Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

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

Sixth Meeting

Paris, France
20–21 February 2013

UNESCO

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IOC/TOWS-WG-VI/3
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EXECUTIVE SUMMARY

The Sixth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-VI) was held in Paris, France, on 20 and 21 February 2013, at UNESCO Headquarters, under the chairmanship of Mr Yutaka Michida (IOC Vice-chairman). The meeting evaluated progress in actions and decisions taken by the Governing Bodies, mainly through Resolution XXVI-7 and Decision EC-XLV/Dec.3.2.

The group recommended the IOC Assembly:

- To extend the TOWS-WG for a further inter-sessional period, with the same mandate and membership;
- To consider establishing the Inter-ICG Task Teams on Disaster Management and Preparedness and on Tsunami Watch Operations on a more regular basis with their revised TORs and composition proposed in ANNEX II;
- To grant additional time for the TOWS-WG to develop Terms of Reference for the studies of data gap analysis and the conduct of these studies by the ICGs.

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

The group accepted the recommendations from the Task Team on Tsunami Watch Operations and requested the Task Team to implement them, in particular,

- Finalize the documentation of areas of responsibilities;
- Develop a standard questionnaire for post-event analysis in consultation with the Task Team on Disaster Management and Preparedness.

The group requested the Inter-ICG Task Team on Tsunami Watch Operations to review the present status of issuing of tsunami advisories to shipping and recommend ways of enhancing dissemination in consultation with relevant organizations including WMO, IHO and IMO.

The group strongly encouraged the Inter-ICG Task Team on Hazard Assessment Related to Highest Potential Tsunami Area to meet as soon as possible.

The group agreed that the work on ‘Outreach and Communications Plan for the IOC Tsunami Programme’ should be implemented by the Group under the leadership of the Chair of ICG/IOTWS.

The group requested that routine reporting on how the IOC tsunami alert list server is performing should be provided to the Group and that the Task Team on Tsunami Watch Operation will review what information goes on the list server and report to the Group.

RESUMÉ EXÉCUTIF

La sixième réunion du Groupe de travail sur les systèmes d'alerte aux tsunamis et aux autres aléas liés au niveau de la mer (TWOS-WG-VI) s'est tenue à Paris, France, les 20 et 21 février 2013, au Siège de l'UNESCO, sous la présidence de M. Yutaka Michida (Vice-Président de la COI). À ladite réunion, le Groupe a évalué les progrès accomplis eu égard aux actions menées et aux décisions prises par les organes directeurs, principalement par le biais de la résolution XXVI-7 et de la décision EC-XLV/Dec.3.2.

Le Groupe a recommandé à l'Assemblée de la COI :

- de reconduire le TOWS-WG pour une intersession supplémentaire, avec le même mandat et la même composition ;
- d'envisager d'établir les équipes spéciales inter-GIC sur la gestion et la préparation en cas de catastrophe et sur les opérations de veille aux tsunamis sur une base plus régulière, avec les mandats et la composition révisés proposés à l'Annexe III ;
- d'accorder au TOWS-WG davantage de temps pour élaborer le mandat les études relatives à l'analyse des données manquantes et la réalisation de ces études par les GIC.

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

Le Groupe a approuvé les recommandations de l'équipe spéciale sur les opérations de veille aux tsunamis et a prié cette dernière de les mettre en œuvre, et en particulier

- de finaliser la documentation sur les zones de responsabilité ;
- d'élaborer, en consultation avec l'équipe spéciale sur la gestion et la préparation en cas de catastrophe un questionnaire standard pour les enquêtes consécutives aux tsunamis.

Le Groupe a prié l'équipe spéciale inter-GIC sur les opérations de veille aux tsunamis d'examiner les conditions actuelles d'émission des avis relatifs aux tsunamis adressés à la marine marchande et de recommander des moyens d'améliorer leur diffusion en consultation avec les organisations compétentes, notamment l'OMM, l'OHI et l'OMI.

Le Groupe a vigoureusement encouragé l'équipe spéciale inter-GIC sur l'évaluation des aléas induits par les zones à fort potentiel tsunamigène de se réunir le plus tôt possible.

Le Groupe est convenu que la mise en œuvre des travaux relatifs au « plan de communication et de sensibilisation pour le programme relatif aux tsunamis de la COI » devrait lui incomber, sous la direction du Président du GIC/IOTWS.

Le Groupe a demandé qu'il lui soit systématiquement rendu compte de la manière dont fonctionne le serveur de liste pour la diffusion d'alertes aux tsunamis de la COI et que l'équipe spéciale sur les opérations de veille aux tsunamis étudie quelles informations vont sur le serveur de liste et lui fasse rapport à ce sujet.

RESUMEN DISPOSITIVO

La sexta reunión del Grupo de Trabajo sobre sistemas de alerta contra tsunamis y otros peligros relacionados con el nivel del mar y atenuación de sus efectos (TOWS-WG-VI) se celebró los días 20 y 21 de febrero de 2013 en París (Francia), en la Sede de la UNESCO, bajo la presidencia del Sr. Yutaka Michida (Vicepresidente de la COI). En la reunión se pasó revista a los avances relativos a las medidas y decisiones adoptadas por los órganos rectores, particularmente en virtud de la Resolución XXVI-7 y la Decisión EC-XLV/Dec.3.2.

El Grupo recomendó a la Asamblea de la COI que:

- prorrogara el TOWS-WG por un nuevo periodo entre reuniones, con el mismo mandato y composición;
- estudiara la posibilidad de establecer Equipos de Trabajo de los ICG sobre Gestión de Desastres y Preparación y sobre Actividades de Vigilancia de Tsunamis con una mayor frecuencia, cuyos mandatos y composición se proponen en el Anexo III;
- concediese más tiempo al TOWS-WG para definir el alcance de los estudios relativos al análisis de los datos faltantes y a la realización de dichos estudios por los ICG.

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

El Grupo aceptó las recomendaciones formuladas por el Equipo de Trabajo sobre Actividades de Vigilancia de Tsunamis y le pidió que las aplicara, en particular que:

- ultimara los documentos sobre las zonasde responsabilidad;
- elaborara un cuestionario tipo para el análisis posterior a los tsunamis en consulta con el Equipo de Trabajo sobre Gestión de Desastres y Preparación.

El Grupo pidió al Equipo de Trabajo de los ICG sobre Actividades de Vigilancia de Tsunamis que examinara la situación actual en cuanto a la publicación de avisos de tsunami para la navegación y que recomendara formas de mejorar su difusión, en consulta con las organizaciones pertinentes, en especial la OMM, la OHI y la OMI.

El Grupo alentó enérgicamente al Equipo de Trabajo de los ICG sobre evaluación de riesgos en zonas de alto potencial tsunamigénico a que se reuniera lo antes posible.

El Grupo acordó que la labor relacionada con el “plan de difusión y comunicación para el Programa sobre Tsunamis de la COI”, debería estar a su cargo, bajo la dirección del Presidente del ICG/IOTWS.

El Grupo pidió que se le proporcionaran informes periódicos sobre el funcionamiento del servidor de la lista de alertas contra tsunamis de la COI y que el Equipo de Trabajo sobre Actividades de Vigilancia de Tsunamis vigilara qué información se incorporaba en el servidor de la lista y lo informara al respecto.

РАБОЧЕЕ РЕЗЮМЕ

20-21 февраля 2013 г. в Париже, Франция, в Штаб-квартире ЮНЕСКО под председательством заместителя председателя МОК г-на Ютаки Мичиды состоялось Шестое совещание Рабочей группы по системам предупреждения и смягчения последствий цунами и других опасных явлений, связанных с изменением уровня моря (РГ-СПЦО). Совещание оценило прогресс в осуществлении мероприятий и выполнении решений, принятых Руководящими органами, в основном по Резолюции XXVI-7 и Решению EC-XLV/Dec.3.2.

Рабочая группа рекомендует Ассамблее МОК:

- продлить деятельность РГ СПЦО на следующий межсессионный период с ее действующим в настоящее время кругом ведения и членским составом;
- рассмотреть возможность учреждения Общих целевых групп МКГ по обеспечению готовности к стихийным бедствиям и ликвидации их последствий и по наблюдению за цунами на более регулярной основе с пересмотренными кругом ведения и членским составом, представленными в Приложении III;
- предоставить РГ СПЦО дополнительное время для выработки круга ведения по исследованиям воздействия пробелов данных и проведения этих исследований силами МКГ.

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

Группа одобрила рекомендации Целевой группы по наблюдению за цунами и предложила Целевой группе осуществить их, и в частности:

- завершить подготовку документации по сферам ответственности;
- разработать, в консультациях с Целевой группой по обеспечению готовности к стихийным бедствиям и ликвидации их последствий, стандартный вопросник для анализа ситуации после стихийных бедствий.

Группа предложила Целевой группе МКГ по наблюдению за цунами пересмотреть нынешний статус выпуска оповещений о цунами для судоходства и рекомендовать методы улучшения их распространения в консультациях с соответствующими организациями, включая ВМО, МГО и ММО.

Группа настоятельно призвала Общую целевую группу по оценке опасностей, связанных с потенциально наиболее цунамигенными районами, собраться на заседание как можно раньше.

Группа согласилась с тем, что работа по «Плану охвата и коммуникации для Программы МОК по цунами» должна осуществляться силами Группы под руководством Председателя МКГ/СПЦИО.

Группа предложила предоставлять ей отчеты о работе сервера списков предупреждения о цунами МОК, с тем чтобы Целевая группа по наблюдению за цунами рассмотрела информацию, попадающую в списки, и предоставила Группе соответствующий доклад.

1. OPENING AND WELCOME

1.1 OPENING

1. The Chair of TOWS-WG, Mr Yutaka Michida, welcomed the participants and opened the Sixth Meeting of the Working Group on Tsunamis and Other Hazards Relates to Sea-Level Mitigation Systems (TOWS-WG-VI).

2. Mr Yutaka Michida stressed that the world continues to face tsunami disasters and the most recent example being the tsunami that hit the Solomon Islands on 6 February 2013. Mr Michida reminded the TOWS-WG about the Terms of Reference for the Working Group (WG). He also reviewed the progress since the Fifth Meeting of TOWS-WG (IOC/TOWS-WG-V/3), the recommendations made during this meeting, and he summarized the instructions given to the TOWS-WG at the 26th Session of the IOC Assembly held in Paris, France, from the 22 June to 6 July 2011 (IOC-XXVI/3), and the 45th Session of IOC Executive Council held in Paris, France, from 26 to 28 June 2012 (IOC/EC-XLV/3). The IOC governing bodies had endorsed virtually all decisions and recommendations from the Fifth Meeting of Working Group of TOWS and respective sessions of the Intergovernmental Coordination Group (ICG). The proposal to expand coverage by the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE-EWS) to the Western Atlantic had not been approved by the Executive Council (EC) of Intergovernmental Oceanographic Commission (IOC). Mr Michida also highlighted the need to prepare in advance any resolution to the 27th Session of the IOC Assembly. In closing, Mr Michida urged that TOWS, ICGs and Member States do their best to continue the Tsunami Programme and activities in light of the difficult financial situation.

3. Ms Wendy Watson-Wright, Executive Secretary of the Intergovernmental Oceanographic Commission (IOC), also welcomed the participants. She highlighted some of the important achievements and the steady progress since the last TOWS meeting, e.g.: (i) the first Exercise NEAMWAVE 12 held the 27 and 28 November 2012 (IOC/2012/TS/103 Vol.1); (ii) three candidate tsunami watch providers in Mediterranean announced in July/August 2012; and (iii) three tsunami service providers in Indian Ocean have taken on full operations responsibility. Ms Watson-Wright expressed thanks to the Japan Meteorological Agency (JMA) and the Pacific Tsunami Warning Center (PTWC) for their provision of tsunami alerts for the Indian Ocean which will end on 31 March 2013.

4. Ms Watson-Wright also highlighted that through extrabudgetary projects and partnerships, the IOC had been able to maintain activities related toward awareness and preparedness. However, Ms Watson-Wright did regret that the TOWS-WG on Inter-ICG Task Team on Hazard Assessment Related to Highest Potential Tsunami Source Areas had not been able to meet yet.

5. Ms Watson-Wright provided an overview of the UNESCO and IOC budget situation. Following the admission of Palestine to UNESCO in November 2011, the UNESCO Regular Programme budget for 2011 was immediately cut by 11% due to the withholding of the payment of the United States of America to UNESCO for 2011. The 2012–2013 UNESCO budget was subsequently reduced from $653 million to $456 million due to the on-going withholding of assessed contributions from the US and Israel. No cuts was made to the UNESCO staffing costs. As a consequence, the activity budget for IOC was reduced by 77% at the beginning of 2012.

