

Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Committee on Ocean Processes and Climate

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1. OPENING

1 The Chairman of the IOC Committee on Ocean Processes and Climate, Dr. D.J. Baker, opened the Session and welcomed the participants.

2 The Secretary of IOC, Dr. G. Kullenberg, welcomed the participants on behalf of IOC. He pointed out that during the past two years, major IOC efforts had been undertaken to strengthen the IOC role in international activities related to the problems of global climate and environmental changes through interaction with, and contribution to the activities of the Intergovernmental Panel on Climate Change (IPCC), co-sponsoring of the Second World Climate Conference (SWCC), and participation in the Preparatory Committee for the United Nations Conference for the Environment and Development (UNCED). The IOC has continued its strong support of TOGA and WOCE implementation and initiated in co-operation with WMO and UNEP formulation of the strategy and concepts for the development of a global ocean observing system as an important component of the Global Climate Observing System, recommended by SWCC, and the UN Earthwatch aimed at monitoring and prediction of environmental changes. IOC, as an intergovernmental body, has been guided by the scientific community, close interaction with which is essential for the success of IOC programmes.

3 Dr. Kullenberg appealed to the Committee to provide advice to the IOC Assembly on the IOC strategy and activities related to the development of a Global Ocean Observing System, IOC participation in the Global Climate Observing System and preparation for, and participation in the 1992 UNCED.

4 Dr. Baker noted that since the establishment of the Committee in 1981 (originally called the Programme Group and then Technical Committee) a number of important events have taken place that lead to the need to consider the future role and activities of the Committee.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

5 The Agenda of the Session as adopted by the Committee is given in Annex I.

2.2 DESIGNATION OF A RAPPORTEUR

6 The Committee designated Mr. José Barberan (Mexico) as Rapporteur for the Session.

2.3 CONDUCT OF THE SESSION

7 The Technical Secretary of the Committee, Dr. A. Tolkachev, IOC Senior Assistant Secretary, reviewed the arrangements, timetable and documentation for the Session.

8 The List of Participants is given in Annex III.

3. REPORT ON THE INTERSESSIONAL ACTIVITIES

3.1 REPORT OF THE CHAIRMAN AND SECRETARY ON THE INTERSESSIONAL ACTIVITIES

9 The document IOC/OPC-IV/6 "Report on Intersessional Activities", prepared by the IOC Secretariat in consultation with the Chairman and Vice-Chairman of the Committee, was presented by the Chairman and the Technical Secretary of the Committee.

- 10 In accordance with its terms of reference and the decisions of the Fifteenth Session of the IOC Assembly (July 1989) and the Twenty-third Session of the IOC Executive Council (March 1990), major efforts of the IOC have concentrated on the promotion and intergovernmental co-ordination of the oceanographic programmes of the WCRP, particularly TOGA and WOCE, and the development of the Global ocean observing system.
- 11 Several important international developments in 1989-1991 have had a significant influence on these activities. They include:
- (i) Approval by the UNESCO General Conference in 1989 of the Third Medium-Term Plan (1990-1995) which included the following statement:
"The development of ocean services will be greatly accelerated leading to a 'global integrated ocean observing system' ('World Ocean Watch'), in support of marine research and ocean use, as a common service to Member States and their scientific community".
 - (ii) Decision of the World Meteorological Organization (in 1989) to co-operate with the IOC in developing a comprehensive Global Ocean Observing System.
 - (iii) The work and recommendations of the WMO-UNEP Intergovernmental Panel on Climate Change (IPCC).
 - (iv) The Second World Climate Conference (October-November 1990), co-sponsored by WMO, UNEP, UNESCO, IOC, FAO and ICSU, identified the need to establish a global ocean observing system of physical, chemical, and biological measurements as a major component of the proposed Global Climate Observing System.
 - (v) An *ad hoc* meeting on the Global Climate Observing System, sponsored by WMO, IOC and ICSU, was held in Winchester, UK, 14-15 January 1991, to discuss the recommendation of the SWCC to establish the Global Climate Observing System.
 - (vi) Participation of the IOC in the activities of the Preparatory Committee for the 1992 United Nations Conference on Environment and Development (UNCED).
- 12 In accordance with the decisions of the IOC Assembly and the Executive Council, actions have been taken to initiate the design and planning of a global ocean observing system. The following proposals and documents on those matters have been prepared for consideration by the IOC Committee on Ocean Processes and Climate at its Fourth Session, and by the IOC Assembly at its Sixteenth Session:
- (i) **Global Ocean Observing System - Status report on existing ocean elements and related systems (Document IOC/INF-833);**
 - (ii) **Toward a Global Ocean Observing System: a Strategy (Document IOC-XVI/8 Annex 3);**
 - (iii) **Proposal on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change (Document UNEP-IOC-WMO/GCNSMS-I/3).**
- 13 The preparation of the proposal on a Global Ocean Observing System has been organized as a joint effort of IOC and WMO, and the proposal on a Coastal Monitoring System (as part of GOOS) as a joint effort of UNEP, IOC and WMO.

