Intergovernmental Oceanographic Commission

Workshop Report No. 199



International Conference for the Establishment of a Tsunami and Coastal Hazards Warning System for the Caribbean and Adjacent Regions

Mexico City, Mexico 1–3 June 2005



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Abstract:

The International Conference for the Development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions was held at Hotel Sevilla Palace, Mexico City between 1 and 3 June 2005. The Meeting was attended by nearly 50 participants from 17 countries in the Caribbean Region, two from other IOC Member States, six organizations, and four observers. The Meeting ensured that Caribbean Member States are fully informed, at the technical level, on tsunami warning and mitigation programmes at the national, regional and global levels. The Meeting adopted a communiqué (Annex IV) that provides guidance to all partners regarding the required actions that will lead towards the establishment of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions. The Meeting also recommended the establishment of an "Intergovernmental Coordination Group for the Caribbean Tsunami and Coastal Hazards Warning System" and drafted Terms of Reference for the Group.

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1. **OPENING**

1.1 OPENING ADDRESS BY IOC OF UNESCO

The International Conference for the Establishment of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions took place in the Hotel Sevilla Palace, Mexico City, from 1 to 3 June 2005. Mr Marco Polo Bernal Yarahuan, IOCARIBE Chairman opened the Conference at 09:00 on Tuesday 1 June 2005. He welcomed the participants to Mexico City. Dr Bernal addressed the Conference and thanked the delegations for their presence.

He explained that this was one of the meetings leading to establishing the framework for the Tsunami and Coastal Hazards Warning System for the Wider Caribbean. UNESCO and its IOC received a clear mandate from the international community to coordinate the establishment of the System during the course of several international and regional meetings, including the World Conference on Disaster Reduction (Kobe, Japan, 18–22 January 2005), and the Phuket Ministerial Meeting on Regional Cooperation on Tsunami Early Warning Arrangements (Phuket, Thailand, 28 and 29 January 2005).

In his opening address, Dr Bernal indicated the outcomes that he hoped would emerge from the meeting. He also indicated the need to identify the mechanism for the coordination of the required research for the assessment of the tsunami hazard, as well as to address the organizational aspects and governance mechanism(s) that will enable the joint operation of the detection/warning system, based on international cooperation.

1.2 MESSAGE FROM THE INTERNATIONAL STRATEGY FOR DISASTER REDUCTION (UN/ISDR)

Mr Reid Basher, Coordinator of the UN/ISDR (International Strategy for Disaster Reduction) was unable to attend the Conference but sent his welcoming remarks to the Conference. In his letter, he stressed that this meeting was an important step towards a consolidated plan for a tsunami warning system for the Caribbean Region as part of broader efforts to increase resilience under the framework of the International Strategy for Disaster Reduction.

In his communicate, Mr Basher emphasized that the International Strategy for Disaster Reduction framework, comprising relevant UN agencies, regional organizations and civil society partners, has been requested to play a facilitation role, through the ISDR Platform for the Promotion of Early Warning (PPEW), alongside the Intergovernmental Oceanographic Commission of UNESCO, in the development of early warning capabilities for the Caribbean region.

Complete text of the ISDR message is included in Annex III.

1.3 MESSAGE FROM WMO

Mr Hugo Hidalgo, Programme Officer of WMO Sub regional Office for North America, Central America and the Caribbean representing the World Meteorological Organization (WMO) addressed the Conference. He expressed his appreciation for the opportunity to address this International Conference for the development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions.

In his remarks he emphasized that this Conference is taking place at a time when the world's attention is dramatically drawn to the perennial concern of natural disasters, which threaten lives, livelihoods, development and security. The international community is deeply grieved by the desolation and suffering of the millions of people devastated by the tsunami that hit Indian Ocean countries on 26 December 2004. The impacts of this disaster have reached staggering proportions in terms of the scale of human loss, associated damage, and number of countries affected as well as related response and recovery efforts.

The recent tsunami disaster has demonstrated in a dramatic fashion the need to intensify efforts to prevent natural hazards from becoming disasters. He stressed the need to develop jointly a clear vision, an effective integrated action plan and move forward together to prevent such disasters in the future. In this connection, the Conference offers a special opportunity that should be seized upon by the international community.

It is WMO's aim to halve the number of deaths due to natural disasters of meteorological, hydrological and climatic origin over the next 15 years, more specifically to reduce by half the associated ten-year average fatality from the period 1995–2004 to the period 2010–2019 for these disasters. WMO is already working towards the realization of this goal. For example, during one of the most intense tropical cyclone seasons in the Atlantic region in 2004, thanks to effective provision and dissemination of warnings, many lives were spared through timely evacuations and other disaster-preparedness measures. The challenge is to ensure that all countries, particularly the least developed countries and Small Island Developing States, have the systems, infrastructure, human capacity and organizational structures to develop and utilize early warning systems. Much can be achieved by deploying resources to strengthen pre-disaster systems for early warnings.

In particular, WMO is joining forces with all key partners, especially UNESCO and its IOC, to ensure that Tsunami Early Warning Systems will soon become a reality in the Caribbean Region and other regions at risk. The WMO Global Telecommunication System (GTS) that interconnects the National Meteorological and Hydrological Services provides tremendous potential for timely and reliable exchange of tsunami warning messages and related information among the appropriate government agencies. The Tsunami Warning System in the Pacific, established under the auspices of the IOC of UNESCO, already utilizes the WMO GTS in that region. WMO's extensive experience and capabilities in the development and operation of global early warning systems for other natural hazards will be crucial in accelerating the development of Tsunami Early Warning Systems for this Region as well.

The natural disaster prevention and mitigation has become one of WMO's most important activities. This is why WMO's Congress decided in 2003 to launch the *Natural Disaster Prevention and Mitigation Programme*. Also, a World Conference for Disaster Prevention was prepared in association with the International Strategy for Natural Disaster to take place in Kobe (Hyogo, Japan) January 2005.

The WMO Natural Disaster Prevention and Mitigation Programme provides a coordinated and integrated approach and —through synergistic partnerships at international, regional and national levels — strengthen WMO's contribution to disasters risk reduction. WMO is committed to ensure that its capacities are optimally provided and integrated to enable communities to take action, effectively and in the timeliest manner.

Three months after Kobe, the XIV Meeting of WMO's AR-IV, which comprises North America, Central America and the Caribbean, took place in San José, Costa Rica. The meeting

stressed the importance of establishing a tsunami early warning system for the region and gave it maximum priority. In this context the representative of WMO expressed satisfaction with the holding of the present conference and was confident that this Conference would provide the guidelines for action items permitting that the warning system to come to reality.

Complete text of the ISDR message is included in <u>Annex III</u>.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 INTRODUCTION OF THE MEETING

Mr Cesar Toro, IOC (UNESCO) Secretary for IOCARIBE welcomed the participants to the Meeting. He informed the participants of the objectives of the Meeting:

- To describe the needed Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, which shall include an updated implementation of the IOC-approved Tsunami Warning System for the IAS;
- To describe the components of such a system and the present status of those components;
- To draft and adopt a plan for establishing the proposed system, and define the roles of regional institutions and organisations in establishing and maintaining it;
- To identify and coordinate donors support of the warning system and related activities;
- To inform IOCARIBE countries on the status of relevant existing warning information systems.

Additionally, he recalled that this meeting will provide the insight of establishing a tsunami and coastal warning system for the Caribbean Sea and Adjacent Regions as a contribution to the Global Tsunami Warning System and to the Global Earth Observing System of Systems (GEOSS).

2.2 DOCUMENTATION AND PRACTICAL ARRANGEMENTS

The IOC (UNESCO) Secretary for IOCARIBE introduced the documentation to the Conference including the Provisional Annotated Agenda and Provisional Timetable. The Agenda of the Meeting is available in <u>Annex I.</u> The List of Participants is available in <u>Annex II.</u>

3. TSUNAMI WARNING AND COASTAL HAZARDS SYSTEMS FOR THE CARIBBEAN SEA AND ADJACENT REGIONS; REVIEW OF EXISTING CONTRIBUTIONS

3.1 BRIEF INTRODUCTION TO THE SESSION

3.2 BACKGROUND

Mr Marco Polo Bernal, IOCARIBE Chairman, in his capacity of Chair of this Conference introduced the main objectives of the Meeting.

He expressed hope that the meeting would provide technical information on tsunamis, detection technology, the limitations of warning systems and how to use inundation information and mapping in planning. He invited the speakers to make their presentations. Each presentation was followed by a brief opportunity for questions and comments. These are not covered in this report the Meeting. The full presentations summary of are available at http://www.ioc.unesco.org/regcar.

3.3 THE TSUNAMI WARNING SYSTEM FOR THE IAS

In his presentation, Mr George Maul (Professor and Department Head, Marine and Environmental Systems, Florida Institute of Technology) explained that, according to Bryant (1991), approximately 25% of Earth's tsunami events occur in the North Atlantic basin, which includes the Caribbean and Mediterranean Seas. The tsunami risk to the Caribbean and Central West Atlantic Region is fourfold: locally generated by earthquakes, sub aerial or submarine landslides, sub aerial or submarine volcanoes, and teletsunami from sources such as that which generated the 1755 Lisbon event (Mader, 2004). Fatalities in the region during the last century and a half include at least 400 in 1853 in Venezuela, 23 in the USVI in 1867, 75 in Panama in 1882, 500 in Jamaica in 1907, 91 in Puerto Rico in 1918, 28 in eastern Canada in 1929, 1790 in the Dominican Republic in 1946, 75 in Puerto Rico in a separate event in 1946, and 2 in Costa Rica in 1991. The conservative total (O'Loughlin and Lander, 2003) is more than 2,500 persons in about 150 years.

In 2003, after 10 years of development (Maul, 2003), the IOC Executive Council approved a tsunami warning system for the Intra-Americas Sea (Caribbean Sea, Gulf of Mexico, Guyana, Bahamas, and the Straits of Florida region). The four elements of the project proposal are: Education, Warning, Management, and Research (http://www.fit.edu/~gmaul). Education is the first order of importance, and is illustrated by the materials published in the popular press (*e.g.* Watlington and Lincoln, 2001) as well as by the IOCARIBE Secretariat and Florida Institute of Technology. Warnings involve three interconnected subsystems: seismic, sea-level, and communications. Numerous management issues need to be fully explored, but perhaps the most stressing is the issue of coastal population growth (Duedall and Maul, 2005). Research issues include development of the next generation of DART (Deep-ocean Assessment and Reporting of Tsunami) buoys, reducing false warnings by neural networks, and mapping of potential sources of tsunamis.

The current state of affairs with the Intra-Americas Sea Tsunami Warning System (IAS TWS) is that no funding has been yet committed. An update of the requirements in the IOC-approved project proposal of 2003 is that approximately \$3,515,000 is needed to modernize the seismic and sea-level subsystems, and a continuing expense of \$2,200,000 per year. In this sense, the IAS TWS proposal needs to change from being a "project" to being a "programme". In order to maintain readiness, the IAS TWS must be integrated into IOCARIBE-GOOS, the regional component of the Global Ocean Observing System. Accordingly, the investments in tsunami warning must have other applications of public benefit, such as monitoring for climate change, for hurricane storm surge, for rogue waves and similar maritime hazards, and for safety of life at sea (tides, currents, waves, and winds).

In Puerto Rico, personnel from the Puerto Rico Seismic Network, the University of Puerto Rico, the Puerto Rico Emergency Management Agency, and the National Weather Service, are putting together the elements of a local warning system. With little funding and much inventiveness, the protocols between the seismic, sea-level, and communications subsystems have been developed, and signage is being placed in sites where tsunami waves have caused death and destruction in the past. Funding for a 24-hour-a-day system has, up top this point, eluded the project.

In summary, there have been more than 2,500 tsunami deaths in the Caribbean and Central West Atlantic Region since 1853, and the Atlantic coastal population is expected to grow by another 40,000,000 people by the year 2025. Most of this population growth will be in the Caribbean and Central America. The IOC-approved Intra-America Sea Tsunami Warning System budget needs to increase about 40% over that required in 2003, largely due to placing DART buoys at strategic sites, repairing existing infrastructure, upgrading sea-level and seismic subsystems, developing warning protocols, and most importantly, educating the public.

During the plenary discussions it was emphasized that many countries in the Caribbean region are developing countries that will need substantial capacity building efforts to enable their full benefit from a tsunami warning and mitigation system.