6. She explained that UNESCO established an Emergency Fund which Member States could make non-earmarked voluntary contributions to in support of the 2012–2013 UNESCO programmes. The UNESCO Director General has provided IOC with two allotments that

have allowed IOC's activity budget to be restored to 58% of what was planned for 2012–2013.

7. In addition to the UNESCO Regular Programme contributions, the US also provided IOC with almost $1,000,000 in extrabudgetary funding. This funding was also cut. As a consequence, IOC has lost five posts. With the UNESCO Regular Programme funding cuts another five posts have been frozen.

8. There are presently no signs that the US will restart paying its dues to UNESCO anytime soon. At the same time, the UNESCO Emergency Fund is not expected to receive significant contributions and it is not sustainable to count on the Emergency Fund. As a consequence, planning is now underway for a reduced 2014–2015 budget.

9. Ms Watson-Wright also highlighted the particular losses of staff in the Tsunami Unit and underlined the challenges that create but expressed satisfaction with the performance of the unit and how it had coped with the situation.

10. Ms Watson-Wright stressed that UNESCO is committed to the Tsunami Programme and many Member States in the UNESCO governing bodies have expressed strong political support to the programme and to IOC.

11. She emphasized the need for Member Sstates to provide financial support to the tsunami coordination efforts, and expressed particular concern for the technical secretariat support to Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS) as the NEAMTIC (Tsunami Information Centre for the North-Eastern Atlantic, the Mediterranean and Connected Seas) project would end on 30 April 2013. Ms Watson-Wright highlighted that the IOC has appealed and applied for continued support and secondments but so far without positive results.

12. Finally, Ms Watson-Wright encouraged TOWS to look at the governance structure for the coordination work. She recalled that it has worked well so far but it may not be sustainable without more direct financial support from Member States. She emphasized that steady coordination support is particularly important for sustained systems like GOOS (Global Ocean Observing System) and Tsunami Warning Systems.

1.2 ADOPTION OF THE AGENDA

13. The Agenda for this meeting was adopted as indicated in ANNEX I. During its adoption, several participants suggested that an update be provided on the staff and budget resources of the Tsunami Unit (TSU) in light of the financial difficulties that the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Intergovernmental Oceanographic Commission (IOC) are undergoing due to the witholding of regular financial dues and voluntary contributions to UNESCO by the United States of America and Israel. Mr Thorkild Aarup, acting Head of the Tsunami Unit, agreed to provide such an oral update under the agenda item 0 on these matters.

1.3 WORKING ARRANGEMENTS

14. Mr Thorkild Aarup provided an overview of logistic details for the meeting. All documents and presentations delivered at this meeting are available from the following website:
http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=1227&lang=en

15. The list of participants is provided in ANNEX IV.

2. REPORTS FROM RELEVANT BODIES

2.1 REPORT FROM THE IOC BODIES

IOC Tsunami Unit Staff and budget situation

16. Mr Thorkild Aarup provided an overview of the staffing resources in the IOC Tsunami Unit (Table 1). The staffing resources comprise two groups: (i) one funded via UNESCO/IOC Regular Programme (RP) funds; and (ii) one funded via extrabudgetary (ExB) funding.

UNESCO/IOC REGULAR PROGRAMME FUNDS	
Staff	**Location**
Bernardo Aliaga (Programme Specialist, full time)	UNESCO/IOC Paris
Silvia Sermeño (Administrative Assistant, full time)	UNESCO/IOC Paris (Full time sick leave from1 July to 31 December 2012; half time sick leave from 1 January to 31 May 2013)
Thorkild Aarup (Acting Head of Unit, also covering GLOSS)	UNESCO/IOC Paris
Rajandra Prasad (National Officer, full time)	UNESCO Apia Office and stationed at SOPAC (Fiji)
Ardito Kodijat (National Officer – half time) Hired as of 1 October 2012	UNESCO Jakarta Office (Indonesia)
EXTRA BUDGETARY FUNDED STAFF	
Staff	**Location, Source**
Francesca Santoro (Programme Specialist, half time)	UNESCO/IOC Paris; NEAMTIC EU funding will end 30 April 2013.
Cornelia Hauke (Administrative Assistant, half time)	UNESCO/IOC Paris; NEAMTIC EU funding will end 30 April 2013. (Full time sick leave from 5 December 2012 to 8 March 2013)
Tony Elliott (Programme Specialist, full time)	Perth, Australia. Funding from Bureau of Meteorology until 30 June 2013 (expected to continue).
NN (Programme Specialist, full time) Recruitment expected in 2nd quater of 2013.	Perth, Australia. Funding from Bureau of Meteorology until 30 June 2013 (expected to continue).
F. Fauzi (Programme Specialist, full time)	Muscat, Oman Oman Fund in Trust project with UNESCO: Oman National Multi-Hazard Early Warning System. Funding available until 31 December 2013

Table 1. Staffing resources at the IOC Tsunami Unit

17. Mr Aarup indicated that there had been considerable staffing changes and it was impacting the continuity and work of the unit. Mr Masahiro Yamamoto left the unit on 26 May 2012 when the funding from the Ministry of Foreign Affairs of Japan ended. Mr Yamamoto graciously continued on a volunteer basis at IOC until 11 October 2012. Mr Stefano Belfiore who worked on NEAMTIC left the unit on 31 August 2012 for a regular programme position at the World Meteorological Organisation (WMO). Ms Jane Cunneen from the Secretariat of the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) in Perth, Australia, was on maternity leave from 1 May 2012 to 4 October 2012 and then she left the unit on 31 December 2012. The two administrative assistants in the unit have been and continue to be on long term sick leave.

18. With respect to the budget for the Tsunami Unit of IOC, Mr Aarup reported that the Tsunami Regular Programme budget for activities had been reduced by about 73% from USD 295,000 originally planned and approved in the UNESCO's Programme and Budget for 2012–2013 (36C/5) to USD 80,000 for the biennium (2012–2013).

19. At the onset of the financial crisis, in November 2011 the UNESCO Director General (DG) established an Emergency Fund which allowed Member States to make voluntary contributions to UNESCO. About USD 74.9 million has been contributed to date. The DG has allocated funds for IOC and the Tsunami Unit from the Emergency Fund in two rounds which has allowed to restore funding of (i) activities towards tsunamis and coastal hazard assessment (USD 120,000) all decentralised to IOC/UNESCO regional offices, (ii) funding towards the ICG meetings during 2012–2013 (USD 45,000), and (iii) special support to the start of the Caribbean Tsunami Information Centre (USD 130,000).

20. Mr Aarup summarized that it is very challenging for the IOC to plan and to keep the Tsunami Unit delivering with the current staffing available, the reduction on the activity budget, and the stop and go nature of the funding. UNESCO has underlined that the Emergency Fund is a temporary measure and it is not sustainable to rely on continued donor contributions. As such, IOC will not be able to rely on additional contributions from the Emergency Fund. Therefore, Mr Aarup strongly encouraged countries to contribute extrabudgetary funding to TSU activities.

Presentation from the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM)

21. Mr Edgard Cabrera provided an overview of the WMO Marine Meteorology and Oceanography Programme (MMOP) and also highlighted some of the outcomes from the Fourth Session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM-4) held in Yeosu, Republic of Korea, from 28 to 31 May 2012 (WMO-No.1093, WMO-IOC/JCOMM-4/3). An important component of the JCOMM is the coordination of forecasting and warning services to various marine user communities including the shipping and offshore oil and gas industry. These services depend on national and regional observing networks, data exchange, and the development and ongoing improvement of forecasting models at national and regional levels for marine related hazards. Mr Cabrera mentioned that an open question remains: how to properly link tsunami alert centres and dissemination of tsunami alerts to the shipping community? In response to this, TOWS requested the Inter-ICG Task Team on Tsunami Watch Operations to review the present status of issuing of tsunami advisories to shipping, and recommend ways of enhancing dissemination in consultation with relevant organizations including the World Meteorological Organization (WMO), the International Hydrographic Organization (IHO) and the International Maritime Organization (IMO).

22. Mr Cabrera also highlighted the Coastal Inundation Forecasting Demonstration Project (CIFDP). CIFDP is a joint project between the Joint WMO-IOC Technical Commission

for Oceanography and Marine Meteorology (JCOMM) and the WMO Commission for Hydrology (CHy). More information about CIFDP is available at: http://www.jcomm.info/images/stories/2013/cifdp_march2013.pdf . Three pilot projects have been developed under CIFDP (Bangladesh, Dominican Republic, and Fiji) and another three are in the planning stages. In regards to these pilot projects, Mr Cabrera indicated that there could be scope for collaboration with the respective tsunami communities.

23. Mr Cabrera introduced Mr Kenji Tsunoda (Co-chair of the Open Programme Area Group on Information Systems and Services [OPAG-ISS] under the WMO Commission for Basic Systems [CBS]). Mr Tsunoda provided a general overview of the WMO Information System (WIS). The WIS will build on the Global Telecommunication System and an outer layer relying on the Internet. This should broaden access. Another importnant component will be the Discovery Access and Retrieval layer which should enable easier and data retrieval. Full information on WIS is available at https://www.wmo.int/pages/prog/www/WIS/overview_en.html.

24. In closing, Mr Cabrera underlined WMO's willingness to assist with tsunami excercises. In advance of tsunami excercises, it has been the practise to alert WMO beforehand to make sure appropriate Global Telecommunication System (GTS) nodes are aware of the excercises. The point of contact concerning GTS is Mr David Tomas.

Report from the Intergovernmental Coordination Group
for the Tsunami and other Coastal Hazards Warning System
for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS)

25. Ms Christa von Hillebrandt (Chair, USA) introduced membership of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), indicating that consists of 44 countries and territories. 32 are Member States of IOC and 3 Observers countries. She described the Area of Responsability (AoR) which is Caribbean and adjacent regions; to the north it includes Bermuda, to the south, Brazil. Meetings are annual, with so far 7 sessions having been held. Ms Hillebrandt introduced also the composition of the officers and working groups of the ICG/CARIBE-EWS and reported that the Implementation Plan of the CARIBE-EWS (IOC-ICG/CARIBE EWS-III/13) is currently being updated.

26. The Caribbean is multilingual, with diverse education systems, and very dependent on coastal resources. Most of the countries have tourism based economies, including hotel and shipping industries and are highly dependent on port operations. Tsunamis are low frequency events but the impact would be extremely high for larger events.

27. She indicated that the region continues to make steady progress in tsunami and coastal hazard monitoring, tsunami hazard modeling, communications and preparedness and outreach. Currently 86% of the seismic stations and 44% of the sea level stations listed in the Implementation Plan are contributing in the system (up from 75% and 32%, respectively in 2011). In addition, the US National Science Foundation (NSF) funded the Continuously Operating Caribbean Observational Network (COCONet) project that is installing GPS stations around the Caribbean. While the purpose of COCONet is academic the intent is to co-locate some GPS stations with sea level stations to be of use to tsunami warning. The NOAA's (National Oceanic and Atmospheric Administration) National Weather Service (NWS) Pacific Tsunami Warning Center (PTWC) provides warnings to all the Caribbean and adjacent regions with the exception of Puerto Rico and the Virgin Islands; and the West Coast and Alaska Tsunami Warning Center (WCATWC) for Puerto Rico and the Virgin Islands continue to provide interim tsunami warning services to the region The US established the Caribbean Tsunami Warning Program in 2010 as a first step towards a

potential Caribbean Tsunami Warning Center (CTWC). This effort has been slowed due to resource constraints.

28. Advances have been made (i) in tsunami hazard modelling through the conduct of training courses, (ii) development of tsunami maps for some additional countries, (iii) the development of the Officers and Working Group Meetings of the ICG/CARIBE-EWS, and (iv) a conference organized by the University of the Antilles in Guadeloupe on 21 and 22 January 2013.

29. Eighty-nine per cent (89%) of the countries have nominated Tsunami Warning Focal Points (TWFPs), with only 4 pending. Since October 2011, monthly communication tests have been conducted between the PTWC and the TWFPs, in addition to 2 unannounced tests. These tests have helped identify some gaps in the communication systems.

30. On 20 March 2013, the Exercise Caribe Wave/Lantex 13 (IOC/2012/TS/101 VOL.1), the second regional tsunami exercise was conducted. The tsunami scenario simulates a tsunami generated by M 8.5 earthquake originating 57 miles north of Oranjestad, Aruba, in the Caribbean Sea. The initial dummy message was issued by the Pacific and West Coast and Alaska Tsunami Warning Centers (PTWC-WCATWC) and disseminated over all its standard broadcast channels. A participant handbook was prepared that includes the tsunami and earthquake scenario information, time lines, the PTWC/WCATWC exercise messages, a model press release and instructions for post-exercise evaluation. Four online webinars have been conducted in support of this exercise.