14 Intergovernmental co-ordination and promotion of the TOGA (started in 1985) and WOCE (started in 1990) programmes is carried out by the Joint WMO-IOC Intergovernmental TOGA Board (ITB), which was established in 1984 and has held four sessions, and by the Joint IOC-WMO Intergovernmental WOCE Panel, which was established in 1989 and held its First Session in 1990.

15 Scientific guidance for TOGA and WOCE implementation is being provided by the joint efforts of the SCOR-IOC CCCO and WMO-ICSU JSC for WCRP, and in particular by the CCCO-JSC Scientific Steering Groups for TOGA and WOCE respectively. Secretarial support for these programmes is provided by the International TOGA and WOCE Project Offices in close collaboration with the IOC and CCCO Secretariats.

3.2 REPORT OF THE CHAIRMAN OF SCOR-IOC COMMITTEE ON CLIMATIC CHANGES AND THE OCEAN

16 The Chairman of the CCCO, Dr. James O'Brien, presented a brief summary of activities of the CCCO. The Eleventh Session of the CCCO took place in Paris (May 28 - 1 June 1990) (Document SCOR-IOC/CCCO-XI/3). The Committee addressed scientific planning, intergovernmental climate initiatives, and the implementation of its WOCE, TOGA, and ocean observing system development activities.

17 Dr. O'Brien highlighted the following efforts of the CCCO:

- (i) **Ocean Observing System Development.** The development of a scientifically based plan for climate related ocean observations was identified as a matter requiring urgent attention. The highest priority should be given to those elements necessary for operational modelling and the prediction of events such as ENSO.
- (ii) **Carbon Dioxide Gas Exchange on Gyre-Global Scale.** The design of a plan to acquire a global oceanic data set, including pCO₂, total CO₂, and alkalinity needs to be addressed. The Committee has proposed to JGOFS that the joint JGOFS-CCCO Carbon Dioxide Panel address this matter through reconstituted terms of reference and membership.
- (iii) **Review of IPCC Working Group-I Report on the Scientific Assessment of Climate Change.** Recognizing the report as a summary of the understanding by its authors as of early 1990, and the IPCC Working Group-I's stated need to update at frequent intervals, the Committee established a working group to undertake a review of the relevant ocean related sections of the IPCC WG-I report, including source references, and new material as appropriate.
- (iv) **Fresh Water Budget.** With regard to global energy and water cycle research, the cycles must be closed by information on the energy and mass exchanges with the ocean surface and the upper ocean transports of heat and salt. Ocean general circulation models will need to be developed to assimilate satellite data with in situ surface and subsurface measurements. There is a gap in the availability of observations of heat and freshwater content in the upper ocean which are required to narrow the uncertainty on the surface fluxes and in methods to determine the surface fluxes as constraints on the energy and water cycles.
- (v) **Sea Level Rise.** There is a need to encourage further investigation on how a global rise in mean sea level would be manifested in steric heights, and how changes in ocean currents would affect regional sea level.
- (vi) **Overturning at High Latitudes - Control of Thermohaline Circulation.** Consideration of the influence of the Arctic Ocean on climate represents a gap in the programmes being conducted within the WCRP. It is not included in WOCE. The feasibility of

an Arctic experiment regarding the relation between circulation, salinity structure, freezing and melting, and freshwater budget in the Arctic Ocean and the deepwater production on the North Atlantic needs to be investigated.

18 In addition, there has been continued collaboration with the WMO-ICSU JSC for WCRP on the development of the WCRP. The co-operating organizations have agreed on participation of a CCCO Executive Group in the deliberations of the JSC.

19 Dr. O'Brien stated that the membership in the CCCO is being reviewed, and he requested the Committee to submit suggestions of names for potential membership in the CCCO.

20 The Twelfth Session of the CCCO will be held in June 1991 in Woods Hole, Massachusetts, USA.

4. WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)

21 Dr. Leo Otto, Chairman of the IOC-WMO Intergovernmental WOCE Panel, highlighted the status of activities, referring to the Report of the First Session (Paris, 22-25 October 1990) (Document IOC-WMO/IWP-I/3). He expressed the view that more countries are in a position to participate in WOCE than were represented at that meeting, such as those countries who were represented at the WOCE Scientific Conference held in 1988.