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- Watlington, R.A., and S.H. Lincoln. *Disaster and Disruption in1867: Hurricane, Earthquake, and Tsunami in the Danish West Indies*. University of the Virgin Islands, St. Thomas, USVI 00803, 134 pp., 2001.

3.4 THE CENTRAL AMERICAN TSUNAMI EARLY WARNING STRATEGY

Mr Claudio Gutierrez-Huete, Executive Director of INETER representing CEPREDENAC made a presentation about main objectives and strategies of the Central American Tsunami Early Warning Strategy.

The main obstacle for the prevention of tsunami disasters in Central America is the lack of studies on hazard, vulnerability or risk related to tsunamis on a regional, national, or local scale. After the 1992 Nicaraguan tsunami, many scientific studies were carried out regarding the generation mechanism for the tsunami, its propagation of tsunami waves and regarding geological causes. However, no serious studies have been made regarding the hazard, vulnerability and risk related to tsunamis in Central America. Since 2004, INETER, in cooperation with Japan, is executing a project regarding the hazard of tsunamis in four zones of the Pacific coast of Nicaragua.

The primary obstacles for national networks to function as warning centres in case of tsunamis are the lack of information on the methods to identify a possible tsunami, the absence

of an organization that guarantees processing of seismic information in a short time, and a communications plan that ensures that the warning message regarding a tsunami reaches its destinataries that are the disaster prevention system, the media, and the population.

He referred to main objectives of the Central American Tsunami Early Warning Strategy:

- (i) Prevent the loss of life caused by tsunamis in Central America via a tsunami warning system;
- (ii) Mitigate economic losses caused by tsunamis, promoting the elaboration of hazard, vulnerability, and risk maps regarding tsunamis;
- (iii) A strengthened capacity of the national seismic networks for the emission of a warning in case of a tsunami;
- (iv) Enhanced capacity of the disaster prevention systems to transmit a warning to the coastal population in case of a tsunami;
- (v) A better-informed and educated population on what to do in case of a tsunami warning;
- (vi) Promote studies on hazard, vulnerability and risk assessments related to tsunamis in the coasts of Central America.

Lastly, Mr Gutierrez gave an overview of the requirements for establishing a regional warning strategy, how it operates and presented a summary of main activities implemented in the Central America region for this purpose. Full presentation of Mr Gutierrez-Huete is available in http://www.ioc.unesco.org/regcar.

3.5 THE CARIBBEAN DISASTER EMERGENCY RESPONSE AGENCY (CDERA)

In his presentation, Mr Lloyd Lynch from the Caribbean Disaster Emergency Response Agency (CDERA) gave an overview of main activities implemented in the region for tsunamis awareness and mitigation. He informed the Conference on CDERA's plans for the establishment of an early warning system in response to the Resolution of the Fifteenth Caribbean Community Council of Ministers Meeting.

During the Caribbean Community Council of Ministers it was agreed the need for establishing a tsunami early system. For that purpose several working groups were started to advance in the following issues:

- (i) <u>Monitoring Network</u>: To determine status of existing seismic and sea level network infrastructure and recommend improvements and/or upgrading of network;
- (ii) <u>Hazard Vulnerability Assessments</u>: To determine the risk of coastal communities by using tsunami flood mapping;
- (iii) <u>Public Education and Information</u>: Design medium to long term education and outreach programs;
- (iv) <u>Emergency Communication</u>: Establish protocols for different tsunami scenarios between the monitoring networks and emergency management agencies, and design a system to issue messages to the communities under threat;

(v) <u>Preparedness and Response Plans</u>: Develop tsunami emergency response plans within the framework of Comprehensive Disaster Management strategy.

It was also agreed to refine the implementation plan and budget of the Intra-Americas Sea Tsunami Warning System project proposal to present it to CARICOM Heads of Government in July 2005.

Mr. Lynch summarized main conclusions as follows:

- (i) Provide an Impact assessment to show potential savings and benefits;
- (ii) Arguments forwarded in last version of IAS-TWS proposal could be strengthened to better convince those who may have influence on the long-term sustainability of the programme;
- (iii) We should not wait until program is threatened before developing a sustainability plan;
- (iv) To develop Emergency Broadcast Strategies to include among others:
 - Use all available broadcasting networks (radio and television) to alert and warn so as to reach the widest target audience;
 - Provide support to build a wide dissemination broadcasting network with strong infrastructure capable to survive the disaster. This network should be designated as the national authentic source for emergency information;
 - Supplement emergency broadcast networks with other new technologies such as text messaging;
 - Consider that there is still room for traditional warning methods.

Full presentation of Mr Llynch is available in http://www.ioc.unesco.org/regcar.

3.6 RECENT EXPERIENCES IN EVACUATION DRILL IN CASE OF A TSUNAMI, COLOMBIA

Mr Eugenio Alarcon, Delegate from Colombia, representing the Civil Defence, introduced Recent Experiences in Evacuation Drills. He explained planning and execution stages for preparing a tsunami evacuation drill. The drill was effected in April 2005 in San Andres de Tumaco, a city located in the Colombian Pacific Coast. The main objective of the exercise was to increase tsunami awareness and prepare population to respond to this natural phenomenon.

He explained the stages needed to implement this exercise and pointed out that it was the first time than an evacuation drill of this magnitude was effected in Colombia and in the region.

Participants attending the Conference learned from this successful experience and from positive results shared by Mr Alarcon during his presentation.

He also emphasized the importance of evacuation drills to mitigate tsunami damage and prevent loss of life and destruction of property and recalled that for this purpose involvement of the public is essential.

Full presentation of Mr Alarcon is available in http://www.ioc.unesco.org/regcar.

4. THE TSUNAMI WARNING SYSTEM FOR THE CARIBBEAN SEA AND ADJACENT REGIONS WITHIN A MULTI-HAZARD OBSERVING AND WARNING SYSTEM AND A GLOBAL FRAMEWORK.

4.1 BRIEF INTRODUCTION OF THE SESSION

In his introductory words, Mr Marco Polo Bernal, IOCARIBE Chairman, explained that this session was dedicated to organizational arrangements for developing a Tsunami Warning and Mitigation System for the Caribbean and Adjacent Regions. He stated that the presentations would give an overview of the requirements in establishing national and regional tsunami warning centres, the operations, services and products and the challenge of long term sustainability.

The responsibility of a national tsunami-warning centre is to provide to the national authorities information about the occurrence of large earthquakes and tsunami at the national and local level. The responsibility of a regional tsunami-warning centre is to provide to the national warning centres or contact points of Member states the information about the occurrence of large earthquakes that can produce ocean-wide tsunamis. These warning centres use the data received from numerous institutions and countries.

4.2 ROLE OF THE PACIFIC TSUNAMI WARNING CENTRE (PTWC)

The Director of the "Richard H. Hagemeyer" Pacific Tsunami Warning Center (PTWC), Mr Charles McCreery, made a presentation to the Meeting on the operational activities and long experiences of PTWC as the operational center for the IOC Tsunami Warning System in the Pacific. He emphasized the critical elements of a complete end-to-end warning system including hazard and risk assessment, warning guidance, preparedness and education, and research. He described in some detail the operational warning components: seismic data collection and analysis, sea-level data collection and analysis, decision-making, and message generation and dissemination. He pointed out the multi-function, multi-hazard uses of the data streams and communications links and their importance to the long-term sustainability of the system.

The PTWC Director also explained that PTWC currently has the capability to provide at least limited tsunami warning guidance to the region, and that it is already providing such guidance to Puerto Rico and the Virgin Islands. This guidance is limited due to the lack of sufficient sea-level data from the region to rapidly detect and measure tsunami waves as well as the lack of operational numerical models to aid in decision-making. However, he pointed out that PTWC and the Japan Meteorological Agency are currently providing interim warning guidance to the Indian Ocean in spite of similar limitations. He explained the steps needed to implement this approach including the designation of contact points and methods for each Member State for receiving bulletins, and the concurrence of the U.S. to provide this service to the region.

What does an end-to-end warning system look like?

Mr Charles McCreery (Director, Pacific Tsunami Warning Centre, Honolulu), continuing with his presentation on the establishment and operation of a Regional Tsunami Warning Centre, pointed out the advantages of having such a Centre located in the region rather than being one function of a more distant global Centre. He also explained the importance of national centres and of having at least one or more of them taking regional responsibilities. Considerations for the design of national and regional Centre capabilities were given including priorities based on an assessment of tsunami risk, requirements for seismic and sea level instrumentation, and methods for rapid warning dissemination. Typical warning products were described based on what is used in the Pacific.

This presentation gave an overview of the requirements in establishing a regional tsunami warning centre, its operations, its services and products, and the challenges for its long-term sustainability. It also addressed the interaction between national and regional centres as well as between different regional centres. Full presentation of Mr McCreery is available in http://www.ioc.unesco.org/regcar.

4.3 THE ROLE OF IOCARIBE-GOOS IN A MULTI-HAZARD OBSERVING AND EARLY WARNING SYSTEM. CONTRIBUTION OF THE TSUNAMI WARNING AND COASTAL HAZARDS SYSTEMS FOR THE CARIBBEAN SEA AND ADJACENT REGIONS TO THE GLOBAL TSUNAMI WARNING SYSTEM AND ITS LINKS TO THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS.

Mr Douglas Wilson, Chairman for IOCARIBE-GOOS, gave an introduction of the main work of the Global Ocean Observing System (GOOS) and its regional components.

In his presentation he mentioned that in order to put in place a system with global reach that can be sustained over the long term requires that it serves multiple, more regularly occurring but equally devastating hazards such as storm surges. In addition, the most cost-effective and efficient way to provide data for ocean hazard warnings is to integrate the system within broader efforts to observe the ocean. It is by entraining the resources and interest of a much wider community of interested, regular users of ocean data, that we can best ensure the long-term sustainability of the technical backbone of a tsunami warning system.

In pursuing proposed objectives, following main lines of action should be considered in the warning system:

- 1. IOCARIBE Secretariat shall request the Pacific Tsunami Warning Centre to extend its warning guidance to the Wider Caribbean Region on an interim basis until such time as this capability can be managed independently within the region, and shall request IOC of UNESCO to provide support as needed for this urgent and critical activity.
- 2. The IOC Assembly shall establish, in accordance with its rules of procedure, an Intergovernmental Coordination Group for the Caribbean Tsunami and Coastal Hazards Warning System to govern the system. Such a group will be composed of IOC Member States and regional organizations from the Wider Caribbean Region (WCR). All the other Members of the IOC, as well as concerned international and regional public and private sector organizations, will be welcome to participate. An interim leadership group shall be named.
- 3. IOCARIBE shall expand the IOCARIBE Tsunami Steering Group of Experts into an interdisciplinary Tsunami and Coastal Hazards Group of Experts (TCHGE), name an interim steering committee, and organize a meeting of this group before 1 December 2005. The Group shall carry out tasks as directed in the Action Plan, and make recommendations to the Intergovernmental Coordination Group on steps required for implementing a complete Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions.

Regional modelling capability must be enhanced to support local hazard mitigation and planning and to integrate coastal hazards and broader coastal management programs. The IOCARIBE Tsunami and Coastal Hazards Group of Experts should address the following, through designated subcommittees if necessary:

(i) An inventory of existing regional and coastal bathymetric data must be performed. Collaborate with the IOC International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA) programme to make regional bathymetry available to all regional modelling researchers in appropriate form. Submit request to individual countries in region through IOC/IHO to determine existence and status of coastal bathymetry and topography data.

What data exist?

Where are they located and in what forms?

Are they available (to users within the country)?

The IOCARIBE Tsunami and Coastal Hazards Group of Experts should complete this report by 1 April 2006.

- (ii) A basin-scale community model for regional tsunami wave propagation should be developed and made available to the entire community, along with instruction on its use and access to relevant bathymetry and seismic hazard information. The IOCARIBE Tsunami and Coastal Hazards Group of Experts should be responsible, through delegation of a subcommittee if necessary, for completing this task.
- (iii) Local capability to model coastal inundation by tsunami and storm surge is critical to public safety and hazard mitigation. The IOCARIBE Tsunami and Coastal Hazards Group of Experts should designate a subcommittee to make recommendations on accomplishing this, including consideration of developing regional coastal modelling centres in collaboration with IOCARIBE-GOOS.

In support of this inundation modelling effort, IOC should recommend that I-GOOS consider the Caribbean region for implementation of their 'Global Storm Surge' pilot programme.

