



**Intergovernmental Coordination  
Group for the Tsunami Early  
Warning and Mitigation System  
in the North-eastern Atlantic,  
the Mediterranean and connected  
seas (ICG/NEAMTWS)**

**Sixth Session**

Istanbul, Turkey

11–13 November 2009

**Intergovernmental Oceanographic Commission**  
*Reports of Governing and Major Subsidiary Bodies*

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## Résumé exécutif

La sixième session du Groupe intergouvernemental UNESCO/COI de coordination du Système d'alerte rapide aux tsunamis et de mitigation dans l'Atlantique du Nord-Est, la Méditerranée et les mers adjacentes (ICG/NEAMTWS-VI), qui s'est réunie à Istanbul (Turquie) du 11 au 13 novembre 2009, a lancé un programme d'exercices de communication en vue de tester les capacités de communication du système d'alerte. Ce programme sera mis en œuvre en 2010 par une équipe spéciale et les 23 points focaux pour l'alerte aux tsunamis (TWFP) désignés jusqu'à présent par des États membres riverains de l'Atlantique du Nord-Est, de la Méditerranée et des mers adjacentes, ainsi que les centres régionaux de veille aux tsunamis proposés en France, en Grèce, en Italie, au Portugal et en Turquie.

**Le GIC a confirmé** l'importance de l'approche multi-aléas pour le NEAMTWS, eu égard notamment aux ondes de tempête qui affectent les États membres sur le pourtour de l'Atlantique du Nord-Est. Elle permettra d'améliorer la prévision des inondations côtières, de centrer les pratiques d'alerte existantes sur différents aléas liés au niveau de la mer et de faire progresser la cartographie des risques et aléas. En liaison avec l'approche multi-aléas, le GIC/NEAMTWS a préconisé une coopération renforcée avec l'Organisation météorologique mondiale (OMM), la Commission européenne (CE) – surtout en ce qui concerne la directive inondations – et l'Agence spatiale européenne (ESA).

**Le GIC a mis en place** un Centre d'information sur les tsunamis pour l'Atlantique du Nord-Est, la Méditerranée et les mers adjacentes (NEAMTIC) au Secrétariat de la COI. Le NEAMTIC collectera et diffusera des informations sur les activités internationales d'alerte aux tsunamis et autres aléas liés au niveau de la mer, en particulier dans la région de l'Atlantique du Nord-Est, de la Méditerranée et des mers adjacentes, favorisera l'identification et l'échange des meilleures pratiques en matière de préparation aux tsunamis et autres aléas liés au niveau de la mer, servira de source d'information pour l'élaboration et la distribution de documents de sensibilisation, d'éducation et de préparation, et collectera des données sur les cas de tsunami.

**Le GIC/NEAMTWS a élu** son Bureau pour les deux prochaines intersessions : M. François Schindelé (France, Commissariat à l'énergie atomique (CEA)), Président, et Mme Maria Ana Baptista (Portugal, Institut supérieur d'ingénierie (ISEL)) et M. Ahmet Cevdet Yalciner (Turquie, Middle East Technical University (METU)), vice-présidents.

La sixième session du GIC/NEAMTWS a accueilli plus de 80 participants de 17 pays membres et deux pays observateurs. Deux pays y prenaient part pour la première fois.

La prochaine session du GIC/NEAMTWS se tiendra du 23 au 25 novembre 2010 à Paris au Siège de la Commission océanographique de l'UNESCO.

## Resumen dispositivo

En la sexta reunión del Grupo Intergubernamental de Coordinación del Sistema de Alerta Temprana contra los Tsunamis y Atenuación de sus Efectos en el Atlántico Nororiental y el Mediterráneo y Mares Adyacentes (ICG/NEAMTWS-VI), celebrada en Estambul (Turquía) del 11 al 13 de noviembre de 2009, se inició un programa de ejercicios de comunicación con objeto de someter a prueba la capacidad de comunicación del sistema de alerta. A lo largo de 2010, la ejecución del programa correrá a cargo de un equipo de trabajo, los 23 puntos focales de alerta contra los tsunamis designados hasta la fecha por Estados Miembros del Atlántico Nororiental y el Mediterráneo y mares adyacentes, y los centros regionales de alerta contra los tsunamis (RTWC) candidatos en Francia, Grecia, Italia, Portugal y Turquía.

**El ICG confirmó** la importancia que reviste para el NEAMTWS un enfoque aplicable a peligros múltiples, en particular en relación con las mareas tormentosas que afectan a los Estados Miembros del Atlántico Nororiental. Este enfoque mejorará la predicción de inundaciones, centrará las prácticas de alerta actuales en diversos peligros relacionados con el nivel del mar y permitirá realizar avances en la determinación de riesgos y peligros. En relación con el enfoque aplicable a peligros múltiples, el ICG/NEAMTWS hizo un llamamiento para fortalecer la cooperación con la Organización Meteorológica Mundial (OMM), la Comisión Europea (CE), en particular en lo tocante a la directiva sobre inundaciones, y la Agencia Espacial Europea (ESA).

**El ICG estableció** un centro de información sobre tsunamis en el Atlántico Nororiental y el Mediterráneo y mares adyacentes (NEAMTIC) en la Secretaría de la COI. Dicho centro recabará y divulgará información sobre actividades internacionales de alerta contra los tsunamis y otros peligros relacionados con el nivel del mar, en particular en la región del Atlántico Nororiental y el Mediterráneo y mares adyacentes, promoverá la determinación y el intercambio de prácticas idóneas en la preparación contra los tsunamis y otros peligros relacionados con el nivel del mar, hará las veces de centro de información para la elaboración y divulgación de materiales de sensibilización, educación y preparación, y reunirá datos sobre casos de tsunamis.

**El ICG eligió** a los miembros de la Mesa del ICG/NEAMTWS para los próximos dos periodos entre reuniones: François Schindelé de Francia (Commissariat à l'Energie Atomique - CEA) como Presidente, y Maria Ana Baptista de Portugal (Instituto Superior de Engenharia - ISEL) y Ahmet Cevdet Yalciner de Turquía (Universidad Técnica de Oriente Medio - METU) como vicepresidentes.

Asistieron a la sexta reunión del ICG/NEAMTWS 80 participantes de 17 Estados Miembros y dos países observadores. Dos países participaban por primera vez.

La próxima reunión del ICG/NEAMTWS se celebrará del 23 al 25 de noviembre de 2010 en París, en la COI de la UNESCO.

## Рабочее резюме

Шестая сессия Межправительственной координационной группы ЮНЕСКО/МОК по Системе раннего предупреждения о цунами и смягчения их последствий в Северо-Восточной Атлантике, Средиземном и прилегающих морях (МКГ/СПЦСВАСМ-VI), состоявшаяся в Стамбуле (Турция) 11-13 ноября 2009 г., положила начало выполнению программы коммуникационных мероприятий в целях тестирования возможностей коммуникации в рамках системы предупреждения. Программа будет осуществляться в течение 2010 г. целевой группой с участием 23 координаторов по предупреждению о цунами (КПЦ), уже назначенных государствами-членами в регионе Северо-Восточной Атлантики, Средиземного и прилегающих морей, а также региональными центрами наблюдения за цунами во Франции, Греции, Италии, Португалии и Турции, которые предлагаются для выполнения соответствующих функций.

**МКГ подтвердила** важность применения СПЦСВАСМ подхода, учитывающего опасность многих явлений, особенно в отношении штормовых нагонов, от которых страдают государства-члены региона Северо-Восточной Атлантики. Такой подход позволит усовершенствовать прогнозирование прибрежных наводнений, сосредоточить существующие методы предупреждения на различных опасных явлениях, связанных с изменением уровня моря, и повысить эффективность картирования опасных явлений и рисков. В отношении подхода, учитывающего опасность многих явлений, МКГ/СПЦСВАСМ призвала укреплять сотрудничество со Всемирной метеорологической организацией (ВМО), Европейской комиссией (ЕК), особенно в рамках Директивы по наводнениям, и Европейским космическим агентством (ЕКА).

**МКГ учредила** в рамках Секретариата МОК Центр информации о цунами для региона Северо-Восточной Атлантики, Средиземного и прилегающих морей (НЕАМТИК). Этот центр будет собирать и распространять информацию о международных мероприятиях, касающихся предупреждения о цунами и других опасных явлениях, связанных с изменением уровня моря, особенно в регионе Северо-Восточной Атлантики, Средиземного и прилегающих морей (СВАСМ), способствовать выявлению передового опыта в области готовности к цунами и другим опасным явлениям, связанным с изменением уровня моря, и обмену таким опытом, выступать в качестве информационного ресурса для разработки и распространения материалов для целей повышения осведомленности общественности, образования и обеспечения готовности к бедствиям, а также собирать информацию о произошедших цунами.

**МКГ избрала** должностных лиц МКГ/СПЦСВАСМ на следующие два межсессионных периода: Франсуа Шенделе (Франция) (Комиссия по атомной энергии – КАЭ) в качестве председателя; Марию Ану Батисту (Португалия) (Высший институт инженерных наук – ИСЕЛ) и Ахмеда Севдета Ялсинера (Турция) (Ближневосточный технический университет – METU) в качестве заместителей председателя.

На шестой сессии МКГ/СПЦСВАСМ присутствовали 80 участников из 17 государств-членов и двух государств-наблюдателей, которые впервые принимали участие в сессии.

Следующая сессия МКГ/СПЦСВАСМ состоится 23-25 ноября 2010 г. в Париже в Штаб-квартире ЮНЕСКО/МОК.



## 1. OPENING

1. The sixth session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS-VI) was opened on Wednesday 11 November 2009 at 10:00 by Mr Stefano Tinti, Chairman of ICG/NEAMTWS, who welcomed the participants to the meeting.
2. Mr Mustafa Erdik, Director of the Kandili Observatory and Earthquake Research Institute (KOERI) addressed his welcoming remarks to the participants. He mentioned KOERI's commitment to set up a Tsunami Early Warning System and described the new seismic equipment installed with this purpose in the Marmara Sea. He stressed the importance of identifying the end users' needs in order to persuade them to support such a system.
3. Mr Kadri Özçaldıran, President of Bogazici University talked about the technical, institutional and coordination challenges involved in the development of a Tsunami Early Warning System. He declared that Bogazici University supports KOERI's efforts to become a Tsunami Warning Centre.
4. Mr Hikmet Çakmak, Deputy Governor of Istanbul talked about the earthquake risk in Istanbul, evoking the 1999 event. He described how the municipality of Istanbul is attempting to deal with this risk by putting in place the City Disaster and Emergency State Directorate, stressing the importance of prevention and community preparedness (Annex III).
5. Mr Hasan Ipek Head, Office of the Prime Minister, Emergency Management Directorate-General, also reminded the audience about the earthquake which took place on the 12 November 1999 as well as the Sumatra one in 2004 and the subsequent tsunami. He described the process leading to the establishment of the Turkish Tsunami Warning System and expressed Turkey's willingness to contribute to the NEAMTWS (Annex III).
6. Mr Stefano Tinti, Chairman of ICG/NEAMTWS expressed his satisfaction with the increased number of participants and delegations attending this session. He described the 1509 Istanbul earthquake that generated a tsunami and showed some figures evaluating the potential losses that such an event could imply today. He expressed confidence that national operational Tsunami Early Warning Systems in the NEAMTWS region will be a reality in the very near future.
7. Mr Peter Koltermann, Head of the UNESCO/IOC Tsunami Unit talked about the specificities of the tsunamis in the Mediterranean and in particular their local character. In this connection, community awareness and preparedness become vital. He also highlighted the need to coordinate among nations to build up a reliable system.

## 2. ORGANIZATION OF THE AGENDA

### 2.1 ADOPTION OF THE AGENDA

8. The Chairman of the ICG/NEAMTWS introduced the provisional Agenda prepared by the Secretariat in coordination with the Officers. The Session adopted the Provisional Agenda, included in Annex I.

### 2.2 DESIGNATION OF THE RAPPORTEUR

9. According to Rule of Procedure no. 25.4, the meeting considered the designation of a Rapporteur. The UK, seconded by Italy, proposed Turkey as rapporteur. Mr Öcal Necmioğlu was designated by his delegation as rapporteur and was approved by acclamation.

## 2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

10. The Chairman reviewed the timetable for the meeting and it was adopted. The Chairman also introduced the documentation for the meeting (Annex IV).

## 2.4 ESTABLISHMENT OF SESSIONAL COMMITTEES AND WORKING/DRAFTING GROUPS

11. The ICG discussed the formation of sessional committees and working groups in order to ease the working in plenary, as well as to facilitate and promote the exchange of information. In addition to the already existing Working Groups 1-4 and the ad hoc Task Team, one sessional committee (Nominations Committee) and two sessional Working Groups (Working Group on the Interim Operational Users Guide for NEAMTWS and Working Group on a Multi-hazard approach of NEAMTWS) were established.

- Nominations Committee. The Chairman explained the mechanics of the process of election of new officers. He solicited the Member States to designate members for the Nomination Committee. Germany, Italy and the UK volunteered. The Committee was chaired by Mr Trevor Guymer from the UK (see agenda item 6).
- Working Group on the Interim Operational Users Guide for NEAMTWS. The Working Group analysed the before-mentioned document before its adoption, especially regarding the content of the alert messages. France, Germany, Greece, Italy, Lebanon, Monaco, Portugal and Turkey volunteered to take part in this Working Group (see agenda item 4.6).
- Working Group on a Multi-hazard approach of NEAMTWS. Mr Trevor Guymer, from the UK delegation, explained the rationale behind the creation of this group. For northern European countries storm surges are the major risk. Many aspects of the end-to-end system envisaged for tsunami early warning is already in place to address storm-surge related hazards and synergy effects could be explored with the NEAMTWS. Denmark, France, Greece, Israel, Ireland, Italy, Spain, and the UK supported the creation of the Working Group and volunteered to participate (see Annex VII).

## 3. REPORT ON ICG/NEAMTWS INTERSESSIONAL ACTIVITIES

### 3.1 REPORT BY THE CHAIRPERSON

12. The Chairman reviewed some of the major results from ICG/NEAMTWS-V. He presented the Decision Matrix for tsunami watches concerning the Mediterranean and the North-eastern Atlantic, and the different types of messages to be used. He went over some of the ongoing NEAMTWS/ICG tasks as described in the implementation plan and congratulated the Task Team on Regional TWS architecture for the work accomplished. He presented the current status of Tsunami National Contacts (TNCs) and Tsunami Warning Focal Points (TWFPs) in the different countries and stressed the important role to be played by them when the Regional Tsunami Watch Centres (RTWCs) will be in place. With regard to the future of the system, the commitment from the five countries that have expressed their willingness to become RTWC must be formalised. More countries, and in particular more North African countries, must be engaged in order to have efficient early warning systems for the entire region of responsibility. These systems should cover all types of tsunami sources, including landslides, to account for local tsunamis.