22 He confirmed that WOCE is well underway, has found substantial support and now is fine-tuning its requirements and priorities. The Report of the First Session contains a comprehensive "Summary of Resource Commitments" and a WOCE SSG Statement on Programme Priorities. Concern was noted that many of the indicated contributions to WOCE are still tentative and that additional resources for unsubscribed or unconfirmed commitments are required for its implementation. Gaps must be filled; attention needs to be given by the Scientific Steering Group to providing information on WOCE to governmental agencies, including scientific justification for elements of the programme. He emphasized the importance of maintaining simultaneity between WOCE field programmes and satellite missions of ERS-1, TOPEX/POSEIDON, and ERS-2. He also noted the importance of regional cooperation, particularly for those with limited individual national resources. The Panel also requested the full support of Member States in insuring that measurements within coastal waters which are important in determining the global ocean circulation of heat and fresh water are successfully made.

23 The next session of the Intergovernmental WOCE Panel will take place in March 1992.

24 As WOCE depends on satellite data, the Committee discussed the need for the IOC to participate in the Committee on Earth Observations Satellites, which is a focal point for international coordination of those global change activities associated with space-based earth observation and related data management. The Committee stressed the need to for support for WOCE from all levels, using all mechanisms, and adopted Recommendation OPC-IV.2.

5. TROPICAL OCEAN AND GLOBAL ATMOSPHERE PROGRAMME (TOGA)

25 Mr. Raymond Godin, Secretary, Committee on Climatic Changes and the Ocean, presented a brief summary of the Fourth Session of the WMO-IOC Intergovernmental TOGA Board (Geneva, 9-12 January 1991) (Document WMO-IOC/TOGA-IV/3S). He reported progress in planning the Coupled Ocean-Atmosphere Response Experiment (COARE) with the establishment of a TOGA COARE Project Office. The Board also recommended pursuing the establishment of a central facility to support data assimilation and coupled ocean-atmosphere model prediction for routine seasonal and annual climate forecasts. Resources

need to be defined.

26 The Board noted the progress being made toward the development of a Global Ocean Observing System and the acknowledgement by the Second World Climate Conference of the need for a Global Climate Observing System. In an effort to increase attention on the Atlantic Ocean, the United States has undertaken an Atlantic Climate Change Programme which the Board reviewed as well as the TOGA Monsoon Numerical Experimentation Group, an effort to improve the capability of modeling the Indian Ocean monsoon system. A TOGA workshop in the Atlantic is under consideration.

27 The Committee noted the effectiveness of the Intergovernmental TOGA Board and the TOGA COARE Experiment as an example of a successful initiative.

28 The next meeting of the Board is expected to be held in January 1992.

6. GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

6.1 GLOBAL SEA LEVEL OBSERVING SYSTEM (GLOSS)

29 Dr. D. Pugh, Chairman of the IOC Group of Experts on GLOSS, reported on the progress in the implementation of the GLOSS. He introduced the Report of the Second Session of the IOC Group of experts on GLOSS held in Miami, USA, 23-26 October 1990 (Document IOC/GE-GLOSS-II/3) and the Report of the IOC Workshop on Sea Level Measurements in Antarctica, held in Leningrad, USSR, 28-31 May 1990 (IOC Workshop Report No. 69).

30 Dr. Pugh presented a summary of the present status of the GLOSS network in terms of data submission to PSMSL. Of 306 GLOSS stations, 133 are "operational stations" for which the most recently acquired data is 1986 or later; 50 are considered "probably operational" for which the most recent data is within the period 1975-1985; 42 stations are "historical stations" for which the most recent data is earlier than 1975; and there are 81 stations for which no PSMSL data exist. These figures do not reflect the full situation since data has not yet been submitted from several recently installed gauges. Nevertheless there are severe problems with the flow of data to the data centers. There are also problems with resources for implementing GLOSS plans, in terms of both financial and secretariat resources, required for international co-ordination of GLOSS, including experts meeting, training courses, etc.

31 He also pointed out the growing interest of member states and scientific community in the problem of sea level rise and referred to the results of the Small States Conference on Sea Level Rise (Malé, Maldives, 1989) and the statement of the Venice Conference "Impact of Sea Level Rise on Cities and Regions" (1990). The Male' Declaration on Global Warming and Sea Level Rise was made available to the participants (Document IOC/OPC-IV/Inf.2).