4.4 OTHER COASTAL HAZARDS WARNING SYSTEMS OPERATING IN THE REGION - PRESENTATIONS OF CONTRIBUTIONS OF MEMBER STATES.

The IOC (UNESCO) Secretary for IOCARIBE introduced this agenda item, He invited representatives of Member states and Organizations to make brief presentations on the current status or of planned activities related to tsunami warning and mitigation. Presentations were given by following Member States and also from countries out of the region attending the Conference: Barbados, Cuba, France (Guadaloupe), Mexico and Canada. Copies of some of them are available in http://www.ioc.unesco.org/regcar.

5. DEVELOPMENT OF THE PROPOSED SYSTEM; REVIEWED WORK PLAN TIMETABLE AND BUDGET

5.1 ESTABLISHMENT OF DRAFTING GROUPS

The IOC (UNESCO) Secretary for IOCARIBE introduced this agenda item, referring to Document IOC/CARTWS-I/1 "Provisional Annotated Agenda" where a general explanation of objectives and expected outcomes for each working group was included.

The objectives of the three groups are summarized as follows:

Group 1: Technical aspects of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions —This group will define the immediately available technology to be used for the seismologic and oceanographic components of the Warning System. It will also define the technology to be used for warning delivery at regional, national and local levels. The draft system may include technical details like localization of buoys, upgrade to real time of existing systems, linkages between global and regional systems. It will, as well, provide an updated budget for establishing, maintaining and running a basic tsunami observing system within a multi-hazard observing system.

Group 2: Organizational aspects of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions — This group will define the roles of regional institutions and organizations serving as Tsunami Warning Centres in each country, with particular focus on training needs and staff reinforcements. It may advance proposals for the number and composition of sub-regional components, the requirements for defining procedures for information exchange between the International System and the National Agency and, next steps, to reach regional agreement.

Group 3: Awareness and preparedness actions for a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions — This group will define a limited number of regional training centres responsible for providing support to National Agencies in charge of emergency procedures dealing among others with tsunamis hazards. It will also prepare plans for sensitise local populations about tsunami risk. It will include territorial and urban planning inclusion for tsunami and other hazards risk.

5.2 MEETING OF DRAFTING GROUPS

The drafting groups met on Thursday 2 June 2005. They started business by electing a Chair who was requested to prepare a summary report of the deliberations.

The Chairs of the drafting groups were:

Group 1 (Technical aspects of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions): Mr Gustavo Malave (Venezuela)

Group 2 (Organizational aspects of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions): Ms Lorna Inniss (Barbados)

Group 3 (Awareness and preparedness actions for a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions): Mr Leonard Nurse (Barbados)

5.3 REPORT BY THE DRAFTING GROUPS

The reports shown below are the composite result of the reports drafted and agreed upon by the drafting groups and the plenary discussions that took place on Friday 3 June 2005. Individual interventions by country or organization representatives are not reflected hereafter.

Report of Drafting Group 1: Technical aspects of a Caribbean Tsunami and Coastal Hazards Warning System

Chairman: Gustavo Malave Flip Chart writer: David Green Rapporteur: Doug Wilson

Members: Tad Murty – Canada Doug Wilson – IOCARIBE-GOOS Zahibo Narcisse – France Griselda Marroquin – El Salvador/SNET Gustavo Malave – Venezuela/FUNVISIS Arnulfo Sanchez – Panama Luis Santos – Guatemala / INSIVUMEH Omar Lizano – Costa Rica/CIMAR Jim Dewey – USA David Green – USA Charles McCreery – PTWC Carlos Gutierrez – Mexico Roberto Perez – Cuba Savi Narayanan – Canada

Group agrees on 'Tsunami and Coastal Hazards Warning System' as an appropriate name —important to keep tsunami focus and include other relevant coastal hazards.

What are the technical aspects that need to be considered?

- Seismic
- Sea Level
- Modelling
- Buoys
- Data Management
- Delivery of Warnings
- Research

Seismic Existing capabilities

Numerous countries have seismic networks, and there are regional networks like UWI SRU as well. All have varying degrees of sensors —short period (e.g., for monitoring volcanic activity, less expensive) and broadband (longer period, more relevant to tsunami), also 'strong motion' sensors.

- USGS will be installing/upgrading 9 broadband real-time systems,
- Nicaragua does have some broadband but we don't have specific information,
- They also have varying degrees and methods of real time reporting,

• Coverage of the necessary real-time broadband sensors is inadequate, but that a great deal of expertise is available.

Priority: An initial network of interconnected real-time broadband seismometers.

Action:

- Conduct an Inventory —identify all systems, sensors and their characteristics, including data needed for cost-benefit analysis,
- Use information to design initial system,
- Leadership: Venezuela and Trinidad,
- Will poll region on inventory and information needed to coordinate, results by July PR seismic meeting,
- Conduct a workshop by September to consolidate information and design system,
- Resolution needed at IOC to get high level approval (particularly for real time data sharing issues),
- Additional task —consider implementation of TREMORS software regionally,
- Sea Level.

Sea Level Existing capabilities

As reported by IOCARIBE-GOOS, an adequate network for tsunami/coastal hazard purposes could be developed through upgrades and rehabilitation of existing sites, and installation of some new instruments. This action needs to be undertaken by a single regional coordinating body.

Priority: An initial network of interoperable real-time tsunami capable sea level gauges.

Action:

- Identify existing instrument systems and status and sites for upgrades, including data needed for cost-benefit analysis,
- Use information to design initial system and develop implementation plan,
- Leadership: IOCARIBE–GOOS will move forward on this through development of a regional sea level network as part of its implementations plan,
- Meeting of partners —network stakeholders, technical experts, and programmes (GLOSS, etc) by September2005.
- Resolution needed at IOC to provide support for IOCARIBE-GOOS activities to develop this network as part of warning system.

Modelling Existing capabilities

Several institutions and individuals have versions of tsunami propagation models, many others have varying degree of coastal modelling capability. In general, availability of near shore bathymetry and coastal topography is unknown.

Priority: High resolution Bathymetry.

Action:

- Request IOC/IHO to resolve by country existence and access to national data,
- Does it exist?
- Where is it?
- Is it available (to users within the country)?
- If it does not exist, what is capability to acquire?
- Responsibility —to be determined, may be responsibility of overall implementing organization or require coordinator,
- Small Working Group (Group of Experts?) form to develop parameters for community model.

Priority: Inundation modelling

Action:

- Working group to consider implementation —perhaps developing regional coastal,
- modelling centre(s),
- Resolution needed to IOC that I-GOOS consider the Caribbean region for implementation of their 'Global Storm Surge' pilot programme.

Buoys Existing capabilities

United States to install five DARTs by end of Fiscal Year 2006.

Others —Venezuela, United States, and Panama— have or will have near shore primarily meteorological buoys or coastal stations.

Priority: Support DART deployments as possible,

Identify and attempt to coordinate data dissemination from coastal buoys.

Action:

• Consider through IOCARIBE-GOOS activities

Data Management capabilities

Widely varying capability but strong intergovernmental support available —GOOS, JCOMM, GLOSS, ODINCARSA, IODE, etc.

Priority: Facilitate local access to local and regional data, and capacity building for development of use of products (necessary for sustainability).

Action:

• Identify groups dealing with data,

- Training session for common metadata, standards and software,
- Determine needs —hardware? Data delivery/visualization? Product development?
- Carried out through partnerships between data proving groups, data users, private partnerships, and intergovernmental organizations —may need organizing through implementing agency.

Delivery of Warnings and Information Existing capabilities

Priority: Identification of contact points and responsible organization for hazard warning in each nation primary and secondary contacts.

GTS access assessment by country WMO/IOC has committed in Indian Ocean to insuring all countries have GTS access —starting with assessment. Will they do this in the Caribbean?

Action:

• IOC resolution requesting WMO address these issues in coordination with implementing agencies.

Research Existing capabilities

Universities, national labs, private research.

Priority: Survey of research plans and needs, Determine applied priority research needs

Action:

- Tsunami scenario models
- Applications of existing science (models, etc) to storm surge and other models
- Paleo tsunami studies
- Geological structural
- Slump sources
- Address through Tsunami and other Group of Experts

The Group agreed that an urgent task is to continue the dialogue among experts with the aim of providing a clear roadmap for implementation. It should contain (a) agreement on measures for establishing an interim warning system for the region; (b) a set of actions that can be undertaken in the near-term (2005-2006) to establish a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions; and (c) longer-term actions (2005-2008) required to implement a comprehensive, robust and durable warning system.

Toward this goal, the Group agreed that several *ad hoc* teams could be formed subsequent to this meeting to further elaborate and define the actions suggested in this Report.



Caribbean Sea Level Network

Status reported GLOSS IX 02/05

Figure 1: Caribbean Sea Level Network

Report of drafting Group 2: Organizational aspects of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions

The Terms of Reference for this group were to:

- Define the roles of regional institutions and organizations serving as Tsunami Warning Centres in each country, with particular focus on training needs and staff reinforcements.
- Advance proposals for number and composition of sub regional components, requirements for defining procedures for information exchange between the International System and the National Agency and next steps to reach regional agreement.

In the context of a Caribbean regional system composed of an integrated network of responsible institutions, four issues needed to be addressed:

- 1. Tangible benefits provided to users, leaders, stakeholders, etc.
- 2. Existing capabilities and institutions that can contribute to the network, development of partnerships.
- 3. Priorities for implementation.

4. Strategy for implementation, action plan, including obtaining institutional commitments, leadership, coordination, and sustainability.

Chair: Lorna Inniss Rapporteur: Jean Weaver

Mmebers:	
Alejandro Gutierrez	IOI —osta Rica
Luis Gomez	Honduras
Michel Rosengus	Mexico/WMO
Hugo Hidalgo	WMO
Hernan Perez-Nieto	Venezuela, MRE CNO
Brad Brown	IOCARIBE
Jean Weaver	USGS, USA
Clair Blong	FEMA, USA
Claudio Gutierrez	CEPREDENAC
Roy A. Watlington	USVI
Lorna Inniss	Barbados

Specific Action Items identified by the group:

- 1. Identify the organization within Member States which will act as Focal Point for the Early Warning System (Deadline —30 days by IOCARIBE)
- 2. Identify the appropriate agency tasked with the responsibility to issue an alert, understanding that this agency may differ from that identified in Item One. (30 days by IOCARIBE).
- 3. Identify all information sources (E.g. sensors, stations) available in the region, including what may be contained in the Chairman's report to the IOCARIBE-GOOS Steering Committee.
- 4. Facilitate the development of national frameworks to simplify integration into the regional system (For example: encourage Member States to join national GOOS or National Oceanographic Committees)
- 5. Identify areas of high risk for natural hazards that may be developed as the first phase planning for improving warning system components: (1 year IOC to lead)
 - a. Puerto Rico trench
 - b. Area around Kick 'em Jenny
 - c. Cayman Trench

(It is noted that the first two sites identified have on-going work or coverage. These three sites may be considered during the sighting of dart buoys).

6. Convene a meeting of disaster managers identified (in point 2), along with technical experts, donors, major tourism players, representatives of cruise lines, the oil industry and the insurance risk sector within the next 6 months (IOCARIBE), so that the technical experts can begin to share information on the system, understand how such information can interface with the disaster management plans being developed, and involve the industries which have a stake in the process (The Delegate of Venezuela made a preliminary offer to host this meeting).

- 7. Request IOC-UNESCO to develop bi-lingual educational materials for public awareness educational programs (IOCARIBE).
- 8. Request IOCARIBE to develop a web page with available bi-lingual educational material. (A number of programmes have already developed such materials and they are available).
- 9. Assimilate existing bathymetric information (near shore) from each jurisdiction where available. Data can then be used locally and regionally by modellers. Each agency identified in No. 2 can be a collection point for the data and information required by researchers.
- 10. Request IOC to consider post-graduate scholarships in areas where members deem expertise to be deficient.
- 11. Implement by IOCARIBE an interdisciplinary Latin America and Caribbean Universities consortium focusing on marine and coastal issues, including natural hazards challenges of the region, as a support for the IOCARIBE Secretariat in its work.
- 12. Require real-time feed back from communities to improve models; it is noted that eyewitness observations help to complete historical data. These data must be transmitted to the regional system.