### 3.2 REPORT BY THE IOC SECRETARIAT

13. The Secretariat reported on the activities conducted during 2009 to support the ICG/NEAMTWS. In addition to supporting the organization of the meetings of the Task Team on the Regional Tsunami Warning System Architecture (Paris, 19–20 March and Rome, 15–16 October 2009), the Secretariat has promoted better integration of the sea level networks of the Mediterranean Sea and the Black Sea for tsunami warning at the 16<sup>th</sup> session of the Mediterranean and Black Sea Hydrographic Commission (MBSHC) (Odessa, Ukraine 22–24 September 2009). The MBSHC adopted two recommendations concerning NEAMTWS: Recommendation 1, “Member States to contribute actively in the development of NEAMTWS” and Recommendation 2, “Where possible, Member States to upgrade national sea level stations identified by NEAMTWS Implementation Plan to real time data delivery and participate in data exchange”. The meeting adopted also Decision 1, “Member States to consider providing coastal bathymetry data IAW relevant resolution to IOC and IHB”.
14. The Secretariat has collaborated with the Italian National Institute for Geophysics and Volcanology (INGV) and the Moroccan Conseil National de la Recherche Scientifique et Technique (CNRST) for a project proposal to the North Atlantic Treaty Organization (NATO) Science for Peace programme concerning the harmonization of NEAMTWS seismic and sea level networks. A response by NATO was expected soon.
15. In order to better develop the multi-hazard component of the NEAMTWS with the involvement of the Member States from the North-eastern Atlantic, the Secretariat has developed a project concept for applying in demonstration sites in the North-eastern Atlantic existing storm surge modelling, fore-casting and hind-casting to develop a methodology for coastal flood risk assessments and the production of hazard and risk maps in the context of (i) early warning systems for hazards related to sea level; and (ii) integrated coastal area management. Such a project would contribute to the implementation of the EC Flood Directive. The project concept has received the attention of Denmark, the UK, Germany and Iceland and will be further discussed following ICG/NEAMTWS-VI for possible development into a project proposal to the European Commission.
16. In cooperation with the Commissariat à l’Energie Atomique (CEA) (France), the National Observatory of Athens (NOA) (Greece), the Dipartimento della Protezione Civile (DPC) (Italy), and the Fundação da Faculdade de Ciências da Universidade de Lisboa (FFCUL) (Portugal), the Secretariat had submitted a project proposal to the European Commission (EC), Directorate-General (DG) for Environment, European Civil Protection for the establishment of a Tsunami Information Centre for the Euro-Mediterranean region that in 2010-2011 would undertake the actions, listed under agenda item 4.1.
17. On the invitation of the Lebanese Government, a tsunami preparedness assessment mission was carried out in Lebanon on 30 September – 2 October with the Geophysical National Center, National Council for Scientific Research. The report of the mission will be made available on the IOC website.

#### 3.2.1 Status of TNCs and TWFPs Nomination

18. The Secretariat provided an update on the status of nominations of the TNCs and TWFPs. As of 11 November 2009, ICG/NEAMTWS Members have nominated 23 TNCs and 23 TWFPs (the full list is given in Annex VIII). Through Circular Letters, the Secretariat periodically invites Member States that have not nominated TNCs and TWFPs to do so.

### 3.3 REPORT BY TOWS-WG

19. The Secretariat reported on the results of the second meeting of the Working Group on Tsunami and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG-II) (Paris, 27 March 2009). The recommendations by the TOWS-WG-II included the following:
- Establish three inter-ICG Task Teams devoted respectively to sea level, preparedness, and tsunami watch operations, with a view to facilitate coordination of activities, develop common requirements and standards, and to share of best practices,
  - Elaborate an Initial Strategy and Plan for the Implementation of the Global Ocean-related Hazards Warning and Mitigation System Framework and of the TOWS-WG Recommendations, to be further developed based on the inputs from the ICGs,
  - Include requirements on the collection and exchange of real-time sea level data for tsunami warning purposes in the work programmes of JCOMM/GLOSS and JCOMM/DBCP, as well as the possible review of GLOSS terms of reference to reflect the operational requirements of the tsunami warning centres,
  - Need for ICGs to identify high-priority science issues that can benefit from contributions from IOC programmes and scientific and technical subsidiary bodies in the context of the IOC Programme and Budget for 2010–2011 and developing a whole-of-IOC perspective,
  - Investigation with the Secretariat of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) to conclude an agreement about the provision of, inter alia, seismic data to TWCs and the coordination of related matters,
  - Investigation with CTBTO and other seismic networks of the possibilities for improved exchange and standardization of real-time seismic data and coordination of training programs for global seismic monitoring for tsunami warning purposes,
  - Facilitation of the exchange, review and adoption of documents and guidelines related to risk assessment methodologies and other standards developed by the ICGs,
  - Development of a document with definitions and terminology on hazards, disasters, vulnerability and risks drawing on existing documents developed by bodies like the United Nations International Strategy for Disaster Reduction (UNISDR) for use by the IOC Secretariat, its Subsidiary Bodies, and its programmes,
  - Assessment of the IOC Oceanographic Data Exchange Policy as it applies to tsunami warning systems and the monitoring of its implementation to ensure the open, free, and unrestricted sharing of tsunami-relevant observational data needed for timely and effective ocean-related hazard detection, analysis, and warning for coastal communities,
  - Possible revision of the terms of reference of the General Bathymetric Chart of the Oceans (GEBCO) to promote and coordinate the development of high-resolution bathymetric data in coastal areas and digital elevation models.

The IOC 25<sup>th</sup> Assembly adopted the recommendations by TOWS-WG-II through Resolution IOC XXV-13 on Global Coordination of Early Warning and Mitigation Systems for Tsunamis and Other Sea-Level Related Hazards. Following Resolution IOC XXV-13 the IOC Executive

Secretary issued Circular Letter 2317 of 4 November 2009 requesting the Chairpersons of the ICGs to nominate two members for each Inter-ICG Task Team by 15 December 2009.

### 3.4 REPORT BY THE WORKING GROUPS

20. The Chairman invited the Chairpersons of the Working Groups to comment on progress achieved during the intersessional period with respect to the Recommendations of NEAMTWS-V and the tasks assigned to them in the Implementation Plan. The reports on the intersessional activities of the Working Groups are included in Annex V.

#### Working Group 1

21. Mr Jörn Behrens presented the WG1 report on behalf of Mr Mauricio González, Chairman of the WG1. He informed the participants about Mr François Schindelé's resignation (former WG1 Chairman). He described the most important developments such as the completion of several documents available on the NEAMTWS webpage. He expressed the need for further work to be undertaken, especially in terms of finding common standards for the hazard description and model outputs. Following some questions from the audience, he indicated that up to now the group had only dealt with large-scale tsunamis with a seismic origin, and that local tsunamis could not be incorporated immediately.

#### Working Group 2

22. Mr Giulio Selvaggi, Chairman of the WG2, presented the current state of the seismic network. He highlighted that North African countries had good seismic networks but that further efforts had to be made to encourage the sharing of data. In this respect he mentioned the potential improvement thanks to the Orpheus data centre initiative and other European Commission-funded projects. He also mentioned the existence of new tools for fast detection of potential tsunamigenic earthquakes, basing on (i) the duration of the P wave, (ii) real-time GPS data.

#### Working Group 3

23. Ms Begoña Pérez, Chairwoman of WG3, reviewed the progress achieved during the intersessional period based on the recommendations provided at the ICG/NEAMTWS-V. She reported on the production of three reports and algorithms for tsunami detection in the context of the TRANSFER project. With respect to the sea level network in 2009, 21 sea level stations have started contributing to NEAMTWS through the IOC sea level monitoring facility providing 1-min data in real time ([www.ioc-sealevelmonitoring.org](http://www.ioc-sealevelmonitoring.org)). France has undertaken some tests to use the Global Telecommunication System (GTS) for sea level data transmission in the NEAM region. There has been no significant improvement with respect to new installation of deep-ocean instrumentation for tsunami-monitoring. Mr Dov Rosen offered some clarifications concerning real time data transmission from some sea level stations in Israel, Cyprus, Malta and Ukraine and stated these stations would first become operational after February 2010.

#### Working Group 4

24. Mr Russell Arthurton, Chairman of WG4, presented the report of WG4 also on behalf of the co-chair Mr Luis Matías. He reviewed the list of tasks accomplished, such as the (i) publication of the IOC Manuals and Guides 50, integrated coastal area management (ICAM) guidelines including recommendations for best practice and standards for emergency preparedness and response (ii) the definition of tsunami alert messaging and standards for Regional Tsunami Watch Centres. Regarding future actions, the preparation of hazard and risk maps is of great relevance in Europe considering the commitments under the European Union (EU) Floods Directive. He explained the proposal to change the WG4 Terms of Reference in

order to put more emphasis in the delivering of products to the communities at risk. This was followed by some discussion concerning the overlap of WG1 and WG4 mandates.

### Structure of the Working Groups

25. Considering the recommendations provided by TOWS-WG-II regarding a harmonized structure of the Working Groups of the ICG, the Chairman and the Secretariat presented a proposal for a modified structure of the Working Groups with WG2 and WG3 merged into a 'Tsunami Detection System' WG, based on the model of the Pacific Tsunami Warning System (PTWS). However, the NEAMTWS/ICG preferred to maintain the existing structure of four standing Working Groups, with revised terms of reference for WG1 and WG2 as indicated in Annex II.A.
26. Based on the proposals by the WGs, the ICG nominated the following Co-Chairpersons of the WGs:
- Working Group 1 - Hazard Assessment and Modelling: Mr Mauricio González (Universidad de Cantabria, Spain) and Mr Jörn Behrens (University of Hamburg, Germany)
  - Working Group 2 - Seismic and Geophysical Measurements: Mr Giulio Selvaggi (INGV, Italy) and Mr Winfried Hanka (GFZ, Germany)
  - Working Group 3 - Sea Level Data Collection and Exchange, Including Offshore Tsunami Detection and Instruments: Ms Begoña Pérez Gómez (Puertos del Estado, Spain) and Mr Dov S. Rosen (Israel Oceanographic & Limnological Research, Israel)
  - Working Group 4 - Public Awareness, Preparedness and Mitigation: Mr Russell Arthurton (Coastal Geoscience, UK) and Mr Stefano Tinti (University of Bologna, Italy)

### 3.5 REPORT BY THE TASK TEAM ON REGIONAL TWS ARCHITECTURE

27. Mr Trevor Guymer, Co-Chairman of the Task Team on Regional Tsunami Warning System (TWS) Architecture, provided a combined report on the results of the third (Paris, 19–20 March 2009) and fourth (Rome, 15–16 October 2009) meetings of the Task Team. Concerning areas of RTWC responsibility, for the moment the Task Team decided to avoid proposing clear geographical boundaries; this issue will be addressed later by the Task Team. Tentatively, the candidate RTWCs would enter into operation between 2010 and 2013 with the following schedule: France (CEA): National Tsunami Warning Centre NTWC/RTWC, 2012; Greece (NOA): NTWC, 2010; Italy (DPC): NTWC, 2010; initial RTWC in 2011 and complete RTWC in 2013; Portugal (IM): NTWC, 2010; RTWC, 2013; Turkey (KOERI): NTWC/RTWC, 2010.
28. To assist the operation of the RTWCs, the Task Team prepared a Draft Operations Guide; however, given uncertainties in formal confirmation by candidate countries of the scheduled entry into operation, the Task Team decided to focus its efforts on the messaging part of the Draft Operations Guide to assist in the conduct of tsunami communication test exercises during 2010 that would link the candidate RTWCs and the TWFPs. Therefore, the Task Team prepared an Interim Operations Users Guide for consideration by the ICG (agenda item 4.6). The Task Team also drafted a Development Plan for the RTWCs taking account that full RTWC operations might be delayed but national centres might provide interim service. The RTWC Development Plan will also consider a revised NEAMTWS architecture and guide transition from the interim to the operational phase, without overlapping with the Implementation Plan, which is at present focused on monitoring networks. The report of the fourth meeting of the Task Team is included in Annex VI.

29. The ICG took note of the progress achieved by the Task Team in developing the Draft Operations Users Guide, the Interim Operations Users Guide and the RTWC Development Plan.
30. Greece observed that the discussion on the RTWC architecture has not been completed in relation to the areas of responsibility and the legal regime governing the exchange of data and watches, and important parameters for the system to operate.
31. The UK supported the point on the areas of competence of the RTWCs and recommended that it be addressed by the Task Team on the Regional TWS Architecture.
32. Germany appreciated the level of details in the presentation on the Draft Operations Guide but expressed concerns regarding the specific geographical characteristics of the Mediterranean in relation to tsunami travel time and distance, emphasizing that it is important also to clarify when not to warn. Germany wondered whether the products identified can assist in the warning and how people and media can be educated to respond to warnings.
33. Mr François Schindelé replied that the decision matrix for the Mediterranean specifies when and when not to issue a watch/advisory.
34. Israel emphasized the need for very detailed bathymetric information. It noted that while the messages submitted can be telegraphic, the words 'watch', 'alert' and 'advisory' should always be included in the header of the messages.
35. The Chairman underlined that the establishment of a Task Team on the communication test exercises is necessary with the participation of the candidate RTWCs and TWFPs.
36. Having accepted the recommendations of the Task Team, the ICG decided:
- To extend the mandate of the Task Team on Regional Tsunami Warning System Architecture and amended its current terms of reference as indicated in Annex II.B
  - To prepare and implement basin-wide Communication Test Exercises during 2010
  - To established a Task Team on the Communication Test Exercises, whose terms of reference are indicated in Annex II.C
37. The ICG nominated Mr Trevor Guymer (National Oceanography Centre, Southampton, UK) and Mr Gerassimos Papadopoulos (National Observatory of Athens, Greece) as Co-Chairmen of the Task Team on the Regional Tsunami Warning System Architecture and Mr Luís Matias (Centro de Geofísica da Universidade de Lisboa, Portugal) as Chairman of the Task Team on Communication Test Exercises.

### 3.6 REPORTS BY OTHER INTERGOVERNMENTAL ORGANIZATIONS

38. Mr Gerassimos Papadopoulos presented an overview of the activities carried out by the International Union of Geodesy and Geophysics (IUGG) Tsunami Commission. Amongst them, the organizing of workshops, the publication of special issues in scientific journals as well as the production of technical or educational material. A closer collaboration between the UNESCO/IOC Tsunami Unit and the IUGG Tsunami Commission should be promoted. (More information about the commission is available at <http://www.iaspei.org/commissions/JCT.html> ). Mr Peter Koltermann, head of the IOC/TSU replied that IOC has become a member of the IUGG Tsunami Comission, and Mr Masahiro Yamamoto of the Tsunami Unit is representing IOC.

#### **4. IMPLEMENTATION**

##### **4.1 TSUNAMI INFORMATION CENTRE FUNCTION**

39. In cooperation with CEA (France), NOA (Greece), DPC (Italy), and FFCUL (Portugal), the Secretariat had submitted a project proposal to the European Commission (DG Environment, European Civil Protection) for the establishment of a Tsunami Information Centre for the Euro-Mediterranean (NEAMTIC) region that in 2010-2011 would undertake the following actions:

- Development and distribution of educational, awareness and preparedness materials, event data collection, and the fostering of research and its application to prevent loss of life and property from tsunamis and other sea-level related hazards;
- Identification and exchange of good practices and assistance to civil protection authorities in the establishment of national and regional warning systems on coastal inundation, and the reduction of risks from tsunamis and other sea-level related hazards through comprehensive mitigation programmes, including integrated coastal zone management;
- Provision of information on warning systems for tsunamis and other sea-level related hazards to civil protection authorities, on the mandate and activities of the European Commission and the IOC in the field of tsunami preparedness, and on how to become active participants in those processes.

The project proposal was short-listed but the EC and UNESCO could not agree on whether the United Nations – European Union Financial and Administrative Framework Agreement (FAFA) would apply. The Secretariat will resubmit the project proposal when the next call for proposals has been launched and the issues concerning FAFA application have been resolved. Options for a direct grant to IOC/UNESCO may be considered in 2011.

40. It was recommended that the NEAMTIC takes advantage of the expertise of the UNESCO/IOC International Tsunami Information Centre (ITIC) working on adapting its existing awareness and educational products to the Mediterranean context. The ICG decided on the establishment of the NEAMTIC at the IOC Secretariat with the terms of reference included in Annex II.D.

##### **4.2 RISK ASSESSMENT GUIDELINES**

41. The Secretariat introduced the recent development of Guidelines and Manuals of relevance to the work of the ICG. Three sets of tsunami-related guidelines have been published over the last year or so. The Tsunami Preparedness Information Guide for Disaster Planners (IOC Manuals and Guides No 49) was prepared by the Secretariat and outlines the construction and maintenance of protective structures and discusses how current disaster prevention and emergency response planning can be improved by using research on past tsunamis.

42. The Hazard Awareness and Mitigation developed under the Integrated Coastal Area Management programme (IOC Manuals and Guides No. 50) was prepared at the request of Member States by experts in the respective hazards and their mitigation in the context of the IOC-ICAM programme. The Guidelines take a global view of sea-level related hazards including tsunamis, storm surges, extreme wind-forced waves, coastal erosion and sea-level rise.