32 The Committee noted with satisfaction the progress in GLOSS development achieved mainly through national efforts and commitments, as well as through support and assistance provided by some countries in setting up GLOSS stations and training specialists. The Committee expressed its appreciation to the Governments of Germany, Sweden, France, UK, USA for their assistance to other countries.

33 The Committee emphasized that GLOSS technical assistance and training programme would need further increased support from IOC, UNESCO and IOC Member States, and additional financial and staff support will also be needed to ensure activities to be provided by the IOC Secretariat for international co-ordination to GLOSS implementation.

34 The Committee noted substantial delays in the submission of data to PSMSL from the majority of GLOSS stations and urged Member States to ensure

their timely submission in accordance with the GLOSS Implementation Plan and requirements of TOGA and WOCE.

35 The Committee noted the actions taken by Canada (MEDS) to start the IGOSS Sea Level Pilot Project in the North and Tropical Atlantic and invited IOC Member States to take part in the Project.

36 The Committee adopted Recommendation OPC-IV.3 on this matter.

6.2 PLANNING OF THE GLOBAL OCEAN OBSERVING SYSTEM

37 Dr. Albert Tolkachev, IOC Senior Assistant Secretary, presented a briefing summarizing the actions to date in developing (i) a Global Ocean Observing System, (ii) a Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change, and (iii) a Global Climate Observing System. He described the proposed relationships among these and the actions required by the Committee and by the upcoming Assembly. He made reference to a number of recently-issued documents including:

- (i) Report of the First Session of the IOC ad hoc Group of Experts on a Global Ocean Observing System (Document IOC/INF-829);
- (ii) Report of the First Session of the Joint CCCO-JSC Ocean Observing System Development Panel (Document CCCO-JSC/OOSDP-I/3);
- (iii) Toward A Global Ocean Observing System: A Strategy, prepared by the IOC Ad hoc Group of Experts (Document IOC-XVI/8 Annex 3);
- (iv) Status Report of Existing Elements of an Ocean Observing and Data Management System (Document IOC/INF-833);
- (v) Report of the UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change containing the Proposal on the development of this system (Document UNEP-IOC-WMO/GCNSMS-I/3);
- (vi) Proposal for a Global Climate Observing System made by the WMO-IOC-ICSU Ad hoc Group (Document IOC-XVI/8 Annex 9).

38 Mr. G. Holland, Chairman of the IOC ad hoc Group of experts on GOOS (Washington DC, USA, 6-7 September 1990), presented the report and recommendations (Document IOC/INF-829), which was formed as a subsidiary body to the OPC to provide advice concerning actions to implement a system of long-term ocean observations and data management and delivery as part of a global system for monitoring and predicting environmental change. The Committee addressed the ad hoc Group's recommendations in detail. The Committee noted that a number of the recommendations concerning the strengthening and accelerated development of existing ocean observing system (Recommendations 3, 7 and 8) should be addressed to appropriate IOC and WMO subsidiary bodies, particularly to IGOSS and IODE. The Committee specifically supported recommendations of the Ad hoc Group on:

- (i) The need for Member States to strengthen their involvement in existing systems;
- (ii) The need to rely on the OOSDP for the conceptual design of the component of GOOS that supports climate monitoring needs;
- (iii) The need for a "protocol" or formal agreement to foster and promote participation in GOOS among Member States.

39 The Committee noted with satisfaction the first Status Report on existing ocean elements and related systems (Document IOC/INF-833) prepared by the Secretariat in response to the Recommendation 2 of the IOC Ad hoc Group.

40 The Committee emphasized that GOOS must be based on existing programmes and capabilities, including national programmes and plans, and that new technologies should be addressed. The Committee supported the views expressed by the IOC Ad hoc Group on need to strengthen support to developing countries by providing instrumentation and training in ocean observations and data applications for research and practical application. The importance of satellite data for GOOS was also stressed. The Committee noted the comments by New Zealand endorsing the need for a Global Ocean Observing System (Document IOC/OPC-IV/7).

41 Extensive discussion took place concerning the proposed definitions and objectives of GOOS, its relationship to other initiatives, and mechanisms for fostering the advancement of the GOOS concept.

Definition and Objectives

42 The Committee expressed concern that the definition of GOOS must be clear, that objectives of GOOS must be fairly simple without sacrificing the required diversity and must also be focused, or efforts will be dissipated. The representative of the United States suggested a modular approach of a Climate Subsystem, a Living Marine Resources Subsystem, a coastal ocean pollution subsystems and an ocean services subsystem. These subsystems would be integrated to avoid duplication of effort among them. It was pointed out that ocean forecasting is now possible, and GOOS should be focused as a means of extending and enhancing ocean forecasting.