Role of Regional Warning Centre

The group agreed that there should be one regional warning centre and a series of national centres that receive the data and information from the Regional Centre. The centre must: conduct its activities and include the following:

- create a historical data base of events
- run models
- develop series of scenarios
- collect and analyze data & information
- issue notices and bulletins
- disseminate info and immediate forecast through different media

Capabilities Requirements for the Region Include:

- a seismological network
- an oceanographic network
- (supported by seismologists, oceanographers and geologists)
- capacity building for public awareness and education (training of trainers)
- public education and awareness across all sectors including media tourism, private, coastal residents
- reliable communication systems telephone lines, web etc.
- specialized technicians required for natural hazards
- National Emergency Operations Centre 24 hour surveillance not necessarily civil protection (depends on each country)
- Information processing tools (GIS capabilities)

• instrumentation and equipment for the system at national level

Tangible benefits

- enrichment of knowledge of individuals
- great academic value
- enhancement of regional organization
- raises public awareness/institutional credibility
- promotes social stability
- facilitates sustainable economic development

The group agreed on the following additional issues:

- 1. Data must be shared by all Member States and researchers in real time —open access is a necessity.
- 2. There must be a national commitment on the part of Member States to respond to the transmitted information.
- 3. Alerts should only be issued by designated national government entities as defined by Item Two in the list of Action Items. Such a standardized system promotes accuracy, credibility and consistency in the way information and data is disseminated.
- 4. The Regional Centre issues warnings, and the National Centres issue alerts and activities alarms.
- 5. Each Member State, irrespective of levels of resources, has capabilities: For example, personnel, equipment (boats), technical expertise. All member states must be engaged in the process of maintenance required to keep the system going.
- 6. Each country requires some equipment and instrumentation for observation stations to help ensure accurate data capture for regional support.

<u>Regional Institutions</u> —It was agreed that this list should be collated and updated as the system progresses and that universities and NGOs can make a commitment to participate in the scientific research for the warning system.

University of the West Indies University of Puerto Rico University of the Virgin Islands University of Costa Rica Universidad de Oriente/Instituto Oceanográfico de Venezuela Dirección de Hidrografía y Navegación Fundaciòn de Investigaciones Sismologicas (FUNVISIS) Instituto Geografico de Venezuela United Nations Environment Program (Regional Seas Office, Jamaica) CIOH Centro de Investigaciones Oceanográficas e Hidrográficas

Report of drafting group 3: Awareness and preparedness actions for a Caribbean Tsunami and Coastal Hazards Warning System

Leonard Nurse (Chair), Barbados George Maul (Rapporteur), IOCARIBE

Members: Riviere Sebastian, Dominica Eugenio Alarcón, Colombia Mike McCoy, USA Bob Jubach, USA Hamlin Jordan, Venezuela Artemio Gallegos, México Lloyd Lynch, Trinidad and Tobago Jóse Luis Peña, México Ellen Prager, USA

The United Nations has been committed for over 10 years to promote policies to reduce loss of lives and property from natural and man-made disasters. These efforts have continued from the International Decade for Natural Disaster Reduction, through the succeeding International Strategy for Disaster Reduction (ISDR) and the establishment of the UN Task Force on Disaster Reduction.

An effective Tsunami and Coastal Hazards Warning System for the Caribbean can be supported by UN efforts in its natural disaster reduction programmes as awareness and preparedness, together with channels of warning delivery, are common to all natural hazards mitigation programmes. Like many other UN initiatives, the Tsunami and Coastal Hazards Warning System for the Caribbean will be people centred and will promote broader community participation. The Tsunami and Coastal Hazards Warning System for the Caribbean will also be based on a multi-hazard approach that will integrate a tsunami warning and mitigation system with other coastal-based natural hazards for efficacy and usefulness to the public.

An effective awareness and preparedness programme for a Tsunami and Coastal Hazards Warning System for the Caribbean will require focus and action in the following broad areas:

- Risk and vulnerability assessments and applications;
- Awareness and education;
- Preparedness and emergency response capacities.

The impact of tsunamis and other hazards can be substantially reduced through institutional and legislative frameworks as well as community participation. This requires that people are well informed and motivated towards safety measures and actions that require:

- 1. Collection, compilation and dissemination of relevant knowledge and information on hazards and vulnerabilities; existing capacities for awareness raising; educational resources (globally, regionally, nationally, locally); and lessons learnt from past disasters;
- 2. Clear and easily understood structures of responsibilities at local, national and regional levels;
- 3. Policies and practices to reduce disaster impact and risk with reference to land use zoning, construction activities, leasing, purchasing & sale of land, forestry and farming;

- 4. Community-wide understanding of their risks; knowledge, behaviour and practices required for safety actions; community engagement in risk assessment and risk management; and
- 5. Information that is easily understood by all levels of societies and all communities.

In addition, <u>countries need to identify one disaster management national focal point</u> for increasing tsunami/multi-hazard public awareness. The focal point of each country, together with other relevant agencies, should plan and implement the actions detailed in the following sections. Finally, the measures detailed below can only be implemented and be effective through strong and ongoing commitments of legislative, financial, and other relevant institutional support of national governments, and the support of the international community.

Hazards	Agencies	Target Group	Predictive Time- scale	Costs	Benefits
Tsunami; Earthquakes; Volcanoes; Landslide; Liquefaction	SRU (UWI-SA) FUNVISIS (Ven) PRSN (UPR-M) VeneMET (Ven) EU (UWI-M) NOAA (PR&VI) USGS (PR&VI) FEMA (PR&VI) CENAPRED (Mex) SNPAD (Col) CDERA CEPREDENAC CEP (UNEP) METEOFRANCE National Defense Coast Guard OTHER	Coastal residents; Users of coastal facilities; Ports; Tourism; Fisherfolk; Airports; Industry; Municipalities; Agriculture; Children and Schools; Media; Other	Minutes to hours	Loss of human life; Property; Economies; Opportunities; Social and political instability; Infrastructure loss; National GDP; Public Health	Protection of Human Life and Property; Economic Viability and Protection; Environmental Protection; Enhancement of Investment Opportunities; Social, Institutional, and Political Stability
Storm Surge; Wind; Flooding; Waves; Swell; Rogue- waves	VeneMET (Ven) NOAA (PR&VI) USGS (PR&VI) FEMA (PR&VI) CENAPRED (Mex) SNPAD (Col) CDERA CEPREDENAC CEP (UNEP) METEOFRANCE CIMH National Met Services OTHER	Coastal residents; Users of coastal facilities; Ports; Tourism; Fisherfolk; Airports; Industry; Municipalities; Agriculture; Children and Schools; Media; Other	Hours to Days	Loss of human life; Property; Economies; Opportunities; Social and political instability; Infrastructure loss; National GDP; Public Health	Protection of Human Life and Property; Economic Viability and Protection; Environmental Protection; Enhancement of Investment Opportunities; Social, Institutional, and Political Stability
Harmful Algal Blooms ⁻	VeneMET (Ven) NOAA (PR&VI)	Coastal residents; Users of coastal	Hours to weeks	Loss of human life [.]	Protection of Human Life

Identify Tangible Benefits provided to Users, Leaders, Stakeholders, etc.

Hazards	Agencies	Target Group	Predictive Time- scale	Costs	Benefits
Spills [.]	USGS (PR&VI)	facilities [.]	beule	Property.	and Property.
Rip Currents.	FEMA (PR&VI)	Ports [.]		Economies.	Economic
Contamination	CENAPRED	Tourism:		Opportunities:	Viability and
Erosion;	(Mex)	Fisherfolk;		Social and	Protection;
Slumping	SNPAD (Col)	Airports;		political	Environmental
1 6	CDERA	Industry;		instability;	Protection;
	CEPREDENAC	Municipalities;		Infrastructure	Enhancement
	CEP (UNEP)	Agriculture;		loss;	of Investment
	METEOFRANCE	Children and		National	Opportunities;
	CIMH	Schools;		GDP;	Social,
	National Met	Media;		Public Health	Institutional,
	Services	Other			and Political
	OTHER				Stability
Climate and	VeneMET (Ven)	Coastal and	Season to	Loss of	Protection of
Sea Level	NOAA (PR&VI)	Riverbank	decade to	Property;	Proterty;
Change	USGS (PR&VI)	residents;	century	Economies;	Economic
	UNAM (Mex)	Ports;		Opportunities;	Viability and
	CEP (UNEP)	Tourism;		Social and	Protection;
	IOCARIBE	Airports;		political	Environmental
	METEOFRANCE	Industry;		instability;	Protection;
	WMO	Municipalities;		Infrastructure	Enhancement
	CIMH	Agriculture;		loss;	of investment
	National	Children and		National	opportunities;
	Meteorological	Schools;		GDP;	Social,
	Services	Media;		Public Health	institutional,
	OTHER	Other			and political
					stability

Identify Tangible Benefits provided to Users, Leaders, Stakeholders, etc.

Existing Capabilities and Institutions that can contribute to the Network

Partnerships between:

- Existing Agencies and Organizations
- Public Institutions and Governments
- Private Sector
- Humanitarian Organizations and Religious Institutions,
- Formal and Informal Education
- NGOs
- Charitable Foundations
- Media (TV, Radio, Print, Internet)
- Donor Institutions
- Target Audience

Priority Actions and Targeted Groups

- Those who are most exposed (Coastal Residents, Workers, Visitors) -Group
- Dissemination of Reliable and Consistent Information —Action
- Emergency Response Agencies —Group
- Building Disaster-Resistant Communities —Action
- Most vulnerable groups (aged, young, hospitalized, restricted mobility) —Group
- Information Access (MOUs) —Action
- Critical Infrastructure and Services —Action
- Legal and Regulatory Reform and Support —Action
- Schools, Churches —Group
- Industry (Tourism, Transportation, Power, Manufacturing, Hospitals) ---Group
- Risk Assessment and Management Plans —Action
 - \circ Reduction
 - \circ Response
 - o Recovery
 - Economic Impact
- Medical, Social, and Psychological Services —Group
- Inundation Mapping and Scenario Modelling —Action

Strategy for Implementation

- Multilingual and Multicultural Context —Regional/Local
 Historical Setting
- Clearinghouse for Educational Materials Regional
 - Capitalize on Existing Networks
 - Leveraging ICT
- Secure Budgets (Educate Politicians, Civil Servants, General Public) Regional/Local
 - o Identify Stakeholders, Inform, and Solicit Support
 - o Develop Sense of National Responsibility
 - Sustainability —political will
- International Funders Regional
 - Regional Disaster Management Agencies Coordinate Access to Funding (e.g. CDERA and other equivalent agencies)
 - Post-disaster coordination and recovery (e.g. OFDA)
 - Private Foundations
- Inform those at Risk —Local
 - o Signage
 - Evacuation routes
 - o Alarms
 - o First Responders
 - Inundation Maps (from storm surge maps)
 - Telephone Directories
 - Hotel Guest Information Kits
 - Cruise-Ship Passenger Information Kits
 - Tourism Booklets (e.g. town maps)
 - School Programs
 - Theater and Music
 - o Advertisements

- o Community Programmes and Literature
- Regular Simulation Exercises Regional/Local
 - Communication equipment tests and drills
 - Updating of information —e.g. change of telephone numbers etc.
- Media Regional/Local
 - o Workshops with Experts before Events
 - Write Guest Editorials
 - Provide basic graphics
 - Provide "Expert List"
 - o Public Service Announcements and Fact Sheets
 - Internet Blogging
- Windows of Opportunity —Regional/Local
 - Select strategic times
 - Press conferences
 - Announcements of Funding Availability
 - o Integrate with other Hazard Awareness Conferences
- Culture of Coastal Hazards Awareness —Local
 - Children and Schools
 - Ramifications of Negligence
 - Elections Issue
- Integrate with Global Efforts Regional
- Evaluation and Monitoring —Local

5.4 DISCUSSIONS AND ADOPTION OF THE UPDATED DRAFT DESIGN PLAN, WORK PLAN AND TIMETABLE

Cesar Toro, The IOC (UNESCO) Secretary for IOCARIBE Secretariat introduced this agenda item. He presented the Action Plan approved by the International Conference for the Development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions.

ACTION PLAN

I. General Issues, as noted in the Communiqué

- IOC/UNESCO Secretariat shall ask Member States to provide contact points and contact methods for receiving interim tsunami warning guidance bulletins by July 1, 2005.
- IOC/UNESCO Secretariat shall request the Pacific Tsunami Warning Centre to extend its warning guidance to the Wider Caribbean Region on an interim basis until such time as this capability can be managed independently within the region, and shall request IOC (UNESCO) to provide support as needed for this urgent and critical activity.
- The IOC Assembly shall establish, in accordance with its rules of procedure, an Intergovernmental Coordination Group for the Caribbean Tsunami and Coastal Hazards Warning System to govern the system. Such a group will be composed of IOC Member States and regional organizations from the Wider Caribbean Region (WCR). All the other Members of the IOC, as well as concerned international and regional public and private sector organizations, will be welcome to participate. An interim leadership group shall be named.