43. The Tsunami Risk Assessment and Mitigation for the Indian Ocean was commissioned by Member States through the ICG/IOTWS Working Group 3 on Risk Assessment. The Guidelines follow the same basic structure as those of the ICAM volume but are restricted to the tsunami hazard and are illustrated solely by reference to the Indian Ocean region. The

Guidelines were adopted by the ICG/IOTWS in April 2009 and have been presented into a Regional Training Seminar and Workshop for participants with an emergency and disaster management background. The guidelines are considered to have a potential to serve as a framework for analogous manual and training guidance for the NEAMTWS region.

#### 4.3 REVIEW OF THE POST-TSUNAMI FIELD GUIDE

44. Mr Peter Koltermann informed the ICG about plans to update the Post-Tsunami Survey Field Guide (IOC Manuals & Guides 37), published in 1998. Considerable development has taken place since the first publication of this guide, and many technical tools and products are now more readily available (i.e. GPS and satellite imagery). There has also been considerable development in the governance structures for regional tsunami warning systems, and considerable experience has been gained in how to conduct such surveys in terms of organization, structure and coordination with national governments. Member States are invited to nominate experts or contribute to the revision process.

#### 4.4 UPDATE OF THE NEAMTWS IMPLEMENTATION PLAN

45. Mr Peter Koltermann introduced this item and recalled the purpose of the Implementation Plan, which describes the design of the end-to-end system, from the detection to the delivering of the warnings to the population. He highlighted the importance of keeping the plan updated, as a reference for the timely development of the system. He stressed that the Implementation Plan should reflect properly the progress of the Working Groups.

#### 4.5 ESTABLISHMENT OF RTWCS AND NTWCS

46. Member States reported on the status of the establishment of their NTWCS and the offers to host RTWCS. No new information was available with respect to what was reported at the fourth meeting of the Task Team on Regional TWS Architecture (Rome, 15–16 October 2009), with the exception of Portugal, which had not attended the meeting.

##### France

47. Ms Frédérique Martini reported on the status of the French candidate RTWC at CEA. The goals of the RTWC will be (a) to alert French authorities - civil security, within 15 minutes of potentially tsunamigenic seismic events in the North-East Atlantic or in Western Mediterranean sea, with event's parameters; (b) to inform, within 15 minutes, as regional centre for Western Mediterranean, other national warning centres, regional watch centres, and focal points; (c) to confirm whether or not there is a potential tsunami event, within the next 20 minutes. The official start of the project is 22 September 2009, while the tsunami warning system will be operational in CEA in January 2012 and national and regional operation will be achieved in July 2012. The French NTWC aims to address three tsunamigenic regions (Ligurian Sea, Maghreb and Gulf of Cadiz) and offer the role of RTWC for Western Mediterranean; provisions of RTWC services to neighbouring countries will be defined according to NEAMTWS decisions. Concerning the monitoring network, 8 seismic stations are already working and 5 more will be installed in the south (6 Broad Band stations, EVOP, LIC, 4 CNRS station, 1 Geoscope station). Seismic data will be exchanged through MPLS with Italy, Spain, Portugal and Germany, and also through the internet. Sea level data are available through SHOM. The sea level network includes 7 real time tide gauges and 20 tide gauges to upgrade. There will be 5 new tide gauges for the Ligurian Sea. From earthquake location, magnitude and time, arrival time will be computed, alert level estimated and sea level height simulated. Alert levels and procedures (watches and advisories) will be those defined by NEAMTWS. Agreements for seismic data exchange have been finalized with Spain and Portugal and are being developed with Italy and Germany. The RTWC will work with the tide gauges available today (e.g., Balears) and at the same time will work to promote a European project to develop the sea level network (i.e North Africa). This should be part of the Development Plan.

### Greece

48. Mr Costas Synolakis, also on behalf of Mr Nikolaos Melis, reported on the status of the Greek candidate RTWC at NOA. The recently elected government has established a Ministry for Civil Protection. A reorganization of the Ministry of Development with the General Secretariat for Research and Technology is ongoing and NOA is expected to be incorporated in it within the next couple of weeks. The National Committee for Tsunami Warning in Greece under the Hellenic National Commission for UNESCO is active, combining the aforementioned two focal points. NOA has a new control room for the 24/7 service with a link to the General Secretariat for Civil Protection; facilities are being upgraded towards the requirements for NTWC/RTWC including a dedicated secured VPN within the new Ministry of Civil Protection. International collaboration involves the Italian INGV (MedNet and the Italian National Seismic Network) and the German GFZ (GEOFON). NOA participates also in the new Unified National Accelerographic Network. There are about 110 permanent broadband seismic stations and SeisComp3 is being used in parallel with the EW-HYDRA system. Some examples were shown from both systems running successfully at NOA. Tide gauge data are made available from the Hellenic Navy Hydrographic Service. A pilot application for upgrading old analogue tide gauges is under testing with full results and extended application expected to finish by the end of 2009, as it was announced in the previous meeting in Paris. The sea level network needs to be further strengthened by new tide gauges at sites on islands close to seismic sources capable of tsunami generation, not only to enable the issuing of improved watch messages, but also to enable fast cancellation of warnings. Among other recent developments are (i) the preparation of a database with hundreds of precomputed scenarios of tsunami propagation identifying target areas; (ii) the addition of continuous GPS station data to rapidly detect uplift/subsidence (currently in testing phase at NOAGI); (iii) the standardization of data exchange procedure for the Hellenic RTWS with other national contributors. Greece will also strive to make the existing deep sea platform SW of Pylos available with a deep water pressure sensor and add a second platform (East of Crete).

### Italy

49. Mr Pierluigi Soddu reported on the status of the Italian candidate RTWC at DPC. The Deputy Director of DPC has been nominated as both TWFP and TNC. The geographical area of interest of the DPC encompasses the Central Mediterranean (Malta, Slovenia, Croatia, Albania, Libya, Tunisia, Montenegro, and Bosnia-Herzegovina). The Italian system is based on collaboration of three institutions including INGV (with 24/7 service) and the High Institute for Environmental Protection and Research (ISPRA), which in the context of their own mandates provide technical support to the DPC (which has a 24/7 service). The Ministry of Foreign Affairs also plays a role in relation to international cooperation. Preliminary activities for the RTWC have involved historical event analysis, source area identification (e.g., Algeria and Greece, exchanging data from Sicily), and scenario formulation. The DPC and ISPRA are currently working towards adding 5 new tide gauges by December 2009, and upgrading 6 existing tide gauges; this should lead to real time data collection by December 2010, with all existing tide gauges (25 in total) being tsunami-enabled. Concerning the seismic network, Italy relies on the INGV and MedNet networks and a network of 41 Italian operative entities and scientific entities ('functional' and 'competent' centres). Solutions for formalizing relations within the RTWC network and with NTWCs need to be identified with the assistance of the Ministry of Foreign Affairs and IOC. The Italian NTWC will be implemented in 2010; initial RTWC function is expected in 2011 and a complete RTWC function in 2013.

### Portugal

50. Ms Maria Ana Baptista reported on the status of the Portuguese candidate RTWC at the Institute of Meteorology (IM). The development of the Portuguese NTWC/RTWC comprises sequential operations of data collection and analysis from the onset of the earthquake to the issuing of messages to the PT Civil Defence. The three main components of the system: are the

seismic detection, the tsunami detection/analysis, and the issuing of messages to the civil authorities. IM is in charge of the seismic network, which comprises 22 broad band stations. There are presently agreements to exchange seismic data with Morocco (CNRST- Centre Nationale pour la Recherche Scientifique et Technique) and France (CEA-Commissariat a l'Energie Atomique). At the moment the following tide stations are connected to IM: 10 stations on the mainland, 3 in the Azores and 1 in Morocco; the data transmission intervals range from 1 second to 4 minutes. Most station upgrades were funded through the NEAREST project (Integrated observations from NEAR shore sources of Tsunamis: towards an early warning system) of the European Union. In terms of seismic detection, the Portuguese NTWC/RTWC is expected to provide estimates of hypocenter location and magnitude within 5 min after the earthquake. The next level of decision will be taken with the help of the Tsunami Analysis Tool (TAT) (in collaboration with the Joint Research Centre - JRC). Once the TAT is triggered a tsunami scenario is selected from the pre-computed scenario database and a message is issued including ETA (estimated tsunami arrival time) and MTA (maximum tsunami amplitude) at the previously selected forecast points along the Portuguese coast. Since November 2009, a scenario database for ETA and MTA has been available, based on 6.5 to 8.5-magnitude earthquakes. With the TAT it is possible to compare in real time the sea level observations and the tsunami waveforms for the selected scenario and update the messages that will be issued for the civil defence. There are still issues to be resolved in terms of funding, as the simultaneous monitoring of earthquake and tsunami requires operational shifts with 2 persons and completeness of the sea level network due to the fact that there are no tsunameters installed offshore and only part of the coastal tide gage stations are connected in real time to the IM. Future activities include the upgrade of the coastal tide stations network and the development of local detailed calculations using the scenarios database as initial conditions (towards end of 2010-2011). A preliminary meeting with AHETA (Associação dos Hotéis e Empreendimentos Turísticos do Algarve) took place on 6 November 2009 in order to understand their availability to promote the dissemination of information on tsunamis and evacuation plans.

## Turkey

51. Mr Nurcan Meral Özel reported on the status of the Turkish candidate RTWC at KOERI. She described the wide network of seismic stations operated by KOERI, especially in the Marmara Sea, with a high risk of earthquakes. KOERI has a Tsunami Working Group collaborating with Directorate of Disaster and Emergency Management (DDEM), State Planning Organization (SPO), General Command of Mapping (GCM), Office of Navigation, Hydrography and Oceanography (ONHO), General Directorate of Disaster Affairs - Earthquake Research Department (GDDA-ERD) and Middle East Technical University (METU); acting as a coordinator and having coordination meetings with all concerned institutions. Recently a protocol on sea level monitoring has been signed between KOERI and the GCM; GCM agreed to transfer (near real time, 15 minutes, which need to be updated to 1 minute) sea level data from three stations in its network (19 stations in total). Data are transferred using GPRS. METU tested GCM data in tsunami modelling. Sharing raw data with third parties may be possible through the IOC Sea Level Station Monitoring Facility. KOERI signed an agreement also with GDDA-ERD to optimize seismic network. NAMI DANCE is the software used by KOERI. SeisComp3 has been tested and considered good. SPO was approached by KOERI to financially support the upgrade to RTWC; the project proposal to SOP concerns a new building, new seismic stations, databases, and staff. National institutions started working together for the RTWC; technical expertise is available but funding is needed. Upgrading of sea level network by GCM depends on this funding; KOERI can provide some funding for this purpose. SPO has submitted the budget plan to the Parliament at the end of October 2009; therefore RTWC activities could start early 2010 depending on the funding. The monitoring areas of interest include the Aegean, the Eastern Mediterranean, the Black Sea, and the Marmara Sea.
52. Lt. Ali Türkezer reported on the status of the Turkish National Tide-Gauge Network (TUDES), managed by the General Command of Mapping. Currently, TUDES consists of 19 tide gauges. The data is sampled at every 10 seconds and averaged over 15 minutes, saved in the

datalogger and transferred to the data centre by telephone lines. At the data centre, the activities of transferring, quality control and analysis of tide gauge data are carried out according to GLOSS standards. Three tide-gauges with acoustic sensors and broadband connection will be contributed to NEAMTWS through KOERI.

53. The ICG noted that significant progress still needs to be made to integrate real time sea level data into the NEAMTWS and that the problem is particularly acute in North Africa, the Eastern Mediterranean and the Black Sea.
54. Concerning the issue of the exchange of sea level data, Tunisia observed that the problem is not with the sea level stations but with the data exchange policy. In Tunisia a high-level meeting is to be held soon to address the issues raised by the joint IOC-IHO letter on the participation of North African and Middle East Member States in GLOSS. Two Tunisian stations are available close to Sicily and in the Gulf of Gabès but data are not allowed to be shared.
55. In the subsequent discussion the following was noted:
56. France noted that concerning exchange of seismic data it would be sufficient to add robust high-speed links between the national seismic centres and hence for them to become tsunami centres, but funding is currently not available.
57. The Head of the Tsunami Unit commented that bilateral sea level data exchange agreements are not according to the IOC data exchange policy and that the issue needs to be solved on a multilateral basis.
58. Germany observed that in case of DART buoys used for detection of near-field tsunamis the seismic noise would combine with the tsunami signal, so that these two signals would be a mix. More work is needed to improve the detection. Germany restated its offer to act as a backup and data collection centre for seismic data.
59. Greece underlined that the areas of responsibility of the RTWCs have not been defined yet and bilateral agreements are needed.
60. The Chairman noted the importance of the work undertaken by Portugal with tourism associations to improve tsunami awareness and preparedness.
61. The ICG took note of the progress in establishing NTWCs and expressed the wish that all the candidate RTWCs make a firm and detailed commitment towards entering the operational phase.

#### 4.6 NEAMTWS OPERATIONS MANUAL

62. Mr François Schindelé presented the Draft Interim Operations Users Guide for the NEAMTWS network prepared by the Task Team on the Regional Tsunami Warning System Architecture and revised by the sessional Working Group taking into account existing examples from IOTWS, CARIBE-EWS and PTWS, as appropriate. The Interim Operations Users Guide focuses on the messaging section of the Draft Operations Users Guide to support the implementation of communication test exercises among candidate RTWCs and TWFPs in 2010. The Interim Operations Users Guide defines types of messages, alert status definitions, message format and content, and product identifiers and dissemination and provides sample tsunami messages.
63. The ICG adopted the Interim Operations Users Guide and entrusted the Task Team on the Communication Test Exercises to use it as the base for the preparation of the communication test exercises in early 2010.

## 5. PROGRAMME AND BUDGET FOR 2010–2011

64. The Head of the Tsunami Unit emphasized the need for financial resources to maintain an adequate level of secretariat support to the ICG/NEAMTWS. Financial needs to maintain the Secretariat are estimated to be €215,000 per year while the availability of IOC Regular Programme for the biennium 2010–2011 amounts to US\$60,000. The Head of the Tsunami Unit encouraged Member States to provide voluntary contributions to the IOC to support the ICG/NEAMTWS Secretariat.

## 6. ELECTIONS OF THE OFFICERS

65. The Election of Officers of the ICG/NEAMTWS was announced with the Invitation in CL 2312, providing the required forms. Open for nominations were the positions of one chair and two vice-chairs. The deadline for nominations was set in the draft agenda and time table and confirmed in the adopted Agenda as Wednesday, November 11, 2009, at 18.00 Local Time.

66. Before the deadline, nominations had been received by the Secretariat for all open Officers positions. Each nomination was duly dated, timed and signed by the Secretariat. The details were checked for completeness.

67. For the position of Chair three nominations were initially received:

**Chair:** Gerassimos Papadoupoulos, Greece  
Seconded by Morocco and Syria  
Nomination form received on 10 November 2009 at 12:00  
CV on record

François Schindelé  
Seconded by UK, Lebanon and Monaco  
Nomination form received on 11 November 2009 at 16:00  
CV on record

Ahmet Cevdet Yalciner, Turkey  
Seconded by Portugal and Spain  
Nomination form received on 9 November 2009 at 12:00  
CV on record

Note the Ministry of Foreign Affairs of Turkey withdrew the candidature for Chair of Dr Ahmet Cevdet Yalciner on 11 November 2009 at 17:30 in a letter received by the IOC Secretariat.

68. For the position of Vice Chairs two nominations were received:

**Vice-Chair:** Ahmet Cevdet Yalciner, Turkey  
Seconded by Portugal and Spain  
Nomination form received on 11 November 2009 at 17:46  
CV on record

Maria Ana Baptista, Portugal  
Seconded by Morocco and Spain  
Nomination form received on 6 November 2009 at 12:00  
CV on record

69. The Election Committee, composed of Germany, Italy and the UK (Chair) met on 11 and 12 November 2009. It duly scrutinized the nomination papers including the withdrawal notice of

the candidature for Chair of Mr Ahmet Cevdet Yalciner. The nomination papers were considered complete, correct and in the required form and format. The Chair of the Nominations Committee, Mr Trevor Guymer reported these findings to the ICG plenary.

