel: 96566339456  
Fax: 96525220543

## **3. ORGANIZATIONS**

### **PACIFIC TSUNAMI WARNING CENTER**

Mr Jason TUELL  
Chief Meteorological Services Division  
NOAA/NWS Office of Climate, Water and  
Weather Services  
W/OS 2  
1325 East-West Highway 13220  
Silver Spring MD 20910  
United States  
Tel: 1 301 713 0624 x 105  
Fax: 1 301 713 1520  
Email: [jason.tuell@noaa.gov](mailto:jason.tuell@noaa.gov)

## **INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION IOC (of UNESCO)**

### ***Tsunami Unit***

Mr Bernardo ALIAGA  
Technical Secretary ICG-CARIBE-EWS  
IOC Tsunami Unit  
Intergovernmental Oceanographic Commission  
(IOC)  
1 Rue Miollis  
75732 Paris, France  
Tel: (33) 1 456 83 980  
Fax: (33) 1 456 85 810  
E-mail: [b.aliaga@unesco.org](mailto:b.aliaga@unesco.org)

Mr Peter KOLTERMANN  
Head IOC Tsunami Unit  
Intergovernmental Oceanographic  
1 Rue Miollis 75732 Paris Cedex 15,  
Tel: +33 (0)1 45 68 40 15,  
Fax: +33 (0) 45 68 58 10,  
E-mail: [p.koltermann@unesco.org](mailto:p.koltermann@unesco.org)

Ms Silvia Sermenio  
Assistant  
IOC Tsunami Unit  
Intergovernmental Oceanographic Commission  
(IOC)  
1 Rue Miollis  
75732 Paris, France  
Tel: (33) 1 456 83 964  
Fax: (33) 1 456 85 810  
E-mail: [s.sermenio@unesco.org](mailto:s.sermenio@unesco.org)

Ms Diana Patricia Mosquera Calle  
Consultant  
IOC Tsunami Unit  
Intergovernmental Oceanographic Commission  
(IOC)  
1 Rue Miollis  
75732 Paris, France  
Tel: (33) 1 456 83 964  
Fax: (33) 1 456 85 810  
E-mail: [d.mosquera@unesco.org](mailto:d.mosquera@unesco.org)

## **IOC SUB-COMMISSION FOR THE CARIBBEAN AND ADJACENT REGIONS (IOCARIBE)**

Mr Cesar TORO  
IOC (UNESCO) Secretary for  
IOCARIBE  
The Towers, 25 Dominica Drive, 3rd Floor  
Kingston 5  
Kingston, Jamaica  
Tel.: +1 876 630 5317  
E-mail: [c.toro@unesco.org](mailto:c.toro@unesco.org)

#### 4. OBSERVERS

Carlos Alfredo PUAC  
CEPRENENAC  
Coordinador del Área Programática Científico  
Técnica, APCT  
9a. Calle 14-81 Zona 3, Mixco Lomas de Cotiá  
Ciudad de Guatemala  
Guatemala  
Tel: 505 23900200  
E-mail: cpuac@sica.int

Dr Wilfried STRAUCH  
Bundesanstalt für Geowissenschaften und  
Rohstoffe (BGR) in Hannover  
Consultant, Project on Georisks in Central  
America  
INETER Instituto Nicaraguense de Estudios  
Territoriales Proyecto de Geo- Riesgos/BGR  
Managua  
Nicaragua  
Tel: +505 22 49 27 61 ext 104  
Fax: +505 22 49 10 82  
E-mail: wilfried.strauch@yahoo.com

Mr Walter WINTZER  
CEPRENENAC  
Coordinador- Área Programática de  
Preparación y Respuesta  
Avenida Hincapié 21-72, Zona 13  
Ciudad de Guatemala  
Guatemala  
Tel: (502) 2362- 1981-83  
Fax: (502) 2390-0200  
E-mail: wwintzer@sica.int

#### 5. LOCAL ORGANIZING COMITEE

Ms Angelica MUNOZ  
Director General de Geofísica  
Instituto Nicaraguense de Estudios  
Territoriales  
Frente a Hospital Metropolis  
Apdo. Postal 2110  
Managua Nicaragua  
Tel: 505 224 92761  
Fax: 505 224 91082  
E-mail: angelica.munoz@gf.inter.gob.ni

Ms Rosario AVILES  
Vulcanologa  
Instituto Nicaraguense de Estudios  
Territoriales  
Frente a Hospital Metropolis  
Apdo. Postal 2110  
Managua Nicaragua  
Tel: +505 22492761 ext 112  
E-mail : rosario.aviles@gf.ineter.gob.ni

ANNEX VI

**LIST OF ACRONYMS**

|             |  |
|-------------|--|
| AFTN        | Aeronautical Fixed Telecommunications Network  |
| AWS         | Anguilla National Warning System (UK)  |
| CAP         | Common Alerting Protocol   |
| CARICOM     | Caribbean Community  |
| CDERA       | Caribbean Disaster Emergency Response Agency   |
| CEPREDENAC  | Central American Coordination Center for Disaster Prevention   |
| CRID        | Regional Disaster Information Center (Latin America and the Caribbean)   |
| CTBTO       | Comprehensive Nuclear-Test-Ban Treaty Organization   |
| CTIC        | Caribbean Tsunami Information Centre   |
| CTWC        | Caribbean Tsunami Warning Centre   |
| DBCP        | Data Buoy Cooperation Panel (IOC-WMO)  |
| DRR-SD      | Disaster Risk Reduction and service delivery   |
| EMWIN       | Emergency Managers Weather Information Network (USA)   |
| GLOSS       | Global sea level Observing System (UNESCO/IOC)   |
| GOES        | Geostationary Operational Environmental Satellite (US/NOAA)  |
| GOOS        | Global Ocean Observing System (WMO-UNEP-IOC)   |
| GTS         | Global Telecommunication System  |
| IBCCA       | International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico  |
| ICG         | Intergovernmental Coordination Group   |
| ICG/IOTWS   | Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning & Mitigation System  |
| ICG/NEAMTWS | Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and connected Seas |
| ICG/PTWS    | Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System   |
| IMS         | IP Multimedia Subsystem  |
| INETER      | Instituto Nicaraguense de Estudios Territoriales   |
| INTERREG    | EU-funded programme  |

|          |   |
|----------|---|
| IOCARIBE | IOC Sub-Commission for the Caribbean and Adjacent Regions |
| IPGP     | Institut de physique du Globe de Paris (France)           |
| ISDR     | International Strategy for Disaster Reduction (UN)        |
| ISO      | International Organization for Standardization            |
| ITIC     | International Tsunami Information Center                  |

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

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

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