43 The Committee also noted the analogy of the World Weather Watch as a global system which include, inter alia, a large range of national observation systems, but identifies a subset of data from these national systems for global exchange and management, thus effectively performing a "filter" function. The Committee pointed out that GOOS may use this aspect of the World Weather Watch as a model of global system that relies on regional and national data, collected for local needs but valuable globally.

44 The Committee noted the need to incorporate existing data sets into GOOS to satisfy the need for multi-decadal data sets.

Relationships to Related Initiatives

45 The Committee noted the role of the OOSDP in developing the conceptual design for the GOOS' climate-related requirements and emphasized the distinction between the OOSDP's function and other GOOS planning activities. The Committee agreed with the recommendation of the IOC Ad hoc Group that OOSDP be relied on for the scientific guidance and the design of GOOS particularly with regard to the climate monitoring and prediction aspects. It was also noted that the design will need to be an evolutionary one with continuous feedbacks between scientific programmes and GOOS development efforts.

46 The Secretary, IOC, presented a Summary of a WMO-IOC-ICSU ad hoc meeting concerning a Global Climate Observing System (GCOS) convened by the Chairman of the Joint Scientific Committee World Climate Research Programme (Winchester, U.K, 14-15 January 1991) and referred to the summary report of that meeting (IOC-XVI/8 Annex 9). This meeting was held in response to a recommendation of the Second World Climate Conference to establish a Global Climate Observing System. The Workshop acknowledged that the development of separate observing systems for the atmosphere and the ocean was not acceptable and perceived that the present level of coordination is not sufficient.

47 Several Committee members who also participated in the Workshop were invited to comment on the results of the Workshop. They noted that the version of the Workshop report available to the Committee did not exactly reflect the consensus of the Workshop in respect to responsibilities for planning GOOS. This version of the report indicates that the GCOS "Office would include a section concerned with planning GOOS". The above Committee members indicated that the sense of the Workshop on this issue could be more

accurately summarized by the following wording: "The Office should include a section concerned with planning, in conjunction with IOC, of the climate-related aspects of GOOS". The Committee asked the Secretary IOC, to convey this concern to the meeting organizers.

- 48 The Secretary sought the guidance of the Committee on two particular recommendations of the Workshop: (i) to establish a "Steering Committee" for the GCOS, and (ii) to establish a GCOS Planning Office. The Committee endorsed the concept of a Steering Committee and Planning Office for GCOS. The Committee also encouraged strong oceanographic representation on the Steering Committee including OPC representation. The Committee affirmed that the IOC is the appropriate organization to lead ocean aspects of such planning. The Workshop did not specify the physical location of the Office, but the Committee recommended that the GOOS Support Office be located in the IOC and serve, among other functions, as an oceanographic component of the proposed GCOS Planning Office.

Mechanisms for Advancing GOOS

- 49 The Committee noted the need to move from ad hoc to permanent arrangements for developing GOOS and to seek funding commitments. The Committee recommended that a GOOS Support Office be established by IOC and charged with the functions listed in the Appendix to Recommendation OPC-IV.1. The Committee welcomed the offer by the United Kingdom to second an employee to this proposed organization, if possible. The Committee noted that the proposed title - "Support" Office - intentionally implies that this group would handle responsibilities beyond "planning" for GOOS, i.e., a composite set of GOOS-related responsibilities that would evolve as progress is made.

- 50 The Committee noted the importance of the United Nations Conference on Environment and Development to be held in Brazil in June 1992, particularly as an opportunity to solicit formal multi-national support and commitments for GOOS (described under item 10 of this report).

- 51 The Committee recommended that the OPC take a leadership role in overseeing the development of GOOS and that the Assembly undertake a comprehensive review of the GOOS administrative structure prior to the Seventeenth Assembly.

- 52 The Committee adopted Recommendation OPC-IV.1 on these topics and proposed that the IOC Assembly, at its Sixteenth Session, adopt it as a Resolution.

6.3 PLANNING OF THE GLOBAL COASTAL OBSERVING SYSTEM: A DRAFT PROPOSAL FOR A LONG-TERM GLOBAL MONITORING SYSTEM OF COASTAL AND NEAR-SHORE PHENOMENA RELATED TO CLIMATE CHANGE (UNEP-IOC-WMO)

- 53 The Committee reviewed the proposal on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change prepared by the UNEP-IOC-WMO Meeting of Experts (Paris, 10-14 December 1990) and the accompanying recommendations.