31. With the support of the Government of Italy through the United Nations Development Program (UNDP), the Office for Organization of Eastern Caribbean States (OECS) and Barbados, steady progress has been made towards the establishment of the Caribbean Tsunami Information Centre (CTIC) to be hosted by the Government of Barbados under a Memorandum of Agreement with UNESCO/IOC. Over the past year, a CTIC business plan, educational and outreach material, and a Strategy for Public and Awareness and Education have been developed by contractors in consultation with Members States and experts. The CARIBE-EWS will continue to seek financial contributions as well as secondments for the CTIC.

Report from the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS)

32. Mr François Schindelé (Chair, France) presented the recent development in the governance 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). There are currently 4 Working Groups (WGs): WG1 on Hazard Assessment and Modelling, WG2 on Seismic and Geophysical Measurements, WG3 on Sea Level Data Collection and Exchange, Including Offshore Tsunami Detection and Instruments, and WG4 on Public Awareness, Preparedness and Mitigation. Moreover, two previously existing task teams have been terminated, and only one Task Team (TT) on Communication Test and Tsunami Exercises is still working.

33. The ICG/NEAMTWS meets every year, and 9 sessions have been organized until now.

34. Mr Schindelé indicated that the region made steady progress in monitoring and, in particular, in sea level monitoring thanks to the major contribution from France, Spain, Italy,

United Kingdom, Greece and Turkey. However, some monitoring gaps still exist, especially in North Africa, and there is a major concerned related to the latency of real-time sea level data.

35. For what regards the architecture of the tsunami warning system for the NEAM (North-Eastern Atlantic, the Mediterranean and Connected Seas) region, the original concept was to establish, where possible, National Tsunami Warning Centres (NTWCs) in each country responsible for issuing warnings to the relevant authorities in the Member State. In addition, some of the Centres were envisaged to act as Regional Tsunami Watch Centres with responsibilities for providing tsunami alerts in particular regions beyond that of their own Member States. However, following further consideration that also took account of developments by other ICGs and recommendations by TOWS encouraging standardization where appropriate, the concept which has evolved is that of Tsunami Watch Providers (TWPs) and Tsunami Watch Recipients. Tsunami Watch Providers are those NTWCs willing and able to provide tsunami alert information to other Member States at designated Forecast Points; Watch Recipients are those Tsunami Warning Focal Points choosing to receive such information; usually they will themselves be NTWCs. In order to be recognized as part of NEAMTWS, Tsunami Watch Providers must meet a number of requirements and be approved by the Intergovermental Coordination Group of NEAMTWS. Until these conditions are met they will be referred to as 'Candidate' Tsunami Watch Providers. A key aspect of this approach is that Tsunami Watch Providers do not have designated geographical areas of responsibility. Member States will have the freedom to decide from which candidate Tsunami Watch Provider(s) they would like to receive tsunami watch messages. The Ninth Session of the ICG/NEAMTWS (ICG/NEAMTWS-IX) held in Southampton from 11 to 14 September 2012, defined the procedure of accreditation for the Candidate Tsunami Watch Providers (CTWPs). A number of qualitative characteristics and functions have been identified that will be checked by an accreditation team made up of three experts, that will visit, upon request, the Candidate Tsunami Watch Providers.

36. There are currently three Candidate Tsunami Watch Providers: the Centre d'alerte aux tsunamis (CENALT) in France, the National Observatory of Athens (NOA) in Greece, and Kandilli Observatory and Earthquake Research Institute (KOERI) at the Boğaziçi University in Turkey.

37. The first Tsunami Exercise NEAMWave12 (IOC/2012/TS/103 Vol.1) was held on 27 and 28 November 2012. Eighteen (18) countries, out of 39 NEAMTWS Member States participated in the exercise. NEAMWave12, as the first Tsunami Exercise in NEAM Region, attempted to assess the national and local warning dissemination and response mechanisms put in place by Member State Civil Protection Authorities (CPAs) upon the reception of a tsunami warning from their TWFPs. In addition, NEAMWave12 addressed the questions related to the evaluation of alert messages by CTWPs and the issuance of the tsunami messages to TWFPs, as in the previous communication test exercises. NEAMWave12 involved the simulation of the assessment of a tsunami, based on an earthquake-driven scenario followed by alert message dissemination by CTWPs (Phase A) and continued with the simulation of the TWFP/NTWCs' and CPAs' actions (Phase B), as soon as the message produced in Phase A has been received. NEAMWave12 was based on multiple scenarios located in 4 different basins, where each CTWP was responsible for a single scenario at each scenario simulation and each non-CTWP Member State was asked to choose a/the scenario(s) to participate in for the exercise.

38. The NEAM Tsunami Information Centre (NEAMTIC) was initiated thanks to financial support from the European Commission Directorate Humanitarian Aid & Civil Protection (ECHO). The NEAMTIC has developed several education and awareness raising products and material, including flyers, posters, online courses, and guides for coastal managers, emergency managers and hotel managers. NEAMTIC materials have been translated in several languages (Greek, Italian, French, and Arabic). A training event for the Civil

Protection Authorities from the entire region was organised, in partnership with another European Union Initiative, the Euromed programme for the prevention, preparedness and response to natural and man-made disasters, in Stromboli, Italy.

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

39. Mr Rick Bailey, Chair of ICG/IOTWS, presented a status report on the Indian Ocean Tsunami Warning and Mitigation System (IOTWS). He reminded the group of the three pillars of the IOTWS Medium Term Strategy (ICG/IOTWS-VIII/18) and addressed progress towards achieving the goals of each pillar during his presentation.

40. Mr Bailey described in detail the tsunami advisory products and the Key Performance Indicators (KPI) adopted by the ICG and implemented by the three operational Regional Tsunami Service Providers (RTSP) in the Indian Ocean. He distinguished between "exchange" products, which are disseminated to the National Tsunami Warning Centres (NTWCs) only, and public products, which are available on the public areas of the RTSP websites. He noted that the RTSPs had been operational since October 2011, and that the 9th Session of theICG/IOTWS-IX held in Jakarta, Indonesia, from 27 to 30 November 2012 had reviewed the RTSPs' performance since becoming operational and concluded that this had been satisfactory. The ICG had therefore requested the RTSPs to assume full operational responsibility for the Indian Ocean region on 31 March 2013, and requested the Japan Meteorological Agency (JMA) and PTWC to cease the Interim Advisory Service that they had provided since April 2005 as of the same date.

41. Mr Bailey provided an overview of the results and outcomes of the Exercise Indian Ocean Wave 2011 (IOC/2011/TS/99, draft) conducted on 12 October 2011, against six objectives. Participation in the exercise had been encouraging with 20 out of 28 Member States taking part. Feedback from the Member States on the exercise had been very useful and the ICG Working Groups were following up on the comments received.

42. Mr Bailey summarised the present status of the IOTWS detection and communication systems, and the awareness and response activities being undertaken by the ICG. He noted in particular the project on Risk Assessment and Tsunami Exercises being conducted by Working Groups 1 and 3 with funding from the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), and the preparation of the compendium *Tsunami Early Warning & Community Preparedness: Insights and Compilation of Good Practices* by Working Group 3 on developing the last mile of the IOTWS. He also noted that the ICG had agreed to support the expansion of the Jakarta Tsunami Information Centre (JTIC) into an Indian Ocean Tsunami Information Centre (IOTIC) to serve the entire Indian Ocean region.

43. Mr Bailey described the response of the IOTWS to the 11 April 2012 west of north Sumatra M8.6 earthquake event, which had put many countries in the region on alert with coastal community evacuations taking place in several countries. The IOTWS had been deemed to work well, even though a major tsunami had not been generated. RTSP threat information and national warnings had been issued promptly, although issues still remain with community awareness and preparedness.

44. Mr Bailey listed some of the important ongoing issues that the ICG will need to address in the coming years and concluded that the current overall status of the IOTWS is good and that the future outlook for the system is healthy.

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

45. Mr Ken Gledhill from New Zealand, Chair of the ICG/PTWS, introduced this item. There are 57 countries and territories that are members of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS). The countries and territories have a wide spread of requirements and capabilities, from very small islands to continental coastlines. He introduced also the composition of the Steering Committee and Working Groups of the ICG/PTWS and reported that the Medium Term Strategy of the PTWS is due for revision at the next session of the ICG/PTWS.

46. He indicated that in pursuing its mandate, the ICG/PTWS has developed key documents including a Medium Term Strategy (MTS), and the Implementation Plan (ICG/PTWS-XXIII/12). The MTS focuses on describing general, common but essential, strategic objectives to ensure an effective and efficient Tsunami Warning System (TWS) operable wherever possible with the other ocean basins and seas. It also provides the framework for Member States to take responsibility and ownership for their national systems and engage in international coordination and collaboration process through the ICG/PTWS and TOWS. The Implementation Plan defines details of the methods to accomplish the strategic objectives. It was approved in principle and is now under finalization by the Steering Committee with some adjustment to align with the MTS and Working Group Structure.

47. Mr Gledhill reminded that the PTWS current Medium Term Strategy is based on three pillars: Risk Assessment and Reduction; Detection, Warning and Dissemination; and Awareness and Response, with several Foundation Elements that are essential tools to support all the pillars, including Interoperability, Research, Capacity Building, and Funding and Sustainability.

48. He recalled the main recommendations from the Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIV/3) held in Beijing, China, from 24 to 27 May 2011, including the approval of the experimental phase of the PTWC Enhanced products, the Pacific Wave Exercises (PacWave11, and PacWave13), and the development of a Sub-Regional Tsunami Warning and Mitigation System for the South China Sea Region.

49. With respect to future sessions, Mr Gledhill indicated that the Russian Federation will host the Twenty-fifth Session of the ICG/PTWS in Vladivostok from 9 to 11 September 2013 (ICG/PTWS-XXV) and the United States of America are interested in hosting the Twenty-Sixth Session of the ICG/PTWS in Honolulu in 2015, subject to the approval of the Government.

50. Mr Gledhill listed and recalled all the Working Groups meetings that have happened from the last session of TOWS, many from the Regional Working Groups (Central America, South America, South China Sea and South West Pacific), as well as a number of trainings that have been performed with the support of Member States, the International Tsunami Information Centre (ITIC), and the Secretariat.

51. He indicated that the main challenges are (i) to maintain continuous and active participation of Member States with sustained funding on national level, (ii) to enhance community preparedness and have it embedded in national legislation, (iii) to adapt the TWSs to threats of near-field earthquakes in concert with increased training opportunities, and (v) the necessity of keep consistency across all ICGs.

52. Key milestones for ICG/PTWS as indicated by Mr Gledhill are (i) the Enhanced Products trial start on 15 April 2013, (ii) the Exercise Pacific Wave 13

(IOC/2013/TS/106Vol.1rev.) on May 2013, and (iii) the revision of the MTS and Implementation Plan that should happen at the coming Twenty-fifth Session of the ICG/PTWS on September 2013 (ICG/PTWS-XXV).

53. Ms Hillebrandt-Andrade, Chair of ICG/CARIBE-EWS, inquired if it is effective for the ICG/PTWS to meet every two years. Mr Gledhill responded that for the PTWS progress is really measurable every two years.

54. Mr Michida, Chair of TOWS, inquired about specific ideas about the challenge of keeping consistency between countries. Mr Gledhill suggested that one of the aspects is to make sure that countries that are in more than one ICG are not penalised because of inconsistency among ICGs.

2.2 REPORT FROM NON IOC BODIES

55. Mr Thorkild Aarup summarised information from the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the International Hydrographic Organization (IHO).

56. Following the 2004 tsunami, UNESCO/IOC and the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) agreed to explore the potential of using data from the International Monitoring System (IMS) for tsunami warning purposes. The provisional arrangement between CTBTO and UNESCO/IOC proved effective in the development phase of the new tsunami warning systems. Following the trial period, an agreement was signed on 3 February 2010 by Irina Bokova, Director General of UNESCO, and Tibor Tóth, Executive Secretary of the CTBTO, to enhance cooperation between the two organizations, notably for the benefit of tsunami early warning systems and capacity-building in developing countries. As of February 2013, Australia, France, Indonesia, Japan, Malaysia, the Philippines, Republic of Korea, Thailand, Turkey and USA have taken advantage of incorporating CTBTO seismic data into the use of their national tsunami monitoring. Additional countries are expected to sign agreements with the CTBTO in the near future. As an indicator, in February 2013 about 3.2 gigabytes of IMS primary seismic, auxiliary seismic and hydroacoustic data were sent in near-real time daily to national tsunami warning centres in the above ten countries.

