

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



**International Coordination Group  
for the Tsunami Warning System  
in the Pacific**

Nineteenth Session  
Wellington, New Zealand

29 September – 2 October 2003

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**Abstract**

The Nineteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific was held in Wellington, New Zealand, from 29 September to 3 October 2003 under the Chairmanship of Dr François Schindel . It was attended by 34 participants from fifteen ICG/ITSU Member States, two organizations and two observers from other countries. The Session reviewed progress made during the inter-sessional period 2001-2003 and drafted its work plan for the period 2004-2005. This work plan will focus on (i) continued support for the International Tsunami Information Centre (ITIC); (ii) support for the development of the Global Tsunami Data Base (GTDB) and the new Integrated Tsunami Data Base (ITDB) consisting of the WinHTDB graphic shell and a Tsunami Travel Time (TTT) module; (iii) finalization of the Tsunami Information Kit; (iv) support for the newly established Working Group on a Comprehensive Tsunami Hazard Reduction Programme (TROIKA); (v) support the newly established Working Group on the Central American Pacific Coast Tsunami Warning System (CAPC-TWS); and (vi) support the newly established Working Group on the Tsunami Warning System in the Southwest Pacific and Indian Ocean (SWP-TWS). The Group requested a budget of US\$ 141,500 for the biennium 2004-2005 to accomplish the work plan. The Group further decided to (i) study possibilities for cooperation with JCOMM; (ii) increase the duration of its ITSU Training Programme held in Hawaii (ITP-Hawaii) to three weeks, and establish an international component (ITP-International) for in-country assistance to Member States; (iii) establish a "Pool of Experts" to assist Member States with expert missions; (iv) accept the "Tsunami Hazard Zone" and "Tsunami Evacuation Route" signs and submit these to ISO; (v) recommend formal collaborative links with the Circum-Pacific Council; (vi) reduce the frequency of the Tsunami Newsletter to 4 issues per year; (vii) redefine the terms of reference of the IOC-ITSU and ITIC web sites; (viii) recommend close(r) collaboration with GLOSS, ISDR and with CEPREDENAC. The Group further revised the ITSU Master Plan Conclusions adding focus on the acquisition of data in real-time and optimizing the network to ensure accurate warning issuance and minimization of false warnings. The Group requested to urgently proceed with the Review of the ITSU Programme in 2004. The Group re-elected Dr Fran ois Schindel  and Dr Charles McCreery as Chair and Vice-Chair of ITSU respectively. The Group welcomed Mr Emilio Lorca as the new ITIC Associate Director, replacing CmDr Rodrigo Nu ez.

(SC-2004/WS/25)

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\* An executive summary of this report is also available in English, French, Russian and Spanish.



**This Report is dedicated to Richard Hagemeyer**

Richard "Dick" Hagemeyer (1924-2001) passed away on October 25, 2001. He was the National Contact for the United States to the International Coordinating Group of the Tsunami Warning System in the Pacific (ICG/ITSU), as well as the USA Tsunami Programme Manager, from 1983 to his passing. During his 51-year career with NOAA and the National Weather Service, he made many important contributions to both the national and international tsunami programmes. Mr Hagemeyer served as the Chairman of ICG/ITSU from 1987 to 1993, being elected during ITSU XI and serving until Session XIV. Those involved in the tsunami programme will greatly miss his leadership, his extensive knowledge of tsunamis, and his dedication to improving the Tsunami Warning System in the Pacific. "With his support, old, slow minicomputers were replaced by high speed workstations and the real-time seismic data, then being recorded in analog on space-consuming drum recorders, was digitized and displayed on computer monitors", recalled Mr Mike Blackford, PTWC Geophysicist-in-Charge (GIC) from 1991-1997. "He was a very good mentor for me, he really felt like a member of the family," expressed Dr Chip McCreery, current PTWC GIC and ICG/ITSU Vice-Chairman.

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## 1. OPENING

1 The Nineteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific was held in Wellington, New Zealand, from 29 September to 3 October 2003 under the Chairmanship of Mr François Schindelé.

2 The Group was addressed by Mr David Kingi, Representative of the Te Papa Rantaki Maori Unit for the Department of Internal Affairs (Parent body of the Ministry of Civil Defence and Emergency Management). He welcomed the Group in traditional Maori fashion.

3 Dr John Norton, Director of Civil Defence addressed the Group. The full version of Dr Norton's speech is available in [Annex VIII](#).

4 Mr François Schindelé, Chair ICG/ITSU addressed the Group. The full version of Mr Schindelé's speech is available in [Annex VIII](#).

5 Mr Peter Pissierssens, Head, Ocean Services IOC, speaking on behalf of Dr Patricio Bernal, Executive Secretary IOC, thanked the Government of New Zealand for the excellent facilities and additional support provided for this Session.

6 He noted that the ITSU Programme was one of the oldest of the IOC and recalled that during the Third Session of the IOC's Assembly in June 1964, the Commission had requested the Secretariat of the IOC to arrange for the convening of a meeting, preferably in Honolulu in early 1965, to "*discuss the international aspects of the tsunami warning system with a view towards securing the best possible international cooperation in all phases of the tsunami warning system, such as: tidal and seismic monitoring stations, internal and international communications, and the issuance and dissemination of warnings*".

7 A working group on the international aspects of the Tsunami Warning System in the Pacific (TWSP) had met in April 1965, in Honolulu. The group had discussed IOC Resolution III.8, its implications for the benefit of the Member States, and the actions required to provide, on an international basis, timely tsunami warnings. As a result, the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU, or ITSU) was formed, composed of Member States in the Pacific region. Its purpose has been, for the past 38 years, to "recommend and coordinate programs most beneficial to countries belonging to the IOC whose coastal areas are threatened by tsunamis".

8 He stressed that the ITSU Programme is the only IOC Programme that deals directly with the protection of human life and property.

9 He noted that the relevance of the ITSU Programme is demonstrated regularly and most recently on 25 September 2003, i.e., during the Wellington ITSU Workshop, when a tsunami warning had been issued after an earthquake occurred in Hokkaido, Japan.

10 Mr Pissierssens then called the attention of the Group to the Master Plan for the Tsunami Warning System in the Pacific, designed to be a long-term guide for improvement of the Tsunami Warning System based on the analysis of existing components of the system. He noted that the second version had been prepared in 1995 (published in 1999) and suggested that updating of the Master Plan might now be required again.

11 He further noted that, despite their vulnerability to the tsunami threat, a number of Member States from the Pacific region had not yet joined the ICG/ITSU, and called on these countries to do so.

12 Mr Pissierssens informed the Group that the Secretarial duties for ITSU would henceforth be assumed by Dr Dimitri Travin but pledged his further commitment to ITSU in terms of assuring funding and to raising its profile within the IOC.

## 2. ORGANIZATION OF THE SESSION

13           **The Group adopted** the Agenda ([Annex I](#), hereto) and Timetable (Document IOC/ITSU-XIX/1 add.).

14           **The Group decided** that there was no need to designate a Rapporteur and **agreed** that input to the Summary Report of the Session, to be adopted under Agenda item 14 will be the responsibility of the Chair, Vice-Chair, Technical Secretary and participants introducing an Agenda item.

15           **The Group established** an intra-sessional working groups to work on Programme and Budget 2004-2005 (to be Chaired by R. Nuñez). Other sessional working groups were established under their respective agenda items as necessary.

16           The Chair of the Local Organizing Committee, Mr Mike O'Leary informed participants on local arrangements.

17           The Technical Secretary informed the Group that no nominations had been received for the Chair and Vice Chair. He informed the Group that nominations would be welcomed until Tuesday 30 September, lunchtime.

18           The Technical Secretary, Mr Peter Pissierssens, introduced the Provisional List of Documents (Doc. IOC/ITSU-XIX/4 prov.), attached as [Annex IV](#). He expressed his concern over the late submission of working documents, which had made it impossible to distribute the documents by mail. He reported that all working documents had been posted on the ITSU web site (<http://ioc.unesco.org/itsu>) for consultation and download.

19           The List of Participants is presented in [Annex III](#).

20           **The Group expressed** its sincere gratitude to Dr Iouri Oliounine who, for many years, had expertly managed the ITSU Programme at the IOC Secretariat. They wished him all the best in his future endeavours.

21           **The Group decided** to dedicate this Session to Mr Richard Hagemeyer, who had sadly passed away during the intersessional period, and **requested** the Secretariat to include a photograph of Mr Hagemeyer and appropriate text in the Summary Report of the Session.

## 3. PROGRESS IN THE PROGRAMME IMPLEMENTATION

### 3.1 REPORT OF THE CHAIR ON THE PROGRAMME AND BUDGET

22           The Chair, Dr François Schindelé introduced this item referring to Document IOC/ITSU-XIX/6 (*Report of the Chair of ICG/ITSU on intersessional activities*) and reported on the intersessional activities of the ICG/ITSU focusing on the significant improvement in the programme.

23           He thanked the delegates of Chile, France, New Zealand, Republic of Korea and the USA for their contribution to the Trust Fund in support of the Tsunami Programme and expressed the wish that other Member States would follow this most important example.

24           Many of the activities recommended by ITSU-XVIII have been successfully implemented: the new procedures and criteria for issuing warnings, watches and cancellations have been implemented; the ad hoc working group Chaired by the Past Chair has drafted a proposal on International Tsunami Signs and Symbols.



25 The Chair stressed that more detailed discussion of the programme implementation will be held under relevant Agenda items.

26 The Chair reported on his input to the Thirty-fifth Session of the IOC Executive Council held in Paris in June 2002. In his address, he had identified ways for the future development of the Programme and the TWS in the Pacific. He pointed out that efforts should be made to improve and adapt a network of sea-level measuring stations in the Pacific to the needs of the TWSP. He stressed that the use of existing gauges for multiple purposes, such as for national tidal networks and for research on long-term sea-level changes, in the context of GOOS, must be encouraged in order to secure the necessary resources for their long-term maintenance. Several delegations had reported on their national activities related to ITSU, stressing the importance of ITSU as the only IOC programme that was specifically aimed at preserving human life. The Executive Council had stressed the need for Member States affected by the risk of tsunamis to increase their investment in national tsunami warning and mitigation facilities. The Executive Council approved the Summary Report of the ITSU-XVIII and adopted the recommendations. The Executive Council adopted Resolution EC-XXXV.1.

27 The Officers Meeting of the ICG/ITSU took place at ITIC during the second week of February 2003. The Officers examined the implementation of the decisions of the Group adopted at its Eighteenth Session and identified areas where further preparations were necessary for ITSU-XIX.

28 The Chair then emphasized the importance of the International Tsunami Information Centre (ITIC) in developing disaster prevention and preparedness activities. He introduced the new ITIC Director, Dr Laura Kong, and focused on two of the numerous activities she has done since her nomination: the excellent quality of the Tsunami Newsletter, and the quality of the contact she has with the Member States and other countries that request information on tsunami and on the TWSP (Tsunami Warning System in the Pacific).

29 He stressed the importance of regional tsunami warning centers and informed on the progress of the implementation of a Central America Tsunami Warning System, and on the decision of Indonesia to implement a tsunami warning system. He recommended the Member States of Central America and of the South West Pacific Region to take the opportunity of this session to meet together and with the Director of ITIC to analyse the difficulties and problem and how to solve them. He recommended using the facilities of the PTWC to transmit the data of several sea-level stations.

30 He concluded reading the conclusions of the *Master Plan* (IOC/INF-1124, 2<sup>nd</sup> Edition, 1999) about the necessary and significant improvements that have been highlighted in 1999 at the time of the publication of the document, in terms of warning, tsunami hazard and risk assessment, preparedness, mitigation and research.

31 **The Group congratulated** its Chair for the continuous attention to the programme's needs and **accepted** his report on intersessional activities.

32 **The Group called on** Member States to be more responsive to inquiries from the ICG/ITSU Officers and be more supportive to the programme implementation.

33 **The Group requested** the Technical Secretary to include the updated version of the Action Sheet, presented as Annex V to the ICG/ITSU Officers Meeting Report (IOC/INF-1181) as Annex V to the Summary Report of the Nineteenth Session of the ICG/ITSU, taking into consideration information provided under relevant Agenda items of this Session.

### 3.2 NATIONAL REPORTS

34 Through Circular Letter No. 2064 of 9 April 2003, Member States had been invited to this Session and were also requested to submit National Reports not later than 1 July 2003, so as to provide participants to the Session with sufficient time to read the reports. The Chair noted with regret that several reports were submitted just at the beginning of the Session and that a few had still not been submitted.

35 The Chair reported that thirteen (out of 25 ICG/ITSU Member States) national reports had been received and been made available through the IOC/ITSU web site. The sum total is provided in the format adopted during ITSU-XVIII and was revised during the last Officers Meeting. In addition, reports of El Salvador and Papua New Guinea had also been received. He recalled that format guidelines for the submission of National Reports had been made available through the web site as Document IOC/ITSU-XIX/Inf.2. He insisted on the importance of knowledge of the occurrence of tsunamis, not only just the damage causing tsunamis. Tsunami Center operators and scientists need to know where the last tsunamis were recorded and who archives these records. He requested that most tsunami observations and records be reported for the next Session.

36 The Delegate of Australia informed the Group that the main focus of activity in Australia during the recent intersessional period has been on organizing tsunami services in light of changing organizational requirements and structures, and the partially implemented plans to develop the Australian Tsunami Alert Service (ATAS). The ATAS is to be co-managed by the Bureau of Meteorology (BOM), Geoscience Australia (GA) and Emergency Management Australia (EMA), with the support of the National Tidal Facility Australia (NTFA). Two key factors in this regard are changes to sea level monitoring and tidal prediction activities and the establishment of a major oceanographic services initiative.

37 The proposed transition of the NTFA to a new National Tidal Centre (NTC) will better support the development of national operational tsunami warning activities. The proposed NTC would subsume the functions and responsibilities of the NTFA and would run under the aegis of an existing operational agency of the Australian Federal Government. The proposal is subject to funding and approval by the Government. The BOM has established an Oceanographic Services Program, to foster the development of ocean services to the community. The new Programme is a major commitment, paralleling the Weather Services Program, which has delivered a very large range of weather services to the community over many decades. It now has management responsibilities for operational tsunami services. The increased focus and attention on these services will better facilitate the development of plans for an ATAS.

38 Australia has adopted a two stage approach to developing its tsunami warning systems, involving the initial development of the ATAS and the longer term objective of a more fully established warning system. Plans have been partially implemented, on the Australian western coasts, and informally in Australia's Pacific coastal areas. Plans further focus on: (i) Consolidation of operational tsunami alert activities involving BOM, GA and NTFA/NTC for all coastal regions; (ii) Recapitalisation and review of observing networks for detecting tsunamis in Australia; (iii) Development of decision support for run-up prediction; (iv) Development of public awareness and education material on the tsunami hazard in Australia; (v) Development of a broader tsunami mitigation strategy with other key national stakeholders or potentially interested participants. Australia is also interested in jointly exploring partnerships with other national agencies in the region to further common tsunami warning objectives, and with ITSU in particular in the nearby areas of the Indian Ocean basin.

39 The Delegate of Canada recognized the importance of ICG/ITSU and is proud of the fact that his country had participated in all nineteen ITSU sessions. These meetings are the main mechanism by which member states discuss the ideas and information necessary for continued improvement of the tsunami warning system. Canada also notes that in the nearly 40 years of ITSU's existence they have had only four National Contacts. It is the opinion of Canada that this continuity is important, as it contributes to active participation at the meetings and to the achievement of long term goals. As noted in the Canadian National Report, over the past two years there has been a continuation of a major modeling initiative and the start of work on a Canadian tsunami catalogue. Both of these projects support tsunami mitigation and education. Funding for these projects ends in another six months, and the challenge will be to secure ongoing funding support. Recent scientific studies have confirmed the tsunami warning station at Langara Island needs to be improved and work is underway to obtain the funding necessary for that work.

40 The Delegate of Chile informed the Group that the Chilean Hydrographic and Oceanographic Service is responsible for the national tsunami warning system in his country. He explained that Chile uses the TREMORS system with a renewed sea level network that comprises 18 sea level stations

(transmitting data by satellite), and that a DART system buoy will be installed in October 2003, 80 miles offshore the north coast of Chile. Chile is furthermore producing educational publications and providing information over the Internet. A series of tsunami inundation maps, of which 26 were already produced, continue to be published for use in ports and coastal cities. At the international level, Chile actively participates in international cooperation activities in Central and South America. At the sub-regional level, Chile collaborates with Peru on tsunami exercises.

41 The Delegate of Ecuador informed the Group that the tsunami warning system in her country has improved since ITSU-XVIII: tsunami inundation maps have been prepared for Esmeraldas City as a first step to identify risk areas. In addition, a reliable tsunami warning system is being developed to identify evacuation routes and emergency shelter locations as part of a tsunami prevention and mitigation plan for Esmeraldas City.

42 The Delegate of Fiji informed the Group that his country plans to develop a TREMORS-based tsunami warning system at the Mineral Resources Department (MRD) Seismology Unit in Suva. This will be implemented in cooperation with PTWC. It is expected that the system will operate on a 24-hour basis, cooperating also with the Fiji Meteorological Services. He noted that some equipment for the monitoring of tide levels in the Fiji Islands (Suva, Lautoka, Savusavu and Labasa) is required.

43 The Delegate of France reported that a new tide gauge was installed in Marquesas Island, in Hiva Oa, which is well known for its extreme amplification effects for tsunamis coming from South and Central America. The project, financed by the French Government, was developed in collaboration with PTWC. France assisted with the repairs of the tide gauge of Nuku Hiva. Accordingly, there are now two tide gauges in Marquesas Island, operating in quasi real-time. A new TREMORS station has also been installed in New Caledonia for monitoring this region of the Pacific. Results are published in real time on the EMSC web site (<http://www.emsc-csem.org/>). The tsunami warning plan of French Polynesia has been upgraded in collaboration with civil defence. A 2-day exercise on tsunami warning was organized in Marquesas Island to validate the new warning plan, involving high authorities and municipalities. As a test, a scenario was followed of a tsunami generated by an earthquake in Chile with a magnitude of 8.4. During the 2-day event, educational documents (IOC) were distributed in schools and educational meetings were held in the municipalities with the population.

44 The Delegate of Indonesia reported that Mr Ibnu Purwana attended the ITSU Training Programme 2003 conducted at ITIC Honolulu (4-15 August 2003). Between 26 and 29 August 2003, the Meteorological and Geophysical Agency of Indonesia conducted an International Seminar/Workshop on Tsunami: "In Memoriam of 120 years Krakatau Eruption-Tsunami and Lesson Learned from Large Tsunami". The Workshop had made the following recommendations: (i) construction of community memorials and preparation of leaflets for the public and at-risk communities; (ii) establishment of National Tsunami Warning Center which can be further developed to cover its area of responsibility to the Southwest Pacific and Indian Ocean; (iii) preparation of guidelines for disaster management in coastal areas; (iv) creation of a comprehensive tsunami database in the format compatible with internationally approved standard; and (v) undertaking of efforts to carry out inundation modeling studies and to prepare evacuation maps.

45 The Delegate of the United States noted that this was his first ITSU meeting after the tragic loss of long time USA representative, Mr Richard Hagemeyer. He then highlighted the continued success of the U.S. National Tsunami Hazard Mitigation Programme (NTHMP) stating that this was now a nationally funded project with individual identification within the National Weather Service program. He noted that the Deep-ocean Assessment and Reporting of Tsunami (DART) buoys have proved their operational capability and have been transitioned from research and development to operational use. The Delegate noted that the USA has continued to fully support the operation of ITIC and development of the unified tsunami data base, and anticipated that such efforts can be expected to continue in the future.

46 The Delegate of Papua New Guinea informed the Group that tsunami awareness in Papua New Guinea had been greatly enhanced as a result of the Aitape Tsunami in 1998. Efforts were now made to improve preparedness with preparation and distribution of tsunami posters and booklets. While Papua

New Guinea lacks effective tsunami monitoring and early warning equipment, better communication links could help to achieve a better level of preparedness. Papua New Guinea will support the establishment of the South West Pacific and Indian Ocean Tsunami Warning System. The Delegate also expressed his country's interest in becoming an IOC and ICG/ITSU Member State (see Also Agenda Item 11).

47 The Delegate of New Zealand informed the Group that for three days 25–27 September, as a prelude to ITSU XIX, New Zealand hosted a Tsunami Workshop, titled “Tsunamis in the South Pacific”. The Workshop occurred as a result of an invitation issued by ITSU and IUGG. The New Zealand Institute of Geological and Nuclear Sciences (GNS) and the National Institute of Water and Atmospheric Sciences (NIWA) responded to the invitation and organized the workshop. They were supported by the Greater Wellington Council, Wellington City Council, The Earthquake Commission and the Ministry of Civil Defence and Emergency Management (MCDEM). The prime organizer of the Workshop was Ms Gaye Downes of GNS. MCDEM is particularly thankful for the considerable work done by Ms Downes in organizing the Workshop and asked that the Chair consider acknowledging the effort put into the Workshop and the success of in support of ITSU goals.

48 The Delegate of Japan recalled the earthquake that occurred on 25 September 2003 in Hokkaido, Japan resulting in a tsunami with a height of more than 3 meters. He noted that JMA would install a new system for earthquake and tsunami observation on 1 October but that this had been too late for the 25 September event.

49 The Delegate of the Russian Federation noted that the overall length of Russian coastline of the Pacific West region is more than 2000 km. The tsunami warning centers of Russia are located at the Pacific coastline in three cities: Yuzhno-Sakhalinsk, Petropavlovsk-Kamchatsky, and Vladivostok. In Petropavlovsk-Kamchatsky in September 2002, the International Tsunami Workshop “Local Tsunami Warning and Mitigation” was organized using the financial support of the IOC/UNESCO, Russian Foundation for Basic Research, Russian Academy of Sciences, and International Ocean Institute (Malta Isl.). The Workshop gathered more than 100 participants from 12 countries. All of the participants thanked the IOC/UNESCO for the Workshop support.

50 The Delegate of the Republic of Korea informed the Group that the Korea Meteorological Administration (KMA) has been trying to assure the promptness and accuracy of announcements of tsunami information. For this reason KMA has been executing simulated tsunami preparedness drills to evaluate the tsunami warning and notification system each year. Recently, KMA has executed the drill using computer communication through the auto reporting system which is part of the National Earthquake Information System (NEIS) developed by KMA this year.

51 **The Group urged** all Member States to add information on tsunami occurrences and observations on sea level stations to national reports.

52 **The Group expressed** its gratitude to the Member States that had submitted national reports and **thanked** the Secretariat for making the reports available on-line.

53 **The Group requested** all Member States to provide, by the end of 2003, a summary (10-15 lines) of their national reports for publication in the ITSU Newsletter in early 2004.

### 3.3 ITIC DIRECTOR'S REPORT

54 The ITIC Director, Dr Laura Kong, introduced this item referring to Document IOC/ITSU-XIX/8 (*Report of the ITIC Director*). She gave her report on the activities of the ITIC during the intersessional period and introduced several new initiatives that would improve the services of the ITIC for Member States. The ITIC Director provided a short overview of the changes in staff noting that she replaced the retiring Michael Blackford in January 2002, and reporting the hiring of Tammy Kaitoku as the ITIC Webmaster in September 2002. She thanked the Associate Director for his hard work during the intersessional period.