• IOCARIBE shall expand the IOCARIBE Tsunami Steering Group of Experts into an interdisciplinary Tsunami and Coastal Hazards Group of Experts (TCHGE), name an interim steering committee, and organize a meeting of this group before 1 December 2005.

II. Recommendations by Working Groups

Group I – Technical Aspects of the System

Seismic Network Description and Inventory

- A subcommittee of the Tsunami and Coastal Hazards Group of Experts (chaired by Lloyd Lynch and Gustavo Malave) will identify regional systems, sensors, and their characteristics, including data needed for coordination and cost-benefit analysis. Initial results will be reported at the July 2005 Caribbean Geology Conference in Puerto Rico.
- The Group will conduct a workshop by September 2005 to consolidate the seismic system design and components and plan for real-time data sharing issues.

Sea Level Network

- The existing IOCARIBE-GOOS Steering Committee will take steps to establish a sustained, real-time reporting Sea Level Network for the Caribbean with adequate distribution, accuracy, and reporting frequency to be a component of the Tsunami and Coastal Hazards Warning System. The SC will:
- Complete the IOCARIBE-GOOS assessment of the existing sea level resources and submit it to IOCARIBE;
- Convene a workshop to bring together all regional parties interested in establishing a Caribbean Sea Level Network;
- Develop an implementation and funding plan by 1 January 2006, including a list of prioritized sites.

Tsunami and Coastal Hazard Modelling

Regional modelling capability must be enhanced to support local hazard mitigation and planning and to integrate coastal hazards and broader coastal management programmes. The IOCARIBE Tsunami and Coastal Hazards Group of Experts should address the following, through designated subcommittees if necessary:

• An inventory of existing regional and coastal bathymetric data must be performed. Collaborate with the IOC International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA) programme to make regional bathymetry available to all regional modelling researchers in appropriate form. Submit request to individual countries in region through IOC/IHO to determine existence and status of coastal bathymetry and topography data. What data exist?

Where is it located and in which forms?

Is it available (to users within the country)?

The IOCARIBE Tsunami and Coastal Hazards Group of Experts should submit this report by 1 April 2006.

Additionally, two complementary components to the development of an effective global warning system for large, earthquake-generated tsunamis, that will help avoid repeating the recent tragedy, were identified: 1) enhancement of the global monitoring and quantification of earthquakes in real time, and 2) coordination of information distribution from the earthquake and tsunami data processing centres to the local governments, and from the local governments to the local populations.

Accurate and rapid seismological information is a key component of an effective global tsunami warning system, which cannot be provided without strong coordination among international infrastructure efforts. At the national scale, efforts should be directed towards improving the distribution of state-of-the-art strong motion and broadband sensors, both on land and on the sea-floor, and the collection of data in real time, sustained over decadal time frames. At the international scale, the national efforts must commit to the free exchange of well characterized waveform data in real time, according to standardized protocols, and contributing with these data to globally coordinated state-of-the-art processing and analysis systems. The information should be progressively updated, merged with other data as the tsunami progresses, and distributed back to national and local governments and populations.

During the plenary discussions it was emphasized that many countries in the Caribbean region are developing countries that will need substantial capacity building efforts to enable their full benefit from a tsunami warning and mitigation system.

6. DONORS SUPPORT & FINANCIAL ASPECTS

Ms Hélène-Marie Gosselin, Director of the UNESCO Office for the Caribbean introduiced this agenda item. She invited representatives of Member States and Organizations to make brief presentations on the current status of planned activities related to tsunami warning and mitigation.

During discussions multilateral development banks such as the Interamerican Development Bank (IADB), and the Caribbean Bank, World Bank were identified as potential donors and financial support sources. Also some International Development Aid Agencies from Canada (CIDA), Japan (JICA), Norway (NORAD), Sweden (SIDA) and United States (USAID) have been playing significant role in the disaster management and rehabilitations of affected zones after a natural disaster, particularly, hurricanes impact.

7. CLOSURE OF THE MEETING

Mr Marco Polo Bernal-Yarahuan, IOCARIBE Chairman, thanked the speakers and other participants for their valuable contributions. He also extended his appreciation to local organizing committee and local staff for their collaboration and support organizing the meeting. The Chairman closed the meeting on Friday 3 June 2005 at 18:00 hours.

7.1 CONCLUSIONS AND OUTCOMES

7.1.1 Communiqué

In order to summarize the discussions held throughout the Meeting during the information sessions (agenda items 3, 4, 5), and particularly during the session of the drafting groups and the plenary discussions thereafter, the Meeting decided to adopt a communiqué as

included below in <u>Annex IV</u>. This document is intended to provide guidance to all partners regarding the required actions that will lead towards the establishment of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions.

The Meeting adopted the "Communiqué of the International Conference for the Establishment of a Tsunami and Coastal Hazards Warning System for the Caribbean and Adjacent Regions held in Mexico City on 1-3 June 2005".

IOC Workshop Report No. 199 Annex I

ANNEX I

AGENDA

1. **OPENING**

- 1.1 OPENING ADDRESS BY IOC OF UNESCO
- 1.2 MESSAGE FROM THE INTERNATIONAL STRATEGY FOR DISASTER REDUCTION (ISDR)
- 1.3 MESSAGE FROM THE WORLD METEOROLOGICAL ORGANIZATION (WMO)

2. ADMINISTRATIVE ARRANGEMENTS

- 2.1 INTRODUCTION OF THE MEETING
- 2.2 DOCUMENTATION AND PRACTICAL ARRANGEMENTS

3. TSUNAMI WARNING AND COASTAL HAZARDS SYSTEMS FOR THE CARIBBEAN SEA AND ADJACENT REGIONS. REVIEW OF EXISTING CONTRIBUTIONS

- 3.1 BRIEF INTRODUCTION OF THE SESSION
- 3.2 BACKGROUND
- 3.3 THE TSUNAMI WARNING SYSTEM FOR THE IAS
- 3.4 THE CENTRAL AMERICAN TSUNAMI EARLY WARNING STRATEGY
- 3.5 THE CARIBBEAN DISASTER EMERGENCY RESPONSE AGENCY (CDERA)
- 3.6 RECENT EXPERIENCES IN EVACUATION TRIALS IN CASE OF A TSUNAMI. COLOMBIA
- 4. THE TSUNAMI WARNING SYSTEM FOR THE CARIBBEAN SEA AND ADJACENT REGIONS WITHIN A MULTI-HAZARD OBSERVING AND WARNING SYSTEM AND A GLOBAL FRAMEWORK.
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 - 4.2 ROLE OF THE INTERNATIONAL TSUNAMI INFORMATION CENTRE (ITIC)
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 - 4.3 THE ROLE OF IOCARIBE-GOOS IN A MULTI-HAZARD OBSERVING AND EARLY WARNING SYSTEM. CONTRIBUTION OF THE TSUNAMI WARNING AND COASTAL HAZARDS SYSTEMS FOR THE CARIBBEAN SEA AND ADJACENT REGIONS TO THE GLOBAL TSUNAMI WARNING SYSTEM AND ITS LINKS TO THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS

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ANNEX II

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ANNEX III

SPEECHES

Message from Reid Basher, Coordinator, ISDR Platform for the Promotion of Early Warning, (ISDR), Bonn, Germany United Nations secretariat for the United Nations International Strategy for Disaster Reduction

Distinguished guests and participants,

We remain in shock at the devastation wrought upon the coastal communities of the Indian Ocean rim on that fateful day of 26 December 2004, when the Earth's crust ripped along a 1000 kilometre fault line producing a massive tsunami that without warning swept away hundreds of thousands of people. We stand in solidarity and support for the millions of people affected through the loss of loved ones and the loss of livelihoods from this terrible event.

The immense natural forces of the Earth, whether expressed by pleasant tropical climate and lush vegetation, or by earthquake, tsunami, hurricane and flood, are part of the dynamic character of our planet and provide the foundations for our human existence. These are things that the people of the Americas have close and often uncomfortable experience of. The awesome power of the ocean when disturbed is something that now no one can ever doubt.

The World Conference on Disaster Reduction, organised by the ISDR secretariat and held in Kobe, Hyogo Prefecture, Japan, over 18-22 January 2005, reviewed the global state of disasters and disaster reduction and concluded that a much more systematic approach was needed to stem the growth of disasters. Disasters are impeding the achievement of development goals in developing countries and causing high financial losses in developed countries.

Many months of negotiations among countries concluded at the conference what is now called the *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. This is a comprehensive plan of priorities and action agreed by governments – the plan to address the fundamental factors that we know can substantially cut the disaster toll.

The ISDR partners and secretariat – the ISDR system – call upon all organisations to take up the Hyogo Framework for Action as their respected guide to implementing the reduction of disaster risk. The ISDR system is already working on specific tools such as indicators to help guide and support practical action by governments and organisations. An important element of the Hyogo Framework is the development of systematic and people centred early warning systems.

The countries of the Indian Ocean are now engaged in intensive discussions and national action plans to develop a tsunami early warning system for their region. They are being supported by the United Nations in this effort, particularly by UNESCO's Intergovernmental Oceanographic Commission (UNESCO-IOC), which has 40 years of experience in tsunami warning systems in the Pacific Ocean, by the World Meteorological Organization (WMO), which has even longer experience in weather hazards and operates essential monitoring and warning systems throughout the world, and by the ISDR Platform for the Promotion of Early Warning (PPEW).

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In particular, the ISDR Platform for the Promotion of Early Warning is administering a US \$11 million project to support the activities of not only these UN organisations, but also other UN entities, Asian disaster reduction and preparedness centres and many other groups. The aim is to develop an effective warning system that is well integrated into other natural hazard warning and preparedness systems and that is part of national risk management mechanisms.

As I am sure you are all aware, the time is ripe for similar efforts in Latin America and the Caribbean. The region's ocean scientists and disaster experts have long understood what is at stake and what needs to be done, and plans have been under formulation for many years. What is different now is that, with the Indian Ocean tragedy fresh in their minds, the policymakers and decision makers are ready to listen and act. Equally, donors are ready to support the region with funds and equipment.

This is a great window of opportunity for the region, calling for a strong and rapid action. It will require an awareness of the multiple hazards and vulnerabilities of the coastal region, and close linkages with disaster management practices. And it will require a coherent and comprehensive regional approach, orchestrated under the technical coordination of UNESCO-IOC and WMO, and integrated into the policies and mechanisms of the regional disaster reduction organisations CEPREDENAC and CDERA which are linked to the ISDR.

The ISDR and PPEW stand ready to assist the region as required. For example, PPEW funded the participation of United Nations University expert Juan Carlos Villagran to participate in the recent tsunami early warning meeting organised by CEPREDENAC in Managua. A Guatemalan, he brings his expertise of community-based early warning in this region as well as the international experiences and messages of the ISDR and its early warning community.

A rich set of important moves are being made this year to advance early warning systems. A global survey of early warning systems has been requested by United Nations Secretary General Kofi Annan, to identify how to develop early warning systems can cover all hazards and all countries. Germany has offered to host the Third International Conference on Early Warning in Bonn in March 2006. This will specifically focus on bringing to the table specific priority projects to implement. A new International Early Warning Programme (IEWP) was launched in Kobe to underpin coordinated action to improve early warning systems worldwide. The 10-year implementation plan of the Global Earth Observation System of Systems (GEOSS) begins in earnest this year and has early warning as a strong cross-cutting feature. PPEW and the ISDR are coordinating the survey, the conference and the IEWP and they actively support the GEOSS process.

In conclusion, I pray that your region will never be visited by a tsunami catastrophe like that experienced in the Indian Ocean, but I also pray that whenever the next tsunami does occur in Latin America or the Caribbean, you will be well prepared and disaster-resilient, with an effective people-centred early warning system that includes a well-informed public that knows how to respond to the warnings.

I wish you every success for this important meeting.

Message from Hugo Hidalgo, Programme Officer, WMO Sub regional Office for North America Central, Central America and the Caribbean

On behalf of the Secretary General of the World Meteorological Organization (WMO) and my own, I wish to express our appreciation for the opportunity to address this International Conference for the development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions.

This Conference is taking place at a time when the world's attention is dramatically drawn to the perennial concern of natural disasters, which threaten lives, livelihoods, development and security. We are all deeply grieved by the desolation and suffering of the millions of people devastated by the tsunami that hit Indian Ocean countries on 26 December 2004. The impacts of this disaster have reached staggering proportions in terms of the scale of human loss, associated damage, and number of countries affected as well as related response and recovery efforts.