- 54 It was also noted that the proposals and recommendations of the Joint meeting of the Co-ordinators of the Regional Task Team on Implications of Climate Changes (Singapore, 12-16 November 1990), organized by UNEP in co-operation with IOC and other international organizations, relevant to the coastal research and monitoring activities were considered by the UNEP-IOC-WMO Meeting of Experts.

- 55 It was noted that this proposal was developed in response to the proposal of the Twenty-third Session of the IOC Executive Council and the recommendations of the Second World Climate Conference, which recommended, in particular, "the establishment of a programme of coastal zone research and monitoring in order to identify effects of climate changes on the coast and coastal ecosystems, and to assess the vulnerability of various natural and managed ecosystems such as coral reefs, mangroves and coastal agriculture".

- 56 In this connection the reference was made to the Declaration of the Small States Conference on Global Warming and Sea Level Rise (November 1989) (Document IOC/OPC-IV/Inf.2), which proposed the establishment of a climate and sea-level programmes and a monitoring network. The Conference applied to WMO, UNEP and UNESCO for their assistance in its implementation.
- 57 The Committee endorsed the concept and objectives of the proposed Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change, as formulated by the Group of experts (Document UNEP-IOC-WMO/GCNSMS-I/3). The Committee recognized the great importance of such a monitoring system both for monitoring and prediction of climate change and for assessment of the environmental and socio-economic impacts of this change and the implementation of policies and measures designed to mitigate the undesirable effects of the expected impacts.
- 58 The Committee, recognizing the importance of the impact of the potential climate change on the coastal socio-economic activities of many coastal member states, agreed that the proposed programme should be developed in conjunction with the development of the Global Ocean Observing System and stressed that these proposals should be considered as an important component of both the Global Ocean Observing System and the Global Climate Observing System.
- 59 The Committee, therefore, requested the Secretary IOC, in co-operation with UNEP and WMO, to consider specific actions to initiate the pilot phase of the proposed programme through joint efforts of the UNEP-IOC-WMO. The Committee stressed the importance of an interagency co-ordination (particularly IOC, UNEP, WMO) in designing, planning and co-ordinating of those activities.
- 60 The Committee proposed that the recommendations of the UNEP-IOC-WMO Experts Group meeting on pilot activities be implemented, in consultation with UNEP and WMO, through the Regional IOC Activities and the UNEP-IOC Regional Task Teams in co-operation with relevant bodies of IOC, namely GE/GLOSS, JWC/IGOSS, IOC/IODE, GIPME, OSLR, and TEMA as appropriate.
- 61 The Committee suggested that IOC Assembly request the IOC Committee for TEMA to consider and develop special technical assistance and training programmes for the development and implementation of the global coastal monitoring component of the Global Ocean Observing System.
- 62 In connection with the specific pilot project activities proposed by the UNEP-IOC-WMO expert meeting, the Committee proposed that the IOC Assembly instruct the Secretary to consider implementation of each pilot project, taking into account the specific interests of Member States and available resources. The Committee recommended, in particular, that the following proposed pilot studies be implemented in the following way, so that they will eventually contribute to the Global Ocean Observing System:
- (i) **Sea level changes and coastal flooding**
 - a) by IOC Regional bodies
 - b) by UNEP-IOC Regional Task Teams
 - c) in consultation with the GE/GLOSS and JWC/IGOSS
 - (ii) **Coastal circulation**
 - a) by IOC Regional bodies
 - b) by UNEP-IOC Regional Task Teams
 - c) in consultation with the IOC body dealing with the study of shelf circulation and JWC/IGOSS
 - (iii) **Assessment of organic carbon accumulation in surface coastal sediments**
 - a) by IOC Regional bodies
 - b) by UNEP-IOC Regional Task Teams
 - c) in consultation with the CCCO, GIPME

- (iv) **Changes in plankton community structure**
 - a) by IOC Regional bodies
 - b) by UNEP-IOC Regional Task Teams
 - c) in consultation with OSLR
- (v) **Benthic communities: coral reef ecosystems**
 - a) by IOC Regional bodies
 - b) by UNEP-IOC Regional Task Teams
 - c) in consultation with OSLR and COMAR
- (vi) **Terrestrial vegetation: mangrove communities**
 - a) by IOC Regional bodies
 - b) by UNEP-IOC Regional Task Teams
 - c) in consultation with OSLR and COMAR

63 The Committee agreed that at the end of the proposed 3 year pilot phase the results should be reviewed by the Committee in order to determine the most appropriate steps for further implementation.