70. The election was convened on Friday 13 November 2009 at 09:45.

*Election of the Vice Chairpersons of the ICG/NEAMTWS*

71. As concerned the position of vice chair there were only two candidates for two positions. The following were therefore elected by acclamation:

Ahmet Cevdet Yalciner and  
Maria Ana Baptista

*Election of Chair of ICG/NEAMTWS*

72. As concerned the position of Chair there were two candidates for one position. An election was convened by secret ballot. 18 ballots were cast. The results of the election were:

François Schindelé	11 votes
Gerassimos A. Papadoupoulos	7 votes

Consequently Mr François Schindelé was declared elected Chair of ICG/NEAMTWS.

**7. DATE AND PLACE FOR ICG/NEAMTWS-VII**

73. The Secretariat informed the ICG of the availability of a plenary room at UNESCO headquarters in Paris, between the 23 and 25 of November 2010 and proposed to hold the next ICG/NEAMTWS there. The Session agreed.

**8. ANY OTHER BUSINESS**

74. No other business was required to be considered by the Session.

**9. ADOPTION OF DECISIONS AND RECOMMENDATIONS**

75. The meeting discussed the draft decisions and recommendations from the plenary and the working groups prepared by the Secretariat. The adopted version is included in Annex II.

**10. CLOSING**

76. The meeting closed on Friday 13 November 2009, at 12:00.

ANNEX I

**AGENDA**

- 1. OPENING**
- 2. ORGANIZATION OF THE AGENDA**
  - 2.1 ADOPTION OF THE AGENDA
  - 2.2 DESIGNATION OF THE RAPPORTEUR
  - 2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION
  - 2.4 ESTABLISHMENT OF SESSIONAL COMMITTEES AND WORKING GROUPS
- 3. REPORTS ON ICG/NEAMTWS INTERSESSIONAL ACTIVITIES**
  - 3.1 REPORT BY THE CHAIRPERSON
  - 3.2 REPORT BY IOC SECRETARIAT
    - 3.2.1 Status of TNCs and TWFPs Nominations**
  - 3.3 REPORT BY TOWS-WG
  - 3.4 REPORT BY THE WORKING GROUPS
  - 3.5 REPORT BY THE TASK TEAM ON REGIONAL TWS ARCHITECTURE
  - 3.6 REPORTS BY OTHER INTERGOVERNMENTAL ORGANIZATIONS
- 4. IMPLEMENTATION**
  - 4.1 TSUNAMI INFORMATION CENTRE FUNCTION (NEAMTIC)
  - 4.2 RISK ASSESSMENT GUIDELINES
  - 4.3 REVIEW OF THE POST-TSUNAMI FIELD GUIDE (M&G 37)
  - 4.4 UPDATE OF NEAMTWS IMPLEMENTATION PLAN
  - 4.5 ESTABLISHMENT OF RTWCs and NTWCs
  - 4.6 OPERATIONS MANUAL
- 5. PROGRAMME AND BUDGET FOR 2010–2011**
- 6. ELECTIONS OF THE OFFICERS**
- 7. DATE AND PLACE FOR ICG/NEAMTWS-VII**
- 8. ANY OTHER BUSINESS**
- 9. ADOPTION OF DECISIONS AND RECOMMENDATIONS**
- 10. CLOSING**

## ANNEX II

### DECISIONS AND RECOMMENDATIONS

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

**Having met** for its 6<sup>th</sup> Session in Istanbul, Turkey, 11–13 November 2009,

**Having reviewed** the progress made in the implementation of the NEAMTWS,

**Having considered** the recommendations of the 2<sup>nd</sup> meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-II) (Paris, 27 March 2009) concerning the development of harmonized working group structures as a foundation for inter-operability,

**Having considered** also IOC Resolution XXV-13 on Global Coordination of Early Warning and Mitigation Systems for Tsunamis and Other Sea-Level Related Hazards and the establishment of inter-ICG task forces on sea level, disaster management and preparedness, and tsunami watch operations,

**Supporting** the recommendations of the 16th session of the Mediterranean and Black Sea Hydrographic Commission (MBSHC) of the International Hydrographic Organization (IHO) (Odessa, 22–24 September 2009) for Member States to: (a) upgrade national sea level stations identified by the NEAMTWS Implementation Plan to real-time data delivery and participate in data exchange; and (b) where possible make coastal bathymetry data available for tsunami modelling and inundation modelling,

**Noting** the reports of the Working Groups and the Task Team on the Regional Tsunami Warning System as well as its draft Interim Operational Users Guide and draft NEAMTWS Development Plan,

**Noting** with satisfaction the increased number of nominations of Tsunami National Contacts (TNCs) and Tsunami Warning Focal Points (TWFPs) by Member States,

**Welcomes** the confirmation by several Member States of the progress achieved in the establishment of NTWCs **and appreciates** the willingness and commitment of France, Greece, Italy, Portugal and Turkey in offering RTWC services to other Member States, as well as of Germany to provide a backup and data collection service;

**Reinforces** the urgency of having the NEAMTWS operational in an interim phase as soon as possible;

**Confirms** the current structure of the Working Groups, with modified Terms of Reference for Working Groups 1 and 4 as detailed in Annex II.A, and **agrees** on the nominations of Co-chairs proposed by the Working Groups and the Officers;

**Extends** the mandate of the Task Team on the Regional Architecture on the Tsunami Warning System until the next session of ICG/NEAMTWS with modified Terms of References as detailed in Annex II.B;

**Decides** to conduct during 2010 Communication Test Exercises between the National Tsunami Warning Centres and the Tsunami Warning Focal Points;

**Establishes** a Task Team on Communication Test Exercises, whose Terms of Reference are detailed in Annex II.C, to conduct and assess the Communication Test Exercises;

**Adopts** both the Interim Operations Users Guide to guide the Communication Test Exercises, and the NEAMTWS Development Plan for finalization for ICG/NEAMTWS-VII;

**Establishes** a Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and connected seas (NEAMTIC) at the IOC Secretariat for the ICG/NEAMTWS, whose Terms of Reference are detailed in Annex II.D, drawing on the expertise of the working groups and the experience and products of the Tsunami Information Centres (TICs). The NEAMTIC will be financed by extrabudgetary funds to which Member States are invited to contribute;

**Welcomes** the strengthened interest of Member States for the incorporation of the multi-hazard approach into the NEAMTWS, especially in relation to storm surges, and **encourages** them to further define scope and focus of activities and possible funding opportunities with the support of the Secretariat and in cooperation with the World Meteorological Organization (WMO), the European Commission (EC) and the European Space Agency (ESA) for consideration at ICG/NEAMTWS-VII;

**Requests** Member States to:

- openly share and exchange for the purpose of the NEAMTWS all tsunami-relevant real-time observational data as appropriate, including through the IOC Sea Level Station Monitoring Facility, and in accordance with the UNESCO/IOC Oceanographic Data Exchange Policy (Resolution XXII-6, IOC-XXII/3),
- facilitate access to coastal bathymetry and topography data, including river estuaries and delta areas, available for tsunami and other coastal inundation modelling,
- nominate both Tsunami Warning Focal Points and Tsunami National Contacts, if they have not done so, also to ensure adequate conditions for the Communication Test Exercises,
- nominate experts to the Working Groups and the Task Teams,
- consider extrabudgetary contributions to IOC in support of NEAMTWS;

**Requests** the ICG/NEAMTWS Chairperson to nominate members for the inter-ICG task teams in accordance with IOC Resolution XXV-13;

**Requests** the Co-chairs of the Working Groups and of the Task Teams to prepare, in consultation with their respective Members, a plan of action for the intersessional period and submit it to the IOC Secretariat no later than the end of 2009;

**Expresses deep appreciation** to Prof. Stefano Tinti and to Dr Gerassimos Papadopoulos for having served respectively as Chairman and Vice-chairman from 2005 to the present session and congratulates Dr François Schindel  for the election as Chairman and Prof Maria Ana Baptista and Prof Ahmet Cevdet Yalciner for the election as Vice-chairpersons for the term 2010–2011; **Thanks** Turkey for hosting its sixth session in Istanbul;.

**Decides** to convene its 7<sup>th</sup> session on 23–25 November 2010 in Paris at UNESCO/IOC.

## Annex II.A

### **Terms of Reference of the Working Groups**

#### **Working Group 1 — Hazard Assessment and Modelling**

The working group will be responsible for providing information and proposing standards for modelling techniques in support of tsunami early warning, sea level related hazard, and coastal inundation. It proposes, facilitates, and supports efforts to homogenize model output and recommends best practices in the production of hazard maps for planning purposes of coastal communities. It interacts with other working groups to provide expertise in utilization of data for forecasting purposes and in adequate interpretation and utilization of modelling results.

#### **Working Group 2 — Seismic and Geophysical Measurements**

The working group will be responsible for defining, based on existing organizations and functions, a transnational seismic network as part of early warning tsunami detection instruments in seismically active coastal areas and providing recommendations on the according data processing and analysis.

#### **Working Group 3 — Sea Level Data Collection and Exchange, Including Offshore Tsunami Detection and Instruments**

The working group will be responsible for defining, based on existing organizations and functions, a transnational sea level and marine network that can be integrated in an early warning tsunami detection system, as well as for providing recommendations on the data processing and analysis.

#### **Working Group 4 — Public Awareness, Preparedness and Mitigation**

The Working Group will advise on the assessment of vulnerability and risk to communities in respect of tsunami events; on procedures for enhancing awareness of, and preparedness for, tsunami impacts including evacuation planning and education; on the receipt and interpretation of tsunami alert messages received from Regional Tsunami Watch Centres by Tsunami Warning Focal Points and National Tsunami Warning Centres for issuance of warnings to threatened communities; and on the options in an Integrated Coastal Area Management (ICAM) context for the mitigation of risk to communities in respect of tsunami impacts.

## Annex II.B

### **Terms of Reference of the Task Team on the Regional Tsunami Warning System Architecture**

#### **Mandate**

Taking account of the NEAMTWS draft implementation plan, the Interim Operations Guide and the outline Development Plan, the working groups' list of actions and tasks, and of the previous decisions made by the ICG and the work carried out formerly, the Task Team shall:

1. Continue to refine architecture, tools and cooperation for RTWC, as elements of the technical end to end operational structure of the NEAMTWS;
2. Complete the development plan and prepare the full operations guide for the NEAMTWS network, with the involvement of all possible contributors and taking into account existing examples, e.g. from IOTWS and PTWS, as appropriate;
3. Maintain the progress matrix as a tool to monitor the implementation of the NEAMTWS, and particularly the regional and national TWC.

### **Modus operandi**

The Task Team will mainly work by correspondence, but hold a first meeting in the beginning of 2010 and a final one, in preparation for the next ICG meeting, in November 2010. Other meetings will be held as needed.

### **Membership**

- The ICG officers and the chairpersons of the ICG working groups
- Representatives of potential RTWCs
- Experts designated by Member States having interest in participating in the system
- Representatives of relevant organizations working in the NEAMTWS region

The Task Team will have two co-chairs nominated by the Officers of the ICG/NEAMTWS.

## Annex II.C

### **Terms of Reference of the Task Team on the Communication Test Exercises**

#### **Mandate**

As part of the preparations phase for the NEAMTWS the Task Team on Communication Test Exercises will:

1. Develop procedures for testing the communication of tsunami alert messages between participating National Tsunami Warning Centres and Tsunami Warning Focal Points including speed and availability within the NEAMTWS region;
2. Conduct the test and organise its assessment;
3. Contribute to reviewing and proposing amendments to the relevant parts of the Operations Guide in the light of experience with the tests;
4. Report to ICG/NEAMTWS-VII.

### **Modus operandi**

The Task Team will work mainly by correspondence but will also meet at least once during the intersessional period.

### **Membership**

- The ICG officers
- Representatives of potential RTWCs
- Experts designated by Member States having interest in participating in the system
- Representatives of relevant organizations working in the NEAMTWS region

The Task Team Chairperson will be nominated by the Officers of the ICG/NEAMTWS.

## Annex II.D

### **Terms of Reference of the Tsunami Information Centre for the North-eastern Atlantic, the Mediterranean and Connected Seas**

1. Collect information on the international warning activities for tsunamis and other sea-level related hazards in the NEAM region, including establishing contacts with the Monitoring

and Information Centre (MIC) of the European Civil Protection as well as civil protection agencies of Member States.

2. Provide to regional and national stakeholders information on tsunamis and other sea-level related hazards, and on tsunami warning and mitigation systems.
3. Foster identification and exchange of best practices and assist national stakeholders in the establishment of regional and national components of NEAMTWS, and the reduction of risks from tsunamis and other sea-level related hazards through comprehensive mitigation programmes.
4. Act as an information resource for the development and distribution of awareness, educational and preparedness materials, event data collection, and the fostering of research and its application with the aim of mitigating loss of life and property from tsunamis and other sea-level related hazards.

## ANNEX III

### OPENING ADDRESSES

**Mr Mustafa Erdik**

Director, Kandilli Observatory and Earthquake Research Institute, Bogazici University

Deputy Governor of Istanbul,  
President of Bogazici University  
President of the Prime Minister's Office for Disaster and Emergency Management  
Chairperson of ICG/NEAMTWS  
Head of IOC Tsunami Unit  
Excellencies, Distinguished delegates and participants, Ladies and Gentlemen,

Good morning.

Welcome the sixth session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas.

The devastating and tragic tsunami that took place in the Indian Ocean about 5 years ago claimed about a quarter million lives and destroyed the socio-economic systems in numerous coastal communities. The region still tries to recover from the effects of disaster and bring normalcy back to the lives of people.

I understand that the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and connected seas (ICG/NEAMTWS) was formed in response to this mega tsunami event.

When exposed to a catastrophic event, a sense of hopelessness and insecurity grows among people and very basic questions begin to be asked on the possibility of early warning. The warning for an impending disaster is one of the most critical aspects for the protection of human suffering and material destruction in a region.

It should be noted that the risk posed by tsunamis is region specific. The risk created by a monstrous earthquake in the middle of an ocean can generate distant tsunamis that can traverse thousands of miles before devastating the vulnerable coastal zones. Yet small and comparatively local tsunamis can be generated by even medium sized earthquakes that can affect coasts within hundreds of km. The latter tsunamis are more akin to those that can take place in the Mediterranean and the Black Sea.

Studies indicate that since 1628 B.C., 41 tsunamis were observed in the Mediterranean and the average return period of a destructive tsunami is about 100 years. Although the 1908 Messina that claimed 75,000 lives and 1956 South Aegean tsunami that claimed 56 lives are still in the memory of people, the tsunami awareness in the general public has been rekindled only after the 2004 Indian Ocean event and the challenge for Europe to be prepared in case of a tsunami has been posed. In addition to several projects and studies, this challenge has prompted the development of early warning systems in the Mediterranean with its neighboring seas.

The creation of an early warning system is important for all in the greater Euro-Mediterranean region. The technical requirements of this early warning are very demanding in particular with the shape of the Mediterranean Sea, the location of the tsunamigenic sources and the geometry of the target coastal zones.

All countries in the region should be ready to make their resources, technologies and methodologies available to support this development to be realized by the efforts of ICG/NEAMTWS under the leadership of UNESCO.

In addition, The European Union should also have to play an important role as the topic has already been included in the 7th Framework Program in the field of environmental research. Similarly the Global Monitoring for Environment and Security (GMES) initiative, developed by the European Commission should have a stake in this process.

Needless to say the early warning system to be developed should be capable of delivering accurate information to the population at risk in a robust, dependable and timely manner.

For short warning periods, the importance of regional and organizational coordination and collaboration, as well as the modes of communicating, public awareness raising and outreach should not be underestimated.

Excellencies, Ladies and Gentleman,

I am pleased to welcome you here in the seat of the Eastern Roman, Byzantium and Ottoman Empires. Istanbul is closely linked to the topic of earthquakes, tsunami and early warning. This year, the city has hosted the international conference on Earthquakes and Tsunami as well as several meetings commemorating the 500th year anniversary for the 1509 earthquake that devastated the city and caused a tsunami.

The city has also been the site of several applications and case studies in connection with EU FP6 earthquake and tsunami related projects such as SAFER, NERIES and TRANSFER.

The main Marmara fault that passes about 25km south of this hotel is primed for a M7.2 plus earthquake expected to take place at an annual probability of 2% (same probability is shared by San Francisco and Tokyo).