However, the recent tsunami disaster has demonstrated in a dramatic fashion the need to intensify efforts to prevent natural hazards from becoming disasters. We need to develop jointly a clear vision, an effective integrated action plan and move forward together to prevent such disasters in the future. In this connection, the Conference offers a special opportunity that should be seized upon by the international community.

It is WMO's aim to halve the number of deaths due to natural disasters of meteorological, hydrological and climatic origin over the next 15 years, more specifically to reduce by half the associated ten-year average fatality from the period 1995-2004 to the period 2010-2019 for these disasters. WMO is already working towards the realization of this goal. For example, during one of the most intense tropical cyclone seasons in the Atlantic region in 2004, thanks to effective provision and dissemination of warnings, many lives were spared through timely evacuations and other disaster-preparedness measures. The challenge is to ensure that all countries, particularly the least developed countries and Small Island Developing States, have the systems, infrastructure, human capacity and organizational structures to develop and utilize early warning systems. Much can be achieved by deploying resources to strengthen pre-disaster systems for early warnings.

In particular, WMO is joining forces with all key partners, especially UNESCO and its IOC, to ensure that Tsunami Early Warning Systems will soon become a reality in the Indian Ocean and other regions at risk. The WMO Global Telecommunication System (GTS) that interconnects the National Meteorological and Hydrological Services provides tremendous potential for timely and reliable exchange of tsunami warning messages and related information among the appropriate government agencies. The Tsunami Warning System in the Pacific, established under the auspices of the IOC of UNESCO, already utilizes the WMO GTS in that region. WMO's extensive experience and capabilities in the development and operation of global early warning systems for other natural hazards will be crucial in accelerating the development of Tsunami Early Warning Systems for this Region as well.

The natural disaster prevention and mitigation has become one of WMO's most important activities and for this reason that WMO's Congress decides in 2003 to launch the **Natural Disaster Prevention and Mitigation Programme.** Also, a World Conference for Disaster Prevention was prepared in association with the International Strategy for Natural Disaster to take place in Kobe (Hyogo, Japan) January 2005.

The WMO Natural Disaster Prevention and Mitigation Programme provides a coordinated and integrated approach and —through synergistic partnerships at international, regional and national levels— strengthen WMO's contribution to disasters risk reduction. WMO is committed to ensure that its capacities are optimally provided and integrated to enable communities to take action, effectively and in the timeliest manner.

Three months after Kobe, the XIV Meeting of WMO's AR-IV, which comprises North America, Central America and the Caribbean, took place in San José, Costa Rica. In this meeting it was stressed the importance of establishing a tsunami early warning system for the region, which was given maximum priority. It is for this reason that WMO is very pleased with this International Conference for the development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions. We are sure that this Conference will provide the guidelines for action items permitting that the warning system to be soon a reality.

ANNEX IV

COMMUNIQUE

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International Conference for the Development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions (Hetel Seville Pelace, Méxice, DE, June 1, 2, 2005)

(Hotel Sevilla Palace, México DF, June 1-3, 2005)

The participants of the International Conference for the Development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, after an intensive three days of work and reflection and being aware of the immediate need to create and implement a tsunami warning system which facilitates the application of adequate and effective measures for the protection of the population and the economies of our countries to cope with the hazards and effects of the tsunamis and other natural phenomena, decided to issue the following:

COMMUNIQUE

Express our solidarity and support to the people affected by the devastating tsunami that occurred on 26 December 2004 in the Indian Ocean, as well as recognize the need to urgently develop a Global Tsunami Warning and Mitigation System.

Noting the results of the meetings recently held in Paris, Barbados, Managua and Jamaica where initiatives and ideas were sought towards the implementation of a global system and other sub-regional systems respectively.

<u>Recognizing</u> the leadership of the Intergovernmental Oceanographic Commission of UNESCO in the historical development of the International Tsunami Warning System in the Pacific (ITSU) and its status as a coordination mechanism for international cooperation, development, and implementation of a Global Tsunami Warning and Mitigation System and its respective regional components, among them the Caribbean system.

Further recognizing the long experience of the Richard H. Hagemeyer Pacific Tsunami Warning Center (PTWC) in Hawaii as the operational center for ITSU, and the fact that PTWC is already providing limited tsunami warning guidance to Puerto Rico and the US Virgin Islands;

<u>Considering that</u>, besides ongoing sub-regional and regional initiatives, it is necessary to address the mandate of all our member states for the development of a technical and political process facilitating the implementation of an integrated, coordinated, and sustainable regional system, which guarantees an adequate programme for detection and alert, mitigation, risk-evaluation, training, education and capacity building for all levels of society, as well as for scientific research.

<u>Acknowledging that</u>, despite present gaps of knowledge about tsunami risks and other natural hazards in our region, we have the obligation to act accordingly, bearing in mind that the essential problem is not a matter of "if" such natural phenomena will occur but "when" it will occur, considering that "when" could be any time in the future.

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<u>Acknowledging further</u> that the impacts of tsunamis and other natural hazards can be drastically reduced through the development of adequate legal, policy, and institutional mechanisms, including the strengthening of education and community involvement.

AGREE TO

Recognize and support the creation of an integrated, and sustained regional system for the detection, forecasting, warning, and mitigation of tsunami and other coastal hazards, that could contribute adequately to other international programmes such as GOOS of IOC (UNESCO) and through this, to GEOSS.

Approve and support the preliminary IOCARIBE Action Plan prepared by this meeting.

<u>Submit</u> for consideration by the Intergovernmental Oceanographic Commission of UNESCO, the IOCARIBE Integrated Regional Programme as a contribution to the ongoing Global Tsunami Warning and Mitigation System.

Recommend that the IOC Assembly establish, in accordance with its rules of procedure, an Intergovernmental Coordination Group for the Caribbean Tsunami and Coastal Hazards Warning System, which will govern the system. Such a group will be composed of IOC Member States and regional organizations from the Wider Caribbean Region (WCR). All the other Members of the IOC, as well as concerned international and regional public and private sector organizations, will be welcome to participate.

<u>Request</u> the Secretariats of the Intergovernmental Oceanographic Commission of UNESCO and the IOCARIBE Sub-Commission to allocate and search for necessary resources to implement the Action Plan as outlined at this meeting.

<u>Recommend</u> to expand the IOCARIBE Tsunami Steering Group of Experts into an interdisciplinary Tsunami and Coastal Hazards Group of Experts, and to organize a meeting of this group before the end of this year.

Further Request that the Group of Experts present to the IOCARIBE Sub-Commission the Action Plan mentioned before, with the special instruction to identify those actions that can be executed in the short term with the available resources at national and regional level including the support of possible donors.

<u>Recognize</u> that Member States have the responsibility to issue warnings within their respective territories.

<u>Request</u> PTWC to extend its warning guidance to the WCR on an interim basis until such time as this capability can be managed independently within the region, and request IOC (UNESCO) to provide support as needed for this urgent and critical activity.

<u>Request</u> IOCARIBE to ask Member States to provide by July 1, 2005 their contact points and contact methods for receiving the interim tsunami warning guidance bulletins.

Mexico City, 6 p.m., 3 June 2005.

ANNEX V

LIST OF ACRONYMS AND ABBREVIATIONS

ADCIRC	ADvanced CIRCulation Model
ASEAN	Association of Southeast Asian Nations
BMG	Meteorological & Geophysical Agency of Indonesia
CDERA	Caribbean Disaster Emergency Response Agency
CEPREDENAC	Central American Coordination Center for Disaster Prevention
CERMES	Centre for Resources Management and Environmental Studies
CIESM	International Science Commission for the Mediterranean
COPECO	Comision Permanente de Contingencias de Honduras
СРР	Cyclone Preparedness Programme
CRATER	Coastal Risk Analysis of Tsunamis & Environmental Remediation
СТВТО	Comprehensive Nuclear-Test-Ban Treaty Organization
DART	Deep Ocean Assessment & Reporting of Tsunamis
DART	Deep-Ocean Assessment and Reporting of Tsunami
DHS	Department of Homeland Security
DIPECHO	Directorate General (European Commission) for Humanitarian Aid
ERI	Earthquake Research Institute
ESA	European Space Agency
FDSN	Federation of Digital Broad-band Seismograph Networks
FEMA	Federal Emergency Management Agency
FUNVISIS	Fundacion Venezolana de Investigaciones Sismològicas
GEOSS	Global Earth Observation System of Systems
GEOSS	Global Earth Observing System of Systems
GLOSS	Global sea level Observing System
GMS	Geostationary Meteorological Satellite (Japan)
GNSS	Global Navigation Satellite System
GOOS	Global Ocean Observing System
GPS	Global Positioning System
GTS	Global Telecommunication System
GTS	Global Telecommunications System
IAS-TWS	Intra-Americas Sea Tsunami Warning System
IATF/DR	Inter-agency Task Force for Disaster Reduction

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IBCCA	International Bathymetric Chart for the Caribbean Sea and Adjacent Regions
ICDSN	Indonesia-China Digital Seismograph Network
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning & Mitigation System
IDC	International Data Centre
IHO	International Hydrographic Organization
IMO	International Maritime Organization
INETER	Instituto Nicaraguense de Estudios Territoriales
INSIVUMEH	Instituto Nacional de Sismologia, Vulcanologia e Hidrologia
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IOGOOS	Indian Ocean GOOS
IOI	International Ocean Institute
IRIS	Incorporated Research Institutions for Seismology
ISDR	International Strategy for Disaster Reduction
ISDR	International Strategy for Disaster Reduction
ITIC	International Tsunami Information Center (USA)
ITU	International Telecommunications Union
JAMSTEC	Japan Marine Science & Technology Center
JICA	International Cooperatng Agency of Japan
LME	Large Marine Ecosystems
NDMO	National Disaster Management focal point/Organization
NGO	Non-Governmental Organizations
NORTHCOM	US Northern Command
ODINAFRICA	Ocean Data Information Network for Africa
PMEL	Pacific Marine Environmental Laboratory
PTWC	Pacific Tsunami Warning System
SNET	Servicio Nacional de Estudios Territoriales del Salvador
TCHGE	Tsunami and Coastal Hazards Group of Experts
TREMORS	Tsunami Risk Evaluation through seismic Moment from a Real-time System
UN	United Nations
UNDP	United Nations Development Programme
UNESCAP	United Nations Economic & Social Commission for Asia & the Pacific
UNESCO	United Nations Educational, Scientific & Cultural Organization

UNGA	United Nations General Assembly
UNOOSA	United Nations Office for Outer Space Affairs
USGS	United Sates Geological Survey
USGS	US Geological Survey
UWI	University of the West Indies
WCDR	World Conference on Disaster Reduction
WCR	Wider Caribbean Region
WMO	World Meteorological Organization