55 During the intersessional period, the ITIC attended a number of meetings on behalf of the ITSU to provide information on the TWSP and other tsunami mitigation efforts. The ITIC Director highlighted two meetings, which have facilitated the active implementations of regional tsunami warning systems in Central America and Indonesia and the South Pacific. She also reported on the successful efforts to recruit member states to ITSU, stating that the countries of El Salvador and Papua New Guinea are forwarding documentation through their respective governments to request membership. She further noted that these countries have already demonstrated an active interest by attending ITSU-XIX this week.

56 The ITIC conducted two Visiting Experts Programmes involving participants from Ecuador and Peru in 2002 and Chile and Indonesia in 2003, and deferred detailed discussion to Agenda Items 4.1 on the following day where the ITP would be extensively discussed. It was noted that the name of the VEP was changed to the ITSU Training Programme in 2003 to more accurately reflect its intent. The ITIC Director noted that the current programme was not long enough to adequately cover the breadth and depth of tsunami warning topics and requested discussion on how to improve the situation. The ITIC Director also made reference to her recent experiences in which the ITP Training in Hawaii was followed by training in Indonesia, and noted the high value to the Member State. She further proposed that an ITP-International programme be considered and that this be combined with the collection of information on each country's tsunami warning capacity and other mitigation needs.

57 The ITIC Director reported briefly on Document IOC/ITSU-XIX/12 (*ITSU Visiting Experts Programme 2001-2003*), which presented the results of a 2003 survey of past VEP participants to determine the value of the Programme and to identify participants still active in the tsunami field that could serve as resources for local and regional tsunami problems. She deferred detailed discussion to Agenda Item 4.1 on the following day where the ITP Programme would be further discussed.

58 The ITIC Director then reported briefly on the Tsunami Newsletter, deferring the detailed discussion to Agenda Item 5.1 on the following day where the Newsletter would be further discussed.

59 The ITIC Director gave an overview of the ITIC Library, noting that it contains about 1,600 shelved items (books, series, reports) and 1,250 documents (reprints, abstracts, manuscripts, photocopies). In September 2003, so as to reach a wider audience, the ITIC Library Card Catalogue was placed online at its web site as a searchable database. The online search engine allows the user to specify different search attributes, including author, title, keyword, and event date, and upon submission, returns a list of references that the ITIC Library holds.

60 The ITIC Director gave a short overview of the various other electronic information services it provides, deferring to Agenda Item 5.4 for the detailed discussion of the ITIC and ITSU web sites. The Director discussed the current status of the Tsunami Bulletin Board, reporting that it was temporarily disabled as an automated system and being transferred to a user-friendlier, web-enhanced application by the end of 2003.

61 The ITIC Director referred to the ITIC Action Plan presented at the Officers Meeting and reported on the status of the items.

62 **The Group expressed its appreciation** for the excellent work done by the ITIC Director and Associate Director, assisting in the implementation of the ITSU-XVIII work plan.

63 The Delegate of Chile confirmed continued support by Chile to ITSU but informed the Group that CmDr Rodrigo Nuñez would not be able to continue in his capacity as ITIC Associate Director due to other future commitments. Accordingly Chile offered the services of Mr Emilio Lorca as ITIC Associate Director.

64 **The Group thanked** Chile for its continued support, thanked CmDr Rodrigo Nuñez for his energetic involvement in ITSU as the ITIC Associate Director, and **welcomed** Mr Emilio Lorca as the new ITIC Associate Director.

### 3.4 PTWC DIRECTOR'S REPORT

65 The PTWC Director, Dr Charles McCreery gave his report on the activities of PTWC during the intersessional period and on assorted issues related to tsunami warning operations. He referred to Document IOC/ITSU-XIX/9 (*Report of the PTWC Director*).

66 He reported that PTWC had been renamed the Richard H. Hagemeyer Pacific Tsunami Warning Center in December 2001 in honor of the former Chair of ICG/ITSU and U.S.A. National Contact who unexpectedly passed away in October 2001.

67 He reported that PTWC issued a total of 59 bulletins between June 2001 and May 2003. Forty of these were Tsunami Information Bulletins for earthquakes with no destructive teletsunami potential. Nineteen were issued for four tsunami warning situations: June 23, 2001 – Peru; September 8, 2002 – Papua New Guinea; January 20, 2003 – Solomon Islands; and January 22, 2003 – Mexico. Of these, only the Peru event produced a significant tsunami with up to 70 casualties.

68 He explained that the new procedures and criteria discussed and accepted at ITSU-XVIII (Document ITSU-XVIII/12) were implemented by PTWC on June 21, 2003. These include changing to the seismic moment magnitude from the Richter surface wave magnitude for magnitude criteria, and raising the magnitude criteria for expanding warnings and watches from greater than 7.5 to greater than 7.8. A key purpose of these changes was to reduce the incidence of unnecessary warnings, a long-standing weakness of the warning system. Canada asked about any changes to WC/ATWC procedures that apply to them and the PTWC Director explained that WC/ATWC procedures remain the same and that they been using moment magnitude for several years for their local and regional events. The Group thanked PTWC for its implementation of the recommendations.

69 The PTWC Director described certain recent changes to its tsunami product identifiers as well as a standardization of bulletin formats. Specific details of these changes are provided in Document IOC/ITSU-XIX/9.

70 During the intersessional period, comprehensive backup capabilities were established between the two U.S.A. tsunami warning centers. This included the exchange and testing of messaging capabilities and procedures. Now, if either Center becomes disabled the other Center can substitute. To the user, such a changeover would be transparent.

71 A brief description of directions for progress based on improving the sea level network and the development of quantitative forecasting capabilities was given, with detailed discussion deferred to agenda items 3.5 and 3.6.

72 The PTWC Director gave an overview regarding a new type of tsunami runup detector used for the past two years on the island of Hawaii. The systems have a compact design and can be easily mounted on land near shore. Based on standard home security alarm and mobile telephone technology, and powered in some locations by solar power, the relatively inexpensive gauges will alert PTWC within about 40 seconds of their sensors being triggered by coastal flooding. The eight systems have been reliable so far and without false triggers.

73 The PTWC Director pointed out that for unknown historical reasons there are many places in the Pacific never named in PTWC warnings because they do not have "warning points" designated for computing estimated arrival times. These include Guatemala, Honduras, Costa Rica, Australia, the Solomon Islands, Papua New Guinea, Indonesia, Tokelau, Vanuatu, Tonga, Kermadec Islands, Tuvalu, Wallis and Futuna, Pitcairn, Niue, and Antarctica. He asked the Group which of these areas should be included or if they knew of any reason why they should not be included.

74 The Delegate of Australia informed the Group that they would work with PTWC to establish warning points for Australia, and volunteered that the small island states in the Pacific would also want warning points.

75 The Delegate of France indicated that Wallis and Futuna should have a warning point.

76 The Delegate of El Salvador volunteered that all the missing Central America countries need warning points.

77 The Delegate of Papua New Guinea said that his country needed to be included.

78 The Delegate of Indonesia indicated the need for a warning point at Biak Island off of Irian Jaya.

79 No reasons were given for not adding warning points. Based on this response, PTWC will add warning points to provide complete Pacific coverage.

80 The PTWC Director brought to the attention of the Group that in a destructive Pacific-wide tsunami there is the potential for some confusion regarding the cancellation. In particular, because individual areas may and should cancel or extend a warning on their own if their information supports it, there can be a conflict with information in the PTWC bulletins. It was suggested that discussions of how this could be approached would be undertaken between interested delegates out of Session.

81 The PTWC Director asked for input from the Group regarding its development of a 5 to 10 year strategic plan. This item will be discussed in more detail under Agenda Item 9.

82 Input from the Group was also requested regarding the need for and development of graphical warning products to supplement text products. These types of products could be distributed by email and EMWIN and also be shown on the PTWC web site. Sample graphical products were shown – a location map showing the epicenter with historical earthquakes and tsunamis, as well as travel time maps with areas of warning and watch indicated. Canada indicated they were interested in such products, particularly the location and travel time maps. Chile made the comment that they currently use EMWIN and they encouraged its use by other Member States because it is fast and reliable. Australia said that such products could be very useful and suggested that they should be developed in concert with emergency management agencies to optimize their utility.

83 **The Group welcomed** the development of graphical and other new products and their dissemination. It was noted that close coordination between PTWC and the Alaska Center should be established to ensure that such new products are prepared and made available by both Centers.

84 **The Group recommended** that products should be designed in consultation with emergency response services to maximize their usefulness.

85 Lastly, the PTWC Director addressed communications issues. He reported on the regular communications tests conducted by PTWC. Although there haven't been any significant problems with the established communication circuits used by Member States, in the response remains sporadic with nearly half of the addressees responding less than 50% of the time. In addition he reported that the 13<sup>th</sup> Edition of the Communications Plan was well along in its preparation and should be distributed before the end of the first quarter of 2004. It will include information about the new procedures and criteria, modified product identifiers, bulletin formats, updated sea level and seismic networks, and updated contact information.

### 3.5 RECENT TECHNOLOGICAL DEVELOPMENTS

86 Dr Frank Gonzalez introduced this Agenda Item. He informed the Group that during ITS 2001, Dr Eddie Bernard, Director of NOAA's Pacific Marine Environmental Laboratory in Seattle, Washington, presented "*Tsunami: Reduction of Impacts through three Key Actions (TROIKA)*". In this presentation, Dr Bernard offered a three-pillar programme to mitigate the impacts of Tsunamis, following the model used in the U.S. National Tsunami Hazard Mitigation Programme (NTHMP) and offered an implementation plan for such a programme. Dr Bernard also offers a number of potential funding options for fully implementing TROIKA on a global scale. The following comprise the three pillars of TROIKA:

1. **Hazard Assessment**-Generating local and distant tsunami inundation maps for coastal communities using internationally accepted numerical model methodology. Estimates of coastal areas susceptible to tsunami flooding will be available from a network of modelers and data managers who will be sharing community modeling tools via the Internet.
2. **Mitigation**-Developing response plans for emergency managers, placing tsunami evacuation signs in threatened coastal areas, and maintaining a tsunami education programme for local residents and school systems.
3. **Warning Guidance**-Developing and deploying a network of early warning tsunami detection buoys in the world's seismically active coastal areas to complement the global network of real-time broadband seismometers and supplement regional tsunami warning centers.

87           **The Group welcomed** the TROIKA proposal stating that it is consistent with its needs and with the approach of other global programmes.

88           **The Group decided** to establish a Sessional Working Group to draft a Recommendation that will recommend the development of the TROIKA proposal as well as the establishment of an inter sessional working Group that will complete the draft project proposal. The Sessional working Group was Chaired by Mr Jeff LaDouce (USA) and included as members CmDr Rodrigo Nuñez (Chile), Dr Viacheslav Gusiakov (IUGG), Mr Neil Head (Australia), Mr Noritake Nishide (Japan) and Dr Boris Levin (Russian Federation).

89           **The Group adopted** [Recommendation ITSU-XIX.1](#).

### 3.6 SEA LEVEL ENHANCEMENTS

90           Dr Charles McCreery introduced this Agenda Item. He indicated that there is the need for comprehensive sea level coverage not only to quickly evaluate destructive tsunamis but also to quickly cancel warnings, the more common situation. He explained that there is gap in Central America in terms of sea level gauges: in the past there were three gauges in Mexico. Today only one gauge is operational (Cabo San Lucas). It was hoped that this could be addressed in cooperation with CICESE. Dr McCreery noted with regret that there are no Central American gauges currently used by PTWC. Another problem area is the Kuril-Kamchatka region: gauges were installed there 3-4 years ago and they operated well for first year but problems occurred and today both gauges are non-operational. This is regrettable as this area is a known source of destructive teletsunamis. Elsewhere some problems exist due to insufficient data sampling and transmission rates. Most national tidal facilities sample at a rate that is less than what we need. In addition many of the gauges transmit only on hourly schedules and this can cause unnecessary delays in evaluating the tsunami. Dr McCreery stated that we should work to upgrade all gauges so they have sampling rates adequate for tsunami waves (at least, and optimally 15-secs sampling) and the capability for real time data should be made, even if only on a triggered basis.

91           The Chair then requested Member States to report on their national sea level gauges status.

92           The Delegate of Chile reported that his country operates 18 stations. All are the same type of instrument that measures several parameters. Samples are taken every two minutes. Unfortunately most records are not good enough for tsunamis. This is the case for most countries: sea level networks were not designed for tsunamis but for hydrographic purposes. The Delegate therefore recommended the merging of the GLOSS and ITSU requirements. Discussion on this topic was referred to Agenda Item 7.4.

93           The Delegate of Australia informed the Group that plans for the sea level observing network operated by Australia currently focus on the future of the National Tidal Facility Australia (NTFA). The NTFA has been the national agency responsible for managing and operating sea level gauges in Australia and (under contract) in a number of South Pacific countries. The proposed transition of the NTFA to a new National Tidal Centre (NTC) to be operated by the Australian Bureau of Meteorology (BOM), is subject to government approval and funding. Subject to the creation of the NTC, the network will be evaluated for relevance to national and international priorities for sea level observations for climate



change, port management and tsunami service applications. The existing network had not been designed with tsunami services as a prime application, and is now of an age where refitting of the observing assets is due. The BOM will be submitting proposals to government for further funding of its planned expanded ocean/marine observing activities. The recapitalization of the sea level gauge network will be included in such new policy proposals which are being framed to meet the budget cycle either in 2004 or the following year. Tsunami requirements will be specifically factored into these plans.

94 The Delegate of Canada reported on 14 stations on the British Columbia coast recording water levels at 1-minute intervals (integrated values). Three of these stations are designated as tsunami warning stations and are capable of transmitting data by MSAT satellite. In the event of a tsunami event real-time transmission can be initiated by an on-site alarm trigger, or by external control within 15 minutes. Records of three tsunami events over the past two years indicate excellent response at two of the three stations and there are plans to improve the response at the third station.

95 Under normal conditions, data from all stations is downloaded once a day. Until recently the download interval had been every three hours, but a change was made to reduce data transmission costs. In the event of a tsunami watch or warning it is important that data be made available to PTWC, WC/ATWC and local emergency response personnel in near real-time. The challenge for Canada will be to supplement the existing telephone line and satellite data transmission modes with other cost effective modes such as Internet or use of existing seismic data transmission systems.

96 The Delegate of Indonesia reported 54 tide gauges managed by the national coordinating agency for survey and mapping. They are used for coastal mapping and the instruments are analogue recorders. Six gauges are maintained by the Directorate General for sea transportation and are intended for monitoring sea level for transportation. The network is now in a stage of coordination in order to modernize it so it can be used for tsunami monitoring as well.

97 The Representative of IUGG, Dr Viacheslav Gusiakov, noted that sea level data are important not only for operational warning but also for tsunami research. Getting these data from stations near a new tsunamigenic event still presents a big problem for researchers, because sea level stations belong to different agencies in different countries and are often not readily available for users outside of these agencies. Dr Gusiakov proposed to make some sort of inventory of sea level stations currently existing in the Pacific whose data are potentially useful for tsunami researchers and that it would contain the basic information on each such as station name, code, type of instrument, exact geographical coordinates, date of establishment, known gaps in functioning, and address of data owner. This information can be included in the HTDB dataset and through the HTDB can be made available to whole tsunami community.

98 The Delegate of Japan noted that it is very important for Japan to cope with local tsunamis, so it has the priority to install and maintain tsunami observation facilities in coasts and islands. There are 103 observational points for tsunamis in Japan at which float-type (well-type) gauges are installed to monitor the sea level. These data are telemetered on a real time basis. The sampling rate is one sample per fifteen seconds. At 66 out of the 103 stations, those belonging to JMA, Huge-Tsunami Gauges are installed. They are a kind of instrument for measuring tsunami run-up and they are installed on land to observe the height of large-scale tsunamis that exceed the measuring range of the float-type gauges. Although JMA sends the data of only 5 stations to PTWC at present, JMA is willing to send more data from other stations.

99 The Delegate of Papua New Guinea reported that his country does not own a sea level gauge network but instruments that exist in the country include one that is partly owned by the Rabaul Volcano Observatory and the University of Hawaii. The equipment has been in operation for a long time and is the source of many existing tsunami records. Several other instruments exist in Papua New Guinea and the region. These are operated by the National Tidal Facility of Australia. Papua New Guinea expressed the need for better co-operation with Australia in regard to data sharing. The use of such instruments worldwide has now expanded to include tsunami monitoring.

100 The Delegate of El Salvador reported that, in addition to the sea level gauges mentioned in his national report, Central America installed 5 stations in Nicaragua, Honduras and Guatemala. They send data via satellite every three hours and have a sampling rate of two minutes. It is planned to provide El Salvador data to PTWC as part of ITSU programme.

101 **The Group recommended** to make an inventory of existing sea level stations, the data of which can be used for the tsunami programme, **and requested** Member States to provide to ITIC all necessary details.

102 **The Group recommended** to keep real time data sets already collected by sea level stations at PTWC so they remain available.

### 3.7 WORKING GROUP ON INTERNATIONAL TSUNAMI SIGNS AND SYMBOLS

103 This Agenda item was introduced by Mr Emilio Lorca (Chile) on behalf of Capt. Hugo Gorziglia (Past Chairman) referring to Document IOC/ITSU-XIX/10 (Progress Report of the ad hoc Working Group on International Tsunami Signs and Symbols). He explained that the need to establish appropriate internationally standardized and recognized signs and symbols for use in tsunami mitigation activities was raised at the Eighteenth Session of the ICG/ITSU, and through Recommendation ITSU-XVIII.2 a Working Group was established to examine this matter. The Working Group integrated by Canada, Chile, Colombia, Peru and the ITIC, Chaired by the Past Chair, Capt. Hugo Gorziglia conducted the work aiming to develop an internationally standardized set of signs and symbols to be used in the field and on tsunami inundation maps, tsunami evacuation maps and educational material.

104 A preliminary report was introduced at the ICG/ITSU Officers Meeting held in Hawaii, USA, 10–13 February 2003, where it was analyzed, and guidance was provided to the Chairman on the way to proceed. The Final Report of the Working Group has been submitted to the ITSU-XIX as Document IOC/ITSU-XIX/10.

105 Mr Lorca reported on the work carried out and on the results reached, proposing to (i) agree on the need to have two international recognized sign for a ‘Tsunami Evacuation Route’ and ‘Tsunami Hazard Zone’; and (ii) to agree on the need to or not to have as an international recognized sign for ‘Tsunami Refuge Zone’.

106 Participants were invited to provide comments on the Report and particularly on the proposals therein included.

107 **The Group accepted** the “Tsunami Hazard Zone” and “Tsunami Evacuation Route” signs.

108 Several Member States pointed out that the use of the colour blue for a warning sign was not appropriate. **The Group decided** that guidance on colours should be obtained from the ISO (International Standards Organization).

109 **The Group expressed concern** over the use of text on the signs, as this would require careful translation of the text into many languages. However, it was recognized that, without text, the signs would be difficult to interpreted by the public.

110 **The Group accepted** the use of text on the signs that in their English language versions read “Tsunami Hazard Zone” and “Tsunami Evacuation Route”, but **requested** all Member States to submit to the IOC Secretariat, by March 2004, the language versions of the text strings for both signs in all official (and other appropriate) languages for their country.

111 **The Group requested** the Executive Secretary IOC to submit a proposal for the agreed tsunami signs to the ISO, including the different language versions, as received from Member States, and to request advice from the ISO on colour schemes.

112           **The Group decided** that there is no need to have an internationally recognized sign for “Tsunami Refuge Zone”.

113           **The Group tasked** the ITIC Director to distribute information on the adopted signs widely upon their approval by the ISO.

114           **The Group**, considering that the *ad hoc* Working Group had successfully finalized its work, **accepted** its report with the modifications made by the ICG/ITSU at its Nineteenth Session, and **disbanded** the Working Group.

### 3.8      REPORT ON HTDB/PAC

115           This Agenda Item was introduced by Dr V. Gusiakov referring to Document IOC/ITSU-XIX/11 (Report on HTDB/PAC). In accordance with Recommendation ITSU-XVII.2, a comprehensive Historical Tsunami Database (HTDB) for the Pacific region has been compiled as part of the joint IUGG/TC and ICG/ITSU Project “Basic Pacific Tsunami Catalogue and Database”. The database consists of three main parts: the catalogue of tsunamigenic events with their basic source parameters, the catalogue of the observed run-up heights and a Pacific-wide catalogue of historical earthquakes (nearly 230,000 events) from pre-historic times to the present. The current version of the database (4.8 of 31 December 2002) covers the period from 47 B.C. to the present time and contains 1,428 entries in the tsunamigenic event catalogue and almost 7,000 run-up heights provided with the exact geographical co-ordinates of the observational sites. The tsunami and earthquake catalogues, collected within the HTDB Project, are embedded inside a specially developed GIS-type graphic shell (WinHTDB) for easy data retrieval, visualization and processing. The WinHTDB shell operates on Windows PC platforms with no additional co-located software required. The full version of the database, including the textual descriptions of tsunami manifestation (for about 240 events) and some additional reference information related to the tsunami problem, is available on the CD-ROM. The Web-version of the database for the Pacific is maintained by the NTL/ICMMG on the following Web site: <http://tsun.sccc.ru/htdbpac>. The web site provides the user with screen forms for data search by a number of criteria, for their listing, sorting and for several types of data processing (a histogram of tsunami occurrence, intensity-time and intensity-magnitude charts).

116           In his presentation, Dr Gusiakov stressed that in its present state, the HTDB contains almost all historical data published in the earlier tsunami catalogues and can be considered as the most complete and reliable historical tsunami dataset available in a digital domain. However, the process of the data compilation and editing is still far from completion. A wealth of data exists in regional and local sources. However, these data are scattered in numerous publications (magazines, newspapers, original reports, etc.) most of them are unavailable outside the region of origin. Besides, quite often these data are published in languages other than English. The further improvement of the database quality and completeness can be done only with help of Regional or National Co-ordinators who are working in the regions and have access to local sources of information. The list of the HTDB Regional Co-ordinators for Pacific tsunamigenic regions is almost complete and was brought to the attention of the group. It is available from the IOC ITSU web site.

117           To help the Regional Co-ordinators with the collection of these data, their conversion into the digital format and association with bibliographical references, a specialized Windows application – PDM (Parametric Data Manager) shell has been developed by the Novosibirsk Tsunami Laboratory (under the IOC Contract 8762452). The PDM is a DBMS-type software written on Visual C ++ and intended for easy and convenient collection and input of tsunami-related data and their further converting into the relational database. The PDM can handle all the basic types of tsunami data and information as parametric (source data, run-up observations, tide measurements) as descriptive (structured text, bibliographical references, digitized images). Dr Gusiakov demonstrated some basic features of the PDM software.

118           Further progress in the HTDB/PAC project implementation is related, first of all, to the recent joint initiative of the ITIC (Honolulu), NGDC/WDC-SEG (Boulder) and the NTL (Novosibirsk) to

develop a plan to compile a unified and comprehensive Global Historical Tsunami Database (GTDB) that will be built by merging the two existing tsunami databases (Worldwide Tsunami Database of the NGDC and the Historical Tsunami Database (HTDB) of the NTL) with further input from the HTDB Regional Co-ordinators for the Pacific on the historical data locally and regionally available (see also Agenda Item 7.3).