Archeological findings show that about 1000 years ago a tsunami destroyed the Theodosius port at Yenikapi (about 6km southwest of the conference venue). All the ships at the port sank at the same time with the goods they were carrying and the personal belongings of the sailors. The site of this finding is being prepared as a museum.

Exactly 500 years ago during the 1509 earthquake a tsunami caused 6m run up height at the same port and flooded several districts in the City. Next one was the 1894 earthquake tsunami that caused 4 to 4.5 m run up height at Golden Horn and the last example was the 1912 earthquake tsunami that caused 2.7m run up height at Yesilkoy shore (near Airport).

This means past big tsunamis attacked Istanbul coast around once every half a millennium/ Considering that the last big tsunami took place in 1509 it only takes an mind that believes in periodicities to think that the expected Istanbul earthquake will also be associated with a tsunami.

In addition to a main strike-slip fault the Sea of Marmara encompasses pull-apart basins surrounded by steep and high slopes with relative height of more than 1,000m maximum. The steep offshore slopes are believed to be the source of past as well as future tsunamis.

Studies conducted by the Istanbul Metropolitan Municipality indicate that these submarine landslides can cause tsunamis that can reach shores within 5 to 10 minute with run-up heights reaching 6m.

Obviously the methodologies to be employed for early warning of such tsunamis are totally different that those to be used for conventional ones. I believe that such causative modes for

tsunamis are also applicable to other parts of the Euro-Med region and we may want to form a special task group for this purpose.

Turkey has committed that KOERI in cooperation with the Prime Ministry's Office for Disaster and Emergency Management, Middle East Technical University, General Command of Mapping and Office of Navigation, Hydrography and Oceanography will become one of the regional TWC in the Mediterranean. The details of our preparations will be presented to you by Professor Nurcan Ozel.

I just would like to note that KOERI has successfully operated an earthquake early warning system in the Marmara region since 2002 and we are in the process of adding 5 ocean bottom measurement systems to the extensive (I believe, the densest in Europe) seismic systems around the Marmara Sea.

The seismic networks encompassing about 160 broad-band stations in Turkey are important assets that need to be fully exploited regionally in the context of establishing a regional tsunami warning system and we are extremely happy today to offer to our region this possibility. We will all work together towards a safer world and mitigating the risk of future tsunamis.

Excellencies, Ladies and Gentleman,

As an engineer that has been involved in a multitude of object-oriented projects I would like to state that the public and governmental demand for our tsunami warning services and the sustainability of demand is one of the most important parameters for our success. We have to create and sustain this demand through campaigns to increase of public, awareness and the sensitization of decision makers.

This is a long term and very demanding effort due to the low frequency of tsunamis. Furthermore, we have to link our services not only with saving of human lives but also with safe shut-down of critical facilities and industry in the coastal zones and insurance applications. This requires an effort on our side to identify the end users of our services.

Similarly we have to ensure that our services can be utilized to encourage and expedite efforts in strengthening pre-disaster strategies. As the tsunami warnings are issued, the government authorities, risk managers and the public at risk should be able to comprehend and utilize this information.

Only regular use of the early warning systems can help to ensure their sustainability and effectiveness for less frequent events, such as tsunamis. The regular use of multi-hazard, multi-purpose alert systems also allows the public to understand the warnings and to repeatedly exercise the specific actions that they should take for each type of hazard.

Before closing, I wish to thank your Excellencies for gracing this opening ceremony and the participants for the expressed commitment to the development of the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and connected Seas.

I wish all delegates and participants as well as the IOC a hard-working and, successful three days.

**Mr Hikmet Çakmak**  
Deputy Governor of Istanbul City

Distinguished delegates,

Dear participants,

I would like to thank everyone that has contributed to the work for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas being established by the Intergovernmental Oceanographic Commission under UNESCO. Moreover, hosting this meeting in our city is a source of happiness for us.

During the next there days, issues concerning the improvement of the coordination related to the establishment of a Tsunami Warning System and Tsunami Disaster Mitigation will be discussed. In this context, I would like to share with you some information concerning disaster preparedness, mitigation and management in Istanbul city.

First of all, it is a scientific fact that there is a potential earthquake risk after the 17 August and 12 November 1999 earthquakes. The survival from this possible earthquake depends on the immediate implementation of necessary actions. Disaster preparedness works should be emphasized especially. Until today, we observe that significant progress has been made with the available means. However, disaster preparedness should be considered not only on a city basis; a comprehensive countrywide approach is necessary.

As the municipality of Istanbul, we have organized a City Disaster and Emergency State Directorate, aiming to establish coordination and cooperation among the organizations and Institutions responsible for carrying out disaster preparedness works. The center of the directorate houses and Operations Center with 50 staff, a Communications Center for 16 staff, Press Center, a Service Groups Work Area for 36 persons, a Studio with radio broadcasting, and Education Hall. The IT infrastructure has been renewed and the configuration of the computer network, compatible with the Disaster Management Information System being established, is finalized. A radio broadcasting system with 10 different frequency bands to provide the citizens the most accurate and vital information in a disaster is established, and Emergency Assistance and Rescue Plans are prepared. 500 containers with Search, Rescue and First-Aid equipment are distributed across the city.

Besides all these, we know that education is a very important element of earthquake preparedness.

Within the scope of a comprehensive Disaster Management Approach consisting of Communications, Information management, Education and Consciousness Raising, we give priority to Prevention and Preparedness rather than Rescue Strategy and Wound healing, which are the right steps towards secure life.

Distinguished delegates,

Dear participants,

Disasters take place at the very moment when they are forgotten; therefore we will not let them be forgotten. We will work together with our available means to decrease the damage from earthquakes.

I would like to conclude my remarks by thanking the organizers of this meeting.

**Mr Hasan Ipek**

Republic of Turkey, Prime Minister, Directorate of Disaster and Emergency Management

Distinguished delegates,

Dear participants,

I welcome you to the Sixth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas, which we are hosting this year. I would like to express my own and our government's gratitude, and would like to add that we are most happy and pleased to host this important meeting.

Tomorrow is the 10<sup>th</sup> anniversary of the 12 November 1999 Duzce earthquake. I would like to commemorate the victims and express my condolences and sympathy to the survivors of that earthquake.

A vast majority of human population is settled in the costal areas of the Earth, which is to a great portion covered by water. Tsunami disasters in the history show clearly that people living both close to the earthquake source and far away from it, have been subject to significant losses. This potential risk exists also today.

The 26 December 2004 Sumatra earthquake and the tsunami disaster in the Indian Ocean, while taking its significant place in the history of natural disasters due to the number of casualties and financial damage it has caused, has also taught important lessons to all citizens of the world, authorities, and responsible decision makers regardless of their age and nationality, and places itself on the top of the world agenda.

Even though our country is far away from the oceans, studies supported by our valuable scientist showed the traces of tsunamis in our costal areas.

Since 2005, works towards the establishment of a Tsunami Warning System in the North Eastern Atlantic and the Mediterranean Region, which is the only region that has no such system in place, has accelerated. Republic of Turkey, being among the countries that knows the devastating outcomes of an earthquake very well, supported this initiative since the beginning and aimed to have an active role.

I believe that this international coordination to prevent the tsunami phenomena to become a disaster in North Eastern Atlantic and the Mediterranean Region, which will not recognize political boundaries and may affect large geographical areas, will continue without slowing down. I would like to state on behalf of my country, that we will fulfil our duties towards this cause with most effort possible.

Before concluding my remarks, I would like to express my confidence on the successful conclusion of this sixth session taking place here, thanks to important decisions and contributions from you. With this, I salute you and wish you success.

**Mr Peter Koltermann**  
Head Tsunami Unit, UNESCO/IOC, Paris, France

Prof Mr Mustafa Erdik  
Director of the Kandilli Observatory And Earthquake Research Institute (KOERI)

Prof Mr Kadri Özçaldıran  
President of Bogazici University

Prof Stefano Tinti  
ICG/NEAMTWS Chairperson

Değerli Temsilciler,  
Hanımlar ve Beyler,  
Sayın Meslektaşlarım!

İstanbul'da yapılan Kuzeydoğu Atlantik, Akdeniz ve Bağlı Denizlerde Tsunami Uyarı ve Hafifletme Sistemi NEAMTWS Hükümetlerarası Eşgüdüm Grubu altıncı toplantısına, UNESCO Genel Direktörü Yardımcısı ve Hükümetlerarası Oşinografi Komisyonu IOC Yürütme Sekreteri Mr Patricio Bernal adına hoşgeldiniz demekten onur ve zevk duymaktayım.

Tarihle dolu, Boğaz'ın iki yakasına ve iki kıtaya yayılan İstanbul'da buluşmak büyük bir zevktir. Elli yılı aşkın bir süre önce eğitim gördüğüm bu kentte yeniden bulunmaktan mutluyum

Distinguished Delegates,  
Ladies and Gentlemen,  
Dear Colleagues!

It is a great honour and pleasure for me to welcome you to the 6<sup>th</sup> Meeting of the Intergovernmental Coordination Group of the Northeast Atlantic, Mediterranean and Connected Seas Tsunami Warning and Mitigation System (NEAMTWS-VI) here in Istanbul on behalf of the Assistant Director General of UNESCO, and Executive Secretary of the Intergovernmental Oceanographic Commission IOC, Mr Patricio Bernal,

Meeting in Istanbul is a great pleasure: a city full of history, a city straddling the Bosphorus, home in two continents. I personally enjoy being back in the city where I went to school over fifty years ago. Istanbul is also a city with scares of old and recent earthquakes. The most recent ones are still reminders that earthquakes cannot be avoided, but we can prepare for them. The first, with its epicenter in northwestern Izmit Province, struck on August 17, 1999 leaving some 17,000 people dead and thousands more homeless. The second struck close to Istanbul on Nov. 12, 2009 killing hundreds more. If and when a tsunami can be generated in such cases is almost irrelevant. The source is too close, there are few minutes of time left to react. From the Samoa tsunami last month we again have learned that the best preparation is to immediately move to higher ground. And it was another wake-up call! Can we adequately inform the people at the coast on what to do, where to go?

So where does that take this Session of the ICG/NEAMTWS? You are responsible for an area with a high frequency of near-field earthquakes, or almost no time to react. In the last four years of building the European Tsunami Warning and Mitigation System the emphasis has been on improving the seismic detection networks, and on developing common ground rules for the detection side and for the protection side. The question to be answered from this session is certainly: how ready are we?

When the 1960 Tsunami off the coast of Chile hit Japan and Hawaii some 16 hours later, it took 5 years, for the IOC to finally establish the PTWS in 1965. It was conceived and still is an ocean-

wide system with central facilities, built for distant, far-field tsunami. It only now changes to address the near-field threat.

In response to the 2004 Indian Ocean Tsunami generated by the strong earthquake off Sumatra, it took only 3 years to start operating several national Tsunami Warning Centres TWCs. Interim coverage was provided already four weeks after this event by the PTWC in Hawaii and JMA in Tokyo. They continue to do so until the new systems are fully operational. Europe did not ask for this interim coverage!

The new systems are not a central system but a system of national systems. Nations are responsible for protecting their population, and it is only nations that can issue warnings. IOC member states in 2005 and the UN General Assembly in 2006 mandated the IOC and its Secretariat to organize coverage from tsunami hazards for other ocean regions prone to the risk of tsunami, and extending that brief to other sea-level related hazards. Now there are three new systems becoming operational.

All oceans are at risk, differing in frequency, magnitude, and impact. All countries around these ocean regions are now well aware of that, they are increasingly getting prepared to meet the challenges at the coast. These are manifold:

- Raising the awareness of the people,
- Preparing local and regional authorities and empowering them to act in a well-rehearsed and appropriate manner whenever a tsunami warning is issued,
- Reviewing and adapting national command structures, and finally
- Participating in this system of nationally owned systems where each neighbour crucially depends on the other to make the NEAMTWS work and perform.

There are still many challenges and today is not the end of getting ready but another step on an arduous long road:

- To sustain these national systems and the required national and international infrastructure over decades,
- To develop clear mechanisms to responsibly share all relevant data, information and experiences with all,
- To provide adequate coverage for all coasts around Europe.

The European system faces a few different challenges:

- It has to cover several closed or semi-enclosed basins and the North East Atlantic coasts, which implies short warning times,
- It is supported by the developed mainland Europe countries, and has as partners the lesser developed countries of the North African coast,
- With the European Union and its Commission it has a strong cohesive element that could be of great impact to the successful implementation of the NEAMTWS.

Warning systems are not attractive, they are dormant. They cost money, keep people busy and over the years will annoy the Secretary of the Treasury: no or little return on investment! The public does not notice them. Only in that one moment when they are needed and perform, they are visible and essential. This dilemma is difficult to resolve. Early Warning Systems try to extend the time available to react. The earlier the threat is known, the better prepared the affected areas are, the greater are the chances to save lives.

Ladies and Gentlemen, for tsunami threats there is no time to be wasted. The time to warn ranges from 20 minutes to a very few hours. This threat is imminent, it is not predictable and it is everywhere. Europe can show it is aware of these hazards, and how it contributes in its very own way by establishing its own NEAMTWS as a system fully connecting to the other TWSs.

Let me thank, also on your behalf, the organizers of this meeting, namely Prof Mr Mustafa Erdik and the Government of Turkey, for this invitation to Turkey and to Istanbul. Wishing you all a productive meeting,

I thank you for your attention!

Bu toplantının organizatörleri Prof Mr Mustafa Erdik ve Türkiye Hükümeti'ne, Türkiye ve İstanbul'a davetleri için sizler adına da teşekkürlerimi sunmama müsaade ediniz. Hepinize verimli çalışmalar diliyorum.

İlginiz için teşekkür ederim!

## ANNEX IV

### LIST OF DOCUMENTS

#### Working Documents

Agenda Item	Code	Title
2.1	ICG/NEAMTWS-VI/1 Prov.	Provisional Agenda
2.1	ICG/NEAMTWS-VI/2 Prov.	Provisional Annotated Agenda
2.3	ICG/NEAMTWS-VI 1 Prov. Add.	Provisional Timetable
	ICG/NEAMTWS-VI/3	Summary Report (to be developed during the session)
2.3	ICG/NEAMTWS-VI/4	Provisional List of Documents (this document)
	ICG/NEAMTWS-VI/5	Provisional List of Participants (to be developed during the session)
3.1		Report by the ICG/NEAMTWS Chairperson
3.2		Report of the Secretariat incl. status of the TNC/TWFP nominations
3.3	Resolution XXV-13	Global Coordination of Early Warning and Mitigation Systems for Tsunamis and Other Sea-Level Related Hazards
3.4		Reports of the Working Groups on their intersessional activities
3.5	ICG/NEAMTWS-TT-III/3	Summary Report of the 3rd meeting of the Task Team on the Regional TWS Architecture
3.5	ICG/NEAMTWS-TT-IV/3	Summary Report of the 4th session of the Task Team on the Regional TWS Architecture
4.1		Draft Terms of Reference for a Tsunami Information Centre function
4.4	IOC Technical Series 73	Implementation Plan (version 3.4)
4.6		Draft Interim Operations Guide
5		Draft Programme and Budget 2010–2011

#### Information Documents

Agenda Item	Code	Title
	CL 2210	Circular Letter 2210 Invitation to ICG/NEAMTWS-VI
	Resolution XXIII-14	Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS)
	ICG/NEAMTWS-I/3	Summary Report of the 1st Session of the ICG/NEAMTWS (Rome, 2005)
	ICG/NEAMTWS-II/3	Summary Report of the 2nd Session of the ICG/NEAMTWS (Nice, 2006)
	ICG/NEAMTWS-III/3	Summary Report of the 3rd Session of the ICG NEAMTWS (Bonn, 2007)
	ICG/NEAMTWS-IV/3 rev.	Summary Report of the 4th Session of the ICG/NEAMTWS (Lisbon, 2007)
	ICG/NEAMTWS-V/3	Summary Report of the 5th Session of the ICG/NEAMTWS (Athens, 2008)
3.2	IOC-XXV/3	Summary Report of the Twenty-fifth Session of the IOC Assembly
3.3	IOC/TOWS-WG-I/3	Summary Report of the 1st meeting of TOWS-WG