64 In response to the recommendation of the UNEP-IOC-WMO Expert meeting on intergovernmental and interagency co-ordination of the proposed pilot activities, the Committee emphasized that coastal ocean monitoring be planned and developed within the framework of the Global Ocean Observing System. The Committee recommended that the IOC Assembly invite UNEP and WMO to support this approach.

6.4 NEW TECHNOLOGY

65 Mr. Y. Jiang, IOC Assistant Secretary, reported to the Committee on the outcome and recommendations of the IOC-SOA International Workshop on Marine Acoustics, Beijing, China, 26-30 March 1990 (IOC Workshop Report No. 68).

66 The workshop was divided into two parts:

- (i) Part I, Scientific presentations, to review theoretical and experimental research results in marine acoustics and its application and technology;
- (ii) Part II, Experts Consultation, to discuss further international co-operation and recommendations.

67 Wide topics on marine acoustics were covered in the scientific presentations, including: (i) present status and (ii) trends in marine acoustics research. Special attention was given to the application of acoustic techniques in marine scientific research, such as:

- (i) measurement of ocean currents, eddy diffusion coefficient, surface waves and internal waves;
- (ii) determination of contaminants, e.g. from discharges of sewage, oil spills;
- (iii) Bottom and sub-bottom profiling;
- (iv) Probing of sea-bed sediments, for practical use in finding manganese nodules; and
- (v) Underwater data transmission, (can transmit information between buoys over 3000 km apart 10-500 bits/sec).

68 For future international collaboration, the Workshop recommended that a Group of Experts on Marine Acoustics be set up under IOC with the following basic tasks:

- (i) to form a focus for international collaboration;
- (ii) to plan a second workshop on Marine Acoustics at the next International Conference on Acoustics in China, 1992;
- (iii) to advise IOC on the applications of marine acoustics to the IOC programmes; and
- (iv) to advise IOC on:
 - a) training courses in marine acoustics for scientists and technologists from developing countries
 - b) sponsorship of an Advanced Study Institute (2 weeks) on Marine Acoustics and Civilian Applications thereof, and
 - c) sponsorship of international exchanges (1 or 2 years) of scientists and advanced students.

69 The Workshop also recommended that IOC:

- (i) encourage collaboration among national agencies undertaking marine acoustics, so as to help avoid complete duplication;
- (ii) ensure information exchange and intercomparisons between possibly overlapping research areas and applications;
- (iii) identify and fill gaps in knowledge; and
- (iv) encourage joint and multi-lateral projects especially where single nation resources are inadequate, for example, the long-range ocean propagation experiments. Many national agencies have the theoretical talents to bring these projects into being.

70 It was emphasized that there is a need for wide-ranging marine acoustic data bases, for example, on noise levels and on standardized oceanographic input data for acoustic propagation models and recommended these data bases be included in the IODE Programme.

71 Ms. E. Tidmarsh, Executive Director of SCOR, informed the Committee that, at its XXth General Meeting in October 1990, SCOR had decided to establish a new Working Group (WG 96) on Acoustic Monitoring of the World Ocean. She provided the Committee with the Terms of Reference for this Working Group. They address a narrow range of topics: the applications of large-scale acoustic tomography for monitoring global climate change in the ocean; the assessment of relevant opportunities for international collaboration; and investigation of other methods and theories relating to studies of the ocean by means of observations of sound propagation over long distances. She indicated that SCOR would welcome IOC's cosponsorship of the group.

72 Some delegates emphasized the importance of the application of marine acoustics to other ocean-related activities and supported the recommendation of the Workshop to set up a Group of Experts. Some delegates, however, pointed out the need to avoid unnecessary duplication of effort in this field, particularly in view of the SCOR's decision to establish a New Working Group and suggested, therefore, to consult with SCOR on this matter.

73 The Committee agreed that SCOR Working Group 96 and relevant IOC Subsidiary Bodies, such as IGOSS, IODE, OSLR, GEBCO and OSNLR, should review the terms of reference for SCOR Working Group 96 and the recommendations of the Marine Acoustics Workshop in order to identify gaps which might require IOC action, such as establishment of a small Group of Experts.

74 The Committee thanked the Government of the People's Republic of China for hosting this important workshop.

75 The Committee was informed of new developments with regard to the use of remotely sensed data from satellites, viz: (i) the establishment by the WMO Commission for Marine Meteorology and the Joint IOC-WMO Committee for IGOSS of a Joint ad hoc Group on Ocean Satellites and Remotely Sensing; and (ii) the holding of the First IOC Training Course on the Applications of Satellite Remote Sensing to Marine Studies, Caracas, Venezuela (24-28 September 1990) for the countries of the IOCARIBE region. A second such course is foreseen to take place in September 1991 for the countries of the IOCINCWIO region in the French Reunion Island.