57. Mr David Wyatt, Professional Secretary at IHO, had provided a written report to TOWS informing on recent updates to IHO Resolution 1/2005–IHO Response to Disasters and associated guidelines to national hydrographic agencies. The guidelines were developed after the 26 December 2004 Indian Ocean Tsunami and revised based on experiences from the 11 March 2011 Tohoku Tsunami. The guidelines aim to: (i) ensure the immediate assessment of damage and its effect on the safety of navigation of national and international shipping; (ii) immediately inform mariners and other interested parties of relevant damage and any dangers, particularly with respect to navigational hazards; (iii) re-establish the basic key maritime transportation routes, and (iv) ensure that charts and other hydrographic information of affected areas are updated as soon as possible. The guidelines also highlight the importance for Coastal States to collect relevant coastal and bathymetric data in their areas of responsibility and to make this available to the appropriate organizations to support the establishment and improvement of tsunami early warning systems, protection of coastal areas and relevant simulation studies. Any necessary regional cooperation for the collection of shallow and deep-water bathymetry can be coordinated through the International Hydrographic Bureau (IHB) in liaison with the relevant Regional Hydrographic Commission, IHO Member States, other Coastal States and relevant International Organizations as appropriate.

3. REVIEW OF PROGRESS

3.1 STATUS OF IMPLEMENTATION OF IOC RESOLUTION XXVI-7

58. This agenda item was introduced by Mr Thorkild Aarup, acting Head of the Tsunami Unit. He reviewed the implementation of the resolution while noting that progress on some of the actions had also been reported at the Fifth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-V) held in Tokyo, Japan, on 15 February 2012 (IOC/TOWS-WG-V/3). Some of the implementation actions that contribute to the implementation of XXVI-7 also fall under the reporting on the four ICGs.

IOC Resolution XXVI-7

59. The Compendium of Definitions and Terminology on Sea-level-related Hazards, Disasters, Vulnerability and Risks in a coastal context (IOC/2011/TS/91) was published in 2011. No significant changes have been made to the definitions and the TOWS-WG has not undertaken any further review of this document.

60. TOWS-WG has continued to consider it premature to request ICGs to carry out an analysis of the impact of data gaps on the tsunami detection, forecast, timeliness and accuracy.

61. At the Fifth Meeting of the TOWS-WG, it was suggested to establish a Task Team to develop a coordinated Communications and Outreach Plan with a focus on media education. Little progress has been made on this and Terms of Reference (ToRs) for the Task Team have not been established.

62. In the subsequent discussion and TOWS recognised that given the financial constraints it would be more optimal for the TOWS-WG members to undertake the appropriate actions. The TOWS-WG decided that the ICG Chairs should meet in the margins of the 27th Session of the IOC Assembly (IOC-XXVII) to develop a first draft of a communication action plan.

63. The Group also discussed the instruction in IOC Resolution XXVI-7 to develop Global Risk Assessment Guidelines utilizing those developed in IOC Manuals and Guides 52 '*Tsunami risk assessment and mitigation for the Indian Ocean: knowing your tsunami risk and what to do about it*' (IOC/2009/MG/52). There have not been resources to hire a consultant to develop these guidelines into a Global Risk Assessment Guidelines document. However, under the recently funded UNESCAP project it is planned to review and revise the existing document. As such it is advisable to wait for this review. Moreover, the consultant hired may also be able to contribute towards the requested global document.

64. The Intergovernmental Oceanographic Commission (IOC) has continued to facilitate the development of CTIC, and the Director General of UNESCO has provided a special contribution from the UNESCO Emergency Fund towards the start of the CTIC (see below).

4. REPORTS OF THE INTER-ICG TASK TEAMS

4.1 INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS

65. The report of the Task Team on Disaster Management and Preparedness was presented by Ms Laura Kong on behalf of the Task Team Chair Ms Irina Rafliana

(Indonesia). Ms Kong recalled that the Task Team had not met since the Inter ICG Task Team on Disaster Management and Preparedness meeting (IOC/TOWS-WG/TT2-I/3) held in Seattle, United States, from 29 November to 1 December 2010.

66. Ms Kong recalled the Terms of Reference for the Task Team and highlighted in particular the task team's objective to facilitate among ICGs: (i) the exchange of experiences and information on preparedness actions, education/awareness raising; (ii) the education and awareness products; and (iii) the replication of preparedness programs and assessment tools.

67. Ms Kong highlighted a number of products, activities and events that the Task Team or some of the Task Team members have been involved in. The manual '*How to plan, conduct, and evaluate UNESCO/IOC tsunami wave exercises*' (IOC/2012/MG/58Rev) has been completed and published. A set of course manuals on Strengthening Tsunami Warning and Emergency Responses: Training Workshop on the development of End-to-End Tsunami Standard Operating Procedures (SOPs) have been produced over the time period 2008–2013, and many workshops on developing SOPs in South America. During 2011–2013, Tsunami Wave Exercises have been held in all four regions. Tsunami Information Centres (TICs) have been established in all four regions. This will also lead to more region specific tsunami information and awareness material becoming available and efforts should be made for the TICs to share and coordinate their development of such materials and to exchange best practices.

68. Ms Kong then highlighted specific examples of information and awareness activities carried out under the four regional tsunami warning systems. Subsequently, Ms Kong reviewed some leassons learned and responses from some of the recent tsunamis. Since 1975, there have been 117 tsunamis with an observed tsunami water height greater than 1 metre; and 13, since 2004. Some of these include local tsunamis, preparedness and difference in reaction patterns in local populations between drill and actual event dealing with multiple earthquakes occurring with short time spans, determination of earthquake parameters for slow earthquakes, closely occurring eartquakes (i.e. border line events between two regional tsunami warning systems), and alert dissemination to local communities. More details can be found in the presentation.

69. The subsequent discussion centered on the future work of the Task Team. TOWS recognised the importance of continued facilitation of exchange of experiences and information on preparedness and education among the ICGs. This information is also facilitated via the Tsunami Information Centers (TICs) and with TICs having been established in all four regions, TOWS recognised that TICs should be represented in this Task Team in order to facilitate information exchange and coordination among these. With that in mind, TOWS decided to update the Terms of References for this Task Team (ANNEX II).

4.2 INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS

70. Mr Srinivasa Kumar, Chair of the Inter-ICG Task Team on Tsunami Watch Operations, reported on the outcomes of the Task Team meeting held in Paris, France, on 18 and 19 February 2013 (TOWS-TT3), immediately prior to this Sixth Meeting of the Working Group on Tsunamis and other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG) held in Paris, France, on 20 and 21 February 2013. He recalled the Task Team Terms of Reference and provided an overview of the progress made since the Task Team was established in 2010. Mr Kumar then provided details of the intensive discussions held during the Task Team meeting. The full meeting report is given in Annex Iii.

71. The Task Team had held extensive discussions on the revision of the Areas of Responsibility map originally proposed at its first meeting held in Seattle, United States, in

December 2010. It recommended that the Areas of Responsibility (AoR) of each ICG should be provided as a list of Member States or territories in each ICG, rather than as a map, and the Secretariat was requested to compile this list. However, it recommended that the detailed Areas of Responsibility of each of the RTSPs/RTWCs should be provided on a map showing coastal coverage and a draft version was presented and discussed by the TOWS-WG. Based on the outcome of these discussions, the Secretariat was requested to prepare a digital version of the draft map for circulation and finalisation prior to submitting for adoption at the 27th Session of the IOC Assembly that will be held from 26 June to 5 July 2013.

72. The Task Team also proposed that a map showing the earthquake source zones within each ICG region should be prepared and Mr Kumar offered to draft this within a few weeks of the TOWS-WG meeting for circulation to the ICG chairs. This would help to identify earthquakes occurring in each region.

73. Mr Kumar noted that Indonesia had requested the IOTWS RTSPs to provide a backup service for the Banda Sea and Java Sea regions. The Task Team recommended to the TOWS-WG that this region should be considered an overlap of the IOTWS and PTWS regions and should therefore be included in the Areas of Responsibility of the IOTWS RTSPs and the Northwest Pacific Tsunami Advisory Center (NWPTAC) of the JMA and PTWC.

74. The Task Team had discussed procedures for the dissemination of IOTWS RTSPs bulletins outside their Area of Responsibility and dissemination of public bulletins via the IOC Public List Server. It had been agreed that the RTSPs would issue earthquake information and threat assessment bulletins for events >6.5M inside the Indian Ocean, and >8.0M outside the Indian Ocean. Only these bulletins would be sent to the IOC Public List Server. To avoid potential confusion, clear mention would be made regarding the intended audience of the bulletins with proper reference made to the authoritative centres responsible for issuing bulletins within an Area of Responsibility. Similar arrangements would apply to PTWS centres issuing bulletins for large Indian Ocean events and for CARIBE-EWS and NEAMTWS centres when they become operational.

75. Mr Kumar informed the TOWS-WG that the Task Team had deliberated on the coordination of public dissemination of regional tsunami threat information and how to avoid potentially conflicting information reaching the media and public. An example of this had occurred in Australia following an event in Santa Cruz Islands when PTWC bulletins had conflicted with Australian national bulletins. At the request of Mr Rick Bailey, the Task Team had agreed that in the short-term, Australian coastlines could be excluded from the current PTWC products and that a detailed review of this issue should be conducted before finalising the enhanced PTWS products, which are due to be implemented in2014.

76. The Task Team had discussed procedures for handling earthquake events happening in quick succession, following the 11 April 2012 event in the Indian Ocean when two earthquakes of >8.0M had occurred within about 2 hours of each other. It had concluded that it was not possible to be prescriptive and that each event should be considered case by case. However, it was agreed that the time and spatial extent between events needed to be taken into consideration. Clear and appropriate statements should also be included in bulletins so those recipients NTWCs understand that bulletins refer to the main shock, aftershock or new event. Standard terminology should be used and this will be developed by the Task Team and shared with the ICGs for approval prior to adoption. The Task Team also considered that a naming convention for earthquakes and tsunamis, similar to the convention for tropical cyclones, would be useful and could help to avoid confusion when events happen close together in time and distance. The Task Team suggested that during an event, when time is limited, a regionalisation scheme such as the Flinn-Engdahl plus the year of the event could be used. If more than one event in a region occurred in a calendar year, then

subsequent events could be numbered sequentially. If an event proves to be significant, the final name could be decided in consultation with the country in which it occurred.

77. Mr Kumar summarised the discussion the Task Team had held on improving the standard questionnaire to be used for post-event assessments. It had been agreed that these assessments were useful and that it was important to standardise the questionnaires for all ICGs. It was considered important to identify Key Performance Indicators for the RTSPs/RTWCs and to include these in the questionnaires so that the inputs could be used to improve the systems. The Task Team recommended that the threshold for conducting a post-event assessment should be any event for which a tsunami wave height of >1 metre was forecast for one or more countries in a region. It further recommended that Inter-ICG Task Teams 2 on Disaster Management and Preparedness, and 3 on Tsunami Watch Operations should compile a list of standard questions for the ICGs to review and adopt prior to the next TOWS-WG meeting (TOWS-WG-VII).

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

79. Regarding RTSP/RTWC Performance Indicators, Mr Kumar noted that more work was required in all parts of the global ocean to evolve these and monitor the performance of warning centres. ICG/IOTWS RTSP Task Team report on RTSP performance would be shared with the other ICGs as guidance and to obtain feedback.

80. Mr Kumar concluded by noting that the Task Team and the TOWS-WG were the only mechanisms for the coordination of tsunami watch operations between the different ICGs and RTSPs/RTWCs. He considered that the Task Team recommendations on global harmonisation provided good guidance to the ICGs. Due to the continuous development of the ICGs, the Terms of Reference of the Task Team were still relevant and there was therefore a need for the Task Team to continue on a more permanent basis than originally envisaged. In this context, Mr Kumar recommended that it was important to make provision for regular meetings as these had proved to be the most productive means of achieving important outcomes and making real progress.

81. TOWS endorsed the report by Mr Kumar and the Task Team. TOWS acknowledged the need for ongoing coordination of watch operations between ICGs and decided to update the Terms of References for the Task Team. TOWS requested that routine reporting on how the IOC tsunami alert list server is performing should be provided to the Group and that the Task Team will review what information goes on the list server and report to the Group.

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

82. Due to financial constraints, this ICG did not meet so it did not make any report.

5. NEW PRODUCTS FOR THE PACIFIC TSUNAMI WARNING AND MITIGATION SYSTEM (PTWS)

Pacific Tsunami Warning and Mitigation System (PTWS)

83. Mr Charles McCreery (USA), Director of the Pacific Tsunami Warning Center (PTWC), and Chair of the ICG/PTWS Task Team on PTWC Enhanced Products introduced the PTWC Enhanced Products for the PTWS. He indicated that the last major revision to the

existing procedures and products was done in 2001 to change from Ms to Mw. One of the reasons for developing enhanced products is that considering the current thresholds and rules for defining Warning and Watch zones, if a big tsunami is confirmed the entire Pacific Ocean is put on a warning status, which may be too conservative and favoring over-warning. Another reason, indicated by National Tsunami Warning Centers (NTWC), is that the existing Warning and Watch categories confused some of them. Instead, the proposed PTWC Enhanced Products are based primarily on numerical tsunami forecast therefore the products provide threat levels, reducing conflicts with NTWC alert levels and avoiding over-warning. He highlighted the improved evaluation by using W-CMT that informs the form of the rupture.