<b>Agenda Item</b>	<b>Code</b>	<b>Title</b>
3.3	IOC/TOWS-WG-II/3	Summary Report of the 2nd meeting of TOWS-WG
3.3		Terms of Reference for NEAMTWS Working Groups and Task Team
3.5	ICG/NEAMTWS-TT-I/3	Summary Report of the 1st meeting of the Task Team on the Regional TWS Architecture
3.5	ICG/NEAMTWS-TT-II/3	Summary Report of the 2nd meeting of the Task Team on the Regional TWS Architecture
4.2	Manuals and Guides 52	Tsunami Risk Assessment and Mitigation for the Indian Ocean
4.2	Manuals and Guides 50, ICAM Dossiers 5	Hazard Awareness and Risk Mitigation in Integrated Coastal Area Management
4.2	Manuals and Guides 49	Tsunami Preparedness: Information Guide for Disaster Planners
4.3	Manuals and Guides 37	Post-tsunami Survey Field Guide
6		Technical Arrangements for the Elections of the Officers of the ICG/NEAMTWS

## ANNEX V

### REPORTS ON THE INTERSESSIONAL ACTIVITIES OF THE WORKING GROUPS

#### **Working Group 1 – Hazard Assessment, Risk and Modelling**

(Prepared by Mauricio González, University of Cantabria, Spain)

After the Greece meeting some inter-sessional activities have been carried out:

- François Schindelé renounced his Chairmanship of the WG1. Thus, a new election for the WG1 Chair and Vice Chair must be planned for Istanbul.
- Some recommendations were proposed in the Greece meeting to the ICG plenary derived from the new/actual developments. During the inter-sessional period several tasks partially completed have been provided, mainly related with the TRANSFER project, which has finished on September 2009.
- **Table with a list of the active sub-areal and submarine volcanic systems in the Açores.** Contribution to WG 1 report NEAMTWS V (Portugal, Teresa Ferreira and Maria Ana Baptista): the A total of 17 events is presented (total of 17) where, for each one, is indicated the absolute or relative dating of the most recent eruption and the identified historical eruptions. The option was not to include in this listing the island of the Crow (Corvo Island) due to the uncertainty of the existing data. With respect to the submarine eruptions (submarine volcanic systems) the information is almost restricted to the historical occurrences. Due to the large submarine area of the Azores Islands the potential for submarine eruptions, presented here, may be rather incomplete and may not reflect the real tsunami threat due to this type of event. Most active volcanoes, in the Açores, had stronger eruptions before present, that might have higher potential to generat tsunamis. Text by: Teresa Ferreira and Maria Ana Baptista. The file (TEXT\_VOLCANOES\_AZORES\_REPORT\_NEAMTWS\_V\_sep09.pdf) is attached to this document for the IOC website.
- **Model collection and assessment of documentation:** As a result of TRANSFER the following information have been provided to IOC:
  - Table with the summary of the responsible partners and numerical models applied in the test sites, boundaries of the study area for the simulations where bathymetries have been reconstructed in each test site. The file (TRANSFER\_TABLE\_models and domains.pdf) is attached to this document for the IOC website. Provided by Ahmet Yalciner.
  - A full list of Tsunami Models used in Tsunami Modeling in the World has been prepared in accordance with TRANSFER and UNESCO IOC NEAMTWS Modeling Working Group by Mauricio González and Jörn Behrens. The initial list has been extended by Ahmet Yalciner with the models used/developed by TRANSFER partners. This has been already included in the IOC WEB site in 2009.
  - A list of Damage Metrics have been provided. The file (2\_TRANSFER\_Deliverable\_5.4-Damage Metrics.pdf) is attached to this document for the IOC website. Provided by METU and FORTH.

- **Proposed table in Greece:**

Task/Action	Timeline	Responsibility	Required Budget*	Status
Compilation of Data base	<b>May 2008</b>	Italy		<b>DONE</b>
List of island, submarine and coastal volcanoes in activity, with their characteristics of activity (effusive, explosive, etc.)	<b>Jan. 2010</b>	Italy, Greece Spain, Portugal, Iceland  Portugal  IOC		<b>DONE</b>
Model collection and assessment of documentation	<b>Nov. 2009</b>	TRANSFER Turkey, Spain, Germany  IOC		<b>DONE</b>
List of Damage Metrics	<b>Nov. 2009</b>	T RANSFER		<b>DONE</b>
Report subduction zone of the Greek islands	<b>Sept. 2009</b>	Greece		<b>N/A</b>
List of standard output	<b>Nov. 2009</b>	TRANSFER, Turkey, Spain, Germany		<b>To discuss in Istanbul</b>

As mentioned in the Implementation Plan the Interim TWS will be “designed to cope only with seismic tsunamigenic sources” and “the main target of the ITWS is that of handling large scale tsunamis, that is tsunamis that have a basin-wide propagation potential and can be destructive far from the source”. Sources have been studied and characterized in TRANSFER.

### Working Group 3 - Sea level data collection and exchange, including offshore tsunami detection instruments

(Prepared by Begoña Pérez, Puertos del Estado, Spain)

#### Status of the core-regional sea level network for NEAMTWS

Following the agreement within WG3 meetings in 2007 and the ICG/NEAMTWS-IV in Lisbon, existing real time sea level stations in the NEAMTWS region provide data temporary to the data portal for GLOSS at VLIZ (Oostende) ([www.ioc-sealevelmonitoring.org](http://www.ioc-sealevelmonitoring.org)) The service, developed for the monitoring the operational status (colour-coded) of the real time sea level stations of GLOSS (Global Sea Level Observing System), includes also the display of last raw sea level data received from the stations committed to NEAMTWS, as well as the Indian Ocean, Pacific and Caribbean Tsunami Warning Systems. The data are not quality controlled and are not processed by an algorithm for tsunami detection. The decision to use this data portal was taken at a moment where no tsunami warning centre, regional or subregional had been established. This is the situation at present.

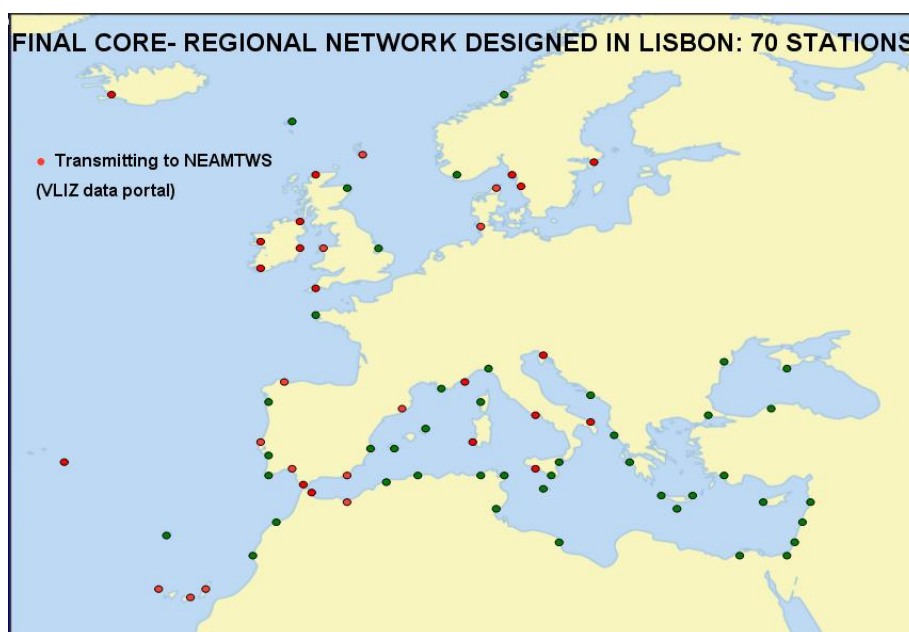


Figure 1: Status (1<sup>st</sup> November 2008), of the stations that already transmit data to VLIZ data portal (not always coincident with already upgraded stations to tsunami requirements). France and Spain have added several stations during 2009 to this initial map. A new status map is under preparation for the coming meeting in Istanbul.

During this year, all the tide gauges contributing to NEAMTWS in November 2008 through the mentioned data portal, have continued their operation. Again a number of new tide gauges from the Atlantic and Western Mediterranean have been installed or upgraded during 2009; the information from the Eastern Mediterranean is still poor and no new stations can be seen displaying their data in the mentioned data portal. The same can be said for the North African coast. On the other hand, the number of stations in the Western Mediterranean and Atlantic is larger than the previously minimum number defined by WG3 for a core-network, following the recommendations of increasing the density of tide gauges as far as possible, especially in the Mediterranean.

The WG3 members and contacts from different national sea level institutions (provided by GLOSS) have been asked to provide information about the status of their sea level stations committed to NEAMTWS. These are the countries/organizations that up to now have replied to the request:

Israel: IOLR will start transmitting sea level data to the temporary data portal for the stations of: Hadera (GLOSS station), Ashdod and Eilat before the NEAMTWS meeting in Istanbul, and for Haifa in December 2009. The reason to monitor Eilat is the potential of earthquakes in the Dead Sea fault (Afro-Syrian fault), which may induce landslides on the Mediterranean coasts of Egypt, Israel, Lebanon, Syria and even Turkey.

MedGLOSS: the software and upgrading equipment for the stations of MedGLOSS in Cyprus (Paphos), Malta (Portomaso), Romania (Constanza) and Ukraine (Kacively) are ready, awaiting a training workshop or installation by IOLR (Israel) team. Ukraine station has an additional problem due to an unknown damage of the pressure sensor.

Cyprus: Paphos sea level station is operational after several months off, but the upgrade to NEAMTWS requirements is delayed as mentioned before (MedGLOSS contribution). Another two sea level stations with NEAMTWS requirements are planned to be installed in Larnaca and Limassol, and they hope they are ready by the end of 2009.

UK: Holyhead and Lerwick have been operational throughout the year, and a third station, Newlyn, became operational in June 2009. These 3 stations have been operating on prototype systems with many upgrades throughout their operational life. A permanent tsunami system has now been designed and will be installed at Newlyn, Holyhead and Lerwick. A fourth station will also be installed at Stornoway within the next few months. All these stations transmit data to the temporary data portal.

Spain: Puertos del Estado, continuing its upgrade and extension of the REDMAR sea level network, has installed 4 new tide gauges in the Balearic Islands, of which three are transmitting data to NEAMTWS via GLOSS data portal: Ibiza2, Palma de Mallorca and Alcudia. Before November 2009, a fifth station will be installed in Mahón (Menorca), an initial proposal for NEAMTWS. Also two additional stations have been installed close to the Gibraltar Strait, in the Mediterranean coast: Algeciras and Tarifa. In general practically all the stations around the Mediterranean coast of Spain (Valencia3, Sagunto, Gandía..), and the Canary Islands (Tenerife2, Las Palmas2) are now upgraded to 1-min sampling-transmission; the number of them contributing to NEAMTWS is still unclear and may be discussed with WG1.

France: a significant number of new stations appear now in our data portal from France: Dieppe, Le Havre, Cherbourg, Roscoff, Le Conquet, Marseille and Nice. All of them upgraded to 1-min sampling-transmission requirement.

IOC: Alexandria is planned to be installed the week of 1-7 November 2009.

The rest of the countries have not reported changes with respect to the status in November 2008. In the NE part of the Mediterranean (notably Greece and Turkey) there are several existing sea level station networks run by hydrographic and geodetic national agencies as well as universities. However, there is a need for detailed information to determine: (i) which stations deliver data in real time; (ii) which stations will need to be upgraded; and (iii) which stations will countries commit to make available for NEAMTWS.

*Suggested action:* Greece and Turkey to provide above information to WG3 Chair and IOC.

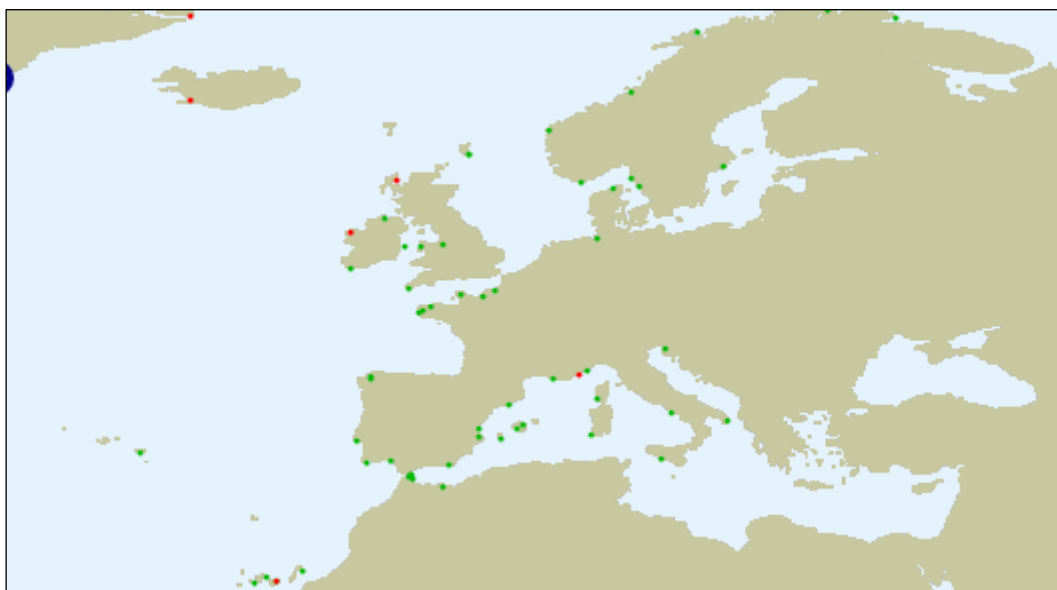


Figure 2: status of tide gauge stations transmitting data to GLOSS data facility in the NEAMTWS region, at date of this report (16<sup>th</sup> October 2009).

### **GTS tests for sea level data transmission**

France has informed the ICG of several tests done in their tide gauges, which need to be studied to see the adequacy for NEAMTWS requirements. A report from this French experience is being prepared and will be presented at the next meeting in Istanbul.

### **Documents and reports**

Three different reports are now available for the WG3, which have been finally finished within TRANSFER project, and have become deliverables of the project. This is the case of the survey of existing sea level stations in Europe, the survey of offshore instrumentation and methods, and the report about tsunami detection algorithms. All of them have been basically developed and finished in 2009 by UK (POL) and Spain (OPPE) in collaboration with other partners of TRANSFER such as GFZ (Germany) and UNIBO (Italy). One of them has become a publication in Natural Hazards and Earth System Sciences: “A Survey of European Sea Level Infrastructure”, P. Woodworth, et al, 2009.

### **Offshore instrumentation:**

The working group has received little extra information during the year concerning the availability of offshore instrumentation with pressure sensors already in place. An example is the autonomous deep sea platform for tsunami detection that will be installed in October-November 2008 within EuroSITES project, at the Poseidon-Pylos site (SE Ionian Sea), one of the critical points proposed and considered of interest for NEAMTWS. Another example is the OBS observatory close to the Alboran Island (Alboran Sea, North of Morocco), that will be established by the Spanish Navy (ROA) and will include a bottom pressure sensor.

### **Far field information**

A first contact was established in 2008 with the American National Data Buoy Center to guarantee the availability of data from the Dart buoys in the Atlantic to NEAMTWS (on the other hand available already through the GTS). Nothing new has been done within WG3 with respect to this, as it is supposed to be assumed by the potential Regional Tsunami Warning Centers.

#### **Working Group 4 - Advisory, Mitigation and Public Awareness**

(Prepared by Russell Arthurton, Coastal Geoscience, UK)

##### **Tasks accomplished**

Of the activities listed in the WG's Action Plan adopted at the ICG/NEAMTWS-V in Athens:

- The IOC guidelines volume for mainstreaming awareness and mitigation of tsunami, storm surge and other sea-level related hazards and risks in ICAM has been completed and is published as No. 50 in the IOC's Manuals and Guides series.
- Tsunami alert messaging and standards for Regional Tsunami Watch centres have been addressed jointly with WG1, and recommendations for inclusion in Section 3 (NEAMTWS Procedures) and as Section 4 (the NEAM Regional Tsunami Watch Centres) of the Operational Users Guide for the NEAMTWS are being submitted for consideration and adoption by the ICG-VI in Istanbul.
- The topic of harmonization of warnings nomenclature and standards between the various IOC-coordinated tsunami warning systems has been put on hold pending consideration by the TOWS Working Group.
- Recommendations for best practice and standards for emergency preparedness and response for national and local authorities have been included in the ICAM guidelines, referred to above.
- The workshop on stakeholder participation in marine-related hazards mitigation processes has not taken place.