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3	Report of the IOC/GFCM/ICSEM International Workshop on Marine Pollution in the Mediterranean; Monte Carlo, 9-14 September	E,F E (out of stock)	22	Liège, Belgium, 7-18 May 1979. Third IOC/WMO Workshop on Marine Pollution Monitoring;	e, f, s, r e, f, s, r	41	First Workshop of Participants in the Joint FAO/IOC/WHO/IAEA/UNEP Project on Monitoring of Pollution in	E
4	1974. Report of the Workshop on the Phenomenon known as 'El Niño'; Guayaquil, Ecuador,	E (out of stock) S (out of	23	WESTPAC Workshop on the Marine Geology and Geophysics of the North-West Pacific; Tokyo, 27-	E, R		West and Central African Region (WACAF/2); Dakar, Senegal, 28 October-	
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6	Resources; Kingston, Jamaica, 17-22 February 1975 Report of the CCOP/SOPAC-IOC IDOE International Workshop on Geology, Mineral Resources and	E	25	of Sampling Procedures of the IOC/ WMO UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open-Ocean	E (Supersede by IOC Technical Series	d 44	Vestern Mediterranean, Venice, Italy, 23-25 October 1985. IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities;	E (out of stock) S
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9	Pollution in East Asian Waters; Penang, 7-13 April 1976 IOC/CMG/SCOR Second International Workshop on Marine	E, F, S, R	28	FACILITIES, Value of the second secon	E	46	August 1986. Reunión de Trabajo para Desarrollo del Programa "Ciencia Occánica en Relación a los	S
10	Geoscience; Mauritius 9-13 August 1976. IOC/WMO Second Workshop on Marine Pollution (Petroleum)	E, F E (out of	29	Lima, 20 April-5 May 1980. WESTPAC Workshop on Marine Biological Methodology; Tokyo, 9-14 February 1981.	E		Recursos No Vivos en la Región del Atlántico Sud-occidental", Porto Alegre, Brasil, 7-11 de abril de 1986.	_
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11 Suppl	Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976. Collected contributions of invited	E (out of	32	Marine Geoscience; Heidelberg, 19-24 July 1982. UNU/IOC/UNESCO Workshop on Internetional Co-operations in the	e, f, s e, f, s	48	Regional Development of the IOC- UN (OETB) Programme on 'Ocean Science in Relation to Non-Living	E, 5
Suppi.	IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976	SIUCK), S		Development of Marine Science and the Transfer of Technology in the context of the New Ocean Regime; Paris, France, 27 September-1 October 1982.		49	Cuba, 4-7 December 1986. AGU-IOC-WMO-CPPS Chapman Conference: An International Symposium on 'El Niño'; Guavaquil. Ecuador.	E
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13	Report of the IOCARIBE Workshop on Environmental Geology of the Caribbean Coastal Area; Port of Spain, Trinidad, 16-18 January	E, S	33	Regime; Paris, France, 27 September-1 October 1982. Workshop on the IREP Component of the JOC Programme on Ocean	E	51	SCAR and SCOR); Paris, France, 2-6 June 1987. CCOP/SOPAC-IOC Workshop on Coastal Processes in the South Pacific Island Nations: Lae Papula.	E
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15	May 1978 CPPS/FAO/IOC/UNEP International Workshop on Marine Pollution in the South-East Pacific; Certification of the Sign 4 Development	E (out of stock)		operation in Marine Science in the Central Eastern Atlantic (Western Africa): Tenerife, 12-17 December 1963, CODI/COMPACTOR 1963	_,.,o	50	Upper Ocean and its Effects upon Living Resources and the Atmosphere; Paris, France, 6-10 May 1985.	F
16	1978. Workshop on the Western Pacific.	E. F. R	35	Workshop on Basic Geo-scientific Marine Research Required for Assessment of Minerals and	E	53	Effects of Pollutants; Oslo, 11-29 August 1986. Workshop on Sea-Level	E
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17	IGOSS Data Processing and Services System (IDPSS); Moscow, 9-11 April 1979, Papers submitted to the Joint	E	36 Suppl.	Vessels: Lisbon, Portugal, 28 May- 2 June 1984. Papers submitted to the IOC/FAO Workshop on the Improved Uses of	E	56	and Compilation, Boulder, Colorado, 18-19 July 1988. IOC-FAO Workshop on Doctrito Workshop on	E
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18	IOC/UNESCO Workshop on Syllabus for Training Marine Technicians; Miami, U.S.A., 22-26 May 1978	E (out of stock), F, S (out of Stock)	38	Gocan and Adjacent Seas and Gulfs; Colombo, 8-13 July 1985. IOC/ROPME/UNEP Symposium on Fate and Eluxes of Oil Pollutants in	E	58	operation in the Study of Red Tides and Ocean Blooms; Takamatsu, Japan, 16-17 November 1987.	F
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19	INC Workshop on Marine Science Syllabus for Secondary Schools; Llantwit Major, Wales, U.K.,	E (out of stock), S, R, Ar		of Submersibles and Remotely Operated Vehicles in the South Pacific; Suva, Fiji,		Suppl.	Warning Systems, Tsunami Analysis, Preparedness,	L

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59	USSR, 4-5 August 1989. IOC-LINEP Regional Workshop to	FFS		
55	Review Priorities for Marine	L, I , O	83	
	Control and Abatement in the		03	Colla
60	Rica, 24-30 August 1989.	E		Capa
00	IOCARIBE-TRODERP proposals;	E	01	12-13 Work
C 4	12-16 September 1989.	-	04	Clima
01	Biological Effects of Pollutants;	E		17 Ju
00	2 October 1988.	-	85	IOC \
62	in the Joint FAO-IOC-WHO-IAEA-	E		Integ
	Pollution in the Marine		~~	June
	Environment of the West and Central African Region; Accra,		86	Interr Black
63	Ghana, 13-17 June 1988. IOC/WESTPAC Workshop on Co-	E		Septe 4 Oct
	operative Study of the Continental Shelf Circulation in the Western		87	Taller
	Pacific; Bangkok, Thailand, 31 October-3 November 1989.			en eo Pacíf
64	Second IOC-FAO Workshop on Recruitment of Penaeid Prawns in	E		Santa 5-14
	the Indo-West Pacific Region (PREP): Phuket, Thailand,		88	IOC-0 Work
	25-31 September 1989.			Easte (GOD
65	Second IOC Workshop on Sardine/Anchovy Recruitment	E		Obnir 17-20
	Project (SARP) in the Southwest Atlantic: Montevideo, Uruguay.		89	IOC-I Scier
66	21-23 August 1989. IOC ad hoc Expert Consultation on	F		Perpi
00	Sardine/ Anchovy Recruitment	-	90	IOC S Mana
67	U.S.A., 1989	E (out of		New
01	Research Problems in the	stock)	91	Hydro
	Venezuela, 28 November-		02	1-10
68	International Workshop on Marine	E	92	sur le
<u></u>	March 1990.	-		occid
69	Sea-Level Measurements in the	E	93	LOC-I
00	Antarctica; Leningrad, USSR, 28- 31 May 1990.	-		Warn
69 Suppl.	Level Measurements in the	F	94	16-19 BMT
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70	1990. IOC-SAREC-UNEP-FAO-IAEA-	E		Eutro Seas
	Aspects of Marine Pollution;			Brem 29 Se
	Mauritius, 29 October - 9 November 1990.	_	95	Colla
71	IOC-FAO Workshop on the Identification of Penaeid Prawn	E		of Ma Capa
	Larvae and Postlarvae; Cleveland, Australia, 23-28 September 1990.			Ocea 23-25
72	IOC/WESTPAC Scientific Steering Group Meeting on Co-Operative	E	96	IOC-I Work
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	Kuala Lumpur; Malaysia, 9-11 October 1990.			Chan Zanzi
73	Expert Consultation for the IOC Programme on Coastal Ocean	E	96	Tanza IOC-I
	Advanced Science and Technology Study: Liège, Belgium, 11-13 May		Suppl.	Planr Integ
74	1991. IOC-UNEP Review Meeting on	E		Eroši Chan
	Oceanographic Processes of Transport and Distribution of			Subr 1. Co
	Pollutants in the Sea; Zagreb, Yugoslavia, 15-18 May 1989.			Unite
75	IOC-SCOR Workshop on Global Ocean Ecosystem Dynamics:	E	96 Suppl	IOC-I Plann
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76	IOC/WESTPAC Scientific Symposium on Marine Science and	E		their Subr
	Management of Marine Areas of the Western Pacific:			2. Se Unite
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77	IOC-SAREC-KMFRI Regional Workshop on Causes and	E		Ocea
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78	24-28 June 1991. IOC-CEC-ICES-WMO-ICSU Ocean	F	98	8-10 CoM9
10	Climate Data Workshop Goddard	-	00	and C
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79	IOC/WESTPAC Workshop on	E	33	on Nu
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	Malaysia, 26.20 November 1001		100	Work
80	IOC-SCOR Workshop on	E		(Glob
	Harmful Algae Blooms; Newport,			Tianji
01	U.S.A. 2-3 November 1991.	-	101	ioc f
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83	IOC Workshop on Donor Collaboration in the Development of Marine Scientific Research	E	104	Barba Work Mana 19-20
04	Capabilities in the Western Indian Ocean Region; Brussels, Belgium, 12-13 October 1992.	E	105	BORI Coas Franc
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85	IOC Workshop on Coastal Oceanography in Relation to Integrated Coastal Zone	E	106	IOC/V on the Indon IOC-I
86	Mañagement; Kona, Hawaii, 1-5 June 1992. International Workshop on the Black Sea; Varna, Bulgaria, 30	E		Work the In Dona 6-9 D
87	September – 4 October 1991 Taller de trabajo sobre efectos biológicos del tenómeno «El Niño»	S only	108 n	UNES Works the M
	en ecosistemas costeros del Pacífico Sudeste; Santa Cruz, Galápagos, Ecuador,	E, F, S)	100	Casp Paris 9-12
88	IOC-CEC-ICSU-ICES Regional Workshop for Member States of Eastern and Northern Europe (GODAR Project); Obninsk Russia	E	Suppl.	Work the M Envire Caspi Pape
89	IOC-ICSEM Workshop on Ocean Sciences in Non-Living Resources;	E	109	1995. First I Symp
90	15-20 October 1990. IOC Seminar on Integrated Coastal Management;	E	110	IOC-I for Medit
91	New Orleans, U.S.A., 17-18 July 1993. Hydroblack'91 CTD Intercalibration Workshop: Woods Hole, U.S.A.	E		(Glob Arche Found Studie
92	1-10 December 1991. Réunion de travail IOCEA-OSNLR sur le Projet « Budgets sédimentaires le long de la côte	E	111	Vallet Chap Circu Sea
93	ccidentale d'Afrique » Abidian, côte d'Ivoire, 26-28 juin 1991. IOC-UNEP Workshop on Impacts of Sea-Level Rise due to Global Warming, Dhaka, Bangladesh.	E	112	22-26 IOC-I on St Mater Miam
94	16-19 November 1992. BMTC-IOC-POLARMAR International Workshop on Training Pequirements in the Eield of	E	113	1993. IOC F Debri
95	Seas and Harmful Algal Blooms, Bremerhaven, Germany, 29 September-3 October 1992. SAREC-IOC Workshop on Donor	E	114	14-16 Intern Integr Mana Pakis
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96	23-25 November 1993. IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach	E	116	Franc IOC/V Scien Susta
96 Suppl.	to Coastal Erosion, Sea Level Changes and their Impacts, Zanzibar, United Republic of Tanzania, 17-21 January 1994. IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; Submitted Papers 1, Coastal Erosion; Zanzibar, United Republic of Tanzania 17-21	E	117	Envire WES Partic Indon 22-26 Joint Work Impro Intern Agen Multil Organ
96 Suppl	January 1994. IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts:	E	118	Fishe Sidne 26-28 IOC-U Fourt
07	2. Sea Level; Zanzibar, United Republic of Tanzania 17-21 January 1994.	-	119	Domi IOC V Data
97	Oceanography in Relation to Sustainable Economic Development and Coastal Area Management of Small Jeland	E	120	21-22 Intern Integr
00	Development States; Fort-de- France, Martinique, 8-10 November, 1993.	_	121	1995. Atelie sur la
90	and Chemical Intercalibration Workshop; Erdemli, Turkey, 15-29 January 1993.	E	122	18–22 IOC-E
35	on Nutrients in Tropical Marine Waters; Mombasa, Kenya, 5-15 April 1994.	-	100	Cherr Hamb 1996
100	Workshop for Member States of the Western Pacific - GODAR-II (Global Oceanographic Data	E	123	Plann Algal Mar d
101	Archeology and Rescue Project); Tianjin, China, 8-11 March 1994. IOC Regional Science Planning Workshop on Harmful Algal Blooms: Montavideo University	E	124	30 Oc GLOE Work Serie the C
102	First IOC Workshop on Coastal Ocean Advanced Science and Technology Study (COASTS);	E	125	1993. Atelie les re Golfe 1-4 ju