119 Speaking about the further development of the of the WinHTDB graphic shell, Dr Gusiakov mentioned a possible extension of its functions by including a new software block for fast calculation of Tsunami Travel Times (TTT). This numerical algorithm was first developed for the Caribbean and South America regions. After some modification, it can be easily incorporated in the current version of the WinHTDB graphic shell for the Pacific allowing to calculate and plot the TTT maps as for the whole Pacific as for any selected area.

120 Dr Gusiakov also informed the Group about the plans on the further development of the WinHTDB graphic shell. A new, completely re-worked version of the shell will be developed by the NTL programmers based on the powerful programming language C++, using the latest versions of commercially available instrumental tools like ASP.NET, OpenGL and MS SQL Server DBMS. The new shell will be based upon the full 3D visualization of maps and data, support different DB formats (such as flat files, MS Access, DBASE, MS SQL Server, Oracle, etc.), support Web-based access to the data with the same level of mapping support as stand-alone Windows application. Hopefully, a beta-version of the new HTDB shell will be ready in two years from now and be presented at the ITSU-XX for evaluation.

121 **The Group commended** Dr Gusiakov for his hard work during the past 8 years on this very valuable product.

122 **The Group gave its full support** for the planned further development of the HTDB/PAC Project with special emphasis on (i) improvement of data quality and completeness in the database, (ii) integration of tsunami travel time module in the current version (4.8) of the HTDB graphic shell, and (iii) development of a new version of the shell based on the new commercially available instrumental.

123 **The Group further described** the HTDB/PAC software as an excellent self-contained product for providing convenient on-site access to the large volume of historical tsunami data in the Pacific for Member States.

124 Discussions on the co-operation between NTL and ITIC on the development of the Global Historical Tsunami Database (GTDB) are reported on under Agenda Item 7.3.

## 4. TRAINING AND EDUCATION

### 4.1 ITSU TRAINING PROGRAMME

125 The ITIC Director, Dr Laura Kong, introduced Document IOC/ITSU-XIX/12 containing the results of a survey done to assess the value of the ITSU Training Programme (ITP), formerly named the Visiting Experts Programme (VEP). The Survey was carried out in response to an IOC/ITSU-XVIII request from Member States (para. 92 of the ITSU-XVIII Summary Report) and the Officers to determine whether former participants had remained in the tsunami field and could thus serve as resources for national and regional tsunami problems.

126 The ITIC Director provided a brief historical summary of the ITSU Training Programme, including its content, duration, frequency and country participation, and followed with a summary of the results from the brief 5-question survey. It was noted that a total of 39 experts had participated in the Programme since its inception in 1974, but that only 14 of the participants responded to the survey. Of these, 13 indicated they were still involved in an oceanographic, geophysical, or meteorological field of work. The poor response, in part due to ITIC's inability to locate the person's current address, is an indicator that many of the former participants may not be working in the field anymore. The possible

pool of former VEP trainees that could assist by serving as tsunami resource people for national and regional tsunami problems thus appears to be relatively small. Nevertheless, upon completion of the Programme, VEP/ITP alumni should be equipped to serve as tsunami resources within their countries and regions. ITIC will maintain a list of active ITP alumni along with their work specialty and experience who can be contacted, and will continue to serve in co-operation with these individuals as information resources on international and national tsunami problems. The ITIC Director noted however, that the lack of available VEP alumni means that ITSU will need to utilize more extensively its human resources in Member States with active tsunami hazard mitigation programmes. These individuals, along with the ITIC generally, would make up a second pool of individuals available for consultation. Dr Kong requested the Group to set aside funding on a continual basis to support the travel of these experts to those Member States requesting assistance. The consultations and other tsunami mitigation efforts would be conducted under the proposed ITSU Training Programme – International (ITP-International, Agenda Item 4.2), which would conduct in-country training for Member States.

127 During the intersessional period, the ITIC conducted the 2002 and 2003 ITP/VEP. The 2002 VEP was held 28 May–11 June 2002, for two scientists from South America, Ms Patricia Arreaga Vargas, Tsunami Programme Co-ordinator at INOCAR, Instituto Oceanográfico de la Armada, Ecuador, and Mr Sergio Rouillon Pardo, Logistics Chief at HIDRONAV, Dirección de Hidrografía y Navegación, Peru. That year, the participants attended the Second Tsunami Symposium held at the East-West Center, University of Hawaii, 28-31 May 2002, where they learned about current tsunami research and mitigation efforts. The 2003 ITP was held 4-15 August 2003 for one seismologist from Indonesia, Mr Ibnu Purwana, Head, Seismology and Tsunami Division, Meteorological and Geophysical Agency, and also the ITSU National Contact, and one oceanographer from Chile, Ms Cecilia Zelaya Gomez, Sistema Nacional de Alerta de Maremotos (SNAM), Servicio Hidrográfico y Oceanográfico de la Armada de Chile (SHOA). In both programmes, there was an increased focus on how to prepare for the local or regional tsunami threat; specific activities included discussions on the operations of the local tsunami warning system with PTWC, and visits to the Hawaii State Civil Defense and Hawaii County Civil Defense agencies.

128 In recent years, ITP participants have spent about 40% of their time learning about the international and local tsunami warning systems directly from the PTWC or ITIC, about 30% learning about the local tsunami warning system as carried out by State and County Emergency Agencies, and about 30% in discussions with experts on tsunami hazard assessment and mitigation (inundation mapping and wave forecasting, public education and awareness programmes, and the conduct of post-tsunami surveys). It should be noted that the time devoted to observing operations at the Pacific Tsunami Warning Center has always been a major aspect of the VEP/ITP, and that in recent years, the ITIC has worked closely with the PTWC to co-ordinate the most efficient presentation of the background material and demonstration of the operations. Currently, the annual Programme takes place over a 2-week time period. The ITIC Director noted, however, that with this amount of time, the participants are only able to gain a broad introduction to the many aspects of the tsunami warning system; in-depth treatments and hands-on training have been sacrificed in favour of subject breadth. Moreover, in recent years in response to participants' requests and that of ICG/ITSU-XVIII Action Sheet, para. 92, the Programme has begun to place an equal emphasis on both the international and the regional/local tsunami warning systems, and additionally on its operational integration with the local emergency management agencies. The inclusion of this additional curriculum without an increase in the length of the Programme has had the effect of reducing the amount of time spent on each of the different aspects of tsunami warning.

129 The ITIC Director invited input from Member States on how to better improve the Programme. She stated that, if no reduction in the scope of the ITP curriculum occurs, the future ITSU Training Programme duration should be increased to at least 2.5 to 3 weeks, with the ITIC budget increased accordingly. At the same time, she recommended that each ITP should pair participants with similar needs and experience levels so that the ITP can be tailored each year to result in the maximum benefit for the participants. With only a limited amount of time, some topics can then be omitted, and others added to best fit the needs of the participants.

130 **The Group decided** to increase the duration of the ITSU Training Programme sessions to three weeks (15 working days), taking into consideration the increased requests for local/regional tsunami

warning and hazard mitigation coverage, as well as the differences in the background of participants. **The Group decided** to maintain the frequency of one course per year for 2-3 students.

131 **The Group noted with regret** that many trained experts appear to be no longer involved in tsunami-related activities.

#### 4.2 TRAINING COURSES (EXPERT LEVEL)

132 The ITIC Director, Dr Laura Kong, introduced this Agenda item by describing the 2002 and 2003 trips by Mr Emilio Lorca, Head of the SNAM, Chile, and the ITIC Director as Experts traveling to Ecuador and Colombia, and Indonesia respectively, to provide tsunami and tsunami hazard mitigation training and briefings. Additionally, ITIC was able to fund an additional request by INOCAR (Ecuador) for training in TIME through the ITP. In January-February 2003, Ms Patricia Arreaga Vargas, a VEP 2002 participant, spent one month with Dr Modesto Ortiz of CICESE, Mexico, working on the project "Tsunami Prevention and Mitigation Plan for Esmeraldas, Ecuador". The development of evacuation maps for this city was a recommendation resulting from the Tsunami Expert visit by Mr Lorca. Similarly, in conjunction with the ITIC Director's participation at the meeting 'In Memoriam of 120 years Krakatau Eruption-Tsunami and Lesson Learned from Large Tsunami ', in memorial of 120 years of Krakatau Eruption, held in Jakarta and Anyer, Indonesia, 26-29 August 2003, the ITIC Director provided a one-day training to Directors of the Meteorological and Geophysical Agency's Regional Seismic Centers. The training curriculum consisted of presentation modules on the science of tsunamis, mitigation, the Tsunami Warning System in the Pacific and the roles and operations of ITSU, the PTWC, and the ITIC, and regional and local tsunami warning systems and their integration with local emergency agencies and services, and mitigation efforts involving risk assessment and public education and preparedness programmes. The curriculum used by the ITIC will be further developed in the coming year and made available for comment and improvement. Upon completion, the training modules will be made available in multiple languages.

133 **The Group decided** to establish a "Pool of Experts" to travel to Member States to provide training and expert consultation on tsunamis and tsunami mitigation (risk assessment, warning, preparedness) to emergency managers and other government personnel. **The Group decided** to initially include in the "pool", the ITIC Director and Associate Director, and as applicable, ITP/VEP alumni from the concerned region to assist. However, **the Group stressed** that the decision to send an expert to a Member State should be balanced against sending students to an ITP course at ITIC as the funds for the "expert pool" missions will need to come from the ITP budget.

134 The Delegate of Australia informed the Group that the WMO Tropical Cyclone Programme had established a similar "mentor" Programme that had proved to be very useful.

135 Dr Kong further reported that ITIC's experience in August 2003, in which the ITP-International training to Indonesian government officials occurred one week after the end of the ITP-Hawaii training attended by Mr Ibnu Purwana, the ITSU National Contact, proved to be a very effective means for intensively focusing on tsunami and information technology transfer. In this case, Mr Purwana was able to gain experience and information from the PTWC and local civil defence officials in Hawaii, which was then followed by the ITIC Director's visit to reinforce those principles learned in Hawaii in his home country. At the same time, the ITIC Director was able to gather information and assess the tsunami mitigation capacity of Indonesia, and discuss with them how ITIC might better serve their needs.

136 Based on this experience, the ITIC Director recommended establishing international component to the ITSU Training Programme, and further recommended that the ITP-Hawaii and ITP-International programmes focus on the same country or region each year if possible. The ITIC Director noted that this could take the form of an ITP-Hawaii programme followed by an in-country visit by an Expert through the ITP-International, or vice-versa; depending on the time interval between the two programmes, the advantage of the latter would be that it would provide an opportunity to better identify candidates for the ITP-Hawaii that followed, and also allow the ITP-Hawaii training to better meet the needs of the Member States.

137 The Tsunami Expert could be from the “Pool of Experts”, or be an Expert from the region, and would utilize the prepared training curriculum with modifications tailored for the region. This programme will provide a means for information dissemination to a larger audience. Thus, the ITP-International would provide in-country training, and ITP-Hawaii would provide training through the ITIC in Honolulu. The enhancement proposed by ITIC is to institutionalize this programme, thereby making it a regular and annually funded programme administered by ITIC and funded by the IOC/ITSU.

138 **The Group agreed** that the conduct of international training was a valuable new initiative, and agreed to establish the ITSU Training Programme – International (ITP-International). **The Group noted** however that, due to the limited financial resources of the ITSU programme, that it may not be possible to organize both the ITP-Hawaii and ITP-International training events on an annual basis, solely with IOC/ITSU funds.

139 The Delegate of the USA informed the Group that his country will be able to assist through funding the travel cost of the ITIC Director to conduct at least two combined “ITP-International training and Member States needs assessments” efforts in 2004, and he invited other ICG/ITSU Member States to co-sponsor such initiatives in order to enable the conducting of at least three Member State visits to establish baselines for capacity building.

140 **The Group requested** the IOC Secretariat to modify the Circular Letter sent to Member States annually (which invites Member States to nominate candidates for the ITP) to inform them of the ITP-Hawaii and ITP-International, and to also request Member States to inform the IOC of planned national and regional ITSU workshops since these would be opportunities to conduct the ITP-International.

141 The Group was then addressed by Dr Robin Falconer on behalf of the Circum-Pacific Council (CPC). The Circum-Pacific Council is an international, non-governmental association of earth scientists and engineers who represent industry, academia, government and other organizations and institutions. The Council was founded in 1972 by Michael T. Halbouty.

142 The mission of the Council is to foster international and cross-sector communication for sustaining earth resources and undertaking risk in the Pacific Region. The Council’s goals include: improving knowledge of earth resources and natural hazards in the Pacific Region; increasing collaboration among geologists, hydrologists, biologists, oceanographers and related scientists; and disseminating earth science information through maps, publications, symposia and workshops. The Council operates under an international Board of Directors.

143 Over the past quarter century, the Council has sponsored 5 Pacific-wide conferences, 6 regional symposia and 14 workshops around the Pacific; compiled and published 51 regional geoscience and resource maps with accompanying explanatory booklets. The Circum-Pacific Council products are now being published in both digital and print form by co-operating organizations engaged in specific topics. Several recent examples include:

- HAZPAC — an interactive digital database characterizing the HAZards of the PACific, published by the US Geological Survey;
- Crowding the Rim: Global Consequences of Natural Hazards — an education module on natural hazards and risk, published by Stanford University.

144 The Council has established a special project on Tsunami Education. This project is designed to work with the Civil Defence and local authorities of coastal zones around the Pacific margin. Outcome objectives include better education, improved warning systems, enhanced responder capability and more prudent land use planning.

145 The Circum-Pacific Council does not have expertise in tsunamis but sees its role as facilitating communication between existing groups and facilitating education programmes. The Circum-Pacific Council would like to work with ITSU to see how tsunami education can be enhanced at the local level.

Dr Robin Falconer ([r.falconer@gns.cri.nz](mailto:r.falconer@gns.cri.nz)) is Chair of the Circum-Pacific Council Tsunami Project. He is keen to work with ITSU individuals on an on-going basis.

146 **The Group thanked** the Circum-Pacific Council for their support of four participants to the ITSU Workshop held prior to ITSU-XIX and to ITSU-XIX, and **considered** this as a concrete expression of interest in collaboration with ITSU.

147 **The Group strongly welcomed the** co-operation between ICG/ITSU and the Circum-Pacific Council and **requested** the IOC Secretariat to discuss with CPC ways and means to establish formal and implementation levels of collaboration.

148 Because of the great similarities in the projects, the **Group recommended** that co-operation could focus on designing a plan of training and education that best addresses the needs requested by Member States.

149 **The Group requested** the IOC Secretariat, CPC, PTWC and ITIC to jointly work towards the conduct of a tsunami session at the next SOPAC meeting in 2004 to raise awareness. **The Group agreed** that this would also be an excellent occasion to organize a meeting of the intersessional working group on the Southwest Pacific and Indian Ocean Tsunami Warning System (see also Agenda Item 6.4).

#### 4.3 PUBLIC EDUCATION

150 Dr Laura Kong introduced this Agenda Item. She recalled that through para. 84 of the ITSU-XVIII Summary Report, Member States were requested to consider the declaration of special time periods for tsunami awareness activities, and to include these activities in their National Reports and summarize their experiences at ITSU-XIX.

151 Through para. 90 of the ITSU-XVIII Summary report, Member States were requested to incorporate tsunami phenomenon and tsunami hazard knowledge into the general national education programmes, and to include these activities in their National Reports and summarize their experiences at ITSU-XIX.

152 Through para. 95 of the ITSU-XVIII Summary Report, Member States were requested to provide the ITIC and IOC Secretariat with information on national training activities and copies of educational and awareness material. Only a few documents were received by the ITIC, mostly from countries that participated in the ITP Programme and the USA. Information on the availability of additional contributions were requested to be included in their National Reports, and summaries given at ITSU-XIX.

153 With regard to Public Awareness, the Delegate of the United States reported on the conduct of successful tsunami awareness months that were held in Alaska and Hawaii to commemorate the anniversary of the 1946 Aleutian Islands earthquake and tsunami that caused significant devastation in both states. Tsunami Awareness Month is held annually every April in Hawaii. Activities have included media briefings, educational television shows on earthquakes and tsunamis and tsunami preparedness that were viewed live in classrooms throughout the State, informational booths at ocean awareness festivals, evacuation drills for schools located in the tsunami evacuation zone, information sessions at public libraries, tours of the PTWC, and conduct of tsunami response exercises. In 2003, the tsunami exercise co-ordinated by the Hawaii State Civil Defence, and involving the PTWC, country emergency agencies and other government and non-government agencies, practiced the tsunami response to the issuance of a local tsunami warning issued by the PTWC.

154 A few delegates reported that, although tsunami awareness is an important issue, it often ranks low on the curriculum of schools, as other disaster awareness is considered to be more relevant due to the low occurrence of tsunamis in those countries. Exceptions are countries like Papua New Guinea, Fiji and Indonesia due to tsunami events that happened in recent history.



- 155 The Delegate of Fiji informed the Group that the Fijian Ministry of Education has incorporated earthquake studies in the primary school (year 8) curriculum (tsunami phenomena are also included). A Natural Disaster Awareness Week is organized in which tsunami awareness and preparedness are a major part of it. Interviews and talk shows are broadcast on radio and television. During the second week of September 2003, a tsunami workshop was organized in Suva, Fiji that commemorated the 14/9/53 Suva Earthquake and Tsunami that devastated the town of Suva. Fiji also conducted a Tsunami Evacuation Exercise for the occupants of two of the high-rise buildings in Suva, and three schools in downtown Suva.
- 156 The Delegate of Indonesia informed the Group that in 2004 a workshop will be organized in his country to commemorate the earthquake and tsunami that occurred in East Java in July 1994 and killed 160 people.
- 157 The Delegate of Papua New Guinea informed the Group that the 1998 Aitape Tsunami that struck his country and killed more than 2,200 people has been an eye opener and a lot of work has been carried out since then to raise awareness for tsunamis.
- 158 The Delegate of Peru provided a CD-Rom with videos, animation, charts and information about the Tsunami Warning System of Peru; they have also printed and handed out an information booklet about tsunamis.
- 159 Referring to discussions at the last ITSU Officers meeting, **the Group requested** Member States to send to ITIC any PowerPoint presentation they may have about ITSU (aimed at the general public), for posting on the ITIC web site for download.
- 160 **The Group requested** Member States to send copies of their tsunami Public Education material to ITIC. ITIC informed the Group that all public education material prepared by ITIC is available to all Member States in printed or electronic format.

## 5. ITSU PUBLICATIONS AND AWARENESS TOOLS

### 5.1 TSUNAMI NEWSLETTER

- 161 Dr Laura Kong, ITIC Director, introduced this Agenda Item. During the intersessional period, the ITIC published the Tsunami Newsletter bi-monthly, producing altogether 11 newsletters averaging 12 pages in length over a 23-month period. The newsletters were produced in-house in full colour. Hard copy circulation continues to be about 350 in about 40 countries; with the remainder (about 400) receiving e-mail notifications of newsletter download availability from the ITIC USA web site ([http://www.prh.noaa.gov/itic/library/pubs/newsletters/nl\\_html/nl\\_2000s.html](http://www.prh.noaa.gov/itic/library/pubs/newsletters/nl_html/nl_2000s.html)). The electronic files range in size from 500 KB to 5 MB depending on the graphical and/or photographic complexity in the issue, and are formatted in Adobe Portable Document Format (PDF). Each issue contains a table listing all earthquakes greater than, or equal to, a magnitude 6.5 that caused the PTWC to issue a tsunami information bulletin, watch, or warning, tsunami information for earthquakes that generated tsunamis, news from PTWC and ITIC, ITSU business progress including changes in ITSU National Contacts, meeting summaries, upcoming conferences, and starting in 2002, feature articles on the different tsunami warning systems currently in operation. In an effort to provide greater content on international tsunami activities, the ITIC Director has been successfully soliciting contributions from Member States, and wishes to encourage all Member States to voluntarily contribute articles and tsunami programme news for publication in the Tsunami Newsletter.
- 162 Dr Kong stressed that it continues to take a considerable amount of time to collect content, design, and then produce the Newsletter, taking an average of about two weeks per issue for design, layout, editing, printing, and distribution by the ITIC Director and her staff. With the publication schedule being every two months, this often leaves little time between issues to concentrate on other matters requiring ITIC attention, and in several instances, month-long delays have resulted because of conflicts with meetings, other reporting requirements, and/or other official travel.

163           **The Group commended** ITIC on the excellent quality of the Newsletter.

164           **The Group decided** to reduce the frequency of the Newsletter to 4 issues per year. **The Group further instructed** ITIC to henceforth publish time-sensitive material (announcements of conferences, tsunami events, etc.) on the ITSU web site (hosted by IOC). In this regard, the Technical Secretary informed the Group that the ITSU web site hosted by IOC has an in-built calendar system that can be used to advertise conferences and other tsunami related events. The Group instructed ITIC to publish short reports of ITSU meetings and training courses in the ITSU Newsletter.

## 5.2    TSUNAMI INFORMATION KIT

165           Dr Laura Kong introduced this Agenda Item. She informed the Group that the finalization and printing of the Tsunami Information Kit (TIK) in time for distribution at ITSU-XIX was not realized due to delays in editing and acquisition of high-resolution graphics and photographs for the TIK. The TIK was renamed as such from its former name as the Tsunami Press Kit to better describe the product's contents, its intent, and its target audience. During 2002–2003, a consultant was contracted to research and write additional descriptions on topics that were not adequately covered by the previous draft, and also to collect high-resolution files of images that would be used in the final version of the TIK. At the Officers Meeting in February 2003, the consultant presented a Draft that was much longer than could be accommodated within the existing budget. As a result, the ITIC Director and the PTWC Director are presently working together to review and improve upon the consultant's work by re-organizing and combining the sections to make the product clearer and more concise. This reduction in size is needed to meet the required specifications of the project. ITIC is also identifying and acquiring graphics, photographs and mareographs for insertion into the textual descriptions. At the same time, the IOC is assisting in the creation of easily modified templates for each page, and an overall presentation binder or folder into which the loose-leaf pages can be inserted.

166           Dr Kong recalled that the Officers, during their 2003 Session, had agreed that the TIK would consist of about 40 pages covering ITSU, the top 10 tsunami questions, the largest tsunamis and their impacts, the international tsunami warning system, preparedness, safety, and lists of publications, addresses, and web sites. The TIK will be designed to permit the easy insertion of additional pages such as those created by Member States to address their country's own tsunami threats. It is anticipated that the TIK will be completed and distributed during the next intersessional period.

167           The Delegate of the Russian Federation informed the Group that substantial parts of the draft TIK had been translated into Russian.

168           The ITIC Associate Director, speaking on behalf of Chile, re-iterated his country's offer to assist with the design and printing of the TIK.

169           **The Group noted** the progress with the Tsunami Information Kit and **instructed** ITIC and the IOC Secretariat to ensure that the product is completed by the January 2005 Officers meeting. **The Group requested** that at least 200 copies be printed and distributed.