##### **Proposed additional tasks**

Additional activities to be carried out by the WG are listed in Table 1 (see Annex) for consideration by ICG/NEAMTWS and discussed below. They are proposed within a framework of risk assessment and the reduction of risk through enhanced preparedness and mitigation. Their inclusion assumes the provision of appropriate resources for execution.

- The preparation of hazard and risk maps is of great relevance in Europe considering the commitments under the EU Floods Directive, which includes floods from the sea in coastal areas. The WG would aim to reactivate links with the EC and Member States on this subject. This task could also be seen in relation to the storm surge hazard, of particular relevance to North-eastern Atlantic countries. The possibility of holding a training course for MS on tsunami risk assessment could be considered.
- For the enhancement of preparedness, IOC, jointly with Portugal (FFCUL), France (CEA), Italy (Civil Protection) and Greece (NOA), have filed a project proposal to the European Commission for the establishment of a Tsunami Information Centre (TIC) at the IOC Secretariat for the NE Atlantic and Mediterranean. If successful, the ICG, through WG4, could provide advice and expertise to fulfil the TIC function; there would be opportunities to aggregate cooperation from additional countries and WG4 could provide advice and expertise to develop the initiative.
- The WG will assist Member States in procedures for interpreting alert messages received by National Warning Centres (event timings, geographical relevance, etc.) for the issuance of warnings to threatened communities. Such assistance could be linked with the training on risk assessment, referred to above.

- For steps that could be taken to mitigate the risk to communities in respect of tsunami impacts, the WG can contribute to a regional review of practices for mitigation responses, starting with a desktop study based on the concepts and procedures indicated in the ICAM Hazard Guidelines. To date, IOC has conducted assessment missions in Ireland and Algeria; Lebanon is scheduled by end of September and Egypt in November. Completion of these missions will present an opportunity to assess mitigation practices. Regional governments in Italy are also interested in testing the ICAM Guidelines in a UNEP-supported project.

### A proposal for modification of the WG4's Terms of Reference

Following the completion of the ICAM guidelines on the awareness and mitigation of marine hazards, and in the light of the experience gained by the ICG/IOTWS in the compilation of its Guidelines on Tsunami risk assessment and mitigation for the Indian Ocean (IOC Manuals and Guides No. 52), WG4 has reviewed its ToR and is submitting the following revised ToR for consideration and adoption by ICG VI.

### Proposed revised ToR

“The Working Group will advise on the assessment of risk to communities in respect of tsunami events; on procedures for enhancing awareness of, and preparedness for, tsunami impacts; on the content of tsunami alert messages issued by Regional Watch centres; on the receipt and interpretation of tsunami alert messages received from Regional Watch centres by National Warning centres for issuance of warnings to threatened communities; and on the options in an ICAM context for the mitigation of risk to communities in respect of tsunami impacts.”

**Table 1 – Proposed additional tasks for WG4**

Activity	Country/ Location	Timeline	Responsibility	Required Budget	Status
Establish concordance with European Commission and Member States in respect of tsunami hazard and risk mapping and the EU Floods Directive (include storm surge hazard also)	EC	2009-10	IOC		O
Pending success of a bid to the EC by several MS for setting up a NEAMTIC, provide advice and expertise to fulfil the TIC function	IOC Paris	2009-10	IOC and specified MS		P
Provide advice and training to MS on the procedures for interpreting tsunami alert messages received by National Warning Centres (event timings, geographical relevance, etc.) for the issuance of warnings to threatened communities		2009-10	IOC		P
Contribute to a regional review of practices for mitigation responses in the context of ICAM		2009-10	IOC		P
Contribute as appropriate to the Operations Guide for the NEAMTWS		2009-10			O

1 Notes: – Status: P – Planned, C – Completed, O – Ongoing

ANNEX VI

**SUMMARY REPORT  
OF THE FOURTH MEETING OF THE TASK TEAM ON THE REGIONAL ARCHITECTURE OF  
THE TSUNAMI WARNING SYSTEM**



IICG/NEAMTWS-TT/IV-3  
Bonn, 2 November 2009  
English only

**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION  
(of UNESCO)**

**SUMMARY REPORT OF THE FOURTH MEETING OF THE TASK TEAM ON THE  
REGIONAL ARCHITECTURE OF THE TSUNAMI WARNING SYSTEM**

**1. OPENING**

The fourth meeting of the ICG/NEAMTWS ad hoc Task Team on the Regional Architecture of the Tsunami Warning System was opened on Thursday, 15 October 2009, in Rome, at the Department of Civil Protection, by Min. Stefano Taviani, Italian Foreign Office. In his speech he emphasized that the protection of coasts vulnerable to tsunamis is a priority after the Samoa/Tonga event but there is currently no Tsunami Warning System (TWS) for the North-eastern Atlantic and Mediterranean (NEAM) region. He recalled the experience of Italian research institutions on tsunamis, the role of Italy in promoting the establishment of the ICG, and the important role played by Prof Stefano Tinti as Chairperson of the ICG/NEAMTWS. He confirmed that Italy is engaged in the establishment of the National Tsunami Warning Centre (NTWC) and related programme of work in the next three years and that this will be announced at ICG/NEAMTWS-VI. He thanked the past Chairman of the Italian Tsunami Coordination Working Group, Min. Stefano Cacciaguerra, for the results achieved. Thanking him for his opening of the meeting, the Co-chair of the Task Team, Mr Trevor Guymer, emphasized the importance of the engagement of civil protection agencies in the NEAMTWS process.

**2. ORGANIZATION OF THE MEETING**

The Co-chair of the Task Team, Mr Francois Schindel , introduced the agenda, documentation and organization of the meeting. The meeting adopted the agenda.

**3. REPORT ON THE STATUS OF PROSPECTIVE RTWCs**

France: Mr Jocelyn Guilbert from the Commissariat   l'Energie Atomique (CEA) presented the status of the French Tsunami Alert System. The official start is 22 September 2009, while the tsunami warning system will be operational in CEA in January 2012 and national and regional operation will be achieved in July 2012. The result exploitation phase will start in 2012. The French NTWC aims to address three tsunamigenic regions (Ligurian Sea, Maghreb and Gulf of Cadiz) and offer the role of RTWC for Western Mediterranean; provisions of RTWC services to neighboring countries will be defined according to NEAMTWS decisions. Concerning the

monitoring network, 8 stations are already working and 5 more will be installed in the south (6 BB stations, EVOP, LIC, 4 CNRS station, 1 Geoscope station; SeisComp3 installed). Seismic data will be exchanged through MPLS with Italy, Spain, Portugal and Germany, and also through the internet. Sea level data are available through SHOM. The sea level network includes 7 real time tide gauges and 20 tide gauge to upgrade. There will be 5 new tide gauges for the Ligurian Sea. From earthquake location, magnitude and time, arrival time will be computed, alert level estimated, sea level height simulated. Alert levels and procedures (watches and advisories) will be those defined by NEAMTWS. Agreements for seismic data exchange are finalized with Spain and Portugal and are being developed with Italy and Germany. The RTWC will work with the tide gauges available today (e.g., Baleares) and at the same time will work to promote a European project to take care of the desirable stations (Southern Mediterranean). This should be part of the Development Plan.

Stefano Tinti commented that it is important to distinguish between what is in the scope of the RTWC and NTWC and what requires international cooperation. In the French presentation, the French project items and actions were separated from the complementary stations needed.

Greece: Mr Nikolaos Melis from the National Observatory of Athens (NOA) presented the status of development of the Greek NTWC/RTWC, with emphasis to the latest developments since the meeting in March. New Tsunami National Contact (Prof Costas Synolakis) and Tsunami Warning Focal Point (NOA-IG) have been nominated, with Mr C. Synolakis and Mr N. Melis appointed as the two new technical focal points to the ICG/NEAMTWS. The recently elected government has established a Ministry for Civil Protection. A reorganization of the Ministry of Development with the Gen. Secr. for Research and Technology is ongoing and NOA is expected to be incorporated in it within the next couple of weeks to follow. The National Committee for Tsunami Warning in Greece under the Hellenic National Commission for UNESCO is active, combining the aforementioned two focal points. NOA has a new control room for the 24/7 service and with a link to the Gen. Secr. for Civil Protection; facilities are being upgraded towards the requirements for NTWC/RTWC including a dedicated secured VPN with the new Ministry of Civil Protection. International collaboration involves the Italian INGV (MEDNET and the Italian National Seismic Network) and the German GFZ (GEOFON). NOA participates also in the new Unified National Accelerographic Network. There are about 110 permanent broadband seismic stations and SeisComp3 is being used in parallel with the EW-HYDRA system. Some examples were shown from both systems running successfully at NOA. Tide gauge data are made available from the Hellenic Navy Hydrographic Service. A pilot application for upgrading old analog tide gauges is under testing with full results and extended application expected to finish by the end of 2009, as it was announced in the previous meeting in Paris. The sea level network needs to be further strengthened by new tide gauges at sites on islands close to seismic sources capable of tsunami initiation, not only to enable the issuing of secure watch messages, but making also more secure and probably fast their cancelation. This is expected to be finalized by the end of 2009 as funds are made available from Gen. Secr. for Res. and Tech. In early 2010 Greece will be able to run a NTWC securely and take a commitment further towards a RTWC. Greece will also strive to make the existing deep sea platform available SW of Pylos and add a second platform (East of Crete), but at the moment the budget for this exercise is not cleared.

Italy: Mr Pierluigi Soddu presented developments with the Italian RTWC at the Department of Civil Protection (DPC). The Deputy Director of DPC has been nominated as both TWFP and TNC. The geographical area of interest of the DPC encompasses the Central Mediterranean (Malta, Slovenia, Croatia, Albania, Libya, Tunisia, Montenegro, and Bosnia-Herzegovina). The Italian system is a synergy of three different institutions: the National Institute for Geophysics and Volcanology (INGV) (with 24/7 service) and the High Institute for Environmental Protection and Research (ISPRA) provide technical support to the DPC (which has a 24/7 service). The Ministry of Foreign Affairs plays also a role in relation to international cooperation. Preliminary activities for the RTWC have involved historical event analysis, source area identification (e.g., Algeria and Greece, exchanging data from Sicily), and scenario formulation. The DPC and ISPRA are currently working towards adding 5 new tide gauges by December 2009, and upgrading 6 existing tide gauges as tsunami detectors; this should lead to real time data collection

by December 2010, with a view to upgrading all existing tide gauges (25) to coastal tsunami detectors. Concerning the seismic network, Italy relies on the INGV and MedNet networks and a network of 41 Italian operative entities and scientific entities ('functional' and 'competent' centres). Solutions for formalizing relations within the RTWC network and with NTWCs need to be identified with the assistance of the Ministry of Foreign Affairs and IOC. The Italian NTWC will be implemented in 2010, initial RTWC function in 2011 and a complete RTWC function in 2013.

Mr Giulio Selvaggi, Director, Earthquake Centre, INGV, gave a presentation on "tsunami early warning using earthquake rupture duration", showing the use of downloadable open-source software to measure *p* wave forms to supplement the decision matrix based only on earthquake magnitude. According to studies, a signal of less than 50 seconds can be a signal that the earthquake can be tsunamigenic, as per examples from the tsunamis of Samoa on 29 September 2009 and Sumatra on 30 September 2009. The meeting agreed that this is a resource that should be further developed and explored and standardized for use by the RTWCs: when the parameters are available they can be included in the bulletin, but it has to be decided what will determine the level of alert.

Portugal: The representative from the Portuguese Instituto Meteorologico (IM) was absent.

Turkey: Mr Dogan Ugur Sanli from the Kandilli Observatory and Earthquake Research Institute (KOERI) described the wide network of seismic stations operated by KOERI, especially in the Marmara Sea, where an earthquake is expected any time soon. KOERI has a Tsunami Group collaborating with Middle East Technical University (METU) that is having coordination meetings with all concerned institutions. Recently a protocol on sea level monitoring has been signed between KOERI and the General Command of Mapping (GCM); GCM agreed to transfer (near real time, 15 minutes, which need to be updated to 1 minute) sea level data (19 stations). Data are transferred using GPRS. METU tested GCM data in tsunami modeling. Sharing raw data with third parties may be problematic, but perhaps is possible with IOC (Sea Level Station Monitoring Facility). KOERI signed an agreement also with the General Directorate for Disaster Affairs, Earthquake Research Department (GDDA-ERD) to optimize seismic network. NAMI DANCE is the software used by KOERI. SeisComp3 has been tested and considered good. Turkey participates in all ICG/NEAMTWS working groups (WG1: METU, WG2: KOERI, WG3: General Command of Mapping, WG4: General Directorate for Disaster Affairs). The State Planning Organization (SOP) was approached by KOERI to support financially the upgrade to RTWC; the project proposal to SOP (2.5 million €) concerns a new building, new seismic stations, databases, and staff. KOERI applied to the Prime Minister to become officially the NTWC and a new institution is being created, the Prime Minister's Directorate of Disaster and Emergency Management. National institutions started working together for the RTWC; technical expertise is available but funding is needed. Upgrading of sea level network by GCM depends on this funding; KOERI can transfer to them some funding. SPO is submitting the budget plan to the Parliament at the end of October 2009; therefore RTWC activities could start early 2010 depending on the funding. The monitoring areas of interest include the Aegean, the Eastern Mediterranean, the Black Sea, and the Marmara Sea.

Germany (backup centre): Mr Jörn Lauterjung from the German Deutsches GeoForschungsZentrum (GFZ) confirmed that although not permanently operating on 24/7 basis, GFZ offers to act as a seismic background data collection and processing centre for NEAMTWS. This role includes

- to collect seismic real-time data from public and private sources over Internet and its private VSAT hub including the data streams from the dedicated VSAT backbone seismic network
- to operate a global earthquake monitoring system issuing very rapidly automatic solutions
- to provide its SeisComp3 software to the RTWCs and to organize operational support

- to provide the collected real-time data feeds and automatic and manual processing results to the RTWCs
- to provide rapid access to its comprehensive seismic data archive of EuroMed and global data
- to provide a platform for the rapid internal exchange of seismic processing results among the RTWCs

#### **4. IMPLEMENTATION PLAN AND RTWC DEVELOPMENT PLAN**

This agenda item was addressed as a whole.

The fourth meeting of the Task Team before ICG/NEAMTWS-VI was motivated by the expectation of the establishment of the first RTWC at the session. The current scenario, instead, is that all candidate centres, as NTWCs, will be able to cover local tsunamis but perhaps not a regional tsunami. A minimalistic plan would be for the NTWCs to be compatible with the criteria indicated by the Task Team and the ICG, relying on available solutions and fully implementing the concept of TWFP. Initial focus can be on NTWCs not just as recipient of information but rather as providers: the TWFPs should be the subject of text and image message tests to verify their capacities. The meeting agreed that this would be an essential function to engage the system. The development plan should capture the status of development of the NTWCs and RTWCs and focus on the architecture, not so much on the monitoring system, as this is addressed by the Implementation Plan.

There is an urgent need to provide an interim service based on messages concerning earthquakes. While in the absence of a complete sea level network opened watch and advisory sequences could not be properly closed, visual observation on site or time can assist. Data from selected stations (backbone) can still be shared among all RTWCs. To enhance the sharing of sea level data, the CTBTO agreement with UNESCO can perhaps provide a model for a similar agreement on sea level data.

Information on the candidate Portuguese RTWC is not available, but most candidate RTWCs are just implementing the national component as NTWCs. It seems that Turkey will be ready first, followed by Greece and Italy in 2010 and then France in 2012. The evolution of NTWCs into RTWCs should be placed into a timeframe, including the interim system (starting from 2011 with the first RTWC), whose steps need to be defined.