84. Mr McCreery indicated that the Enhanced Products are still conservative but should greatly reduce over-warning by providing estimated level of impact, including graphical as well as text products and a GOOGLE Earth KMZ file of forecast points to facilitate drilling-down to finer spatial resolution. He further added that the use of real-time model can handle earthquake locations and mechanisms anywhere, not just a shallow-thrust events in subduction zones.

85. Mr McCreery described in detail the new initial text products, with sections that include specific guidance for national authorities, and the new graphical products that provide information on threat level (inundation heights) for coastal segments. He indicated that supplemental text products will detail threat levels for specific locations (forecast points/sea level gauges) and wide Pacific maps with polygons.

86. He informed that RIFT numerical tsunami forecast model is run for a limited region near the epicentre within the first 10 minutes. RIFT is one of three numerical forecast models in use at PTWC, each of which has its own strengths and weaknesses. RIFT is the model upon which the new products are primarily based. Forecasts from the other two models, SIFT and ATFM, are compared for consistency. Using Green's Law inundation estimates are provided for a number of forecast points for each country through KMZ files including the value offshore and the value with Green's Law (which is more conservative).

87. Mr Rick Bailey, Chair of IOTWS, commented on the section on potential impacts that provides heights/amplitude, indicating that this may open room for conflicting information with NTWCs. Mr McCreery responded that the way it is written now is less conflicting than previously because it gives some information but it is not prescriptive.

88. Mr Francois Schindelé, Chair of NEAMTWS, consulted if maps indicating Travel Time could show Estimated Arrival Time (EAT) instead. Mr McCreery responded that this can be done. Mr Schindelé inquired if the Forecast Points are still considered in the PTWC Enhanced Products. Mr McCreery responded that they are still in the text product and many more points are available now in the KMZ file, which have off shore and Green's Law heights/amplitude and could easily be also providing EAT.

89. A discussion about the availability of the tsunami information products for media and the public took place but was not conclusive. Most of participants agreed on the need to get right information to the media while referring always to NTWCs for detailed information. Mr McCreery indicated that the general public does get their information from media; therefore if media does not have good information then there will be a gap in the system.

6. OTHER ISSUES

90. No other issues were discussed.

7. DATE AND PLACE OF THE NEXT MEETING

91. If the 27th Session of the IOC Assembly decides to continue the TOWS-WG, it is proposed that the next meeting takes place at UNESCO Headquarters tentatively around February or March 2014.

8. CLOSURE OF MEETING

92. The Chairman thanked all the participants for attending the meeting and for their contributions.

ANNEX I

AGENDA

1 OPENING AND WELCOME

1.1 OPENING

1.2 ADOPTION OF AGENDA

1.3 WORKING ARRANGEMENTS

2 REPORTS FROM PARTICIPANT BODIES

2.1 REPORT FROM IOC BODIES

2.2 REPORT OF NON-IOC BODIES

3 REVIEW OF PROGRESS

3.1 STATUS OF IMPLEMENTATION OF IOC Resolution XXVI-7

4 REPORTS OF THE INTER-ICG TASK TEAMS

4.1 INTER-ICG TASK TEAM ON DISASTER MANAGEMENT AND PREPAREDNESS

4.2 INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATIONS

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

5 NEW PRODUCTS FOR PTWS

6 OTHER ISSUES

7 DATE AND PLACE OF THE NEXT MEETING

8. CLOSURE OF MEETING

ANNEX II

**UPDATED TERMS OF REFERENCES
FOR INTER-ICG TASK TEAMS**

The Inter ICG Task Team on Disaster Management and Preparedness shall:

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

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

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

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

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

(vi) Report to the TOWS–WG.

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

The Inter-ICG Task Team on Tsunami Watch Operations shall:

(i) Provide a mechanism to the ICGs for coordination of tsunami watch operations among the Tsunami Warning Systems;

(ii) Maintain an inventory of current and proposed products and their dissemination methods;

(iii) Recommend and promote harmonized terminology;

(iv) Maintain an inventory of areas of responsibilities, geographical coverage, system architectures, and other relevant characteristics;

(v) Recommend operational standards, procedures and guidelines for regional and national providers of tsunami threat information, watches and/or warnings;

(vi) Monitor status of the regional provision of tsunami threat information;

(vii) Report to TOWS-WG.

The representatives to the Inter-ICG Task Team on Tsunami Watch Operations shall be nominated by their respective ICG Chairpersons. The membership shall consist of two representatives from each ICG, and include representatives from the regional providers of tsunami threat information. The IOC Chair will appoint the Chair of the TASK TEAM.

The Inter-ICG Task Team on Tsunami Potential Assessment

No change in Terms of References.
Terms of References are given under Annex VI in the Fourth Meeting of TOWS-WG held in Paris, France, on 20 and 21 March 2011. (IOC/TOWS-WG-IV/3)

ANNEX III

**UNESCO/IOC TOWS-WG TASK TEAM
ON TSUNAMI WATCH OPERATIONS**

Room XV, UNESCO/IOC Miollis building
Paris, France
18–19 February 2013

DRAFT MEETING REPORT

1 OPENING AND MEETING ORGANISATION

The Chair of TOWS-WG Task Team (TT) on Tsunami Watch Operations, Mr Srinivasa Kumar, welcomed the participants to the meeting and made some introductory remarks. He invited Mr Thorkild Aarup, Head (a.i) of IOC Tsunami Unit, and Mr Tony Elliott, Technical Secretary for the Task Team, to make some introductory comments and to provide details of meeting arrangements and facilities. Mr Kumar then invited the participants to introduce themselves.

2 PRESENTATION ON THE PROGRESS OF TASK TEAM 3

Mr Kumar gave a presentation summarising the progress of TT to date. He reviewed the recommendations made at the first meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Inter-ICG Task Team 3 on Tsunami Watch Operations, that was held in Seattle, USA, from 29 November to 1 December 2010 (IOC/TOWS-WG/TT3-I/3). He listed the members of the Task Team and noted that the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) should nominate a new member to replace Mr Charles Ngunjiri. He recalled the previous meetings the Task Team had held and noted that the Intergovernmental Coordination Groups (ICGs) had had the opportunity to review the Task Team recommendations. There had also been ample opportunity to test the products the Task Team had recommended through tsunami exercises and communications tests. Some issues had been identified that would be discussed at this meeting, including overlapping Areas of Responsibility (AoR), the content of public bulletins, and the governance of the IOC Public List Server.

Mr Kumar remarked that the Areas of Responsibility for the warning centres presented in the last TT report would need to be re-visited during this meeting. He recalled the harmonised products, terminologies and different levels of threat that had been agreed at the Inter-ICG Task Team on Tsunami Watch Operations meeting held in Seattle, USA, from 29 November to 1 December 2010 (IOC/TOWS-WG/TT3-I/3). The types of bulletins provided by the Regional Tsunami Service Providers (RTSPs) would also need to be discussed. The IOTWS had decided on two types of bulletins: exchange bulletins to National Tsunami Warning Centers (NTWCs), and public bulletins. In particular, it would be important to decide the criteria and kind of information that should be contained in public bulletins, inside and outside the Area of Responsibility of the warning centre.

Performance Indicators for assessing the performance of the warning centres would need to be discussed. These would need to be established for all ICGs in the light of the new warning products that are being introduced, particularly for Service Level 2 parameters such as wave height, arrival time etc. The process for verifying the operational status of warning centres would also need to be discussed and concrete recommendations made.

Mr Kumar noted that TT was the only forum for the ICGs to come together to discuss harmonisation issues of global importance. He recommended that the group should have

more permanent status than a Task Team. He noted that there was also a need to harmonise the terminology for sea level measurements used in bulletins, as these varied between ICGs and warning centres.

Mr Takeshi Koizumi agreed that there needed to be further discussion about the reporting of events outside the Area of Responsibility of a warning centre and noted that this is linked to the type of bulletin, exchange or public.

There was discussion on the future status of the Task Team under TOWS-WG, which itself is subject to a biennial renewal of its mandate by the Assembly. Mr Aarup commented that there were two other Task Teams under the TOWS-WG and that the future of this Task Team needed to be considered in that bigger picture before the TOWS-WG made any recommendation to the Assembly.

Recommendation 1 to TOWS-WG on the permanent status of Task Team on Tsunami Watch Operations:

- The status of Task Team on Tsunami Watch Operations should be made more permanent, considering the perpetual nature of its Terms of Reference.

3 PRESENTATIONS FROM THE REPRESENTATIVES OF THE INTERGOVERNMENTAL COORDINATION GROUPS

3.1 INTERGOVERNMENTAL COORDINATION GROUP FOR THE PACIFIC TSUNAMI WARNING SYSTEM (ICG/PTWS)

Mr Takeshi Koizumi, Vice-Chair of ICG/PTWS, gave a presentation on the status of the PTWS. He noted that in the Pacific, services provided by the Pacific Tsunami Warning Center (PTWC) and West Coast and Alaska Tsunami Warning Center (WCATWC) were complementary, and the PTWC did not cover the West Coast of USA. On the other hand, the Northwest Pacific Tsunami Advisory Center (NWPTAC) service was in addition to the PTWC service in the Northwest Pacific region. PTWC and NWPTAC coordinate seismic parameters, and if an earthquake occurs in the JMA region, PTWC waits for and uses JMA's seismic parameters. If an earthquake occurs outside JMA's region, then PTWC takes the lead and JMA will wait for and use PTWC's seismic parameters.

Mr Koizumi reminded the Task Team that based on the lessons learned from the Tohoku Earthquake and Tsunami in 2011, the JMA will change its Standard Operating Procedures (SOPs) for domestic warnings from 7 March 2013, reducing the number of estimated tsunami height classifications from 8 to 5, for instance. The new PTWC classification will be almost the same as the JMA domestic warning classification and will therefore avoid conflicting information.

Mr Ken Gledhill reported on the Working Group structure of PTWS. He noted that because of its size, the PTWS has regional Working Groups for its four sub-regions. Mr Gledhill provided a brief summary of the activities of the technical Working Groups and Task Teams.

Mr Koizumi reminded the group that the PTWC will commence issuing new products in trial experimental mode on 15 February 2013 and that it was planned to conduct Exercise Pacific Wave 13 (IOC/2013/TS/106VOL.1.) from 1 to 14 April 2013 to allow Member States to validate the new PTWC products. Finally, he reminded the Group that the Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS-XXV) would be held in Vladivastok, Russia, from 9 to 11 September 2013, and would be preceded by a workshop on 'Forecasting the tsunami wave impact on Coastal Territories'.

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

Ms Christa von Hillebrandt-Andrade, Chair of ICG/CARIBE-EWS, gave a presentation on the status of the CARIBE-EWS. She showed the current Area of Responsibility covered by the CARIBE-EWS including areas covered by national systems or other arrangements, and noted that more than 80 tsunamis had been observed in the Caribbean and Western Atlantic. Tsunami advisory products are currently provided by PTWC and WCATWC (Puerto Rico and Virgin Islands), with the same thresholds as used in the PTWS. She noted that there was a difference in the meaning of "Watch" between PTWC and WCATWC. Proposals for new warning products were tested at the Exercise Caribe Wave/Lantex 13 (IOC/2012/TS/101 VOL.1.) as agreed at the Seventh session of the ICG/CARIBE-EWS, held in Willemstad, Curacao, from 2 to 4 April 2012 (IOC/ICG/CARIBE EWS-VII). These products are now under review by the Member States. In the new products, wave heights are provided but no details of threat level are mentioned.

Ms von Hillebrandt-Andrade informed that the Seventh Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-VII) held in Willemstad, Curacao, from 2 to 4 April 2012 had recommended that its Area of Responsibility should be expanded to include all coasts of the Western Atlantic not presently covered by a warning centre. However, this recommendation was not accepted by the Forty-fifth Session of IOC Executive Council (IOC/EC-XLV) held in Paris, France, from 26 to 28 June 2012, with both Argentina and Brazil requesting further information on the need for this expansion.

Ms von Hillebrandt-Andrade listed the ICG officers and Working Group chairs and provided an update on the status of the Caribbean Tsunami Warning Centre (CTWC) and Caribbean Tsunami Information Centre (CTIC). She provided details of the seismic and sea level monitoring networks and the communications tests, and the Exercise Caribe Wave 11 (IOC/2010/TS/93 Rev.) held on 23 March 2011, and Exercise Caribe Wave/Lantex 13 (IOC/2012/TS/101 VOL.1) implemented on 20 March 2013. She noted that there was a need for coordination with the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS) for far field events. Strengthening and development of SOPs and preparedness plans were also required. Ms von Hillebrandt-Andrade noted that the threat from volcanism is high in the Caribbean and this needs to be addressed.