## 5.3    TSUNAMI GLOSSARY

170           CmDr Rodrigo Nuñez, ITIC Associate Director, introduced this Agenda Item. He reported that SHOA (Chile) had prepared the final English, French and Spanish PDF versions of the Tsunami Glossary that are included on the CD-ROM made available to all Member States at the ITSU-XIX Session and which also includes all the electronic documents and publications available on-line from the ITIC website (Newsletters, Master Plan, textbooks, etc). He gave a brief demonstration of the CD-ROM to the Group. He showed that all *ITSU Newsletters* (starting in 1964) are available from the CD-ROM. With regard to the school textbooks, he informed the Group that the Spanish versions have been printed in colour. A new product was also developed by SHOA: a PC-based animated cartoon that describes how to survive a tsunami. Although currently available only in Spanish, it can be translated into other languages as well.

171 CmDr Nuñez announced furthermore that in March 2004, SHOA will print hard copies of both the Spanish and English versions of the Glossary. SHOA will fund part of the cost of printing.

172 **The Group congratulated** SHOA for the substantial work carried out developing the CD-ROM that was described as an impressive, high-quality reference and educational tool.

173 The Chair informed the Group that France has prepared the final French version and provided all materials (background, pictures, figures) to Chile for use in the English and Spanish versions. In addition, France printed 1,200 copies of the French version and provided 200 of these to Canada.

174 The Delegate of the Republic of Korea expressed his interest in translating the glossary into Korean.

175 The Delegate of Canada, referring to the assistance provided 10 years ago with the translation of the school text books from Spanish into English, offered to provide support for translation of teaching guides and other products.

176 **The Group invited** Member States to translate all ITSU documentation for public and expert use into their national and local languages.

#### 5.4 ITSU WEBSITES

177 CmDr Rodrigo Nuñez, ITIC Associate Director reported to the Group about the new structure of the Tsunami-related web sites hosted by IOC, ITIC-USA and ITIC-Chile, protocols for posting information and maintenance responsibilities. He informed the Group that the ITIC-Chile site will be closed down in December 2003. Files will be transferred to the ITSU (IOC, Paris) and ITIC-USA sites before the closing date of the ITIC-Chile.

178 He explained that the ITSU-IOC site targets experts, providing technical information (history, structure, membership, activities, formal documents). The site enables members to post material. The system has a 'content informer' function sending an e-mail to members when new content has been added. The site also contains all ITSU-related technical documents and reports.

179 The ITIC-USA site aims at the general public and contains the Master Plan, photo gallery, newsletters, reading list, safety rules, post-tsunami field guide, Great Waves, fact sheets, and other content aimed at creating awareness.

180 **The Group thanked** SHOA in general, and CmDr Rodrigo Nuñez in particular, for developing and hosting the ITIC-Chile website for many years.

181 **The Group thanked** ITIC-USA and the IOC Secretariat for hosting the ITIC-USA and ITSU-IOC sites and **instructed** them to co-ordinate content development of the two sites, clearly keeping in mind the two target audiences.

182 **The Group requested** to provide access to tsunami bulletin board logs through the web site(s) and **tasked** ITIC to investigate the possibilities.

183 **The Group requested** Member States to register on the ITSU web site hosted by IOC (<http://ioc.unesco.org/itsu>).

#### 5.5 OTHER

184 The Delegate of Ecuador informed the Group of Ecuador's *Tsunami Bulletin*. This product contains information about tsunami events, related activities and information on tsunami mitigation. Ms Arreaga Vargas expressed thanks to ITIC for assisting with the printing of the product.

## 6. REGIONAL AND OTHER TSUNAMI WARNING SYSTEMS

### 6.1 NORTHWEST PACIFIC TSUNAMI WARNING SYSTEM

185 Mr Noritake Nishide (Japan) introduced this Agenda Item. He recalled the Earthquake that occurred on 25 September 2003 in Hokkaido, Japan. He then proceeded to provide information on the tsunami warning centre based at JMA and its activities. In Document IOC/ITSU-XIX/13, Japan explained the present status of technical improvement of determining earthquake location using LISS (Live Internet Seismic Server) data. Japan also presented the quick determination method for Mw using P wave according to the same document.

186 Mr Nishide explained Japan's quantitative tsunami forecast method for local and distant tsunami as described in the National Report of Japan, and provided information on Japan's tide gauge network for tsunami observation in detail as information for Sea Level Enhancement discussed under Agenda item 3.6.

187 Responding to a question from Australia, Japan explained about the reliability of LISS for the operational tsunami warning system as follows: there are almost no problems because data of about 20 stations can usually be used for hypocenter determination of large earthquakes even if some stations may drop, but, it is not appropriate for the operational tsunami warning system to rely only on LISS because LISS uses the Internet.

188 For the purpose of utilizing seismic data in the Philippines and Indonesia, Japan proposed that the Group request the Comprehensive Test Ban Treaty Organization (CTBTO) to allow the Group to use the data of seismic network of CTBTO in real-time basis for tsunami warning.

189 The Chair gave clarification on this issue explaining that the data of auxiliary seismic stations of one country are used by that country for real-time warning purposes. For example, the New Caledonia auxiliary seismic station is processed by the French TREMORS system, and published on the EMSC web site.

190 **The Group regretted** that there are currently no seismic stations available for tsunami warning close to the Philippines and Indonesia, although data are needed in that region. It was noted however, that there are 2 CTBTO (Comprehensive Test Ban Treaty Organization) stations in the Philippines and 6 in Indonesia. **The Group requested** the countries owning the stations to make them available for tsunami and earthquake warning purposes.

191 The Delegate of Fiji informed the Group that his country has auxiliary seismic stations for CTBTO, which will soon be satellite-enabled.

192 The Delegate of Indonesia informed the Group that his country has 6 auxiliary seismic stations. The data from these stations can be contributed to Japan.

### 6.2 IAS TSUNAMI WARNING SYSTEM

193 This Agenda Item was introduced by Dr Charles McCreery. He recalled that ITSU-XVII had reviewed a proposal for an IAS tsunami warning system. The Thirty-fifth Session of IOC Executive Council had reviewed the proposal and had recommended that "*the Workshop on the IAS Project on the development of the Tsunami Warning System in the Caribbean be arranged with the participation of experts from the Pacific and Caribbean region*" in order to review the original project proposal of the IOCARIBE Tsunami Steering Group of Experts and provide comments. This had led to the organization of a Workshop in Mayaguez, Puerto Rico from 19-21 December 2000. A draft version of the proposal was prepared and subsequently discussed at ITSU-XVIII where a working group was established, tasked to address outstanding issues. The proposal was then submitted to IOCARIBE-VII (Veracruz, Mexico, 25-28 February 2002). At that meeting the proposal was strongly endorsed but no funding was identified. Some additional work has been done to try implementing some parts of the proposal at the US national level.

194 The Delegate of the USA informed the Group that the US National Tsunami Hazard Mitigation Programme, consistent with the US NOAA's National Weather Service (NWS) Strategic plan (2000-2005) has identified expansion of the US Tsunami Warning Programme in the Caribbean, specifically for Puerto Rico and the US Virgin Islands. Although effective funding has not been received, PTWC and WC/ATWC agreed, in a January 2003 meeting at the University of Puerto Rico, Mayaguez, to provide tsunami warning support to these islands through the NWS forecast office, Puerto Rico. Lack of a robust water level network hinders the ability to provide timely warning cancellations. Puerto Rico has made significant progress in training disaster management personnel and the local population on the tsunami threat and preparations. Funding requests for a more complete tsunami warning capability for the area continue to be reflected in the NTHMP requirements.

195 **The Group noted** the information provided by the speakers and **expressed its appreciation** to the USA for their continued efforts in this area.

### 6.3 CENTRAL AMERICA PACIFIC COAST TSUNAMI WARNING SYSTEMS

196 Mr Claudio Gutiérrez Huete (Nicaragua) introduced this Agenda Item. He informed the Group that the six countries of Central America and CEPREDENAC (Coordination Center for the Prevention of Natural Disasters in Central America) have decided to start the process for a Regional Tsunami Warning System for the Central American Region. Nicaragua received the assignment to formulate the proposal, and this proposal was completed and presented to the Executive Secretary of CEPREDENAC on 24 September 2003. The proposal has been presented by CEPREDENAC to other Central American Countries in order to obtain comments, suggestions and inputs; and then to formulate the final version of the Central American Regional Tsunami Warning System, at the end of this year.

197 The system would have the following components:

- (i) A Co-ordination Council with two representatives from each country;
- (ii) National Seismic Centers, in each country, with broad band stations and software (TREMORS);
- (iii) A regional communication network based on the Internet, satellite systems and radio links;
- (iv) Special "Units" in the National Systems for Disaster Prevention in each country, to transmit the tsunami warning for the coastal population; and
- (v) A national communication system with the coastal population in each country.

198 Mr Gutiérrez Huete noted that it is not the intention to have a single Warning Center for the whole Central American Region. Each National Seismic Center will work in a very co-ordinated manner. The system will be multi-national and have redundancies. Sea-level stations will be improved in order to transmit in real-time to the PTWC.

199 The Executive Secretary of CEPREDENAC will present the official request for assistance to the Intergovernmental Oceanographic Commission (IOC) of UNESCO, to the PTWC, ITIC and the Chilean Government, probably next year. The main contact of this project is the Executive Secretary of CEPREDENAC, based in Panama.

200 Mr Gutiérrez Huete, on behalf of CEPREDENAC, invited the ICG/ITSU to comment on the proposal.

201 The Delegate of El Salvador added that in some of the Central American countries many instruments are already in place and possibly all that is required is the training of local staff to gather and analyze the data generated by the instruments.

202 The Delegate of Chile, referring to the mission of Mr Emilio Lorca to Member States in Central America, expressed Chile's commitment to continue such support as required.

203 **The Group considered** that the Central American Tsunami Warning System proposal will serve as an excellent example for the planned Southwest Pacific and Indian Ocean warning system.

204 **The Group stressed** the need to foresee multiple warning centres to provide the necessary redundancy in case of damage to warning centres after earthquakes. **The Group also called** on the participating Member States to ensure effective communication links to send and receive warning messages.

205 Responding to the request of CEPREDENAC to ICG/ITSU for a review of the proposal, **the Group decided** to establish an intersessional working group. To define its terms of reference, the Group established a sessional working group, chaired by Nicaragua and including ITIC, PTWC, France, Chile, Nicaragua and El Salvador as members.

206 **The Group adopted** [Recommendation ITSU-XIX.2](#).

#### 6.4 SOUTHWEST PACIFIC AND INDIAN OCEAN TSUNAMI WARNING SYSTEM

207 Mr Ibnu Purwana (Indonesia) introduced this Agenda Item. He recalled that the idea of initiating the establishment of a Regional Tsunami Warning System in the Southwest Pacific and Indian Ocean was raised at ITSU-XVI (Lima, Peru, 23–26 September 1997). Now the issue is raised with a more clearly defined background of considerations:

- (i) Due to its tectonic setting which is located at the junction of three major plates of the Pacific, Eurasian, and Indo-Australian, and one minor plate of the Philippines, Indonesia has a high activity in earthquakes and tsunamis. Historical data show that many tsunamis in Indonesia are destructives and have affected neighboring countries such as Australia, Papua New Guinea, the Philippines, etc.
- (ii) The Meteorological and Geophysical Agency of Indonesia currently operates:
  - a. 28 telemetry vertical component short period seismometers with real-time monitoring and semi-automatic processing at 5 Regional Centers and at it's Headquarters in Jakarta;
  - b. 30 non-telemetry vertical component short period seismographs;
  - c. 11 non-telemetry 3-component short period seismographs;
  - d. 22 non-telemetry broadband seismographs, jointly operated under JISNET (Japan – Indonesia Seismic Network);
  - e. 6 telemetry broadband seismographs of CTBTO Seismic Auxiliary Stations (3 are under construction).

The Indonesia sea-level network consisting of 54 tide gauge stations is operated by the National Co-ordinating Agency for Survey and Mapping (Bakosurtanal or Badan Koordinasi Survei dan Pemetaan Nasional). The main purpose of the network operation is for coastline mapping.

- (iii) In the year 2003–2004, the IMGEP (Improvement of Meteorological and Geophysical Equipment Project) funded by IDB (Islamic Development Bank) will add 27 broad band seismometers to be integrated with the existing six CTBTO Seismic Auxiliary Stations and some selected JISNET stations to form a National Seismic Network with a real-time monitoring and automatic processing at Jakarta Headquarters.
- (iv) As recommended by ITSU-XVIII, the International Seminar/Workshop on Tsunami “In Memoriam of 120 years Krakatau Eruption-Tsunami and Lesson Learned from Large Tsunami” was conducted in Jakarta and Anyer 26–29 August 2003. One of the workshop's recommendations is the establishment of the National Tsunami Warning System based on existing national seismic and sea-level networks, real-time telemetry and automated data processing and evaluation, and reliable methods of warning dissemination, taking into account

the experience resulting from the operation of existing regional and national tsunami warning system in the Pacific. The system should be designed so as to permit the future expansion of its Area of Responsibility to include tsunami warnings to other parts of Southwest Pacific and Indian Ocean (the Philippines, Australia, New Zealand, Papua New Guinea, Fiji, etc.)

208 **The Group welcomed** the efforts of Indonesia to establish a regional warning system for the Southwest Pacific and Indian Ocean, **noting** that this geographic region is currently not well covered by ITSU/PTWC. The proposed regional warning system will be very useful for several countries.

209 The Delegate of Australia offered his country's support for the establishment of such a warning system.

210 The Delegate of Australia then raised the prospect of the extension of ITSU's area of geographical interests further westward, in support of the proposal to establish a tsunami warning service in the Indian Ocean. The Secretariat advised that a decision of an IOC Governing Body would be required to formally redefine ITSU's Terms of Reference with respect to the area it covers, on advice from ITSU.

211 The Director of the PTWC advised it could assist in the detection of seismic events in the Indian Ocean basin but the delays involved in confirming tsunami events would be too large for such an arrangement to be viable in an on-going operational framework.

212 The Delegate of Australia flagged that he wished to further discuss under Agenda Item 7.5 the coverage of ITSU in the context of how ITSU may relate to other global and regional programmes that are now being managed and co-ordinated by the WMO/IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM).

213 **The Group considered** that it may be appropriate to expand the geographic focus of the ICG/ITSU beyond the Pacific, provided that concerned Member States would express the need for such an expansion at the IOC Governing Body level. This may be discussed during ITSU-XX.

214 **The Group established** a sessional working group to prepare a recommendation to establish an inter-sessional working group that will study the establishment of a regional warning system for the Southwest Pacific and Indian Ocean. The sessional working group was Chaired by Indonesia and members included Australia, Papua New Guinea, Fiji, New Zealand, Japan, ITIC and PTWC.

215 **The Group adopted** [Recommendation ITSU-XIX.4](#).

## 6.5 OTHER REGIONS

216 The Chair informed the Group on the current situation in Europe where in several European countries (France, Greece, Italy, Portugal, UK...) research on tsunamis research continues. It essentially focuses on seismic and landslide tsunami modeling, and also on historical and paleotsunami research.

## 7. EXISTING PARTNERSHIPS AND OPPORTUNITIES FOR NEW ONES

### 7.1 CO-OPERATION WITH THE IUGG TSUNAMI COMMISSION

217 This Agenda Item was introduced by Dr V. Gusiakov, referring to Document IOC/ITSU-XIX/14 (Co-operation with the IUGG Tsunami Commission).

218 Dr V. Gusiakov, outgoing Chair of the IUGG Tsunami Commission (IUGG/TC) informed the Group on the recent activity of the IUGG/TC with a focus on the joint IUGG-ICG/ITSU efforts. In the inter-sessional period, the close co-operation with the IUGG Tsunami Commission continued in two main areas: co-ordination of joint projects and conducting of joint workshops. In the first area the main efforts were directed to the implementation of the HTDB/PAC Project. This joint IUGG/TC and ICG/ITSU



Project was launched in 1995 and intended to improve the cataloguing of historical tsunamis in the Pacific by means of organizing them in the form of a parametric tsunami catalogue and a database. The detailed report on the progress of the HTDB/PAC Project implementation was presented to the session under Agenda Item 3.8.

219 With regard to joint workshops, Dr Gusiakov reported that in response to the decision of ITSU-XVIII, the International Workshop “Local Tsunami Warning and Mitigation” was jointly organized by the IUGG/TC and the ICG/ITSU in Petropavlovsk-Kamchatsky, Russia, between 10 and 15 September 2002. The Shirshov Institute of Oceanology of the Russian Academy of Sciences (RAS) and the Kamchatka Seismological Department of Geophysical Service of the RAS were the local organizers. Dr J. Bourgeois (USA) and Dr M. Nosov served as lead co-conveners of the Workshop. The main purpose of the Workshop was to consider the state-of-the-art of the local tsunami problem and to discuss fundamental and applied studies directed at the reduction of a local tsunami hazard. As one of the most active seismic- and tsunami-prone areas in the Pacific, having a long history of historical and paleo-tsunamis and complemented by interesting environmental features, Kamchatka was an appropriate place for the international tsunami community members to discuss the local tsunami problem. Additionally, the workshop was held in commemoration of the 50th anniversary of the 1952 Great Kamchatka Earthquake and Tsunami.

220 Over 100 scientists (42 registered participants) from 12 countries (Bulgaria, Canada, France, French Polynesia, Indonesia, Italy, Japan, New Zealand, Republic of Korea, Russia, Turkey, USA) attended the Workshop. A special student session, that was unanimously recognized as of a high scientific quality by all the workshop participants, was included in the Workshop programme to facilitate the participation of young scientists. The Workshop was followed by a one-day geological field excursion led by Dr J. Bourgeois (USA) and Dr T. Pinegina (Russia). Participants were familiarized with paleo-tsunami methodology and field practice. At several coastal locations on the Khalatyrskiy Beach, 30 km northeast of Petropavlovsk-Kamchatsky, the geological traces of the 1737 and 1952 Kamchatka tsunamis were demonstrated.

221 The proceedings of the Workshop were published (both in English and in Russian) by the Shirshov Institute of Oceanology as a volume: International Workshop “Local Tsunami Warning and Mitigation”, 10–15 September 2002, Petropavlovsk-Kamchatsky, Russia, Proceedings, Shirshov Institute of Oceanology, Moscow, 2002, 210 pp. The short report and Recommendations of the Workshop is added as [Annex VI](#).

222 Secondly, the International Workshop “In Memoriam of 120 years Krakatau Eruption-Tsunami and Lesson Learned from Large Tsunami” was held in Jakarta and Anyer, Indonesia between 26 and 29 August 2003. The local arrangements of the workshop were made by the Meteorological and Geophysical Agency of Indonesia (BMG) and the Department of Marine Affairs and Fishery (DKP) in co-operation with several other related government agencies, as well as with the IUGG/TC and the ICG/ITSU. Dr Fauzi and Mr C. Prasetya served as the main local contacts during the workshop arrangements and procedures.

223 The Workshop was attended by more than 100 Indonesian participants representing different government agencies and institutions dealing with natural hazard monitoring and prevention, as well as by international experts from Japan, USA, Germany and Russia. As a result of the Workshop, the list of recommendations was discussed and adopted. In its full version, the list will be presented to the ITSU-XIX by the National Contact of Indonesia. Here we just mention Recommendation 2, as directly related to the long-term ITSU plan for the establishment of the Regional Tsunami Warning System in the Southwest Pacific, that stresses the need for the creation of the National Tsunami Warning System in Indonesia and strongly supports the initiation of a concerted effort among national and international institutions to co-ordinate and co-operate in the provision of early warnings for regional tsunamis.

224 The Workshop was followed by a boat trip to the Krakatau complex to see the remnants of the Krakatau volcano and a new volcanic island (Anak Krakatau) continuously growing since its emergence in 1929 in the center of the caldera formed as a result of the 1883 eruption. During the excursion, the



participants were briefed on the geological and tectonic settings of the area, the history of the Krakatau volcano and its recent activities.

225 Dr V. Gusiakov highlighted one of the recommendations that concerns the plans of Indonesia on the creation of its National Tsunami Warning System based on already available seismic and mareograph networks and processing facilities existing in their operational center located in the Headquarters of the Geophysical and Meteorological Agency in Jakarta. It is important that this system is designed based on experience resulting from the operation of existing regional and national tsunami warning systems in the Pacific to permit its future expansion to cover other parts of the Southwest Pacific and Indian Ocean (Philippines, Australia, New Zealand, Papua New Guinea).

226 Thirdly, Dr Gusiakov reported on the International Workshop "*Tsunamis in the South and Central Pacific - Research towards Preparedness and Mitigation*" that was held in Wellington, New Zealand on 25 and 26 September. It was the fourth workshop in a series of joint workshops organized by the IUGG/TC and ICG/ITSU, and convened by Dr Viacheslav Gusiakov (Russia), Dr François Schindel  (France), Ms Gaye Downes (New Zealand), and Mr Roy Walters (New Zealand).

227 Eighty-six participants from 18 countries attended the Workshop, many of the international delegates who also attending the ICG/ITSU XIX Session. Thirty-one papers were presented orally, ranging from overviews of regional vulnerability to tsunami, the Pacific historical tsunami record, Pacific-wide and regional Tsunami Warning systems, and preparedness plans, as well as insights into public awareness and preparedness in New Zealand and Washington, USA, tsunami modeling, paleo-tsunami research in New Zealand and submarine landslide identification and tsunami generation potential. Eight posters were also presented. A presentation was given by Dr Robin Falconer, Vice-President Oceania, Circum-Pacific Council (CPC) and Chairman, CPC Tsunami Special Project, on CPC's intention to sponsor tsunami education/preparedness projects in the Pacific. A two-hour interactive Panel Discussion was held on "Tsunami Warning Response to a Magnitude 8.7 Chilean Earthquake". The discussion involved the directors from Chilean, French Polynesian, Japanese and Pacific Tsunami Warning Centers, State or National Emergency Management officials from Hawaii and Washington, USA, New Zealand and Australia, and Researchers from Washington, USA, and New Zealand.

228 Finally, Dr V. Gusiakov informed the Group about the last IUGG Tsunami Commission meeting that was held last July in Sapporo, Japan in conjunction with XXth International Tsunami Symposium. In this meeting, new Commission Officers were elected: Dr Kenji Satake (Japan) as Chair, Dr Frank Gonzalez (USA) and Dr G. Papadopoulos (Greece) as Vice-Chairs, and Dr F. Imamura (Japan) as Secretary. Two new members were incorporated in the Commission: Dr V. Titov from USA and Ms G. Downes from New Zealand. The updated list of the current Commission membership can be found at <http://omzg.sccc.ru/tsulab/IUGGTCmembers.html>. The full report on the IUGG/TC business meeting in Sapporo can be obtained from <http://omzg.sccc.ru/tsulab/IUGGTCrep2003.html>.

229 **The Group expressed** its satisfaction with the long history of co-operation with IUGG and **hoped** that this excellent collaboration will continue.

230 **The Group proposed** to organize the next Workshop back-to-back with the next ITSU Session (see also Agenda Item 13).