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103	Liège, Belgium, 5-9 May 1994. IOC Workshop on GIS Applications in the Coastal Zone Management of Small Island Developing States:	Е	
104	Barbados, 20-22 April 1994. Workshop on Integrated Coastal Management: Dartmouth, Capada	Е	
105	19-20 September 1994. BORDOMER 95: Conference on	Е	
105 Suppl.	France, 6-10 February 1995. Conference on Coastal Change: Proceedings; Bordeaux, France	Е	
106	6-10 February 1995 IOC/WESTPAC Workshop	Е	
107	Indonesia, 20-21 October 1994. IOC-ICSU-NIO-NOAA Regional Workshop for Member States of the Indian Ocean - GODAR-III;	E	
108	6-9 December 1994. UNESCO-IHP-IOC-IAEA Workshop on Sea-Level Rise and the Multidisciplingary Studies of	Е	
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109	First IOC-UNEP CEPPOL Symposium; San José, Costa Rica, 14-15 April 1993.	E	
110	IOC-ICSU-CEC regional Workshop for Member States of the Mediterranean - GODAR-IV (Global Oceanographic Data Archeology and Rescue Project) Foundation for International	E	
111	Studies, University of Malta, Valletta, Malta, 25-28 April 1995. Chapman Conference on the Circulation of the Intra-Americas Sea: La Parguera, Puerto Rico, 20 de Larvare 1005	E	
112	IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials (GESREM) Workshop; Miami U.S.A & December	Е	
113	1993. IOC Regional Workshop on Marine Debris and Waste Management in the Gulf of Guinea: Lagos, Nigeria.	Е	
114	14-16 December 1994. International Workshop on Integrated Coastal Zone Management (ICZM) Karachi, Pakistan;	E	
115	10-14 October 1994. IOC/GLOSS-IAPSO Workshop on Sea Level Variability and Southern Ocean Dynamics: Bordeaux.	Е	
116	France, 31 January 1995 IOC/WESTPAC International Scientific Symposium on Sustainability of Marine Environment: Review of the WESTPAC Programme, with	E	
117	Particular Reference to ICAM, Bali, Indonesia, 22-26 November 1994. Joint IOC-CIDA-Sida (SAREC) Workshop on the Benefits of Improved Relationships between International Development Agencies, the IOC and other Multilateral Inter-governmental Organizations in the Delivery of Ocean, Marine Affairs and	E	
118	Fisheries Programmes; Sidney B.C., Canada, 26-28 September 1995. IOC-UNEP-NOAA-Sea Grant Fourth Caribbean Marine Debris Workshop; La Romana, Santo	E	
119	Domingo, 21-24 August 1995. IOC Workshop on Ocean Colour Data Requirements and Utilization; Sydney B.C., Canada,	Е	
120	21-22 September 1995. International Training Workshop on Integrated Coastal Management; Tampa, Florida, U.S.A., 15-17 July	Е	
121	1995. Atelier régional IOC-CERESCOR sur la gestion intégrée des zones littorales (ICAM). Conakry. Guinée.	F	
122	18–22 décembré 1995 IOC-EU-BSH-NOAA-(WDC-A) International Workshop on Oceanographic Biological and Chemical Data Management, Hamburg, Germany, 20-23 May	E	
123	1996 Second IOC Regional Science Planning Workshop on Harmful Algal Blooms in South America;	E, S	5
124	30 October–1 November 1995. GLOBEC-IOC-SAHFOS-MBA Workshop on the Analysis of Time Series with Particular Reference to the Continuous Plankton Recorder	E	
125	Atelier sous-régional de la COI sur les ressources marines vivantes du Golfe de Guinée ; Cotonou, Bénin, 1-4 juillet 1996.	E	

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No.	Title	Lang
126	IOC-UNEP-PERSGA-ACOPS- IUCN Workshop on Oceanographic Input to Integrated Coastal Zone Management in the Red Sea and Gulf of Aden. Jeddah, Saudi	E
127	Arabia, 8 October 1995. IOC Regional Workshop for Member States of the Caribbean and South America GODAR-V (Global Cceanographic Data Archeology and Rescue Project); Cartagena de Indias, Colombia, 8-11 October 1996.	E
128	Atelier IOC-Banque Mondiale- Sida/SAREC-ONE sur la Gestion Intégrée des Zones Côtières ; Nosy Bé, Madagascar,	E
129	Gas and Fluids in Marine Sediments, Amsterdam, the	Е
130	Netherlands; 27-29 January 1997. Atelier régional de la COI sur l'océanographie côtière et la gestion de la zone côtière ;Moroni, RFI des Comores, 16-19 décembre	E
131	GOOS Coastal Module Planning Workshop; Miami, USA, 24-28	Е
132	February 1997 Third IOC-FANSA Workshop; Punta-Arenas, Chile, 28-30 July	S/E
133	1997 Joint IOC-CIESM Training Workshop on Sea-level Observations and Analysis for the Countries of the Mediterranean and Plock Sease, Birknohead LLK 16	E
134	27 June 1997. IOC/WESTPAC-CCOP Workshop on Paleogeographic Mapping (Holocene Optimum): Shanghai, China 27-29 May 1907	E
135	Regional Workshop on Integrated Coastal Zone Management;	Е
136	Chabanar, Iran, February 1996. IOC Regional Workshop for Member States of Western Africa (GODAR-VI); Accra, Ghana, 22-25 April 1997.	E
137	GOOS Planning Workshop for Living Marine Resources, Dartmouth USA: 1-5 March 1996	Е
138	Gestión de Sistemas Oceanográficos del Pacífico Oriental: Concepción, Chile, 9-16 de abril de 1996.	S
139	Sistemas Oceanográficos del Atlántico Sudoccidental, Taller, TEMA; Furg, Rio Grande, Brasil, 3- 11 de noviembre de 1997	S
140	Building for the Mediterranean Region; Valletta, Malta, 26-29 November 1997	E
141	IOC/WESTPAC Workshop on Co- operative Study in the Gulf of Thailand: A Science Plan; Bangkok, Thailand, 25-28 February	E
142	Peragic Biogeography ICoPB II. Proceedings of the 2nd International Conference. Final Report of SCOR/IOC Working Group 93; Noordwijkerhout, The Netherlands, 9-14 July 1995.	E
143	Geosphere-biosphere coupling: Carbonate Mud Mounds and Cold Water Reefs; Gent, Belgium, 7–11 February 1998	E
144	IOC-SOPAC Workshop Report on Pacific Regional Global Ocean Observing Systems; Suva, Fiji, 13-	E
145	I/C-Black Sea Regional Committee Workshop: 'Black Sea Fluxes' Istanbul, Turkey, 10-12 June 1997.	E
146	Living Marine Resources Panel Meeting, Paris, France, 23-25 March 1998	E
147	IOC-SOA International Training Workshop on the Intregration of Marine Sciences into the Process of Integrated Coastal Management,	E
148	Dalian, China, 19-24 May 1997. IOC/WESTPAC International Scientific Symposium – Role of Ocean Sciences for Sustainable Development Okinawa, Japan, 2-7	E
149	February 1998. Workshops on Marine Debris & Waste Management in the Gulf of Guines 1995 97	Е
150	First IOCARIBE-ANCA Workshop Havana, Cuba, 29 June-1 July	Е
151	Taller Pluridisciplinario TEMA sobre Redes del Gran, Caribe en Gestión Integrada de Áreas Çosteras Cartagena de Indias,	S
152	Colombia, /-12 de septiembre de 1998. Workshop on Data for Sustainable Integrated Coastal Management (SICOM) Maputo Mozombiauo	E
153	Incomparing the second	E
154	26 June 1998 IOC-Sida-Flanders-SFRI Workshop on Ocean Data Management in the IOCINCWIO Region (ODINEA	E

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155	project) Capetown, South Africa, 30 November-11 December 1998. Science of the Mediterranean Sea and its applications LINESCO	189 E	Work Draft Mana
156	Paris 29-31 July 1997 IOC-LUC-KMFRI Workshop on RECOSCIX-WIO in the Year 2000 and Beyond, Mombasa, Kenya, 12-	E	Carta Octol Talle Anter
157	16 April 1999 '98 IOC-KMI International Workshop on Integrated Coastal Management (ICM). Seoul	E	Integ y el C Color 2003
158	Republic of Korea 16-18 April 1998 The IOCARIBE Users and the Global Ocean Observing System (GOOS) Capacity Building	190 E	First Work Chris Dece
159	Workshop, San José, Costa Rica, 22-24 April 1999 Oceanic Fronts and Related Phenomena (Konstantin Fedorov Memorial Symposium) –	191 E	North Marg Sedir Interr Twelf
160	Proceedings, Pushkin, Russian Federation, 18-22 May 1998 Under preparation		Train Progi Denn
161 162	Under preparation Workshop report on the Transports and Linkages of the Intra-americas Sea (IAS). Cozumel. Mexico. 1-5	E 192	Regio Moni ROP Dece
163 164	November 1997 Under preparation IOC-Sida-Flanders-MCM Third	193 F	Work Deve
104	Workshop on Ocean Data Management in the IOCINCWIO Region (ODINEA Project), Cape Town, South Africa, 29 November	194	France IOC/I the C
165	An African Conference on Sustainable Integrated Management: Proceedings of the	E, F 195	Ocea Work in the Torre
166	Workshops. An Integrated Approach. (PACSICOM), Maputo, Mozambique, 18–25 July 1998 IOC-SOA International Workshop on Coastal Megacities: Challenges of Growing Urbanization of the	196 E	Octol Interr for th Warn the Ir Fram
	World's Coastal Areas; Hangzhou, P.R. China, 27 –30 September 1999	197	Marc Geos Proce
167	IOC-Flanders First ODINAFRICA-II Planning Workshop, Dakar, Senegal, 2-4 May 2000	E	Intero Studi Africa
168	Geological Processes on European Continental Margins; International Conference and Eight Post-cruise Meeting of the Training-Through- Research Programme, Granada, Spain. 31 January – 3 February	E 198	Confe Meet Rese 5 Fet Seco Meet
169	2000 International Conference on the International Oceanographic Data & Information Exchange in the Western Pacific (IODE-WESTPAC) 1999, ICIWP '99, Langkawi,	under preparation 199	Tsun Syste Gran 2005 Interr Estat
170	IOCARIBE-GODAR-I Cortagenas, Colombia, February	under preparation	for th Regio
171	Ocean Circulation Science derived from the Atlantic, Indian and Arctic Sea Level Networks, Toulouse Frances 40 11 May 1000	E	
172 173	(Under preparation) The Benefits of the Implementation of the GOOS in the Mediterranean Region, Rabat, Morocco, 1-3 November 1999	E, F	
174	IOC-SOPAC Regional Workshop on Coastal Global Ocean Observing System (GOOS) for the Pacific Region, Apia, Samoa, 16-	E	
175	17 August 2000 Geological Processes on Deep- water European Margins, Moscow-	E	
176	Mozhenka, 28 Jan2 Feb. 2001 MedGLOSS Workshop and Coordination Meeting for the Pilot Monitoring Network System of Systematic Sea Level Measurements in the Mediterranean and Black Seas, Haifa Jersel 15-17 May 2000	E	
177	(Under preparation)		
178	(Under preparation) (Under preparation)		
180	Abstracts of Presentations at Workshops during the 7" session of the IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Honolulu, USA,	E	
181	(Under preparation)		
182 183	(Under preparation) Geosphere/Biosphere/Hydrosphere Coupling Process, Fluid Escape Structures and Tectonics at Continental Margins and Ocean Ridges, International Conference & Tenth Post-cruise Meeting of the Training-through-Research Programme, Aveiro, Portugal, 30 January-2 February 2002	E	
184 185 186	(Under préparation) (Under preparation) (Under preparation)		
186 187	(Under preparation) (Under preparation) Geological and Biological Processes at deep-sea European Margins and Oceanic Baseine	E	
188	Bologna, Italy, 2–6 February 2003 Proceedings of 'The Ocean Colour Data' Symposium, Brussels, Belgium, 25-27 November 2002	E	

189	Workshop for the Formulation of a	EF
	Management (ICM) in Latin America and the Caribbean (LAC), Cartagena, Colombia, 23–25 October 2003	(electronic copy only)
	Anterovecto de Manejo Costero Integrado (MCI) en América Latina y el Caribe (ALC), Cartagena, Colombia, 23–25 de Octubre de 2003	
190	First ODINCARSA Planning Workshop for Caribbean Islands, Christchurch, Barbados, 15–18	E (electronic
191	North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes — International Conference and Twelfth Post-cruise Meeting of the Training-through-research Programme Concenbagen	E E
192	Denmark, 29–31 January 2004 Regional Workshop on Coral Reefs Monitoring and Management in the DODME See Area Irag I P 14 17	E
193	Workshop on New Technical Developments in Sea and Land	preparation)
194	France, 14–16 October 2003 IOC/ROPME Planning Meeting for the Ocean Data and Information Network for the Central Indian	(electronic copy only (under preparation
195	Ocean Region Workshop on Indicators of Stress in the Marine Benthos, Torregrande-Oristano, Italy, 8–9	E
196	International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean within a Global Framework, Paris, France, 3–8	E
197	March 2005 Geosphere-Biosphere Coupling Processes: The TTR Interdisciplinary Approach Towards Studies of the European and North African Margins; International Conference and Post-cruise Meeting of the Training-Through- Research Programme Morocon 2-	E
198	5 February 2005 Second International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean, Grand Baie Mauritius 14–16 April	E
199	2005 International Conference for the	E
n	Establishment of a Tsunami and Coastal Hazards Warning System for the Caribbean and Adjacent Regions, Mexico, 1–3 June 2005	_

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