3.3 INTERGOVERNMENTAL COORDINATION GROUP FOR THE TSUNAMI EARLY WARNING AND MITIGATION SYSTEM IN THE NORTH-EASTERN ATLANTIC, THE MEDITERRANEAN AND CONNECTED SEAS (ICG/NEAMTWS)

Mr Gerassimos Papadopoulos provided an overview of the status of the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS). He informed that the Area of Responsibility of NEAMTWS covered the Northeast Atlantic, the Mediterranean and connected seas, including the Marmara and Black Seas. The system is only for near source earthquake generated tsunamis. The structure is similar to the other regional systems. There are five candidate watch centres, each of which is a national warning centre. Three of the five candidate centres are in an interim phase: Greece, France and Turkey. The other two (Portugal and Italy) will start operations in 2013 or 2014. The NEAMTWS uses trusted earthquake parameters identified by the authorized warning centre or global centres such as German Research Centre for Geosciences (GFZ) to generate tsunami messages. Tsunami messages are categorized as advisory or watch with travel times provided for the coastal areas.

Tsunami models are currently not being used and will be considered after a careful consideration on the procedures being followed in the other ICGs. The information provided by the individual centres is currently not coordinated. Capability requirements for the warning centres have been identified and a formal accreditation process will be held by a committee.

Regular communications tests are held monthly, with the majority of Member States participating. The NEAMWave12 exercise was organised on 27-28 November 2012. For different tsunami scenarios have been used, which are quite realistic for each region, corresponding mainly to a past event.

Mr Francois Schindelé, Chair of ICG/NEAMTWS, noted that the NEAMTWS did not have specific Areas of Responsibility, but practically each centre is covering a geographical region, and all centres are using the same decision matrixes (one for North-eastern Atlantic ocean and another for Mediterranean and Black seas). He further noted that there is currently no tsunami modelling products provided by NEAMTWS for the estimation of the tsunami height. The products provided details of arrival time and threat, based on earthquake magnitude, location and depth. All the relevant information should be included in the first message, because decisions must be taken immediately and there is no time to take into account the information of a second message. Messages are sent to the Tsunami Warning Focal Points (TWFP) and to several Tsunami national contact. The ICG has not yet decided about public messages and it is up to each country to decide what to tell its media.

3.4 INTERGOVERNMENTAL COORDINATION GROUP FOR THE INDIAN OCEAN TSUNAMI WARNING AND MITIGATION SYSTEM (ICG/IOTWS)

Mr Srinivasa Kumar, Vice-Chair of ICG/IOTWS, provided a status report on the Indian Ocean Tsunami Warning and Mitigation System (IOTWS). He provided an overview of the IOTWS structure, system architecture, RTSP services and product types. He explained that the “exchange” bulletins disseminated to NTWCs comprised wave height and arrival time parameters together with a simple threat/no threat status for each of the IOTWS Coastal Forecast Zones, based on RTSP model scenarios. All RTSPs use the same Coastal Forecast Zone database and threat threshold, but operate different models.

Mr Kumar explained that the IOTWS had established criteria for potential centres to become RTSPs and had defined Performance Indicators to assess RTSP performance. Service Level 2 Performance Indicators had been agreed at the recent Ninth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-IX) held in Jakarta, Indonesia, from 27 to 30 November 2012, and would be used in future assessments. An assessment of the performance of the RTSPs in the period between 12 October 2011 and 28 October 2012 had been conducted prior to ICG/IOTWS-IX and the results had been very encouraging, with most Performance Indicators being met. On this basis, the ICG had decided that the RTSPs of Australia, India and Indonesia had met the required standards and requested them to assume full operational responsibility from 31 March 2013. PTWC and JMA were requested to cease the Interim Advisory Service to the Indian Ocean region on the same date.

Mr Kumar then elaborated on a number of issues the ICG/IOTWS had requested the TOWS-WG to consider and advise on, including: the development of a detailed map defining the boundary between the IOTWS and PTWS Areas of Responsibility; to review and agree procedures for RTSPs and other regional warning centres issuing bulletins for areas outside their Areas of Responsibility; to develop standard text relating to the intended receivers of bulletins with referral to the recognized responsible RTSP/Regional Tsunami Warning (or Watch) Centre (RTWC) for a region; to review the governance of the IOC Public List Server; to develop an improved standard questionnaire for post event analysis by all ICGs; and to explore the possibility of adopting a naming convention for tsunamigenic earthquakes, similar

to the World Meteorological Organization (WMO) convention for naming tropical cyclones. These issues would be discussed under the relevant agenda items during this meeting.

4 AREAS OF RESPONSIBILITY, GEOGRAPHICAL COVERAGE, SYSTEM ARCHITECTURES IN EACH INTERGOVERNMENTAL COORDINATION GROUP

Discussion on this agenda item was led by Ms Christa von Hillebrandt-Andrade. The discussion centred on defining the membership of each ICG and the Area of Responsibility of each RTSP/RTWC. It was concluded that there was no definitive list of ICG Member States and the Secretariat was requested to prepare one prior to the 27th Session of the IOC Assembly (IOC-XXVII) that will be held from 26 June to 5 July 2013 in Paris, France. It was also agreed that there was ambiguity and some confusion over the Areas of Responsibility of the RTSPs/RTWCs in each ICG and there was considerable discussion and iterations to draft a map to define these areas. A further issue requiring clarification was the earthquake source regions to be monitored by each ICG to ensure that there were no gaps in coverage.

Subsequent discussions resulted in some confusion regarding the representation of Areas of Responsibility of the ICGs. Extensive discussions were held on the boundary between the IOTWS and PTWS in view of the request by Indonesia to IOTWS RTSPs to provide a back-up service for the coasts covering Banda Sea and Java Sea.

It was decided that two maps should be produced:

- Map of Area of Responsibility of RTSPs/RTWCs.
- Map of Earthquake Source Regions of the ICGs.

Recommendations 2 to TOWS-WG on Areas of Responsibility, geographical coverage, system architectures in each of the ICGs:

- List of Members States in each ICG to be prepared by the IOC Secretariat in table format.
- A global map of the Areas of Responsibility of the RTSPs/RTWCs to be prepared.
- The coasts of Banda Sea and Java Sea to be included in the Area of Responsibility of both the PTWS and IOTWS so that efforts are made in both ICGs to provide back-up service. The current service of PTWC and NWPTAC for the Banda and Java Seas to be continued until the IOTWS RTSPs have developed their coastal forecast zones and models for this region.
- Map of earthquake source region of each ICG to be prepared to identify the earthquakes occuring within and outside their ocean basins.

5 PROCEDURES, TERMINOLOGIES, PRODUCTS AND DISSEMINATION

5.1 PROCEDURES FOR HANDLING LARGE EVENTS HAPPENING IN QUICK SUCCESSION

There was broad discussion on this topic, which was prompted by the event in the Indian Ocean on 11 April 2012 when two large earthquakes greater than 8.0M occurred within about 2 hours of each other. All three IOTWS RTSPs issued bulletins for both events. JMA did not issue a bulletin for the 2nd earthquake since there was a possibility that this might be misunderstood as a result of the magnitude being downgraded. PTWC issued bulletins in one sequence for both events. Mr Chip McCreery, Director of PTWC, commented that PTWC handles two events as separate if they happen far apart. However, this is a subjective decision and there are no prescribed values for distance or time separation.

It was concluded that it was not possible to be prescriptive and that each event should be considered case by case. However, it was agreed that the time and spatial extent between events needed to be taken into consideration. Clear and appropriate statements should also be included in bulletins so that recipient NTWCs could understand that bulletins refer to the main shock, aftershock or a new event. Standard terminology should be used and this will be developed by the Task Team and shared with the ICGs for approval prior to adoption. It was suggested that standard terminology in update bulletins should make clear reference to the subject of the update, e.g.:

- Earthquake parameters,
- Aftershock,
- Sea level observations,
- Threat level and/or areas of threat.

Recommendation 3 to TOWS-WG on procedures for handling large events happening in quick succession. The following recommendation is a guideline based on best practice:

- It is not possible to be prescriptive and each event should be considered case by case.
- It is important to take into consideration the time and spatial extent between the events.
- It should be made very clear in the initial part of the bulletin, so that the receiving centre understands that the bulletin is for a main shock, aftershock or a new event. Standard terminology in update bulletins should make clear reference to the subject of the update:
    - Earthquake Parameters,
    - Aftershock,
    - Sea-level observations,
    - Threat levels and/or area of threat.

5.2 NAMING CONVENTION FOR TSUNAMIGENIC EARTHQUAKES

Mr Takeshi Koizumi noted that in Japan, it is a practice of JMA to name large events. However, this can be difficult if the fault rupture is very wide. Mr Kumar commented that there had been discussion in the IOTWS about naming tsunamigenic earthquakes and TOWS-WG had been requested to consider this.

There was broad discussion on this topic and the Task Team concluded that a naming convention for earthquakes and tsunamis, similar to the convention for tropical cyclones, would be useful and could help to avoid confusion when events happen close together in time and distance. The Task Team suggested that during an event, when time is limited, a regionalisation scheme such as the Flinn-Engdahl plus the year of the event could be used. If more than one event in a region occurred in a calendar year then subsequent events could be numbered sequentially. If an event proves to be significant, the final name could be decided in consultation with the country in which it occurred.

Recommendation 4 to TOWS-WG on naming convention for tsunami events:

- It is useful to have a naming convention for Tsunamis.
- During the event:

- Use the regionalization scheme of Flinn Engdhal+Year (on an interim basis, since Flinn Engdhal is not being updated by the USGS),
- If there are more events in the same year, then they should be numbered sequentially.

- After the event:
  - Name could be decided in consultation with the country in which it occurred.

5.3 IMPROVED STANDARD QUESTIONNAIRE FOR POST-EVENT ANALYSIS BY ALL INTERGOVERNMETAL COORDINATION GROUPS

Ms Laura Kong, Director of the International Tsunami Information Centre (ITIC), led discussion on this agenda item. She noted that the post-event surveys were routinely conducted by the IOC Secretariat after major events and that the survey questionnaire had evolved since it was first introduced in the IOTWS following the event of Bengkulu, Sumatra, on 12 September 2007.

The Task Team agreed that the post-event assessments conducted by the IOC Secretariat were useful and that it was important to standardise the questionnaires for all ICGs. It was considered important to identify Key Performance Indicators for the RTSPs/RTWCs and to include these in the questionnaires so that the inputs could be used to improve the systems. The survey questionnaire should be kept simple and should be completed online if possible. The Task Team recommended that the threshold for conducting a post-event assessment should be any event for which a tsunami wave height of >1metre was forecast for one or more countries in a region. It further recommended that Inter-ICG Task Teams 2 on Disaster Management and Preparedness, and 3 on Tsunami Watch Operations should compile a list of standard questions for the ICGs to review and adopt prior to the next TOWS-WG meeting.

Recommendation 5 to TOWS-WG on standard questionnaire for post-event analysis by all ICGs:

- The assessments and questionnaires are valuable.
- Identify Key Performance Indicators that are generic and include them in the questionnaire so that the inputs can be used to improve the systems.
- The trigger should be threat of >1 M forecast to one or more countries in the region.
- TOWS-WG Task Teams 2 and 3 to review the questions and develop a standard set of questions before the next TOWS meeting.
- It is the responsibility of the ICGs to review and adopt the method for surveys.

5.4 PROCEDURES FOR RTSPS DISSEMINATING BULLETINS FOR AREAS OUTSIDE THEIR AREAS OF RESPONSIBILITY AND DISSEMINATION OF PUBLIC BULLETINS ON THE IOC PUBLIC LIST SERVER

Mr Chip McCreery led discussion on this item. He commented that he respected the seismic analysis of other Regional Tsunami Service Providers (RTSPs) and they should be allowed to exchange earthquake parameters with other RTSPs and other centres. However, he was of the opinion that an RTSP should not issue a tsunami product unless it threatens the coastline of their Area of Responsibility.

Mr Srinivasa Kumar elaborated on the IOTWS RTSPs' procedures and explained that earthquake bulletins (Type I) were issued for out of region earthquakes >M6.5, but threat

information (Type II) was only issued to Indian Ocean countries for out of region events >M8.0.

Mr Takeshi Koizumi mentioned that even earthquake bulletins should not be issued for events happening outside an RTSP's Area of Responsibility.

A significant concern was that IOTWS RTSP public bulletins were sent automatically to the IOC Public List Server, and were therefore available to the global public. So there could be conflict of information with the recognised authoritative centres for the region affected. The PTWS officers had raised this issue with their IOTWS counterparts and as a result the IOTWS RTSPs had agreed to cease sending public bulletins to the IOC Public List Server until this matter was resolved.