231 The Delegate of Chile informed the Group that they were prepared to host the Workshop back-to-back.

## 7.2 CO-OPERATION WITH ISDR

232 Mr Dimitri Travin of the IOC Secretariat introduced this Agenda Item. He reported that no formal co-operation between ICG/ITSU and ISDR had been established yet, but that contact was made by the IOC Secretariat with ISDR recently.

233 The Delegate of Australia informed the group of the possibility of organizing a Tsunami Workshop in conjunction with the next SOPAC conference in 2004 and suggested the support of ISDR be sought for this event.

234 **The Group requested** the IOC Secretariat, in co-operation with Australia and Fiji, to urgently approach ISDR and invite them to participate in the above-mentioned event.

235 **The Group requested** the IOC Secretariat to send the ITSU-XVIII and ITSU-XIX Summary Reports to ISDR to inform them about the ITSU and IUGG programmes and activities.

### 7.3 WORLD DATA CENTRE, SOLID EARTH GEOPHYSICS DEVELOPMENTS RELATED TO TSUNAMIS

236 Ms Paula Dunbar (USA) introduced this Agenda item. She explained that the World Data Center for Solid Earth Geophysics is operated by the US National Oceanic and Atmospheric Administration's National Geophysical Data Center (WDC/NGDC), Boulder, Colorado, USA. The WDC/NGDC has had a major role in the post-event data collection (including the compilation, cataloguing, and synthesis) of all available information on tsunami sources and effects to support modeling, engineering, planning and educational purposes. Currently, Ms Dunbar heads the Tsunami Programme at the WDC/NGDC, having assumed this position upon the retirements of Mr Jim Lander, Ms Pat Lockridge and Mr Lowell Whiteside.

237 Ms Dunbar then gave an overview of the products and services provided by WDC/NGDC with special focus on web-based services. The WDC/NGDC has maintained the Worldwide Tsunami Database (WWTD), which includes more than 2,370 events since 2000 BC and more than 6,700 locations where tsunamis were observed. Data are stored in Oracle, a relational database management system, and are accessible over the Web as tables, reports, and interactive maps. The ESRI ArcIMS interactive maps provide integrated Web-based GIS access to the hazards databases. She noted that with the free ArcExplorer it is possible to extract layers and to access other web-based GIS servers.

238 The Novosibirsk Tsunami Laboratory (NTL), Institute of Computational Mathematics and Mathematical Geophysics, Siberian Division, Russian Academy of Sciences, is headed by Dr Viacheslav K. Gusiakov. Dr Gusiakov, as the Co-ordinator of the HTDB/PAC Project (see Agenda Item 3.8), has led the effort to compile the comprehensive Historical Tsunami Database for the Pacific (HTDB) as a joint IUGG/TC and ICG/ITSU Project. The Web-version of the database for the Pacific, providing screen forms for data search by a number of criteria, is maintained by the NTL/ICMMG at <http://tsun.sccc.ru/htdbpac>. In recent years the geographical coverage of the HTDB datasets was extended to cover other main tsunamigenic regions such as the Atlantic (261 events from 60 BC to the present) and the Mediterranean (535 events from 1628 BC to present). The web-versions of these catalogues can be found at <http://tsun.sccc.ru/htdbatl> (for the Atlantic) and <http://tsun.sccc.ru/htdbmed> (for the Mediterranean).

239 At ITSU-XVIII (Para. 162-164 of the ITSU-XVIII Summary Report), regarding the development of a joint NGDC/NOAA-ICG/ITSU-IUGG/TC Pacific Tsunami database product, had recommended that the HTDB/PAC Project Leader and the WDC/NGDC Tsunami Programme Manager work together to develop a unified and standardized set of historical tsunami data. Input from the HTDB Regional Co-ordinators for the Pacific would be solicited, thereby utilizing an existing framework. The unified database should first be developed for the Pacific where a majority of the events have occurred, but ultimately should include tsunami events from all other tsunamigenic areas of the world's oceans.

240 The benefits of having such a single, unified product are straightforward. First, this product will reduce confusion for end users looking for a reliable source of information on historical tsunamis. And second, in the process of preparation of the joint product, many discrepancies and uncertainties in parameters of historical tsunamigenic events still existing in both the HTDB and WWTD databases will be resolved.

241 As requested by the ITSU Officers (and as a follow-up to ITSU-XVIII), the ITIC assisted with the development of a plan to compile a unified and comprehensive Global Historical Tsunami Database (GTDB) through the merging of the two existing tsunami databases (WWTD, HTDB) with the further input from the HTDB Regional Co-ordinators for the Pacific on the historical data locally and regionally available. This proposal was developed extensively during June 2003, by NGDC, HTDB and ITIC. The first NGDC/HTDB working meeting was held on 8 July 2003 in Sapporo, Japan, before the IUGG Tsunami Symposium. The meeting was attended by Ms P. Dunbar, Dr L. Kong, Dr V. Gusiakov, Dr C. McCreery (PTWC Director), Dr L. Dengler (HEED Director, California, USA), Dr K. Satake (IUGG/TC Chair), and Ms G. Downes (IGNS Ltd., New Zealand). The second NGDC/HTDB meeting took place on 24 September 2003, just prior to the International Tsunami Workshop and the ICG/ITSU-XIX Session.

242 Currently, it is planned to define a new database format that will include information from both databases. This new format is being developed jointly by Ms P. Dunbar and Dr V. Gusiakov. During the remaining months of 2003, the current content of both databases will be revised based upon the printed tsunami catalogues and other widely available publications. Consequently, in the first quarter of 2004, both databases will be merged and converted into the new format. During the planned working visit of Dr Gusiakov to the NGDC/SEG, currently scheduled for February-March 2004, the remaining discrepancies and uncertainties in the database content will be resolved and all records in the event and run-up tables will be provided with basic references. The master copy of the unified database will be created and maintained in the Oracle DBMS at the NGDC/SEG from where the data can be accessed via Web-based text forms and ArcIMS interactive maps, as well as exported in different formats such as ASCII flat files, Excel, Access, MS SQL Server or other formats specified by the ITIC for use by the tsunami warning centers and other potential users.

243 It is further recommended that the official copy of the database be housed at the WDC/NGDC, which has an effective and widely known distribution system through which the tsunami database will reach more users in a wider range of disciplines. Hosting of the tsunami database by WDC/NGDC would thus take advantage of its existing institutional framework, human resources, and database archiving and delivery technologies, to support and enhance the tsunami database. The NTL also has users who are familiar with the data access and display applications available from the web-version of the HTDB. Therefore, it is recommended that the data files exported from the unified database will also be available from the NTL website in Novosibirsk, Russia.

244 Additionally, recognizing that some international users may not have ready access to the Internet, as well as recognizing the needs of individual researchers to have an access to the historical data in "offline" mode (e.g., being on research ships or in the field during post-event tsunami surveys), it is suggested that the offline, stand-alone application (WinHTDB graphic shell with the TTT module) continue to be supported and distributed using the data files retrieved from the unified tsunami database.

245 **The Group requested** Dr V. Gusiakov to provide the IOC Secretariat with a master copy of the HTDB database (version 4.9), and **instructed** the IOC Secretariat to copy and distribute the CD-ROM to all ICG/ITSU Member States (2 copies/country).

246 **The Group thanked** NGDC/NOAA and NTL/ICMMG for the considerable work already achieved in building historical tsunami databases and **welcomed** the proposed initiative for a single unified tsunami database.

247 The Delegate of USA informed the Group that his country will contribute financial resources for the implementation of the project so the financial implications for IOC will be limited.

248 **The Group established** a sessional working group tasked with preparing a draft recommendation on this issue.

249 **The Group adopted** [Recommendation ITSU-XIX.3](#).

#### 7.4 CO-OPERATION WITH GLOSS

250 CmDr Rodrigo Nuñez, in his capacity of Vice-chairman of IGOOS introduced this item. He provided an overview of the GLOSS programme and its activities. He explained that GLOSS currently has almost 300 tide gauges around the world. GLOSS tries to establish a high quality sea-level network used for climate, oceanographic and coastal research. GLOSS is co-ordinated by IOC and is a major contributor to the Global Ocean Observing System (GOOS). For scientific research GLOSS measures long-term changes in global sea-level and ocean circulation. With regard to practical applications, GLOSS attempts to predict flood risks in coastal regions. GLOSS measures sea-level using satellite radar altimetry, tide gauges and seabed devices in the case of deep oceans. More information on GLOSS can be obtained from <http://www.pol.ac.uk/psmsl/programmes/gloss.info.html>. In terms of time scales momentary changes in sea-level can occur due to tsunamis, daily changes due to tides and surges. There are also seasonal changes, inter-annual changes (e.g., due to ENSO) and long-term changes due to climate change. IPCC has concluded that there has been a global rise of approximately 10-20 cm during the past 100 years.

251 With regard to GLOSS activities, the regional developments are very important: regional networks of gauges with greater spatial density, to serve the particular oceanographic interests of those regions. At the national level, GLOSS contributes to the activities of national agencies by improving the standards for sea-level recording around the world. With regard to training, GLOSS organizes annual training courses on the techniques of tide gauge operations, and workshops on special interests.

252 Data from GLOSS tide gauges are sent to the University of Hawaii Sea-Level Center (<http://www.soest.hawaii.edu/UHSLC>). Subsequently the data are archived at the Permanent Service for Mean Sea Level. There is a delay between the measuring and publishing due to quality control. The data are also made available on CD-ROM.

253 GLOSS is receiving a lot of support to upgrade GLOSS-Sea Level Stations to have CGPS (Continuous GPS) installed at several locations. This concept is being pushed at all GLOSS meetings but no real encouragement has been given to support the tsunami warning system (even though GLOSS is trying to increase the number of stations reporting in near real-time and real-time).

254 GLOSS-VIII will be held in October 2003 in Paris, France. The ITSU Chair will participate and will be able to inform the GLOSS community on ITSU requirements.

255 The Chair invited the Group to guide him with regard to his participation in GLOSS-VIII.

256 **The Group recommended** not to approach GLOSS with a broad request involving all sea-level stations, but rather to concentrate on new stations and most advanced stations as they could easily provide for the needs of ITSU.

257 The PTWC Director called for the Group to re-define its requirements in terms of sampling rate to ensure that the data provided by the stations remain adequate for a long time.

258 **The Group requested** the Chair to identify, for e.g., Indonesia, El Salvador and Nicaragua, the best sites to install new gauges.

#### 7.5 OTHER

##### 7.5.1 Joint IOC-WMO Technical Commission for Oceanography and Marine Meteorology (JCOMM)

259 Mr Phil Parker, in his capacity of Co-ordinator of the JCOMM Services Programme Area reported on possible co-operation with JCOMM. JCOMM is the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology. He explained that JCOMM was established to streamline the management of operational oceanographic activities at the international level, and thereby improve the

outcomes for Member countries/States and the global population at large. While initially ITSU was not included in the merger of operational activities of IOC and WMO, the current phases of the respective management and planning cycles of ITSU, IOC, WMO and JCOMM could provide an opportunity for initiating discussion about the benefits to ITSU in closely allying itself with JCOMM and how to progress with such a dialogue.

260 The structure of the JCOMM Open Programme Areas (OPAs) was briefly reviewed, and in particular the expert panels on waves and surges, and sea-level observations, were identified as possible key areas for common interest and co-ordination. It was also pointed out that with the inclusion of GLOSS in the Observations OPA and recent inclusion of IODE in the Data Management OPA, there are already some significant precedents for close ties between flagship IOC programmes and JCOMM. Whether ITSU might more naturally ally with the Services OPA, or the other mentioned OPAs, could be a matter of further investigation. The potential for gaining efficiency through this process, which has been a major factor driving the establishment of JCOMM, could also potentially provide positive benefits for ITSU and its funding situation.

261 **The Group agreed** to investigate a potential closer relationship with JCOMM, through a recommendation to the IOC and WMO Executive Councils, and to agree to investigate the benefits and how best they might be realized. The recommendation should envisage a report that would be prepared for consideration by JCOMM-II, which will be held in Halifax, Canada, in the fall of 2005.

262 **The Group recommended** to study the Terms of Reference of the JCOMM Programme Areas in general, and its Expert Teams in particular, and identify areas where JCOMM and ICG/ITSU could collaborate. This could involve the Services, Observations, Capacity Building or Data Management Programme Areas.

263 **The Group adopted** [Resolution IOC/ITSU-XIX.1](#).

#### **7.1.2 Co-ordination Center for the Prevention of Natural Disasters in Central America (CEPREDENAC)**

264 **The Group requested** the Chair and IOC Secretariat to contact the CEPREDENAC Executive Secretary with the objective of seeking formal collaboration between CEPREDENAC and ICG/ITSU.

### **8. PROPOSALS FOR FUTURE PROJECTS**

#### **8.1 RESILIENCE OF MARGINAL COMMUNITIES UNDER TSUNAMI THREAT**

265 Prof. Hansjürgen Meyer (Colombia) introduced this Agenda item. He explained that ITSU's strategies and recommendations focus on saving lives, via evacuation or land-use planning. Large and possibly increasing populations do not have means to access hazards information, nor to leave their dwellings. Resisting tsunami is a less safe strategy for the most exposed, but in many areas and under very limiting natural and social conditions it could be the most feasible approach, to both reducing risk on lives and property. Many ways and means to resist heavy seas and tsunami have been implemented in different regions, times and cultures: mounds, pole-supported housing, resistant structures, dykes, walls, landfills, reforestation, etc.

266 The proposed project aims at broadening the spectrum of mitigation strategies recommended by ITSU, with solutions aiming at increasing the resistance/resilience of marginal habitats, reduction of risk on tsunami-exposed lives in dwellings with very limited opportunities to leave, and reduction of risk on property.

267 The proposed actions by ITSU members would be to explore and gather information on traditional and modern physical strategies to protect coastal communities from high seas and tsunami, on their performance, the associated technologies, costs, etc., analyze, explain and comment each one,



providing information and recommendations on applicability and implementation, and to publish as an ITSU document those regarded as practical, for educational purposes.

268           **The Group decided** to establish an intersessional working group to further develop the proposal including a detailed implementation plan, budget and timetable. The Group will be chaired by Prof. H. Meyer (Colombia) and membership will include Australia and the ITIC Director. The working group will submit the revised draft proposal to the 2005 Officers Meeting.

## 8.2   SEA-LEVEL WAVEFORM DATABASE

269           This proposal was introduced by the Chair. Sea-level gauges are an essential element of tsunami warning systems: they are used to quickly confirm the existence or non existence of tsunami waves following an earthquake, to monitor the tsunami's progress, to help estimate the severity of the hazard. Water level gauges may also be the only way to detect a tsunami in cases when the tsunami is not earthquake generated. PTWC receives numerous sea-level data in real-time or quasi real-time. The fifth mandate of ITIC revised in 1977 is *'to help make available all records pertaining to tsunamis'*.

270           In the conclusion of the Master Plan, one of the areas for work that is especially important for improving the TWSP is *'Collect and archive all water level gauge data as well as runup and inundation measurements following each large earthquake and/or tsunami. The absence of a tsunami signal on a record is also important, and those records should be saved as well'*.

271           The access of regional and national tsunami warning centres to a sea-level waveform data bank will improve considerably their efficiency. The conditions that must be required are:

- this databank must run 24 hours a day and 7 days a week,
- this server should be installed at PTWC where the data from many sources are collected in near real time,
- the system must be totally automatic not to add to the work of PTWC in the case of a warning, and
- the system must be safe — a firewall can be programmed to only accept messages from pre-approved sources.

272           The seismological centres have installed and have been running such systems for more than 10 years. The most common system is named AutoDRM (Automatic Data Request Manager). This system is implemented with a server archive database that processes email requests through the Internet. The user sends a very simple email message through the Internet indicating the key information of the request (email address for the response, starting and ending date of the data, station name, channel, and format). The requester will receive, after a couple of minutes (depending on the Internet access speed) a message with the data requested.

273           In seismology, the sample rate is typically from 4 samples per second to 50 samples per second. So the size of the files can be substantial. In comparison, the sampling rate of sea-level gage data varies from 1 sample every 6 minutes to 1 sample every 15 seconds (a factor of up to 1,000 less). Consequently, the size of the sea-level database is very small in comparison to seismic waveform databases. In case of being triggered, some stations send data at a higher sampling. A second channel can be defined to record this different data.

274           One example of the use of AutoDRM in the Group is by CPPT. They request broadband and very broad-band data from DASE, GEOScope and the IRIS data bank, to compute the focal mechanism of the large earthquakes (Rapid Determination of Focal Mechanism project).

275           **The Group recognized** that the implementation of a sea-level database will improve the tsunami warning system by providing access by all warning centres of data in real-time.

276 The PTWC will investigate the possibility to install the AUTODRM server at PTWC as a pilot project activity and will inform the Officers on its progress during their 2005 Meeting. Member States will be provided with a full report during ITSU-XX.

277 In addition, WDC, Solid Earth Geophysics will investigate the possibility of archiving the complete database and making it accessible for research purposes.

## 9. LONG TERM STRATEGY OF THE ITSU PROGRAMME

278 The PTWC Director introduced this Agenda item. He recommended that ITSU take time to reflect on its priorities for the next 5–10 years on the basis of the ITSU Master Plan, published in 1999.

279 He recalled that the ITSU Master plan had been divided into a number of “areas of work”, listed in the ITSU Master Plan under “Conclusions” and he proceeded reviewing the progress made since 1999 on these issues:

- **Runup Maps** - *Use numerical model and historical data to create potential runup maps as the basis for hazard assessment, for evacuation maps and plans, and to motivate other key mitigation activities on the local level including public education, land use planning, and engineering efforts:* many Member States have made substantial progress in developing runup maps;
- **Historical Data** - *Put historical data into a common database format, and develop tools that make those data readily available to persons and offices that need them in the mitigation and research communities:* a lot of progress has been made (e.g., HTDB) and the new work plan includes the unified database project;
- **Tsunami Education** - *Continue to develop educational materials and programmes that will improve tsunami awareness and education among the public, warning center operators, emergency managers, and policy makers:* here also, a lot of progress has been made (Tsunami Newsletter, see Agenda Item 5.1 and the Tsunami Glossary, Agenda Item 5.3). During the next intersessional period the “Tsunami Information Kit” will be published;
- **Warning Centers** - *Establish new regional warning centers for the local tsunami threat in areas without coverage, and develop technologies and methodologies to improve the speed, accuracy, and reliability of all tsunami warning centers:* during the current Session several proposals for regional tsunami warning systems were discussed (see the Central American Tsunami Warning System, Agenda Item 6.3, and the Southwest Pacific and Indian Ocean Tsunami Warning System, Agenda Item 6.4) ;
- **Water Level Instrumentation** - *Improve the strategic coverage of water level instruments and the quality of signals they record for both warning and research purposes:* addition of coastal and deep-sea stations (Sea-level enhancements, Agenda Item 3.6);
- **Operational Actions** - *Local authorities, observatories, and warning centers need to send tsunami observations immediately to their national warning centers, and in turn those centers must send that information immediately to PTWC:* substantial work remains to be done;
- **New Tsunamis** - *Collect and archive all water level gauge data as well as runup and inundation measurements following each large earthquake and/or tsunami. The absence of a tsunami signal on a record is also important, and those records should be saved as well:* A new project has been proposed for a Sea-level Waveform Databank for the Tsunami Programme (Agenda Item 8.2);
- **Communications** - *Keep abreast of new communications systems that may be more effective for warning centers and other purposes, and adopt them for use in the TWSP as appropriate:* no substantial progress has been made in implementing a new communication system. During

previous sessions the use of systems like Iridium had been considered but no action was taken. Some experience was gathered with EMWIN (by Chile);

- **Research** - *Encourage and support research on tsunamis and all tsunami-related topics with the potential to improve mitigation*: This continues to be part of the ITSU programme through the joint organization of the tsunami workshops.

280 The PTWC Director referred to the US “Tsunami Ready Program” that established a set of requirements that a coastal community should fulfill to ensure maximum tsunami preparedness. Upon fulfilling the requirements a “stamp of approval” is issued. He recommended that ITSU define a set of “international” requirements and consider a similar “certification”.

281 **The Group considered** that substantial progress has been made in the implementation of the Master Plan and **recommended** focused action on (i) acquisition of data in real-time; (ii) optimizing the network to ensure accurate warning issuance and minimization of false warnings.

282 **The Group**, noting that capacity building and mitigation are currently not included in the above-mentioned list of issues, **decided** to add these terms to the list, and to publish the revised Master Plan “conclusions” on the ITSU web site. The revised conclusions are added as [Annex VIII](#).

283 **The Group decided** to include the revision of the Master Plan in the agenda of ITSU-XX.

284 The Delegate of Colombia noted that ITSU is currently not giving sufficient attention to the possible impact of asteroids and the subsequent generation of large tsunamis. The ITIC Director informed that this subject will be covered in the new Tsunami Information Kit.

## 10. EVALUATION OF THE IOC TSUNAMI PROGRAMME

285 This Agenda Item was introduced by the Technical Secretary. He recalled the decision taken by the Group at its Eighteenth Session where it “*acknowledged the need for the programme evaluation and agreed that it should be carried out by a team of external experts knowledgeable in the tsunami programme and the work of international organizations*”. At that time the Group had invited Mr M. Blackford to lead the team. Regrettably in December 2002, Mr Blackford, informed the Chair that due to health reasons his contribution would be delayed.

286 During their 2003 Session, the Officers had therefore suggested Dr Emile Okal (USA), Mr Salvador Farreras (Mexico), Dr Stefano Tinti (Italy), Mr Luis Mendes Victor (Portugal), Dr Tad Murty (Canada) and Mr Dennis Sigrist (USA). The Officers further decided to use the GOOS review as an example that could be used to define the structure of the ITSU evaluation. It was also recommended by the Officers that the evaluation be completed for the 2004 Session of the IOC Executive Council.

287 The Chair had contacted some of the above-mentioned experts by e-mail but had received few replies. The Group was invited to recommend ways to implement the review within the set timetable.

288 After some discussions **the Group decided** to:

- (i) Add Dr George Maul (University of Florida, USA) and Dr Paul LeBlond (ex-University of British Columbia, Canada) to the list;
- (ii) request the IOC Secretariat and ITIC Director to define the Terms of Reference for the Review by 1 December 2003, based upon the GOOS Review Terms of Reference;
- (iii) request the Chair and IOC Secretariat to contact the above-mentioned experts and prepare the final list of Review Team members (and Chair of the Review Team) by 31 December 2003;
- (iv) make the necessary arrangements for the Review Team to implement the Review and submit their Report by May 2004;



- (v) invite the Chair of the Review Team to provide a summary report during the IOC Executive Council, June 2004.

289 **The Group requested** the Executive Secretary IOC to allocate the necessary funds for the Review from the IOC Policy Budget.

## 11. OTHER BUSINESS

290 The Observer of Papua New Guinea expressed his country's interest to join IOC and ICG/ITSU and informed the Group that the necessary formal contacts will be made with UNESCO and IOC in the next few months.

291 **The Group noted** the statement of Papua New Guinea's Observer with appreciation and looked forward to welcoming Papua New Guinea as a new Member of ICG/ITSU.