Given the status of the candidate RTWCs, the bulletin component of the Operations Users Guide would now not be used immediately; however, it could be tested through messaging tests involving the candidate RTWCs and the TWFPs, which are expected to receive the watches and advisories from the RTWCs. Other types of exercises can be done, but the primary role rests with civil protection agencies; there can be simulations (starting from after the monitoring system): tsunamigenic or non-tsunamigenic earthquakes; then the RTWCs would send messages to TWFPs. A special Task Team inclusive of Civil Protection Agencies, jointly with the IOC Secretariat could lead the development of the tests.

Performance indicators would have to consider delay, accuracy, etc. and be criteria for the TWFPs, as a subset of criteria for NTWC when there are no facilities.

The meeting agreed that the full Development Plan will be prepared after ICG/NEAMTWS-VI based on official commitments by Member States. However, an outline of its proposed contents will be presented at the ICG.

## **5. RTWC OPERATIONS USERS GUIDE AS PART OF THE DEVELOPMENT PLAN**

Given the delay in the confirmation of the commitment by candidate RTWCs, the Task Team decided to concentrate its work on section 4 of the draft Operations Users Guide, “The NEAM Regional Tsunami Watch Centres (RTWCs)”, to be renamed to “The NEAM Regional Tsunami Watch Centres (RTWCs) and National Tsunami Warning Centres (NTWCs) willing to share their data”.

The Task Team adopted a simplified structure for the Operations Users Guide, to be renamed the Interim Operations Users Guide and focusing on the communication tests. The revised document will be presented to ICG/NEAMTWS-VI for approval and will have a validity of one year. Its basic elements are:

- Introduction: types of test (communication test, simulation)
- Definitions of RTWC, NTWC, TWFP, TNC
- Roles and requirements
- Messages
- Forecast points
- Communication means

The discussion focused on the list of types of messages, on sections 3.6, “Tsunami Messages”, and 4.10, “Sample Tsunami Messages”. Sequencing in tsunami messages will include four different messages (watch, advisory, information, and communication test). These messages will concern the regional and basin levels, not the local. In the case of an event, three messages are expected from the RTWCs: (1) seismic event, (2) confirmation, (3) end of watch. A new header for tsunami watch exercise will be used to distinguish it from a real tsunami watch. The frequency of messages would have to be decided.

Consideration was given to the ambiguity of the word ‘regional’ in the Mediterranean context and the need to better characterize the destination of messages in terms of marginal seas and sub-basins as well as parts of the coastal zone of a country. A solution would be to provide watches to cities with a certain population at epicentral distances close to the event. Each country should provide a limited number of predefined forecast points to be requested by the IOC Secretariat via a Circular Letter to Member States. This approach seems better as it does not discriminate between countries with and without a NTWC, which would calculate tsunami impacts.

WG 2 should work on the possibilities offered by the accelerometric network (an example from Greece was noted that would help an accelerometric network if catastrophic events clip broadband instruments and accelerometric data will provide immediate estimates of earthquake magnitude) and continuous GPS monitoring.

## **6. INTER-ICG TASK TEAM ON TSUNAMI WATCH OPERATION**

Resolution XXV-13 on Global Coordination of Early Warning and Mitigation Systems for Tsunamis and Other Sea-Level Related Hazards establishes an Inter-ICG Task Team on Tsunami Watch Operations. The Task Team is expected to play a role on behalf of ICG/NEAMTWS to coordinate and harmonize work on tsunami watch operations. This will be addressed directly by ICG/NEAMTWS-VI.

## **7. ANY OTHER BUSINESS**

There was no other business to deal with.

## **8. INPUTS TO ICG/NEAMTWS-VI**

The inputs of the Task Team to ICG/NEAMTWS-VI will include:

Documents:

- A combined report from the third and fourth meetings
- The draft Interim Operations Users Guide
- An outline of the Development Plan for RTWCs and NTWCs

Recommendations:

- Preparation and implementation of a basin-wide tsunami watch messaging exercise during 2010
- Creation of an ad hoc Task Team to support the watch messaging exercise
- Establishment of a sessional working/drafting group to draft the terms of reference of the new Task Team
- Extension of the mandate of the Task Team on Regional TWS Architecture and review of its current terms of reference

## **9. CLOSING**

The Co-chairs of the Task Team closed the fourth meeting at 15:00 on Friday, 16 October 2009.

### **ANNEXES** (*not included*)

- I. List of participants
- II. Interim Operations Users Guide
- III. Outline of the Development Plan for RTWCs and NTWCs

## ANNEX VII

### **SESSIONAL WORKING GROUP ON A MULTI-HAZARD APPROACH OF NEAMTWS**

Chairman: Trevor Guymer (UK)

Participants: Denmark (Erik Buch), France (Ronan Créach, Frédérique Martini), Germany (Jörn Behrens, Alexander Rudloff, Anna Von Gyldenfeldt), Greece (Demetrios Paliatsos, Ioannis Kalogeras, Pinelopi Spilioti), Ireland (Brian McConnell), Israel (Dov S. Rosen), Italy (Stefano Corsini), Monaco (Michel Boisson), Romania (Constantin Ionescu, Gheorghe Marmureanu), Spain (Begoña Perez Gomez, Elena Tel), UK (Dave Smith), observer (Annalisa Gardi)

The sessional Working Group on a Multi-Hazard Approach of NEAMTWS, met on 12 November 2009 in the context that NEAMTWS was conceived at the outset as a multi-hazard warning and mitigation system. The European Commission<sup>2</sup> and the European Council<sup>3</sup> have recognized that NEAMTWS is an essential contribution to a European multi hazard early warning system, emphasizing that tsunami monitoring instruments can be used for storm surge monitoring or for measuring long-term sea level changes related to climate change.

NEAMTWS can also provide an important contribution to the implementation of the EU Floods Directive,<sup>4</sup> which mandates EU Member States to:

- undertake preliminary flood risk assessment by 2011
- develop flood hazard maps and flood risk maps by 2013 (including flooding from the sea)
- develop flood risk plans by 2015, including flood forecasts and early warning system

However, it is noted that the European Flood Alert System (EFAS) only deals with the riverine component of coastal flooding and therefore there is a need to establish corresponding services for flooding from the sea.

More recently, the XV Session of WMO's Regional Association VI (Europe) (Brussels, 18–24 September 2009)<sup>5</sup> expressed the wish to extend the tropical cyclone initiative on floods to Europe in partnership with IOC and NEAMTWS:

4.6.11 [...] requested the Secretary-General, in consultation with UNESCO/IOC, to expand and facilitate the development of storm surge watch schemes for regions subject to extra-tropical systems, including in RA VI.

4.6.12 [...] ensure that in situ and remote sensed sea-level observations are routinely collected and disseminated via the GTS, in support of coastal marine hazard warning services, including in particular for storm surges and tsunamis.

4.6.13 [...] It acknowledged that WMO initiatives in Multi-Hazard Early Warning Systems demonstration projects, for strengthening the operational cooperation of NMHSs [National Meteorological and Hydrological Services] with disaster risk management agencies, would be instrumental in strengthening tsunami early warning and mitigation

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<sup>2</sup> Document SEC(2007) 1721, Towards Better Protecting Citizens against Disaster Risks: Strengthening Early Warning Systems in Europe.

<sup>3</sup> Document 15479/07, Council conclusions on the establishment of an Early Warning System for tsunamis in the North East Atlantic and the Mediterranean region.

<sup>4</sup> Directive 2007/60/EC on the assessment and management of flood risks.

<sup>5</sup> Document XV-RAVI/App\_Doc. 4.6, Enhanced Capabilities of Members in Multi-Hazard Early Warning and Disaster Prevention and Preparedness.

system capabilities in countries in the North Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS).

Trevor Guymer indicated that the European Space Agency (ESA) has launched a Storm Surge Project, with a Data User Element Project for 2010 and €1 million available for a 2-year project. The objectives of the project will be:

- To contribute through Earth Observation to an integrated approach to storm surges, wave, sea-level and flood forecasting as part of a wider optimal strategy for building an improved forecast and warning capability for coastal inundation
- To increase the use of advanced capabilities of ESA and ESA Third Party Mission EO data to storm surge applications

An ESA invitation to tender for this project is expected by March 2010.

The sessional Working Group considered that the work of ICG/NEAMTWS Working Groups 1 (Hazard Assessment and Modelling) and 4 (Public Awareness, Preparedness and Mitigation) is very relevant to the needs expressed by the EC, WMO and ESA. The activities of Working Group 3 on Sea Level Data Collection and Exchange, together with the Global Sea Level Observing System (GLOSS) and the Joint WMO-IOC Technical Commission on Oceanography and Marine Meteorology (JCOMM) are instrumental to all aspects of sea level related hazards.

The sessional Working Group on a multi-hazard approach to NEAMTWS focused its work on storm surges, while noting other sea-level related hazards, e.g. landslides, sea level rise. Among participating Member States there was considerable enthusiasm for a multi-hazard initiative, considering also that in the NEAM region, setting up warning centres only for tsunamis could be difficult for some Member States to justify. This suggests that for those situations a multi-hazard approach would be more viable.

Based on a project proposal prepared by the Secretariat, the sessional Working Group considered possible activities and outputs of a NEAMTWS project on coastal floods to be:

- Assessment and upgrading of existing flood hazard and risk maps
- Development of operational plan for coastal flood risk management based on integrated coastal area management and demonstration in target region
- Development of decision matrix for coastal hazard watch and warnings
- Feasibility study for Regional Storm Surge Watch Centre for target region

The sessional Working Group concluded that work on storm surges is relevant to tsunami risk mitigation especially for better understanding of mechanisms for wave propagation, sharing knowledge and experience on warning practices, and learning more from hazard and risk mapping.

The sessional Working Group decided to investigate in more detail the scope of a possible NEAMTWS activity on storm surges, inviting attendees to circulate ideas by email, discuss within their governments and consider response(s) to ESA ITT in March 2010 as well as to other funding opportunities. In cooperation with the Secretariat and under the leadership of UK and Denmark, the Working Group will continue to work informally and with an open membership until the next session of ICG/NEAMTWS.

## ANNEX VIII

### NOMINATED TNCS AND TWFPs

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ALBANIA		
ALGERIA		
BELGIUM		Algemene Directie Crisiscentrum
BULGARIA	Bulgarian Institute of Oceanology (BAS)	Bulgarian Institute of Oceanology (BAS)
CAPE VERDE	Instituto Nacional de Meteorologia e Geophísica	Instituto Nacional de Meteorologia e Geophísica
CROATIA	Institute of Oceanography and Fisheries	
CYPRUS	Cyprus Oceanography Centre, University of Cyprus	Cyprus Oceanography Centre, University of Cyprus
DENMARK	Danish Meteorological Institute	Danish Meteorological Institute
EGYPT	National Research Institute of Astronomy and Geophysics (NRIAG)	National Research Institute of Astronomy and Geophysics (NRIAG)
	National Institute of Oceanography and Fisheries (NIOF)	
ESTONIA	Estonian Marine Institute, University of Tartu	Estonian Marine Institute, University of Tartu
FINLAND	Finnish Institute of Marine Research	Monitoring Center for Natural Disasters, Finnish Meteorological Institute
FRANCE	Ministère de l'Ecologie, du Développement et de l'Aménagement Durables	Laboratoire de Géophysique, Commissariat à l'Energie Atomique (CEA)
GEORGIA		
GERMANY		
GREECE	Technical University of Crete, Department of Environmental Engineering	National Observatory of Athens (NOA)
ICELAND		
IRELAND	Geological Survey of Ireland	
ISRAEL	Israel Oceanographic and Limnological Research	
ITALY	Dipartimento della Protezione Civile	Dipartimento della Protezione Civile
LEBANON	Geophysical National Center, National Council for Scientific Research	Geophysical National Center, National Council for Scientific Research
LIBYA		
MALTA	Ministry of Foreign Affairs	Ministry of Foreign Affairs
MAURITANIA		
MONACO	Centre Scientifique de Monaco	Compagnie des Sapeurs-Pompiers de Monaco
MOROCCO		
NETHERLANDS		KNMW Royal Netherlands Meteorological Institute
NORWAY		Directorate for Civil Protection and Emergency Planning (DSB)
POLAND		National Centre for Coordination of Rescue Operations and Protection of Population, National Headquarters of the State Fire Service
PORTUGAL	Instituto de Meteorologia	Chefe do Núcleo de Riscos e Alerta Autoridade Nacional de Protecção Civil
ROMANIA	National Institute for Earth Physics	National Institute for Earth Physics
RUSSIAN FEDERATION		
SERBIA		
SLOVENIA		
SPAIN	Instituto Español de Oceanografía	Jefe del Area de Riesgos Naturales, Dirección General de Protección Civil y Emergencias
SWEDEN		
SYRIA	Syrian Wireless Organization (SWO), Ministry of Telecommunication and Technology	Syrian Wireless Organization (SWO), Ministry of Telecommunication and Technology
TUNISIA		
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UNITED KINGDOM	National Oceanographic Centre, Southampton (NOCS)	Humanitarian Operations, Department for International Development (DFID)

ANNEX IX

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## ANNEX X

### LIST OF ACRONYMS

<b>CAM</b>	Coastal Area Management
<b>CEA</b>	Commissariat à l'Energie Atomique (France)
<b>CNRS</b>	Centre national de la recherche scientifique
<b>CNRST</b>	Conseil National de la Recherche Scientifique et Technique
<b>CTBTO</b>	Comprehensive Nuclear-Test-Ban Treaty Organization
<b>DG</b>	Directorate-General (E.U.)
<b>DBCP</b>	Data Buoy Cooperation Panel
<b>DPC</b>	Dipartimento della Protezione Civile
<b>EC</b>	Executive Council
<b>ETA</b>	estimated tsunami arrival time
<b>EU</b>	European Union
<b>FAFA</b>	Financial and Administrative Framework Agreement
<b>FFCUL</b>	Fundação da Faculdade de Ciências da Universidade de Lisboa
<b>GDDA-ERD</b>	General Directorate for Disaster Affairs, Earthquake Research Department
<b>GEBCO</b>	General Bathymetric Chart of the Oceans
<b>GFZ</b>	GeoForschungsZentrum/National Research Centre for Geosciences
<b>GLOSS</b>	Global Sea Level Observing System
<b>GPRS</b>	General Packet Radio Service
<b>GTS</b>	Global Telecommunication System
<b>ICG</b>	Intergovernmental Coordination Group
<b>ICG/NEAMTWS</b>	Intergovernmental Coordination Group/Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas
<b>IHO</b>	International Hydrographic Organization
<b>IM</b>	Institute of Meteorology
<b>INGV</b>	Italian Institute of Geology and Vulcanology/Istituto Nazionale di Geofiscia e Vulcanologia
<b>IOC</b>	Intergovernmental Oceanographic Commission (UNESCO)
<b>ITIC</b>	International Tsunami Information Centre
<b>JCOMM</b>	Joint Technical Commission for Oceanography and Marine Meteorology
<b>JRC</b>	Joint Research Centre
<b>KOERI</b>	Kandilli Observatory and Earthquake Research Institute
<b>MBSHC</b>	Mediterranean and Black Sea Hydrographic Commission
<b>MedNet</b>	Mediterranean Network
<b>MTA</b>	maximum tsunami amplitude

<b>METU</b>	Middle East Technical University
<b>NATO</b>	North Atlantic Treaty Organization
<b>NEAMTIC</b>	Tsunami Information Centre for the Euro-Mediterranean
<b>NTWC</b>	National Tsunami Watch Centres
<b>PTWS</b>	Pacific Tsunami Warning System
<b>RTWC</b>	Regional Tsunami Watch Centres
<b>TNC</b>	Tsunami National Contact
<b>TOWS</b>	Tsunami and Other Ocean Hazards Warning and Mitigation Systems
<b>TUDES</b>	Turkish National Tide-Gauge Network
<b>TWFP</b>	Tsunami Warning Focal Point
<b>TWS</b>	Tsunami Warning System
<b>SPO</b>	State Planning Organization
<b>ISPRA</b>	High Institute for Environmental Protection and Research
<b>UNDP</b>	United Nations Development Programmes
<b>UNESCO</b>	United Nations Educational Scientific and Cultural Organisation
<b>UN/ISDR</b>	United Nations International Strategy for Disaster Reduction
<b>VPN</b>	Virtual Private Network
<b>WG</b>	Working Group
<b>WMO</b>	World Meteorological Organization

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

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

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