After extensive discussion, the Task Team agreed that the IOTWS RTSPs could issue earthquake information and threat assessment bulletins for events >6.5M inside the Indian Ocean and >8.0M outside the Indian Ocean. Only these bulletins would be sent to the IOC Public List Server. To avoid potential confusion, clear mention should be made regarding the intended audience of the bulletins with proper reference made to the authoritative centres responsible for issuing bulletins within an Area of Responsibility. The exact wording of this bulletin text will be discussed and agreed by PTWC, JMA and the IOTWS RTSPs following which the dissemination of IOTWS RTSP bulletins over the IOC list server will resume.

Similarly, PTWS warning centres would issue earthquake and threat assessment bulletins only for such large events in the Indian Ocean only if their model assessments indicated a threat to coasts in the Pacific Ocean.

Similar arrangements would apply to events for CARIBE-EWS and NEAMTWS centres when they become operational.

Recommendation 6 to TOWS-WG on procedures for RTSPs disseminating bulletins for areas outside their Areas of Responsibility and dissemination of public bulletins on the IOC Public list server :

- IOTWS RTSPs will issue earthquake information as well as threat assessment bulletins for all events of >6.5M in the Indian Ocean and >8.0M outside the Indian Ocean. Only those bulletins will be sent to the IOC Public List Server. Earthquake information bulletins for events between 6.5 to 8.0M outside the Indian Ocean will not be sent to the IOC Public List Server.
- Clear mention is to be made in the bulletins regarding the intended audience with proper reference to the centres that are responsible for issuing bulletins to countries within their Area of Responsibility. The wording will be finalized between PTWC, JMA and the IOTWS RTSPs and after finalization, the dissemination of bulletins over the IOC Public List Server will resume.
- Similarly, the PTWS RTWCs will issue earthquake and threat assessment bulletins only for such large events in the Indian Ocean if their model assessments indicate a threat to coasts in the Pacific Ocean.
- Similar arrangements should be worked out between the NEAMTWS and the CARIBE EWS as and when their services become operational
- The map of earthquake source regions of the ICGs will be used to identify different earthquakes happening in different basins.

5.5 COORDINATION OF PUBLIC DISSEMINATION OF REGIONAL TSUNAMI THREAT INFORMATION – HOW TO AVOID CONFLICTING INFORMATION FOR THE MEDIA AND PUBLIC?

The background to this discussion was the recent Santa Cruz Islands event on 6 February 2013 when PTWC put the East coast of Australia in a Watch whereas the Joint Australian Tsunami Warning Centre assessed there was no threat, leading to a conflict of information between the RTWC and the NTWC. Mr Rick Bailey, Chair of ICG/IOTWS, commented that it was difficult to explain this conflict to the public and national media. He considered that the new products being introduced by the PTWC may help to overcome this situation. In the meantime, Mr Rick Bailey requested that PTWC excluded Australian coastlines from its current products.

Recommendation 7 to TOWS-WG on coordination of public dissemination of regional tsunami threat information:

- In the short-term, Australia requested to be excluded from the current PTWC products.
- There is a need to have a detailed review of these issues while finalizing the new PTWS products.

5.6 STANDARDS FOR REPORTING OF WATER LEVELS BY DIFFERENT RTSPs/RTWCs

Mr Chip McCreery provided the background to this discussion. He explained that there was inconsistency between the warning centres on the reporting of water levels or more specifically wave height. This was because the term “wave height” itself was interpreted differently by different people. For example, disaster managers had a different interpretation to oceanographers.

It was agreed that it was important to have consistency in what is forecast and reported in tsunami bulletins. It was further agreed that the Task Team should study this and prepare a paper including its recommendations before the Seventh meeting of the TOWS-WG.

Recommendation 8 to TOWS-WG on standards for reporting of water levels by different RTSPs/RTWCs:

- There needs to be consistency in what is forecasted and reported in the tsunami bulletins.
- TT to come up with brief recommendations before the next TOWS meeting.

6 GUIDELINES FOR THE REVIEW OF TSUNAMI WATCH OPERATIONS

Mr Gerassimos Papadopoulos led discussion on this agenda item. The discussion focused on the need to define Performance Indicators for RTSPs/RTWCs. Each ICG representative provided a summary of the present situation in their region:

NEAMTWS: The ICG has identified capability requirements for candidate warning centres that were qualitative rather than quantitative. A list of 12 requirements and 12 functions had been listed in the report of the Eighth 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-VIII) held in Santander, Spain, from 22 to 24 November 2011. Eight of the functions were operational. An accreditation process had been defined with accreditation team members drawn from Member States and other ICGs.

Candidate centre accreditation will be conducted by visits by team members who will assess the centre's status against the 24 requirements and functions. The process for evaluating the centres' products is yet to be defined.

CARIBE-EWS: There is no warning centre as yet, so there is nothing to review. However, the ICG had defined 7 Performance Indicators that should be met, which relate to elapse times, accuracy of estimates etc. It had not been decided yet who would actually review the results.

PTWS: Elapsed time and accuracy of PTWC earthquake parameter estimates are assessed. JMA has also conducted some evaluation. However, there are no Performance Indicators for the whole system. These might be developed for the new products when they are implemented in the PTWS.

IOTWS: Capability requirements and Performance Indicators have been established against which RTSP performance was assessed recently. These will form the basis for future performance assessments, which will be conducted and reported prior to each session of the ICG.

Mr Rick Bailey noted that the IOTWS had considered an accreditation process but this had not been accepted by some Member States. This was why the IOTWS had decided to document RTSP performance, so that Member States could review and decide which RTSP to use.

Further discussion followed on the value of conducting post-event evaluation as a way of assessing performance. It was noted that it was important to ask the right questions in post-event survey questionnaires, as each event was different. Each ICG should be responsible for conducting its own evaluation but there could be common questions designed to assess common Performance Indicators.

It was concluded that the definition of Performance Indicators was a complex issue requiring further work in all parts of the global ocean to evolve Performance Indicators and monitor the performance of RTSPs/RTWCs.

Recommendations 9 to TOWS-WG on guidelines for the review of tsunami watch operations.

- More work is required in all parts of the global ocean to evolve Performance Indicators and monitor the performance of different centres.
- IOTWS RTSP Task Team report on RTSP performance to be shared with other ICGs and feedback obtained

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

The Task Team considered that it had discussed cross-cutting issues throughout its meeting and concluded that the main issue relating to other TOWS-WG Task Teams was the revision and re-structuring of the post-event survey questionnaire.

8 REVIEW OF ACTION ITEMS AND RECOMMENDATIONS TO TOWS-WG

Recommendation 1 to TOWS-WG on the permanent status of Task Team 3 on Tsunami Watch Operations:

- The status of Task Team 3 on Tsunami Watch Opertions should be made more permanent, considering the perpetual nature of its Terms of Reference.

Recommendations 2 to TOWS-WG on Areas of Responsibility, geographical coverage, system architectures in each of the ICGs:

- List of Members States in each ICG to be prepared by the IOC Secretariat in table format.
- A global map of the Areas of Responsibility of the RTSPs/RTWCs to be prepared.
- The coasts of Banda Sea and Java Sea to be included in the Area of Responsibility of both the PTWS and IOTWS so that efforts are made in both ICGs to provide back-up service. The current service of PTWC and NWPTAC for the Banda and Java Seas to be continued, until the IOTWS RTSPs have developed their coastal forecast zones and models for this region.
- Map of earthquake source region of each ICG to be prepared to identify the earthquakes occuring within and outside their ocean basins.

Recommendation 3 to TOWS-WG on procedures for handling large events happening in quick succession. The following recommendation is a guideline based on best practice:

- It is not possible to be prescriptive and each event should be considered case by case.
- It is important to take into consideration the time and spatial extent between the events.
- It should be made very clear in the initial part of the bulletin, so that the receiving centre understands that the bulletin is for a main shock, aftershock or a new event. Standard terminology in update bulletins should make clear reference to the subject of the update:
    - Earthquake Parameters
    - Aftershock
    - Sea-level observations
    - Threat levels and/or area of threat.

Recommendation 4 to TOWS-WG on naming convention for tsunami events:

- It is useful to have a naming convention for Tsunamis.
- During the event:
    - Use the regionalization scheme of Flinn Engdhal+Year (on an interim basis, since Flinn Engdhal is not being updated by the USGS).
    - If there are more events in the same year, then they should be numbered sequentially.
- After the event:
    - Name could be decided in consultation with the country in which it occurred.

Recommendation 5 to TOWS-WG on standard questionnaire for post-event analysis by all ICGs:

- The assessments and questionnaires are valuable.
- Identify Key Performance Indicators that are generic and include them in the questionnaire so that the inputs can be used to improve the systems.
- The trigger should be threat of >1 M forecast to one or more countries in the region.
- TOWS-WG Task Teams 2 and 3 to review the questions and develop a standard set of questions before the next TOWS meeting.
- It is the responsibility of the ICGs to review and adopt the method for surveys.

Recommendation 6 to TOWS-WG on procedures for RTSPs disseminating bulletins for areas outside their Areas of Responsibility and dissemination of public bulletins on the IOC Public list server:

- IOTWS RTSPs will issue earthquake information as well as threat assessment bulletins for all events of >6.5M in the Indian Ocean and >8.0M outside the Indian Ocean. Only those bulletins will be sent to the IOC Public List Server. Earthquake information bulletins for events between 6.5 to 8.0M outside the Indian Ocean will not be sent to the IOC Public List Server.
- Clear mention is to be made in the bulletins regarding the intended audience with proper reference to the centres that are responsible for issuing bulletins to countries within their Area of Responsibility. The wording will be finalized between PTWC, JMA and the IOTWS RTSPs and after finalization, the dissemination of bulletins over the IOC Public List Server will resume.
- Similarly, the PTWS RTWCs will issue earthquake and threat assessment bulletins only for such large events in the Indian Ocean if their model assessments indicate a threat to coasts in the Pacific Ocean.
- Similar arrangements should be worked out between the NEAMTWS and the CARIBE-EWS as and when their services become operational.
- The map of earthquake source regions of the ICGs will be used to identify different earthquakes happening in different basins.

Recommendation 7 to TOWS-WG on coordination of public dissemination of regional tsunami threat information:

- In the short-term, Australia requested to be excluded from the current PTWC products.
- There is a need to have a detailed review of these issues while finalizing the new PTWS products.

Recommendation 8 to TOWS-WG on standards for reporting of water levels by different RTSPs/RTWCs:

- There needs to be consistency in what is forecasted and reported in the tsunami bulletins.
- TT3 to come up with brief recommendations before the next TOWS meeting.

Recommendations 9 to TOWS-WG on guidelines for the review of tsunami watch operations:

- More work is required in all parts of the global ocean to evolve Performance Indicators and monitor the performance of different centres.
- IOTWS RTSP Task Team report on RTSP performance to be shared with other ICGs and feedback obtained

9 CLOSE OF MEETING

Mr Srinivasa Kumar thanked the participants for attending the meeting and for their contributions and closed the meeting at 5:30 p.m.

**UNESCO/IOC TOWS-WG TASK TEAM 3
ON TSUNAMI WATCH OPERATIONS**

Room XV, UNESCO/IOC Miollis building
Paris, France
18–19 February 2013

AGENDA

Day 1:
Monday, 18 February 2013

ITEM	TIME	TOPIC	LEAD
	08:30−09:00	**Registration**	
1	09:00−09:30	**Opening and Session Organization** • Overview of the meeting logistics, introductions of the participants, review of the agenda, etc	Mr Srinivasa Kumar
2	09:30−10:00	**Presentation on the Progress of TT3** • Review of the TT3 recommendations, examine their current validity and obtain feedback on the status of their adoption within the ICGs	Mr Srinivasa Kumar
3	10:00−10:30	**Brief Presentations from the ICG Representatives** • Overview of the current status and future plans regarding tsunami watch operations – Area of Responsibility, Operational Procedures, Products, Terminologies, Performance Indicators, Monitoring Mechanisms, working groups structure as well as task teams functioning within each ICG	Representative from each ICG
10:30–11:00		Break	
3 cont	11:00−12:30	**Brief Presentations from the ICG Representatives.** Continued.	
12:30−14:00		Lunch	
4	14:00−15:30	**Areas of responsibilities, geographical coverage, system architectures in each of the ICGs** • Review and revise the Area of Responsibility of each ICG (in terms of coasts and earthquake sources) vis-à-vis the current representation in the TT3 Report	Ms Christa von Hillebrandt
15:30-16:00		Break	

ITEM	TIME	TOPIC	LEAD
5	16:00−17:30	**Procedures, Terminologies, Products and Dissemination** • Discuss recommendations towards harmonized terminologies, uniform standards and procedures. Some important discussion items include: ○ Procedures for RTSPs disseminating bulletins for areas outside their AoR ○ Standard Format for RTSP bulletins (text relating to intended audience and referral to responsible RTSP) ○ Governance and Content of the IOC Public List Server for tsunami bulletins ○ Improved, Standard questionnaire for post-event analysis by all ICGs ○ Procedure for handling large events happening in quick succession ○ Standards for Reporting of Water levels by different RTSPs ○ Coordination of public dissemination of regional tsunami threat information - how to avoid conflicting information for the media and public ○ Any other issues	Mr Chip McCreery
17:30		Close Day 1	