## 12. PROGRAMME AND BUDGET FOR 2004-2005

292 The Technical Secretary informed the Group that an amount of US\$ 58,500 had been included in the UNESCO 32 C/5 for ITSU operational activities as part of the MLA-3 Ocean Services. In addition, US\$ 24,000 would be obtained from the MLA-5 Regions, bringing the total for ITSU for the biennium 2004-2005 to US\$82,500. Additional funds would become available from the headings 'TEMA — general grants scheme' and 'TEMA-CB activities general pool' that will be attributed on a competitive basis.

293 The Chairman of the Sessional Working Group on Programme and Budget, CmDr Rodrigo Nuñez then proceeded with the introduction of the relevant draft Recommendation.

294 **The Group adopted** [Recommendation IOC/ITSU-XIX.5](#), containing the programme activities adopted during the Session and estimate of funds needed to implement them successfully.

295 **The Group noted** that the total requested budget of US\$ 63,000 for 2004, and US\$ 78,500 for 2005 (total US\$ 141,500) exceeded the expected funds available from the UNESCO Regular Programme budget, allocated to ITSU but **considered** that the difference could be covered by Member State contributions to the IOC Trust Fund or in-kind contributions towards the implementation of programme activities.

296 **The Group expressed** its highest appreciation for support provided by Member States to the IOC Trust Fund, earmarked for ITSU, and **hoped** that Member States will continue to provide financial or in-kind support.

## 13. DATES AND PLACE FOR ITSU-XX

297 **The Group welcomed** the kind offer of Chile, offered by Capt. Fernando Mingram, to host the Twentieth Session of ICG/ITSU in Valparaiso, Chile between 3 and 7 October 2005. Chile also kindly offered to host the IUGG Workshop in the preceding week in Santiago.

298 **The Group gratefully accepted** their offer to host the Twentieth Session. The meeting will be formally hosted by the Hydrographic and Oceanographic Service of the Chilean Navy (SHOA). The IUGG Workshop will be co-organized with the National Emergency Office (ONEMI).

299 The Delegate of Ecuador offered to host ITSU-XXI in 2007. A formal invitation will be sent to the Executive Secretary IOC.

#### 14. ELECTION OF CHAIR AND VICE-CHAIR

300 The Technical Secretary informed the Group on the rules and practical arrangements for the election of the Officers of the IOC Subsidiary Bodies as they are presented in Document IOC/INF-785, *IOC Manual* of 1989, Part I, Item 5 and in the Revised Rules of Procedure, as of June 1994 (Document IOC/EC-XXVII/Inf.1).

301 **The Group expressed its appreciation** for the excellent work carried out by the current Chair and Vice-Chair between their first election at ITSU-XVII and the current Session and, in compliance with the rules, **invited** them to continue for another (and final) intersessional period. The Chair and Vice-Chair accepted.

302 **The Group re-elected** Dr François Schindelé and Dr Charles McCreery as Chair and Vice-Chair of ITSU respectively by acclamation.

303 The Chair and Vice-Chair thanked the Group for their confidence and they pledged their best efforts to honour this confidence during the next intersessional period.

#### 15. ADOPTION OF THE SUMMARY REPORT AND RECOMMENDATIONS

304 **The Group reviewed** the draft resolutions and recommendations and the draft Summary Report and adopted them as herein presented. **The Group requested** the ICG/ITSU Chair and the IOC Technical Secretary to prepare an Action Sheet on the ITSU-XIX decisions by the end of 2003, and to make it available to all Member States and ITSU-XIX participants through the ITSU website.

305 **The Group requested** its Chair to report on the proceedings of ITSU-XIX to the upcoming Session of the IOC Executive Council and to urge Member States for continued and increased support for ITSU.

#### 16. CLOSURE

306 The Chairman thanked all the delegates for their hard work in meeting the Session's objectives. He invited the ICG/ITSU Member States to participate more actively in the intersessional activities and in the Session's discussions. He expressed a strong belief that the success of the programme to a large extent depends on the efficiency of the ITSU National Contacts and their continuous involvement in the Tsunami Programme activities.

307 Mr David Kingi, Representative of the Te papa Rantaki Maori Unit addressed the meeting wishing the participants a safe journey home.

308 Mr Mike O'Leary, speaking on behalf of Dr John Norton thanked the participants for their visit to New Zealand and expressed the hope that the ITSU programme would continue to grow.

The Chairman, Vice-Chairman, ITIC Director, ITIC Associate Director and Technical Secretary thanked the local host referring in particular to the local support team including Mike O'Leary, Sara Williams, Jessica Smith, James O'Reilly, Clinton Poole and Hadley Thomson.

309 The Chairman declared the Meeting closed at 18:30 on 02 October 2003.

ANNEX I

AGENDA

- 1. OPENING**
- 2. ORGANIZATION OF THE SESSION**
- 3. PROGRESS IN THE PROGRAMME IMPLEMENTATION**
  - 3.1 REPORT OF THE CHAIRMAN ON THE PROGRAMME AND BUDGET
  - 3.2 NATIONAL REPORTS
  - 3.3 ITIC DIRECTOR'S REPORT
  - 3.4 PTWC DIRECTOR'S REPORT
  - 3.5 RECENT TECHNOLOGICAL DEVELOPMENTS
  - 3.6 SEA LEVEL ENHANCEMENTS
  - 3.7 WORKING GROUP ON INTERNATIONAL TSUNAMI SIGNS AND SYMBOLS
  - 3.8 REPORT ON HTDB/PAC
- 4. TRAINING AND EDUCATION**
  - 4.1 ITSU TRAINING PROGRAMME
  - 4.2 TRAINING COURSES (EXPERT LEVEL)
  - 4.3 PUBLIC EDUCATION
  - 4.4 OTHER
- 5. ITSU PUBLICATIONS AND AWARENESS TOOLS**
  - 5.1 TSUNAMI NEWSLETTER
  - 5.2 TSUNAMI INFORMATION KIT
  - 5.3 TSUNAMI GLOSSARY
  - 5.4 ITSU WEBSITES
- 6. REGIONAL AND OTHER TSUNAMI WARNING SYSTEMS**
  - 6.1 NORTHWEST PACIFIC TSUNAMI WARNING SYSTEM
  - 6.2 IAS TSUNAMI WARNING SYSTEM
  - 6.3 CENTRAL AMERICAN TSUNAMI WARNING SYSTEM
  - 6.4 SOUTHWEST PACIFIC AND INDIAN OCEAN TSUNAMI WARNING SYSTEM
  - 6.5 OTHER REGIONS
- 7. EXISTING PARTNERSHIPS AND OPPORTUNITIES FOR NEW ONES**
  - 7.1 CO-OPERATION WITH THE IUGG TSUNAMI COMMISSION
  - 7.2 CO-OPERATION WITH ISDR
  - 7.3 WORLD DATA CENTRE-A, SOLID EARTH GEOPHYSICS DEVELOPMENTS RELATED TO TSUNAMIS
  - 7.4 COOPERATION WITH GLOSS
  - 7.5 OTHER
- 8. PROPOSALS FOR FUTURE PROJECTS**
- 9. LONG TERM STRATEGY OF THE ITSU PROGRAMME**
- 10. EVALUATION OF THE IOC TSUNAMI PROGRAMME**
- 11. OTHER BUSINESS**

- 12. PROGRAMME AND BUDGET FOR 2004-2005**
- 13. DATES AND PLACE FOR ITSU-XX**
- 14. ELECTION OF CHAIR AND VICE-CHAIR**
- 15. ADOPTION OF THE SUMMARY REPORT AND RECOMMENDATIONS**
- 16. CLOSURE**

ANNEX II

LIST OF RESOLUTIONS AND RECOMMENDATIONS

**Resolution ITSU-XIX.1**

**CO-OPERATION WITH JCOMM**

**Recognizing** the strong common links between ITSU and other operational programmes of the IOC now being coordinated, managed and facilitated jointly with WMO under JCOMM, including common Secretariat functions and personnel,

**Considering** the strong likelihood of benefits flowing to ITSU, JCOMM and the providers and users of tsunami services at the international, regional and local levels, of closer ties with JCOMM, including internal streamlining,

**Appreciating** the benefits that have been factored into decisions to make similar rearrangements of programmatic relationships with JCOMM for other flagship IOC programmes such as IODE and GLOSS,

**Decides** to study the benefits of establishing cooperative links with JCOMM, and how they might be realized, with the view to presenting a report to WMO and IOC Executive Councils and the JCOMM Management Committee in preparation for consideration by JCOMM-II;

**Requests** the Chair to discuss the co-operation with JCOMM at the appropriate level.

**Recommendation ITSU-XIX.1**

**WORKING GROUP ON A COMPREHENSIVE TSUNAMI HAZARD REDUCTION PROGRAMME**

The International Co-ordination Group for the Tsunami Warning System in the Pacific,

**Recognizing the value of** the proposal submitted by the USA during IOC/ITSU-XVIII entitled '*Tsunami Reduction of Impacts through three Key Actions*' (TROIKA), authored by Dr Eddie Bernard of NOAA's Pacific Marine Environmental Laboratory,

**Noting** the continued success of the U.S. National Tsunami Hazard Mitigation Programme (NTHMP),

**Further recognizing** that the Group enthusiastically adopted TROIKA as a model for comprehensive tsunami hazard reduction programs in tsunamigenic areas of the Pacific,

**Decides to establish an inter-sessional working group** to prepare a pilot implementation programme for the Pacific with the following terms of reference:

(i) To identify elements of the existing capabilities in all three components described in the TROIKA proposal and listed below:

(a) **Hazard Assessment**—Generating local and distant tsunami inundation maps for coastal communities using internationally accepted numerical model methodology. Estimates of coastal areas susceptible to tsunami flooding will be available from a network of modelers and data managers who will be sharing community modeling tools via the Internet.

(b) **Mitigation**—Developing response plans for emergency managers, universally accepted tsunami information signs in accordance with local plans/procedures, and maintaining a tsunami education programme for disaster management personnel, local residents and school systems.

- (c) **Warning Guidance**—Developing and deploying a network of early warning tsunami detection instruments in seismically active coastal areas of the Pacific Ocean to complement the global network of real-time sea level networks and broadband seismometers for the international tsunami warning system and to supplement regional tsunami warning centers.
- (ii) To fully develop the capacity requirements in each component;
  - (iii) To identify cost estimates to achieve the full capacity level in each component;
  - (iv) To develop an implementation plan;
  - (v) To present the Group's results to the 2005 ITSU Officers meeting;
  - (vi) To incorporate feedback from the ITSU Officers meeting and submit the Group's final report to ITSU-XX;
  - (vii) To liaise with the UN International Strategy for Disaster Reduction (ISDR) regarding tsunami hazard reduction.

**Recommends** that the Group will be composed of Eddie Bernard (United States), Rodrigo H. Nunez (Chile), Neil Head (Australia) and Chaired by the Director of ITIC.

**Recommends further** that each ICG/ITSU Member State reports to the Group Chairman on its ongoing efforts related to each of the three TROIKA components, not later than 13 February 2004, to assist the Group in its efforts.

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Financial implications

- Travel costs of the Chile Group member to attend a Group meeting in the USA in 2004 (US\$3,000),
- Travel costs of the USA Group member to travel to Hawaii to participate in the January 2005 ITSU Officers' meeting (US\$2,500)
- Travel costs for the USA Group member to participate in the ITSU-XX meeting (US\$3,000).
- Total US\$8,500: US\$5,500 in 2004 and US\$3,000 in 2005.

**Recommendation ITSU-XIX.2**

**WORKING GROUP ON THE CENTRAL AMERICA PACIFIC COAST TSUNAMI  
WARNING SYSTEM**

The International Co-ordination Group for the Tsunami Warning System in the Pacific,

**Recognizing** that Central America has a significant threat from both local and distant tsunamis,

**Noting** that the six countries of Central America and the Coordination Center for the Prevention of Natural Disasters in Central America (CEPREDENAC) during a meeting held in Managua, Nicaragua on 3 September 2003 decided to start the process for a Regional Tsunami Warning System and to request IOC/ITSU assistance in developing it,

**Acknowledging** that there already exist within the countries of Central America many capabilities applicable to the requirements of a tsunami warning system,

**Recognizing further** that a draft proposal for a Tsunami Warning System for Central America has been developed by Nicaragua and is currently in the process of review and consultation by the Central American countries as requested by the Executive Secretary of CEPREDENAC,

**Further acknowledging** that there are mutual benefits to the Central America region and the Pacific region that would be realized through the establishment of this warning system,

**Decides** to establish an Intersessional Working Group on the Central America Tsunami Warning System with the following terms of reference:

- (i) To identify immediate and long-term ways on how ITSU, ITIC, and PTWC can assist in the development and implementation of this system;
- (ii) To review and recommend to the Executive Secretary of CEPREDENAC improvements to the proposal, based upon the long experiences of ITSU;

**Recommends** that the Group will be composed of representatives from Nicaragua, Chile, France, Observer from El Salvador, the Directors of ITIC and PTWC and Chaired by the representative from Nicaragua;

**Acknowledges** that ITSU is the Co-ordinating Body for the Tsunami Warning System in the Pacific (TWSP) and **encourages** non-ITSU Member States to contact the IOC Secretariat to request membership of the ICG/ITSU.

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Financial implications

US\$5,000 for 2004

US\$5,000 for 2005

### **Recommendation ITSU-XIX.3**

#### **GLOBAL HISTORICAL TSUNAMI DATABASE PROJECT**

The International Co-ordination Group for the Tsunami Warning System in the Pacific,

**Noting** that the NTL/ICMMG (on behalf of ICG/ITSU) and the WDG/NGDC continue to hold two distinct databases, that are similar in format, but differ in terms of number of events, historical run-up records as well as in parameters of particular events,

**Recognizing** the benefits of having a single unified database that will serve as a reliable source of information on historical tsunamis in the Pacific for end-users,

**Decides:**

- (i) to implement the Global Historical Tsunami Database Project that will develop a unified, consistent, quality tsunami database based upon the two existing tsunami databases;
- (ii) that the Project will be implemented jointly by ITIC, the WDG/NGDC and the NTL/ICMMG;
- (iii) that the official copy of the database be housed and maintained at the WDC/NGDC from where the data can be accessed, free of charge, via Web-based HTML forms and ArcISM interactive maps as well as exported in different formats specified by the ITIC for the use by the tsunami warning centers and other potential users;
- (iv) that the offline, standalone application (WinHTDB graphic shell) continues to be supported and be updated by adding a new software for calculation of the Tsunami Travel Time (TTT). This will take into account that some users may not have easy access to the Internet, and it will respond to the needs of requiring access to the historical data in “offline” mode;

**Requests** that WDG/NGDC provides copies of a CD-ROM to the IOC Secretariat, including the data base, graphic shell and TTT software, for distribution to Member States and allow IOC Member States to make copies as required.

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Financial implications:

US\$3,000 in 2004 from IOC; no funds required from IOC for 2005  
US\$20,000 in 2004 from USA (NWS/PR)

#### **Recommendation ITSU-XIX.4**

### **WORKING GROUP ON THE TSUNAMI WARNING SYSTEM IN THE SOUTHWEST PACIFIC AND INDIAN OCEAN**

The International Co-ordination Group for the Tsunami Warning System in the Pacific,

**Recognizing** that the Southwest Pacific and Indian Ocean has a significant threat from both local and distant tsunamis,

**Further recognizing** that some areas of this region are not covered by the PTWC,

**Noting** the interest of Member States in the Indian Ocean and Southwest Pacific regions to enhance their tsunami warning services,

**Acknowledging** that Indonesia has decided to develop its National Tsunami Warning System with already existing and planned upgrades to seismic and sea-level networks and that the PTWC provides distant tsunami warnings for the Southwest Pacific,

**Further acknowledging** that there may be mutual benefits to these regions and to the Tsunami Warning System in the Pacific from the establishment of this system;

**Decides** to establish an intersessional Working Group on the Southwest Pacific and Indian Ocean with the following Terms of Reference:

- to evaluate capabilities of countries in these regions for providing tsunami warning services;
- to ascertain requirements from countries in the Southwest Pacific and Indian Ocean for the tsunami warning services;

**Requests** Australia and ITIC to prepare a draft prior to the next SOPAC meeting for consideration by the Working Group.

**Recommends** that the Group be composed of representatives from Indonesia, Australia, Fiji, New Zealand, Japan, Observer from Papua New Guinea and the Directors of ITIC and PTWC and Chaired by the Representative of Indonesia;

**Acknowledges** that ITSU is the Co-ordination Body for the Tsunami Warning System in the Pacific (TWSP) and **encourages** non-ITSU Member States to contact the IOC Secretariat to request membership of the ICG/ITSU.

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Financial implications:

US\$5,000 for 2004; US\$5,000 for 2005.



**Recommendation ITSU-XIX.5**

**PROGRAMME OF WORK AND BUDGET FOR 2004--2005**

The International Co-ordination Group for the Tsunami Warning System in the Pacific,

**Recalling** that the IOC Tsunami Programme was identified by the IOC Governing Bodies as a high priority and flagship programme of the Commission, being an unique programme within the IOC fully dedicated to the co-ordination of an operational natural hazard warning system with the goal of reducing the tsunami danger and its impact on coastal communities,

**Appreciating highly** the support of Chile, France, New Zealand, Republic of Korea and USA provided to the IOC Tsunami Programme in 2002-2003 through Trust Fund contributions and in-kind contributions of Member States,

**Also appreciating** the support of USA in hosting and funding the operation of PTWC and ITIC,

**Taking into account** discussions, which took place during the Nineteenth Session of the ICG/ITSU regarding the programme activities and agreed upon priorities for 2004-2005,

**Being informed** of the IOC Programme and Budget for 2004-2005 adopted by the Twenty-second Session of the IOC Assembly held in Paris in June/July 2003,

**Adopts** the following ICG/ITSU Programme for 2004-2005 and identifies required resources;

- (i) Assistance to the International Tsunami Information Centre (ITIC) for its continuing activities and fulfilling its obligations to the ICG/ITSU during 2004-2005.  
Budget:           2004           US\$29,000  
                      2005           US\$27,000
- (ii) Support to the ITIC Associate Director, including one trip each year to ITIC for briefing and reporting on the accomplishments.  
Budget:           2004           US\$3,500  
                      2005           US\$3,500 (Officers meeting)
- (iii) Organization of the ITSU Officers Meeting in January 2005 in Honolulu, Hawaii, USA and the Twentieth Session of the Group (ITSU-XX) in October of 2005, in Valparaiso, Chile, and the Budget:    2004           US\$5,000  
                      2005           US\$25,000
- (iv) Participation of ITSU Officers/Experts/Secretariat at meetings of other organizations dealing with issues relevant to the Tsunami Programme and of the ICG/ITSU Chairman at meetings of other bodies.  
Budget:           2004           US\$5,000  
                      2005           US\$5,000
- (v) Partial support to complete the development of the Global Tsunami Data Base (GTDB) and the new Integrated Tsunami Data Base (ITDB) consisting of WinHTDB graphic shell and Tsunami Travel Time (TTT) module.  
Budget:           2004           US\$3,000
- (vi) Tsunami Information Kit finalization.  
Budget:           2004           US\$2,000 (ITIC)  
                      2005           US\$5,000 (3,000 printing and 2,000 for the translation into French and Spanish languages – 1,000 each).

- (vii) Support for the Working Group on a Comprehensive Tsunami Hazard Reduction Programme (TROIKA).  
Budget:           2004                   US\$5,500  
                          2005                   US\$3,000
- (viii) Support for the Working Group on the Central American Pacific Coast Tsunami Warning System (CAPC-TWS).  
Budget:           2004                   US\$5,000  
                          2005                   US\$5,000
- (ix) Support for the Working Group on the Tsunami Warning System in the Southwest Pacific and Indian Ocean (SWP-TWS).  
Budget            2004                   US\$5,000  
                          2005                   US\$5,000

**Recognizing further** that the IOC Tsunami Programme cannot meet successfully its obligation without an adequate provision of resources,

**Invites** all Member States to support the Tsunami Programme by following the example of a few Member States contributing directly to the IOC Trust Fund or in-kind by covering operational costs of maintaining the Tsunami Warning System;

**Requests** ITSU National Contacts to be pro-active in making national authorities aware of the programme and of the benefits of disaster reduction, through risk determination and resource allocation to diminish its impact;

**Requests** the Executive Secretary IOC to take all necessary measures for providing support to the Tsunami Programme, by allocating the necessary funds and staff; and

**Expresses** a strong hope that in the light of the importance and priority of the programme, all activities mentioned in the Work Programme for 2004-2005 above, will receive the necessary funding.

<b>Budget Summary (in US\$)</b>		
<b>Year/Priority</b>	<b>2004</b>	<b>2005</b>
i.	29,000	27,000
ii.	3,500	3,500
iii.	5,000	25,000
iv.	5,000	5,000
v.	3,000	-----
vi.	2,000	5,000
vii.	5,500	3,000
viii.	5,000	5,000
ix.	5,000	5,000
<b>TOTAL</b>	<b>63,000</b>	<b>78,500</b>
<b>GRAND TOTAL</b>	<b>2004-2005</b>	<b>US\$ 141,500</b>

ANNEX III

LIST OF PARTICIPANTS

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ANNEX IV

**LIST OF DOCUMENTS**

<b>Working Documents</b>	<b>Title</b>
IOC/ITSU-XIX/1 prov.	Provisional Agenda
IOC/ITSU-XIX/1 add.	Provisional Timetable
IOC/ITSU-XIX/3	Summary Report (prepared during the Session)
IOC/ITSU-XIX/4 prov.	Provisional List of Documents (this Document)
IOC/ITSU-XIX/5 prov.	Provisional List of Participants
IOC/ITSU-XIX/6	Report of the Chairman of ICG/ITSU on Intersessional Activities
IOC/ITSU-XIX/7	National Reports on Tsunami-related Activities
IOC/ITSU-XIX/8	Report of the ITIC Director
IOC/ITSU-XIX/9	Report of the PTWC Director
IOC/ITSU-XIX/10	Progress Report of the <i>ad hoc</i> Working Group on International Tsunami Signs and Symbols
IOC/ITSU-XIX/11	Report on HTD/PAC
IOC/ITSU-XIX/12	Report on the ICG/ITSU visiting experts and tsunami training programme, 1974-2003
IOC/ITSU-XIX/13	Cooperation with the IUGG Tsunami Commission



ANNEX V

**ACTION SHEET – IMPLEMENTATION OF THE DECISIONS OF ITSU-XVIII**  
(As of September 2003)

Para. No.	Action	Responsible	Deadline
<b>3.1 Report of Chairman</b>			
26	Include updated version of ITSU-XVII Action Sheet as Annex to ITSU-XVIII Summary Report (SR)	Tech. Sec.	Nov.'01 <u>Done</u>
<b>3.2 National Reports</b>			
41	Continue practice of making Nat. Reports available to Member States (MS) by mail, e-mail & on IOC website	Tech. Sec.	<u>Done</u>
	Use agreed formats for Nat. Reports development	MS	<u>Done</u>
<b>3.3 ITIC Director Report</b>			
47	Make ITSU-related publications (mentioned in para. 46) available on ITIC website in all IOC working languages	ITIC Assoc. Director	Mid '02 <u>Done</u>
49	Make Russian version of tsunami & earthquake textbooks & post to users	ITIC Assoc. Director	First semester '02 <u>Done</u>
	Send modified figures of textbooks to ITIC Assoc. Director	ITSU Nat. Contact Russia	Dec.'01 <u>Done</u>
53	Keep format of Tsunami Newsletter publication as decided by ITSU-XVII & bi-monthly periodicity	ITIC Director	<u>Done</u>
	Publish 2 annual issues of Tsunami Newsletter (2000 & 2001)	ITIC Director	2001 in Jan.'02 2002 in Dec.'02 2000-2001 in Dec '03 2002-2003 in June '04
	Include summaries of Nat. Reports presented at ITSU-XVIII in 2001 issue	ITIC Director	Jan.'02 ITIC will publish the ITSU-XVIII national reports in the 2000-2002 annual newsletter
55	Organize & support visit of ITIC Assoc. Director to ITIC at earliest convenience after nomination of new ITIC Director	ITIC Director Tech. Sec.	First months of '02 <u>Done</u>
	Develop joint ITIC Director/Assoc. Director plan of action for 2002-2003	ITIC Director & Assoc. Director	First months of '02 <u>Done</u>
56	Provide ITIC with information on warming & watches follow-up; contribute to Tsunami Newsletter; respond to correspondence from ICG/ITSU Officers & IOC Sec.	MS PTWC	<u>Continuing</u>
57	Update list of ITSU Nat. Contacts, mailing lists & send to MS & IOC Secretariat	ITIC Assoc. Director	Feb.'02 <u>Done</u>

Para. No.	Action	Responsible	Deadline
<b>4.1 Communication Plan &amp; Overview of Warning System</b>			
61	Provide PTWC within few days with information on what bulletins & at what time they were received	MS	<u>Continuing</u>
63	Consider usage of Internet for sending tsunami messages & report to ICG/ITSU Officers	ITIC & PTWC Directors	Beginning '03 <u>Done</u>
<b>4.2 Recent Technological Developments</b>			
67	Send travel data of amplitude spectra of surface waves used to compute Mm & Mw by e-mail for all events of magnitude > 7.0 as soon as data from 20 stations are available	PTWC Director	<u>Not completed</u>
68	Include item on technological development in ITSU-XIX Agenda	Tech. Sec. ICG/ITSU Chair	Jan.'03 <u>Done</u>
<b>5.1 Warning Climate Bulletins</b>			
71	Inform MS of ITSU-XVIII decisions relevant to definition of ITSU Area of Responsibility	Tech. Sec.	Dec.'01 <u>Done</u>
74	Announce changes relevant to recommendations on procedures & criteria used for issuing warnings, watches & cancellations adopted by ITSU-XVIII	Tech. Sec.	Dec.'01 <u>Not completed</u>
	Co-ordinate applications of recommendations with WC/AIWA	PTWC Director	During '02 <u>Done</u>
75	Report results of printing recommendations in practice to ITSU-XIX	PTWC Director	Oct.'03 <u>Done</u>
<b>5.2 CD-ROM &amp; Web Version of the Basic Pacific Tsunami Catalogue &amp; Database</b>			
78	Further improvement of HTDB/PAC in terms of data quality & completeness	HTDB/PAC Project Leader	Continuing <u>Done</u>
78,80,179	Implement HTDB Training Workshop on its application & improvement of content	HTDB/PAC Project Leader Nat. Contact Chile ICG/ITSU Chair Tech. Sec.	Second half '02 <u>Done</u>
<b>6. Training &amp; Education</b>			
84	Consider declaring special time periods for awareness exercises. Report experience to ITSU-XIX	Nat. Contacts in ICG/ITSU MS	Intersessional period Oct.03 <u>Continuing</u>
90	Incorporate knowledge of phenomenon & hazard in general national education programmes. Report experience to ITSU-XIX.	MS	Intersessional period Oct.'03 <u>Continuing</u>
92	Develop list of VEP trainers containing their product work field & plan of using former VEP trainees to assist serving national & regional problems	ITIC Director & Assoc. Director	Second half '02 <u>Done</u>
	Include in VEP training programme items on local or regional tsunami threat	ITIC Director	Mid '02 <u>Done</u>

Para. No.	Action	Responsible	Deadline
93	Organize training courses in 2002 for experts from Central America & 2002 for experts from countries (to be identified later)	ITIC Director Tech. Sec.	Mid '02 & '03 <u>Done but no candidatures received from C. America</u>
95	Provide ITIC & IOC Secretariat with information on national training activities & copies of educational & awareness material	ITUS Nat. Contacts	Continuously <b>Continuing</b>
97-98	Study proposal on establishing Group of Experts on tsunamis & tsunami mitigation who will travel & brief emergency managers on hazard & methods of mitigation	ICG/ITSU Chair, Officers	Jan.'03 Established at ITSU-XIX
99	Organize Workshop on local tsunamis (Petropavlovsk-Kamchatskii, Russia)	Nat. Contact Russia Tech. Sec.	Aug-Sept.'02 <u>Done</u>
	Explore interest of European & Japanese funding agencies to support Workshop	ICG/ITSU Chair Nat. Contact Japan	First half '02 <u>No result</u>
100	Assist Colombia & Ecuador in developing national mitigation plans by organizing expert mission to these countries	Nat. Contacts Chile, Colombia, Ecuador Tech. Sec.	First quarter '02 <u>Done</u>
	Develop action plan of visit	Nat. Contacts Chile, Colombia, Ecuador	Feb.'02 <u>Done</u>
<b>7.1 Tsunami Newsletter</b>			
103	Provide ITIC with articles & other publishing material for inclusion in Newsletter	MS ITIC Director	<u>Done</u>
	Continue publication of Newsletter in hardcopy & electronic forms	ITIC Director	'02-'03 <u>Done</u>
	Report experience to ICG/ITSU Officers Mtg. & ITSU-XIX	ITIC Director	Jan.'03 Oct.'03 <u>Done</u>
<b>7.2 Tsunami Press Kit</b>			
105	Send editorial changes on textual part of Press Kit to IOC	MS Tech. Sec.	Jan.'02 <u>Done</u>
	Complete work for multi-coloured publication of Press Kit	Tech. Sec. ICG/ITSU Officers Consultant	Dec.'02 <u>Done (to be published early 2005)</u>
106	Provide Tech. Sec. with revised list of available websites	ITIC Assoc. Director	Jan.'02 <u>Done</u>
	Provide Tech. Sec. with list of publications for inclusion in Press Kit	ICG/ITSU Chair Officers	Jan.'02 <u>Done</u>
107	Publish loose-leaf Press Kit in hardcopy & electronic for Ms Chile to help IOC in designing & publishing Kit folders	Tech. Sec. Consultant Nat. Contact Chile	Dec.'02 See 105
108	Include in Press Kit, pages on national activities	MS	<b>Not done</b>

Para. No.	Action	Responsible	Deadline
<b>7.3 Tsunami Glossary</b>			
110	Review Spanish version & publish on ITIC website	Nat. Contacts Chile, Nicaragua, Colombia, Mexico, Ecuador, Peru ITIC Assoc. Director	Oct.'01 <b>Ready to be published</b>
	Publish multi-coloured document in English & Spanish with IOC financial support (Contract arrangements)	Nat. Contact Nicaragua Tech. Sec.	Jan.'02 <b>Ready to be published</b>
111	Translate into Russian & publish Russian version of Glossary	Nat. Contact Russia	Beginning '03 <b>No action: discussed at ITSU-XIX</b>
	Provide Russia with all necessary documentation for translation & publication	ITIC Assoc. Director	First quarter '02 <b>No action: discussed at ITSU-XIX</b>
112	Consider translation of Glossary into French & inform Tech. Sec. of results	Nat. Contacts Canada, France	Mid '02 <b>Done</b>
	Publish French version of Glossary in multi-coloured form	Nat. Contact France	End '02 <b>Done</b>
113	Consider supporting distribution of Glossary by mail to MS in English & Spanish	Tech. Sec.	First half '02 <b>No action: will be done after publication</b>
<b>7.4 Tsunami Websites</b>			
116	Add to ITIC website an education category based on input provided by Canada	Nat. Contact Canada ITIC Assoc. Director	First quarter '02 <b>Done. Input provided at ITSU-XIX</b>
117	Send ITIC Assoc. Director information on national websites related to tsunamis	MS	Continuously <b>No action</b>
118	Include this information in ITIC website & add web page with link to national sites	ITIC Assoc. Director	Continuously <b>No action</b>
119	Include ITIC site in IOC Ocean Portal URLs	ITIC Assoc. Director	First quarter '02 <b>Done</b>
<b>8.1 Far East Tsunami Warning System (FE-TWS)</b>			
121, 124	Study ways of extending FE-TWS responsibilities to Northwestern Pacific & report results to ITSU-XIX	Nat. Contact Japan	2002-2003 Oct.'03 <b>Done. Discussed at ITSU-XIX</b>
<b>8.2 IAS Tsunami Warning System</b>			
136	Modify IAS TWS project proposal by addressing outstanding issues & submit proposal in final form to IOCARIBE Regional Sub-Commission	<i>Ad hoc</i> Working Group Chair ICG/ITSU Chair	31 Jan.'02 <b>Done. Discussed at ITSU-XIX</b>
<b>8.3 Other Regions</b>			
140	Report to European Commission the Group's concern related to possible termination of European-wide Tsunami Programme within EU	ICG/ITSU Chair Tech. Sec.	Oct-Nov.'01 (Lagos Mtg) <b>Done</b>

Para. No.	Action	Responsible	Deadline
	activities		
142	Assist in organizing meeting between Indonesia & Australia to establish co-operation in areas of research & mitigation of tsunamis	Tech. Sec. Nat. Contacts Indonesia, Australia	End '02 <b>No action</b>
143	Organize International Tsunami Workshop in Indonesia to commemorate 120 <sup>th</sup> anniversary of 1883 Kiakatou eruption & tsunami	ICG/ITSU Chair IUGG/TC Chair Nat. Contact Indonesia Tech. Sec.	Mid '03 <b>Done</b>
145	Assist CEPREDENAC in establishment of national & regional TWS by sharing experience & providing training	ICG/ITSU Chair Nat. Contact Nicaragua Tech. Sec.	2002-2003 <b>No action</b>
<b>9.1 Co-operation with IUGG/TC</b>			
157	Report progress of <i>ad hoc</i> study group on standard set of symbols & signs & present results to ITSU-XIX	<i>Ad hoc</i> Study Group Chair	Jan.'03 Oct.'03 <b>Done</b>
<b>9.2 Post-IDNDR Developments</b>			
161	Improve links with ISDR Secretariat & develop specific work plan for collaboration with ISDR	ICG/ITSU Chair Tech. Sec.	First half '02 <b>Ongoing</b>
	Provide ISDR through IOC Exec. Secretary with regular reports on Group's activities & system development	ICG/ITSU Chair	Continuously <b>Ongoing</b>
161	Circulate reports on Group's activities mentioned above to ITSU Nat. Contacts	Tech. Sec.	Continuously <b>No action</b>
<b>9.3 WDC-A, SEG</b>			
164	Explore possibility of launching joint NGDC/NOAA-ICG/ITSU-IUGG/TC product on development of joint CD-ROM for Pacific Tsunamis	ICG/ITSU Chair HTDB/PAC Project Leader	First half '02 <b>Discussed at ITSU-XIX: Done</b>
<b>9.4 Co-operation With Other Organizations</b>			
169	Organize exchange of information between WAPMERR & ICG/ITSU & identify areas of common interest	ICG/ITSU Chair Tech. Sec.	First half '02 <b>No action</b>
171	Contact APEC & explore willingness to conduct project on ' <i>Analysis of Economic Benefit of Tsunami Warning Centres Operations in provision of Tsunami Warnings in APEC Region</i> '. Report progress to ITSU Officers Mtg.	ICG/ITSU Chair	'02 Jan.'03 <b>Done</b>
<b>10. Proposals For Future Projects</b>			
176	Support TROIKA proposal through in-kind contributions to its components	MS	Continuously <b>Done at ITSU-XIX</b>
177	Inform ITSU-XIX on progress in implementation of proposal on Spatial & Temporal Periodicity in Pacific Tsunami Occurrence	Nat. Contact Russia	Oct.'03 <b>No action</b>

Para. No.	Action	Responsible	Deadline
178	Inform ITSU-XIX on progress in publication of series of scientific popular books containing information on earthquakes & tsunamis	Nat. Contact Russia	Oct.'03 Reported at ITSU-XIX
179	Provide Russia with artwork of earthquake & tsunami text books, include captions in Russian & publish on CD-ROM free of charge to IOC	Nat. Contact Chile	Mid-'02 <u>Done</u>
<b>11.1 Evaluation of the Tsunami Programme</b>			
181	Establish <i>ad hoc</i> team of external experts to implement programme evaluation	ICG/ITSU Chair & Officers Tech. Sec.	Jan.'02 Discussed at ITSU-XIX
	Contact ISDR inviting them to join evaluation process	ICG/ITSU Chair	Jan.'02 Discussed at ITSU-XIX
	Provide Team Leader with available material related to evaluation process	Tech. Sec.	Feb.'02 Discussed at ITSU-XIX
	Complete evaluation process & report to ITSU-XIX	Evaluation Team Leader	Mid-'03 Oct.'03 Discussed at ITSU-XIX
<b>12. Other Business</b>			
185	Formulate proposals for co-operation with private sector	Evaluation Team Leader	Mid-'03 To be dealt with by evaluators (see 181)
<b>13. Programme &amp; Budget 2002-2003</b>			
188	Issue IOC Circular Letter informing IOC MS on status of CL N <sup>o</sup> . 1658's implementation	Tech. Sec.	Dec.'01 Done: Circular Letter No. 2019 was sent on 18 April 2002
	Provide financial direct & in-kind support to Tsunami Programme	MS	Continuously See above
190	Explore possibility of additional support to programme from TEMA & regional activities implementation	Ocean Services Head	Oct-Dec.'01 <u>Done</u>
<b>14. Dates &amp; Place for ITSU-XIX</b>			
192	Organize ITSU-XIX	ICG/ITSU Chair Nat. Contact New Zealand Tech. Sec.	Oct.'03 <u>Done</u>
	Establish agreement between UNESCO & New Zealand on ITSU-XIX implementation	Tech. Sec. Nat. Contact New Zealand	Mid-'03 <u>Done</u>
193	Involve IOC/WESTPAC & SOPAC in invitation process for ITSU-XIX	ICG/ITSU Chair	Mid-'02 <u>Done</u>
194	Implement next ITSU Officers Mtg.	ICG/ITSU Chair Tech. Sec.	Jan.'03 <u>Done</u>
<b>15. Adoption of Summary Report &amp; Recommendations</b>			
195	Finalization & publication of ITSU-XVIII SR	ICG/ITSU Officers Tech. Sec.	Dec.'01 <u>Done</u>
	Development of Action Sheet based on ITSU-XVIII decisions	Tech. Sec.	Nov-Dec.'01 <u>Done</u>

<b>Para. No.</b>	<b>Action</b>	<b>Responsible</b>	<b>Deadline</b>
<b>Recommendation ITSU-XVIII.1 ‘Sea Level Enhancements’</b>			
	Review existing sea-level gauges & availability to PTWC of data from these gauges	MS	Continuously Reported at ITSU-XIX
	Add or upgrade gauges as necessary to achieve gauge spacing of at least one gauge every 500 kms along tsunami-prone coasts	MS	Continuously Reported at ITSU-XIX
	Consider installing either island gauges or deep ocean sensors, such as DART buoys in areas seaward of known tsunamigenic seismic zones & also consider multi-use of existing gauges	MS	Continuously Reported at ITSU-XIX
	Include information on actions taken & progress achieved into national reports fro ITSU-XVIII	MS	Oct.’03 Reported at ITSU-XIX
<b>Recommendation ITSU-XVIII.2 ‘WG on International Tsunami Signs &amp; Symbols’</b>			
	See para. 157		
<b>Recommendation ITSU-XVIII.3 ‘Programme of Work &amp; Budget for 2002-2003’</b>			
	Support Tsunami Programme by contributing to IOC Trust Fund of in-kind by covering operational costs of maintaining Tsunami Warning System	MS	<u>Continuously</u>
	Make national authorities aware of programme & benefits of disaster reduction	ITSU Nat. Contacts	<u>Continuously</u>
	Take measures for providing support to Tsunami Programme at level requested by Recommendation	Exec. Sec. IOC Tech. Sec. MS	<u>Continuously</u>



ANNEX VI

**RECOMMENDATIONS OF THE WORKSHOPS**

**International Workshop “Local Tsunami Warning and Mitigation”**, Petropavlovsk-Kamchatskiy, Russia, September 10–15, 2002

In response to the recommendations of the XVIII Session of UNESCO/IOC/ICG/ITSU, the International Workshop “Local Tsunami Warning and Mitigation” was jointly organized by the IUGG Tsunami Commission and the International Co-ordination Group for the Tsunami Warning System in the Pacific of the UNESCO in Petropavlovsk-Kamchatskiy, Russia, on September 10 - 15, 2002. P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences (RAS) and the Kamchatka Seismological Department of Geophysical Service of the RAS led the Workshop as local organizers. Destructive effects of many tsunamis are confined to the areas within one hour of the propagation time (that is, within several hundred km of their source location). These tsunamis are classified as local, as opposed to the regional and the Pacific-wide tsunamis whose destructive effects can be exposed well outside (up to 10 thousand km) their area of origin. In all the main Pacific tsunamigenic regions, the majority of tsunami-related casualties and property damage come from local tsunamis. A very short travel time increases a local tsunami hazard. It is therefore an important challenge for the research community and decision-makers to identify the ways for reducing losses of lives and property damage from the local tsunamis. The main purpose of the Workshop was to consider the state-of-the-art of the local tsunami problem and to discuss fundamental and applied studies directed at the reduction of a local tsunami hazard.

As one of the most active seismic- and tsunami-prone areas in the Pacific, having a long history of historical and paleo-tsunamis and complemented by interesting environmental features, Kamchatka was an appropriate place for the international tsunami community members to discuss the local tsunami problem. Additionally, the workshop was held in commemoration of the 50th anniversary of the 1952 Great Kamchatka Earthquake and Tsunami. The magnitude 8.3 Kamchatka earthquake of November 4, 1952 generated a catastrophic tsunami that killed more than two thousand people in the Northern Kuriles. The town of Severo-Kurilsk (Paramushir Island) was completely destroyed. This catastrophic event initiated the scientific study of the tsunami problem in Russia and resulted in the creation of the Soviet Far East Tsunami Warning System at the end of the 50s.

Over 100 scientists (42 registered participants) from 12 countries (Bulgaria, Canada, France, French Polynesia, Indonesia, Italy, Japan, New Zealand, Republic of Korea, Russia, Turkey, the USA) attended the Workshop. The Workshop programme and the submitted abstracts can be found at <http://ocean47.phys.msu.su/>.

The oral presentations made at the Workshop were grouped in the following topics:

- 1952 Kamchatka Earthquake and Tsunami,
- Historical Catalogues and Databases,
- Seismo-tectonics of Tsunami,
- Numerical and Analytical Models of Local Tsunami Behavior,
- Mitigation and Risk Assessment,
- Tsunami Geology and Paleotsunamis,
- Tsunami Measurement and Data Analysis,
- Hydroacoustic Methods in Tsunami Research.

A special student session, that was unanimously recognized as of a high scientific quality by all the workshop participants, was included in the Workshop programme to facilitate the participation of young scientists.

The Workshop was followed by a one-day geological field excursion led by Dr J. Bourgeois and Dr T. Pinegina. Participants were familiarized with paleotsunami methodology and field practice. At several



coastal locations on the Khalatyrskiy Beach, 30 km northeast of Petropavlovsk-Kamchatskiy, the geological traces of the 1737 and 1952 Kamchatka tsunamis were demonstrated.

Analysis of the state-of-the-art of the local tsunami problem made by the Workshop participants testifies to the potential of a significant improvement for the forecast methodology and hazard reduction. Based on the presented papers and follow-up discussions, the Workshop has made the following recommendations as an approach to realizing this potential.

#### *Databases*

Comprehensive historical databases are one of the key elements of the local tsunami risk assessment methodology. The existing tsunami databases supported by the Novosibirsk Tsunami Laboratory (NTL) and the NGDC/NOAA can serve as a good basis for this work. Study of paleotsunami deposits can provide a significant addition for historical database that can considerably extend its time coverage. While nearly all historical events included in the published national, regional and Pacific-wide catalogs have already been included in the databases, a wealth of less-known data still exists locally. A lot of work is still needed for their search, parameterization and including in the databases.

#### *People Education*

Local tsunami has a very short travel time, therefore conventional tsunami warning procedures might be ineffective. People living in vulnerable coastal areas should be well-informed about a potential tsunamis hazard. Everybody should know how to act in the case of a strong earthquake or tsunami warning. The Workshop strongly recommends to conduct public educational programs (involving mass media), to publish informational booklets, etc.

#### *Paleotsunami research*

A destructive tsunami is rather a rare event at a given coastal location. To estimate the existing tsunami hazard properly, a long-term observations are required. Geologic records of pre-historical tsunamis can extend the historical and instrumental records to the recent past. They are also necessary in filling historic records gaps, or in filling geographic gaps for known tsunamis. Paleotsunami data in conjunction with numerical modeling can be useful for the tsunami sources identification.

#### *Hydroacoustic methods in the local tsunami warning problem*

Monitoring of the hydroacoustic signals emitted by the source area of impending underwater earthquake allows localization of this area for some time (from several to tens of minutes) prior to the main shock. This result testifies to the potential perspectives of hydroacoustic methods for the short-time prediction of local tsunamis.

#### *Tsunami generation mechanism*

Several papers presented at the Workshop have clearly demonstrated that the submarine slumping can play an important role in tsunami generation; nonlinear phenomena in a tsunami source can increase the tsunami amplitude. The Workshop recommends further investigation of the tsunami generation mechanism. The investigation should be directed at the development of the software tools for the calculation of the initial conditions in the generation area allowing the submarine slumping and non-linear phenomena for their further use in the tsunami propagation models.

#### *High resolution bathymetry and topographic data*

Quite often numerical modeling is the only way to determine the potential run-ups and to delineate the inundation area from local tsunamis. For accurate modeling, detailed bathymetric and topographic data are required. The Workshop recommends to continue efforts for collecting high-resolution bathymetric and topographic data for the tsunami-prone areas available in different centers and institutions in a single web-assessed database.

#### Preparation of collected volume "The 1952 Great Kamchatka Tsunami"

The 1952 Great Kamchatka Tsunami was one of the most destructive tsunamis in the last century. It had a destructive effect in the South Kamchatka and North Kuriles and was widely observed all over the Pacific. The publication of a special volume of papers containing all the earlier known and new materials related to this event is of great importance for understanding of local tsunami behaviour,

generation and propagation mechanism of trans-Pacific tsunamis and for improvement of their warning and hazard mitigation.

*Kamchatka Tsunami Warning Center*

The Workshop recommends setting up in Petropavlovsk-Kamchatky the “Kamchatka Tsunami Center” (KTC). Being one of the most active seismic- and tsunami-prone areas in the Pacific, Kamchatka is an appropriate place for a scientific center to coordinate the tsunami research, to carry out educational activity, etc. Using the scientific potential of the research centers and institutions located in the Far-East region, the TCW could serve as Center of Excellence for the development of new methods of tsunami prediction and mitigation and their implementation in the existing Tsunami Warning System.