Day 2:
Tuesday, 19 February 2013

ITEM	TIME	TOPIC	LEAD
5 cont	09:00−10:30	**Procedures, Terminologies, Products and Dissemination** Continued.	Mr Chip McCreery
10:30–11:00		Break	
6	11:00−12:30	**Guidelines for the review of tsunami watch operations** Discuss Performance Indicators (keeping in view the new products) and mechanism for review of tsunami watch operations	Mr Gerassimos Papadopoulos
12:30–13:30		Lunch	

ITEM	TIME	TOPIC	LEAD
7	13:30–15:30	**Discussions on cross-cutting issues related to other Task Teams of TOWS & Action Items**	All
15:30–16:00		Break	
8	16:00–16:30	**Review of Action Items and Recommendations to TOWS-WG**	Mr Srinivasa Kumar
9	16:30	Close of Meeting	

**UNESCO/IOC TOWS-WG TASK TEAM
ON TSUNAMI WATCH OPERATIONS**

Room XV, UNESCO/IOC Miollis building
Paris, France
18 – 19 February 2013

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ANNEX IV

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ANNEX V

LIST OF ACRONYMS

AFTM	Alaska Tsunami Forecast Model
AoR	Area of Responsability
CARIBE EWS	Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions
CBS	WMO Commission for Basic Systems
CENALT	Centre d'alerte aux tsunamis in France,
CHy	WMO Commission for Hydrology
CIFDP	Coastal Inundation Forecasting Demonstration Project
COCONet	Continuously Operating Caribbean Observational Network project
CPA	Civil Protection Authorities (s)
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization
CTE	Communication Test Exercise
CTIC	Caribbean Tsunami Information Centre
CTWC	Caribbean Tsunami Warning Center
CTWP	Caribbean Tsunami Warning Programme / Candidate Tsunami Watch Providers
DBCP	Data Buoy Cooperation Panel
DG	Director General
DMO	Disaster Management Organizations
EAT	Estimated Arrival Time
EC	Executive Council
ECHO	European Commission Directorate Humanitarian Aid & Civil Protection
ETWS	Expert Team on Wind Waves and Storm Surges
EU	European Union
ExB	Extrabudgetary Funding
GFZ	German Research Centre for Geosciences

GTS	Global Telecommunication System
ICAM	Integrated Coastal Area Management Programme
ICG	Intergovernmental Coordination Group
ICG/CARIBE-EWS	Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System
ICG/NEAMTWS	Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas
ICG/PTWS	Report from the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System
IHB	International Hydrographic Bureau
IHO	International Hydrographic Organization
IMO	International Maritime Organization
IMS	International Monitoring System
IOC	Intergovernmental Oceanographic Commission
IOTIC	Indian Ocean Tsunami Information Centre
IOTWS	Indian Ocean Tsunami Warning and Mitigation System
ISDR	Un International Strategy for Disaster Reduction
ITIC	International Tsunami Information Centre
JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology
JMA	Japan Meteorological Agency
JTIC	Jakarta Tsunami Information Centre
KOERI	Kandilli Observatory and Earthquake Research Institute
KPI	Key Performance Indicators
MMOP	WMO Marine Meteorology and Oceanography Programme
MTS	Medium Term Strategy
NEAM	North-Eastern Atlantic, the Mediterranean and Connected Seas region

NEAMTIC	Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and connected seas
NEAMTWS	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas
NOA	National Observatory of Athens in Greece,
NOAA	National Oceanic and Atmospheric Administration of the United States of America
NSF	US National Science Foundation
NTWC	National Tsunami Warning Centre
NTWFP	National Tsunami Warning Focal Point
NWPTAC	Northwest Pacific Tsunami Advisory Center
NWS	National Weather Service
OECS	Organization of Eastern Caribbean States
OPAG-ISS	Open Programme Area Group on Information Systems and Services
PTWC	Pacific Tsunami Warning Center
PTWS	Pacific Tsunami Warning and Mitigation System (formerly ITSU)
RIFT	Rapid Inundation Forecasting of Tsunamis
RP	Regular Programme
RTSP	Regional Tsunami Service Provider
RTWC	Regional Tsunami Warning (or Watch) Centre
SIFT	Short-term Inundation Forecasting for Tsunamis
SOP	Standard Operating Procedure
SOPAC	Pacific Islands Applied Geoscience Commission
TIC	Tsunami Information Centres
ToR	Terms of Reference
TOWS-WG	Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems
TSU	Tsunami Coordination Unit
TT	Task Team

TWFP	Tsunami Warning Focal Point
TWP	Tsunami Watch Provider
TWS	Tsunami Warning System
UNISDR	United Nations Office for Disaster Risk Reduction
UNDP	United Nations Development Programme
UNESCAP	Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCATWC	West Coast and Alaska Tsunami Warning Center
WG	Working Group
WMO	World Meteorological Organization

In this Series, entitled

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

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans S. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Also printed in Spanish)***
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping ***(Also printed in French and Spanish)***
12. Joint 100-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica lnternacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica ***(Spanish only)***
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources ***(Also printed in French and Spanish)***
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities ***(Also printed in Spanish)***
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CCPS Working Group on the Investigations of 'El Niño' (***Also printed in Spanish)***
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. Cancelled
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic ***(Also printed in French)***
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping
59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications

60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Spanish only)***
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOG-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO, Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" ***(Spanish only)***
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic ***(Also printed in French)***
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
199 First Session of the Joint 100-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel, South Africa, 1997
120. Report of Ocean Climate Time-Series Workshop, Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate, USA, 1997
121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997

122. First Session of the IOC-IUCN-NOAA *Ad hoc* Consultative Meeting on Large Marine Ecosystems (LME), France, 1997

123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997

124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996 ***(also printed in Spanish)***

125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997

126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997

127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998

128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997

129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997

130. First Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 1998

131. Fourth Session of the Health of the Oceans (HOTO) Panel of the Global Ocean Observing System (GOOS), Singapore, 1997

132. Sixteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997

133. First Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1998

134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997

135. Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), France, 1998

136. Seventh Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting, Germany, 1997

137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998

138. Implementation of Global Ocean Observations for GOOS/GCOS, Second Session, France, 1998

139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998

140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998

141. Ninth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Ecuador, 1998 ***(Spanish only)***

142. Seventh Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Croatia, 1998

143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998

144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999

145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999

146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999

147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999

148. Second Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1999

149. Eighth Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Japan, 1999

150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999

151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999

152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999

153. Seventeenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999

154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998

IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998

155. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICSU/Impl-III/3, France, 1999

156. First Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Venezuela, 1999 ***(also printed in Spanish and French)***

157. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999

158. Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Russian Federation, 1999

159. Third Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), Chile, 1999

160. Fourth Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS). Hawaii, 2000

161. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000

162. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000

163. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000

164. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000

165. Second Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Cuba, 2000 ***(also printed in Spanish and French)***

166. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000

167. First GOOS Users' Forum, 2000

168. Seventh Session of the Group of Experts on the Global Sea Level Observing System, Honolulu, 2001

169. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 ***(also printed in French)***

170. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001

171. First Session of the IOC-SCOR Ocean CO_2 Advisory Panel, France, 2000

172. Fifth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Norway, 2000 ***(electronic copy only)***

173. Third Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, USA, 2001 ***(also printed in Spanish and French)***

174. Second Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Italy, 2001

175. Second Session of the Black Sea GOOS Workshop, Georgia, 2001

176. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000

177. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Morocco, 2002 ***(also printed in French)***

178. Sixth Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Australia, 2001 ***(electronic copy only)***

179. *Cancelled*

180. Second Session of the IOC-SCOR Ocean CO_2 Advisory Panel, Honolulu, Hawaii, U.S.A, 2002 ***(electronic copy only)***

181. IOC Workshop on the Establishment of SEAGOOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 (SEAGOOS preparatory workshop) ***(electronic copy only)***

182. First Session of the IODE Steering Group for the Resource Kit, USA, 19–21 March 2001

183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002

184. Seventh Session of the IODE Group of Experts on Marine Information Management (GEMIM), France, 2002 ***(electronic copy only)***

185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2001 ***(electronic copy only)***

186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002 ***(electronic copy only)***

187. Fourth Session of the ad hoc Advisory Group for IOCARIBE-GOOS, 2002, Mexico ***(also printed in French and Spanish)***

188. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IBCWIO), Mauritius, 2000

189. Third session of the Editorial Board for the International Bathymetric Chart of the Western Pacific, Chine, 2000

190. Third Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Vietnam, 2002

191. Eighth Session of the IOC Consultative Group on Ocean Mapping, Russian Federation, 2001

192. Third Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Lisbon, 2003 ***(also printed in French)***

193. Extraordinary Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Chile, 1999 ***(Spanish only; electronic copy only)***

194. Fifth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, France, 2002

195. Sixth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, South Africa, 2003

196. Fourth Session of the Coastal Ocean Observations Panel, South Africa, 2002 ***(electronic copy only)***

197. First Session of the JCOMM/IODE Expert Team On Data Management Practices, Belgium, 2003 *(also JCOMM Meeting Report No. 25)*

198. Fifth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2003

199. Ninth Session of the IOC Consultative Group on Ocean Mapping, Monaco, 2003 ***(Recommendations in English, French, Russian and Spanish included)***

200. Eighth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2003 ***(electronic copy only)***

201. Fourth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Greece, 2004 ***(also printed in French)***

202. Sixth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2004 ***(electronic copy only)***

203. Fifth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Argentina, 2005 ***(also printed in French)***

204. Ninth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2005 ***(electronic copy only)***

205. Eighth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), China, 2003 ***(electronic copy only)***

206. Sixth Meeting of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Spain, 2006 ***(also printed in French)***

207. Third Session of the Regional Forum of the Global Ocean Observing System, South Africa, 2006 ***(electronic copy only)***

208. Seventh Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2005 ***(electronic copy only)***

209. Eighth Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2006 ***(electronic copy only)***

210. Seventh Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Gabon, 2007 ***(bilingual English/French)***

211. First Meeting of the IOC Working Group on the Future of IOC, Paris, 2008 ***(Executive Summary in English, French, Russian and Spanish included)***

212. First meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 3–4 April 2008 ***(Executive Summary in English, French, Russian and Spanish included)***

213. First Session of the Panel for Integrated Coastal Observation (PICO-I), Paris, 10–11 April 2008 ***(electronic copy only)***

214. Tenth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 6–8 June 2007 ***(electronic copy only)***

215. Eighth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 21–25 April 2008 ***(bilingual English/French)***

216. Fourth Session of the Global Ocean Observing System (GOOS) Regional Alliances Forum (GRF), Guayaquil, Ecuador, 25–27 November 2008 ***(electronic copy only)***

217. Second Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 27 March 2009 ***(Executive Summary in English, French, Russian and Spanish included)***

218. Ninth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 30 March–3 April 2009 ***(bilingual English/French)***

219. First Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 3), Broomfield, Colorado, U.S.A., 1 October 2005 ***(electronic copy only)***

220. Second Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 6), Paris, France, 20 April 2007 ***(electronic copy only)***

221. Third Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 10), Villefranche-sur-mer, France, 3–4 October 2008 ***(electronic copy only)***

222. Fourth Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 15), Jena, Germany, 14 September 2009 ***(electronic copy only)***

223. First Meeting of the joint IOC-ICES Study Group on Nutrient Standards (SGONS) (also IOCCP Reports, 20), Paris, France, 23–24 March 2010 *(Executive Summary in E, F, R, S included)*

224. Third Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Lisbon, Portugal, 5–6 May 2010 ***(Executive Summary in English, French, Russian and Spanish included)***

225. Eleventh Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 13–15 May 2009 ***(electronic copy only)***

226. Second Session of the Panel for Integrated Coastal Observation (PICO-II), Paris, 24–26 February 2009 ***(electronic copy only)***

227. First meeting of the Task Team on Seismic Data Exchange in the South West Pacific of the ICG/PTWS Regional Working Group for the Southwest Pacific, Port Vila, Vanuatu, 19–20 October 2009 ***(electronic copy only)***

228. Fourth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, France, 20–21 March 2011 ***(Executive Summary in English, French, Russian and Spanish included)***

229. Second Session of the IODE Steering Group for Ocean Teacher (SG-OT), Miami, Florida, 11–15 April 2011

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

231. First Meeting of the Inter-ICG Task Team 2 on Disaster Management and Preparedness (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010

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

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

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

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

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

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

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

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

240. Ad hoc Session of the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH), Ostend, Belgium, 25 October 2012

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

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

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

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