*Acknowledgement*

The participants wish to thank members of the Local Organizing Committee for the excellent organization of the Workshop. Special thanks go to Mrs. Olga Yakovenko, whose tremendous efforts made at every stage of the Workshop arrangement are highly appreciated. The Organizing Committee is also grateful to Physics Faculty of M. V. Lomonosov Moscow State University for supporting the Workshop web-site.

The financial support for the Workshop obtained from the Intergovernmental Oceanographic Commission of UNESCO, the Russian Foundation for Basic Research, the Russian Academy of Sciences, and International Ocean Institute is greatly appreciated.

**International Seminar/Workshop on Tsunami, “In Memoriam 120 years of Krakatau Eruption-Tsunami and Lesson Learned from Large Tsunami”**, Jakarta and Anyer, Indonesia, 26-29 August 2003

On the occasion of the International Seminar/Workshop on Tsunami, “In Memoriam 120 years of Krakatau Eruption-Tsunami and Lesson Learned from Large Tsunami”, held from August 26 to 29, 2003, in Jakarta and Anyer, Indonesia,

One hundred and twenty scientists, engineers, researchers, and public officials representing geophysical, geological, oceanographic, and engineering disciplines, and seismological and oceanographic monitoring and emergency management, public protection, and planning institutions, universities, and other government agencies, from Indonesia and internationally from the USA, Russia, Germany, Japan, and the Netherlands,

As a Group gathered to review, exchange experiences, and elaborate upon tsunamis, tsunami warning systems, tsunami impacts and responses to earthquake and tsunami affecting Indonesia, and ways in which to effectively mitigate the tsunami hazard by identifying tsunami risk so as to save lives and reduce property damage,

And afterward, having listened and discussed the aforementioned, the Group offers the following Recommendations:

**Recommendation I**: Increasing tsunami hazard and risk awareness of people

Recognizing the importance of public awareness to tsunami hazards and the risks for those living in the coastal areas, and mindful that human beings tend to forget rapidly,

Acknowledging that tsunami occurrences are rare, but can occur at any time and cause significant damage and loss of life,

Noting the lessons learned from the tsunami occurrences in 1883 from the eruption of Krakatau, the 1992 Flores earthquake, the 1994 East Java earthquake, the 1996 Biak earthquake, and the 2000 Banggai earthquake,

Firmly convinced that raising the awareness of public officials, emergency managers, policy makers, professionals, school teachers, and coastal residents on tsunami, and providing education on ways in which to reduce the tsunami's impacts on coastal communities, will greatly reduce the risk of the tsunami disaster,

Recommends the construction of community memorials, such as monuments, museums, and informational signage, to remind each other and provide a means of passing tsunami information to next generation,

Further recommends the preparation and publication of informational leaflets, pamphlets, and books for the public and at-risk communities, and the dissemination of these appropriately in partnership with the mass media so as to increase society's awareness of and preparation for this natural hazard.

#### Recommendation II: Establishing Tsunami Warning System

Recognizing the main role of government institutions in providing early warnings on tsunami,

Aware that the tsunami monitoring system should consist of seismograph and tide gauge network that are currently operated by several institutions,

Aware that tsunami warnings must be issued quickly and reliably to appropriate authorities in at-risk coastal communities,

Strongly supports the initiation of a concerted effort among national and international institutions to coordinate and cooperate in the provision of early warnings for regional tsunami,

Recommends the establishment of a National Tsunami Warning System based on existing national seismic and sea level networks, real-time telemetry and automated data processing and evaluation, and reliable methods of warning dissemination, taking into account the experience resulting from the operation of existing regional and national tsunami warning systems in the Pacific. The system should be designed so as to permit the future expansion of its Area of Responsibility to include tsunami warnings to other parts of the Southwest Pacific and Indian Ocean (Philippines, Australia, New Zealand, Papua New Guinea).

#### Recommendation III: Establishing guidelines to face and anticipate tsunami disasters

Recognizing the significant degree of disaster generated by tsunami,

Understanding the characteristics of the Indonesian community, especially those living in coastal areas who do not wish to live far from their place for working,

Mindful that coastal areas are at risk from potentially destructive tsunamis,

Strongly urges the local government to implement countermeasures for protection against tsunami in the forms of green belts, and sea walls or other concrete constructions, to reduce the impacts of tsunamis,

Recommends the preparation of guidelines for disaster management in coastal areas.

#### Recommendation IV: Constructing Historical Tsunami Database

Recognizing the importance of historical data on tsunami occurrences as a manifestation for the development of warning criteria and identification of areas at risk,

Mindful that numerous data exist within different government agencies and public institutions and that they are not readily available and easily accessible,

Recommends that comprehensive historical tsunami database be created in the format compatible with internationally approved standards.

Recommendation V: Preparing Coastal Evacuation Maps

Aware that many residents may be unprepared to immediately evacuate low-lying coastal areas following a tsunamigenic local earthquake,

Acknowledging that the key components of the tsunami mitigation programme, that is hazard assessment, warning guidance, preparedness, must be highly interactive and well-coordinated to be effective,

Recognizing that not all areas have the same risk of tsunami attacks,

Mindful that there is limitations of resources of the government as well as the community,

Strongly support the concerned government institutions to scale their priorities for mitigating the tsunami disaster.

Recommends the undertaking of efforts to carry out inundation modeling studies and the preparation of evacuation maps for all populated coastal areas threatened by local tsunamis, and to educate those at-risk population about local tsunamis, the danger they pose, and the steps they must take to protect their lives should one occur.

Further recommends the preparation of multi-hazards and micro-zonation maps which compile the distribution of occurrences and potential impacts of all natural hazards in selected at-risk areas.

Acknowledgements

Appreciating the high fruitful discussion which took place during the seminar and the workshop, grateful for the support of the UNSCO/IOC International Coordination Group for the Tsunami Warning System in the Pacific and the IUGG – Tsunami Commission, and confident that the Recommendations of the workshop will contribute to the improvement of safety against tsunami in Indonesia and other countries.

Appreciating the great contributions from the Director, UNESCO/IOC International Tsunami Information Center and the Outgoing Chair, IUGG – Tsunami Commission, in serving as information resources and facilitation consultants on tsunami mitigation and tsunami warning systems.

Expresses heartfelt thanks to the Meteorological and Geophysical Agency, Ministry of Marine Affairs and Fishery, and all others for their most thorough organization of the seminar and workshop and their warm hospitality.

**International Workshop "Tsunamis in the South Pacific"**, Wellington, New Zealand, 25-26 September 2003

The Workshop, *Tsunamis in the South Pacific – Research towards Preparedness and Mitigation*, jointly convened by the IUGG Tsunami Commission and the International Coordination Group of the Tsunami Warning System for the Pacific (ICG/ITSU), the Institute of Geological & Nuclear Sciences (GNS) and the National Institute for Water and Atmospheric Research (NIWA), was held in Wellington on 25-27 September 2003. Thirty one papers were presented orally, ranging from overviews of regional vulnerability to tsunami, the Pacific historical tsunami record, Pacific-wide and regional Tsunami Warning systems, and preparedness plans, as well as insights into public awareness and preparedness in New Zealand and Washington, USA, tsunami modelling, paleotsunami research in New Zealand and submarine landslide identification and tsunami generation potential. Eight posters were also presented. A presentation was given by Dr Robin Falconer, Vice President Oceania,

Circum-Pacific Council (CPC) and Chairman, CPC Tsunami Special Project, on CPC's intention to sponsor tsunami education/preparedness projects in the Pacific.

A two-hour interactive Panel Discussion was held on "Tsunami Warning Response to a M8.7 Chilean Earthquake". The discussion involved directors from Chilean, French Polynesian, Japanese, and Pacific Tsunami Warning Centres, State or National Emergency Management officials from Hawaii and Washington, USA, New Zealand and Australia, and Researchers from Washington, USA, and New Zealand.

Eighty-six registrants from 18 countries attended the Workshop, many of the international delegates also attending the ICG/ITSU XIX conference from 29 September – 3 October 2003. Five delegates (Russia (2), El Salvador, USA, Colombia) were sponsored by the IOC, while the Circum-Pacific Council sponsored four delegates from Ecuador, Papua New Guinea, Fiji, and Indonesia to attend both the Workshop and ICG/ITSU conference. Locally, the Workshop was supported by the Earthquake Commission, Greater Wellington Regional Council, Wellington City Council, the Royal Society of New Zealand, the Ministry of Civil Defence and Emergency Management, the Institute of Geological & Nuclear Sciences, and the National Institute of Water and Atmospheric Research.

The workshop concluded with the following recommendations.

**Recommendation 1 (Historical data).**

Despite the written histories of many areas in the SW Pacific being much shorter than in many other areas of the Pacific, a wealth of historical data on tsunami occurrence and manifestation exists in many governmental, institutional and historical archives. These data are scattered in numerous publications and are not readily available. The workshop recommends continuing efforts to search for historical data on regional and local levels, and to encourage their integration into the Pacific-wide historical database.

Geological information on paleotsunamis can provide extremely important estimates of the long-term tsunami risk for coastal locations where the historical record is short. Systematic paleotsunami research in these areas should be encouraged and supported.

Systematic searches of recent sea level records for tsunami signals are further recommended to improve our knowledge of the areas at risk. These data should be saved and copies sent to the ITIC for archiving.

**Recommendation 2 (Regional TWS for SW Pacific and Indian Ocean).**

Taking into account the very recent decision of Indonesia to start the creation of the National Tsunami Warning System, the Workshop recommends that Indonesia and other countries of the South-West Pacific proceed in the development of the Regional Tsunami Warning System for the SW Pacific and Indian Ocean with reference to the ITSU Master Plan for Further Development of the Pacific Tsunami Warning System. This will benefit not only countries of the region but will also enhance the ability of the PTWC to locate smaller earthquakes in this area and to assess their tsunami threat.

**Recommendation 3 (Deep-water tsunami observations)**

In many presentations and discussions during the Workshop, the importance of the deep ocean tsunami measurements for evaluation of the tsunami threat and prediction of tsunami heights at the coast was highlighted. The Workshop recommends that every opportunity should be used to further expand the network of deep-water instruments and to integrate the data into the operations of the PTWC. Development of methods for the interpretation of these data should be encouraged.

**Recommendation 4 (Availability of sea level data for operational warning)**

Taking into account the recent considerable improvements in the sea level networks in New Zealand, the Workshop recommends increasing the use, through the Internet, of the real time or near-real time sea level data from New Zealand stations and other areas in the South Pacific, for use by PTWC and for access by the scientific community.

**Recommendation 5 (Technical Report on the Panel Discussion)**

The panel discussion on the responses of warning centers and emergency agencies to the issuance of tsunami warning messages for a major M8.7 earthquake off the northern Chile coast was very useful and productive. The Workshop recommends that the records of this panel discussion be converted into a Technical Report by GNS and NIWA, in collaboration with ITIC.

**Recommendation 6 (Far-Field Tsunami Workshop in 2004)**

Pacific-wide tsunami are rare in the practice of the TWS operations in the Pacific. However, the risk of failure of prediction as well as the cost of false alarm is very high due to the large number of countries and territories put into a warning status. The Workshop recommends a special ITSU workshop to discuss issues related to Pacific-wide TWS operations. The workshop is recommended for 2004, possibly in October, in conjunction with the VIII Earth Science Congress in Santiago, Chile.

**Recommendation 7 (Public Education and Awareness)**

Workshop participants recommend developing and maintaining archives of tsunami public education and emergency management products for sharing and international consultation. It is further recommended that ITIC be consulted to facilitate an international archive of these products.

**Thanks to Local Organizers**

The participants of the Workshop wish to express their sincere thanks to the local organizers (Gaye Downes, Roy Walters, Ursula Cochran, Neville Ching, Mauri McSaveney, Peter Wood) for their excellent organization and conducting of the Workshop.

ANNEX VII

**REVISED CONCLUSIONS OF THE *ITSU MASTER PLAN***

Although a significant amount of progress has been made in recent years to improve the Tsunami Warning System in the Pacific, much still remains to be done to effectively mitigate the hazard posed by local and distant tsunamis in all parts of the Pacific Basin. Areas for work that are especially important for improving the TWSP and should receive the highest priority for action by ITSU in the coming years are the following:

- ***Runup Maps*** - Use numerical model and historical data to create potential runup maps as the basis for hazard assessment, for evacuation maps and plans, and to motivate other key mitigation activities on the local level including public education, land use planning, and engineering efforts.
- ***Tsunami Education*** - Continue to develop educational materials and programs that will improve tsunami awareness and education among the public, warning center operators, emergency managers, and policy makers.
- ***Warning Centers*** - Establish new regional warning centers for the local tsunami threat in areas without coverage, and develop technologies and methodologies to improve the speed, accuracy, and reliability of all tsunami warning centers.
- ***Water Level Instrumentation*** - Improve the strategic coverage of water level instruments and the quality of signals they record for both warning and research purposes.
- ***Historical Data*** - Put historical data into a common database format, and develop tools that make those data readily available to persons and offices that need them in the mitigation and research communities.
- ***New Tsunamis*** - Collect and archive all water level gauge data as well as runup and inundation measurements following each tsunami.
- ***Communications*** - Keep abreast of new communications systems that may be more effective for warning center and other purposes, and adopt them for use in the TWSP as appropriate.
- ***Research*** - Encourage and support research on tsunamis and tsunami-related topics that will lead to improvements in mitigation.
- ***Tsunami mitigation*** – Support disaster mitigation activities of relevant response managers through active participation in local, regional and national disaster planning and targeted educational material
- ***Capacity building*** – Establish or strengthen and further develop regional and local tsunami-related expertise, skills and capabilities through development or promotion of training and exchange programs, internet based learning, and formal technical or scientific courses.

The components of the tsunami mitigation plan - hazard assessment, warning guidance, response, and research - must be highly interactive and well coordinated to be effective. ITSU, as a coordinating body of scientists, emergency managers, emergency planners, and warning center operators, with representatives from each affected nation, is well designed to successfully implement this plan.

ANNEX VIII

SPEECHES

**A: Welcome Speech of the Chairman ICG/ITSU, François Schindele**

Mr John Norton, Director of Civil Defense in New Zealand,  
Mr Peter Pissierssens, Representative of IOC/UNESCO,  
Distinguished Delegates of Member States  
Ladies & Gentlemen,

It is an honour & a great pleasure to open the Nineteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, as Chairman of this Group.

On behalf of the Group I express my thanks to the Government of New Zealand to have hosted this session in your nice country & for your welcome address. From the 25 Member States of ITSU, 15 are attending this meeting, Australia, Canada, Chile, Colombia, Republic of Korea, Ecuador, Fiji, France, Indonesia, Japan, New Zealand, Nicaragua, Peru, Russian Federation & USA.

Two other countries are attending this Session as observers: El Salvador & Papua New Guinea. This is the first time that so many countries are attending the ITSU Session & I thank all the delegates for coming & in their effort to participate.

Since 1965, the ITSU Group met every 2 years in a different country. This gives the opportunity to the Member States to visit the facilities & to have a look in the country of the host, of the tsunami hazard.

The critical issue of our Group is the continuous improvement of the Tsunami Warning System in the Pacific taking into account:

- the knowledge of the tsunami hazard;
- the recent & continuous progress in science & technology to assess the tsunami risk & to mitigate it;
- the mitigation becomes more & more critical due to the increase of population living close & on the coast where the tsunami hazard is the highest.

This Session gives the opportunity to Member States to report on the progress made, but also the difficulties they had to implement a tsunami mitigation programme & to express their point of view of what must be done to achieve a better & more effective system.

Two bodies are very important for the Group:

- The Pacific Tsunami Warning Centre in Hawaii, that is the headquarters of the Tsunami Warning System, & the International Tsunami Information Center that give the information on TWS, how to implement such a system, gather & distribute knowledge on tsunamis, & so on.

During all of this week, we will review the progress made since the last ITSU Session 2 years ago. One of the important issues is the enhancement of the sea level network & I know that several countries have improved theirs, then we must decide what must be done during the next 2 years to achieve a very significant level of expertise & efficiency.

I ask all delegates to participate actively in all discussions during the Session. Your capability to involve the new Member States, observers & bring them all the knowledge we have on the tsunami hazard assessment & mitigation is crucial. More countries active in our group will improve the quality & efficiency of the TWSP.

The very recent case last week of the Japanese earthquake & tsunami confirm that we are well prepared to fight it, but do not forget that since 1964, no wide Pacific Tsunami has threatened all the coasts of the region.



Finally, I want to thank the local Organizing Committee, especially Mike O'Leary, for the hard & excellent work done during the last year to organize this Session in such nice facilities. I wish everybody an excellent & productive session.

Thank you for your attention

**B: New Zealand Director of Civil Defence – Welcome to the Attendees of ITSU XIX**

Welcome

Kia ora. Tena kotu katoa

New Zealand is very happy to welcome the delegates to the 19<sup>th</sup> Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific (ITSU). We are aware that the majority of attendees are from the 25 signatory countries and are visitors to New Zealand. To our international guests, welcome to New Zealand and especially welcome to Wellington.

New Zealand is aware that the ITSU programme operates under UNESCO and specifically under the auspices of the Intergovernmental Oceanographic Commission (IOC). We are very pleased to be able to assist with the organization and operation of the Warning System in conjunction with IOC.

It has been traditional that the biennial meetings of ITSU are preceded by an international conference. During the organization stages of the ITSU Session we were delighted that the Institute of Geological and Nuclear Sciences (GNS) and the National Institute of Water and Atmospheric (NIWA) accepted an invitation from ITSU and IUGG to stage a Workshop preceding this ITSU Session. The Workshop was titled "Tsunami in the South Pacific – Research towards Preparedness and Mitigation."

In New Zealand we are in a very dynamic stage in the development of our capability to manage emergencies.

Late last year the Civil Defence Emergency Management Act came into effect and the whole sector is moving rapidly to implement the arrangements required by the legislation. There is considerable energy, commitment and progress in the sector that will result in New Zealand being significantly better prepared for dealing with emergencies.

One of the requirements of that legislation is for regional Civil Defence Emergency Management Groups to identify the hazards and risks their regions face and then address them on a priority basis. Due to the location and shape of New Zealand virtually every area is vulnerable to some aspects of tsunami.

New Zealand's location in the South Pacific, our straddling of two major plate boundaries and our active volcanic zones make us particularly vulnerable to tsunami. This includes those that travel across the Pacific as well as those that are generated closer to home. I am aware that there are numerous initiatives to add to our level of understanding in both of these areas and sessions such as this are vital for sharing and disseminating that knowledge.

In relation to far field tsunami we are almost completely reliant on the services provided by the Pacific Tsunami Warning Centre for early warning and detailed information on the nature and size of any potential tsunami. The information coming from PTWC is an integral part of New Zealand's National Warning System and we are very keen to support ITSU in as many ways as possible. That includes the earlier Tsunami Workshop and the ITSU XIX Session this week.

Tsunami is not a common hazard in New Zealand but we do have some regional and national examples in our history. The focus of ITSU on tsunami warning, hazard and risk assessment and mitigation actions fits well with the Ministry of Civil Defence and Emergency Management's role in New Zealand. Our role is to;

- Define our hazards
- Understand the nature of the hazard
- Understand what has to be done to manage the risk and the consequences.

New Zealand manages the risks and consequences of a 4R's basis (Reduction, Readiness, Response and Recovery). We are also required as a result of our new legislation to have a new National Civil Defence Emergency Management Plan developed within three years. We are currently consulting various aspects of this with our communities at the moment.

So again welcome to New Zealand and we hope you have a very successful Session.

Mr John Norton  
Director of Civil Defence  
Ministry of Civil Defence & Emergency Management.

ANNEX IX

**LIST OF ACRONYMS**

ATAS	Australian Tsunami Alert Service
ATWC	Alaska Tsunami Warning Centre
BMG	Meteorological and Geophysical Agency (Indonesia)
BOM	Bureau of Meteorology (Australia)
CEPREDENAC	Co-ordination Center for the Prevention of Natural Disasters in Central America
CGPS	Continuous GPS
CICESE	Centro de Investigacion Cientifica y de Educacion Superior de Ensenda (Mexico)
CPC	Circum-Pacific Council
CTBTO	Comprehensive Test Ban Treaty Organization
DART	Deep-ocean Assessment and Reporting of Tsunamis
DKP	Department of Marine Affairs & Fishery (Indonesia)
EMA	Emergency Management Australia
EMSC	European-Mediterranean Seismological Centre
ENSO	El Nino Southern Oscillation
GA	Geoscience Australia
GHTD	Global Historical Tsunami Database
GLOSS	Global Sea-Level Observing System
GNS	Geological and Nuclear Sciences
GOOS	Global Ocean Observing System (IOC)
HIDRONAV	Dirección de Hidrografía y Navegación (Peru)
HTDB	Historical Tsunami Data Base
ICG/ITSU	International Co-ordination Group for the Tsunami Warning System in the Pacific
IDB	Islamic Development Bank (Indonesia)
IGOOS	Intergovernmental Committee for GOOS
IMGEP	Improvement of Meteorological & Geophysical Equipment Project
INOCAR	Instituto Oceanográfico de la Armada (Ecuador)
IOC	Intergovernmental Oceanographic Commission of UNESCO
IOCARIBE	IOC Sub-Commission for the Caribbean & Adjacent Regions
IODE	International Oceanographic Data & Information Exchange
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
ISO	International Organization for Standardization
ITIC	International Tsunami Information Center
IUGG	International Union of Geodesy & Geophysics
JCOMM	Joint Technical Commission for Oceanography & Marine Meteorology
JISNET	Japan – Indonesia Seismic Network
JMA	Japan Meteorological Agency
KMA	Korea Meteorological Agency
MCDEM	Ministry of Civil Defence & Emergency Management (New Zealand)
MRD	Mineral Resources Department (Fiji)
NEIS	National Earthquake Information System
NIWA	National Institute of Water & Atmospheric Sciences
NOAA	National Oceanic & Atmospheric Administration (USA)
NTC	National Tidal Centre (Australia)
NTFA	National Tidal Facility Australia
NTHMP	National Tsunami Hazard Mitigation Programme (USA)
NTL	Novosibirsk Tsunami Laboratory (Russia)
NWS	National Weather Service (USA)
OPA	Open Programme Areas
PTWC	Pacific Tsunami Warning Center

SHOA	Servicio Hidrográfico y Oceanográfico de la Armada (Chile)
SNAM	Sistema Nacional de Alerta de Maremotos
SOPAC	South Pacific Applied Geoscience Commission
TEMA	Training, Education & Mutual Assistance (IOC)
TIK	Tsunami Information Kit
TWSP	Tsunami Warning System in the Pacific
VEP	Visiting Experts Programme
WDC/NGDC	World Data Center/ National Geophysical Data Center
WMO	World Meteorological Organization
WWTD	World Wide Tsunami Database

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, Papetee, 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 R 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, 2002	E, F, S, R
91.	Thirty-fifth Session of the Executive Council, Paris, 2001	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*