76 The Committee expressed its satisfaction with those developments.

77 The Committee emphasized that IOC work with appropriate agencies to encourage free and open access to satellite data among the international oceanographic community. Research data should be available at no more than the cost of reproduction and distribution. Some proposals on this matter are reflected in Recommendation OPC-IV.2.

7. **PROPOSED PROGRAMME ON COASTAL OCEAN CIRCULATION DYNAMICS AND FLUXES**

78 Mr. Jiang informed the Committee on the progress made since the last session of the Committee.

79 The proposed programme was presented to the Fifteenth Session of the IOC Assembly, and the Assembly in principle adopted it by Resolution IOC-XV-3 and requested the Secretary IOC to organize a Workshop. Following the decision, a Planning Meeting for the workshop was organized in Paris on 9-11 May 1990 to which SCOR was invited. The workshop has been initially planned for January 1991, but is now postponed to the second half of this year. SCOR has expressed its willingness to co-sponsor the workshop.

80 Mr. Jiang introduced briefly the contents of the proposed draft programme on Coastal Ocean Circulation Dynamics and Fluxes (Document IOC-XVI/8 Annex 1) including the overall goal, objectives and the elements of the proposed programme.

81 The Committee agreed on the draft programme plan with the suggestion of combining the planned workshops and seminars with other relevant meetings.

82 The Committee also agreed that the Document IOC-XVI/8 Annex 1 be presented to the Sixteenth Session of the IOC Assembly for further consideration and decision regarding proposed actions.

8. **OTHER RELEVANT INTERNATIONAL AND NATIONAL PROGRAMMES**

83 The Committee noted the proposed Core Project of the IGBP entitled "Land-Ocean Interactions in the Coastal Zone" in connection with the proposed UNEP-IOC-WMO coastal monitoring activities described above (Document IOC/OPC-IV/Inf.1).

84 The Executive Director of SCOR recalled that Goal 2 of the Joint Global Ocean Flux Study of SCOR requires it to "develop a capability to predict on a global scale the response of oceanic biogeochemical processes to anthropogenic perturbations, in particular those related to climate change." This will require collaboration with IOC to ensure that the Global Ocean Observing System incorporates the requirements of JGOFS for long-term measurements of the ocean and that GOOS is able to take advantage of the results of JGOFS. She noted that since the publication of the JGOFS Science Plan, representatives of the SCOR Committee for JGOFS and the IOC have initiated discussions of the ways in which IOC can contribute to JGOFS. Active liaison between JGOFS and the Commission is being maintained through Dr. Neil Andersen, Chairman of the IOC Committee for GIPME.

9. THE WMO-UNEP INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE AND THE SECOND WORLD CLIMATE CONFERENCE: IMPLICATIONS FOR IOC AND ITS ROLE IN THE FOLLOW-UP

85 The Secretary IOC, initiated a discussion of actions to be taken following the completion of the IPCC's initial work and the results of the Second World Climate Conference. He noted that IPCC Working Groups 1 and 3, in particular, identified the need for ocean observations and noted the effective role of the SCOR-JSC CCCO in the development of such conclusions. The Ministerial Declaration of the SWCC invites international organizations including IOC, FAO, WMO, ICSU, and UNEP to coordinate relevant activities, reflecting the need for a number of communities to be coordinated in their climate-related initiatives. As a result, an Inter-Secretariat meeting was held to discuss the World Climate Programme where this need was strongly reaffirmed.

86 The Secretary asked the Committee for guidance concerning the role of the IOC in future World Climate Research Programme activities and related efforts. The Committee emphasized the importance of continued IOC involvement in the work of the IPCC in its scientific assessment work and the need for stronger statements by the IPCC of the need for ocean observations, particularly in determining regional variability and potential impacts of climate change. In noting that the IPCC is adopting a more scientific role, the Committee concluded that it is appropriate for IOC to be actively involved. The UNESCO representative of the recent United Nations Administrative Coordinating Committee (October 1990) raised the question of IOC co-sponsorship of the IPCC, which UNESCO would support. However, no response has so far been given on this proposal. The Committee stressed that this effort should be actively pursued.

87 The next plenary session of the IPCC will be held 13-15 March 1991 in Geneva.

88 The Committee noted with appreciation the successful efforts of the IOC at the Second World Climate Conference in obtaining recognition of the role of the ocean in climate. The conclusions of the Conference specifically call for the development of a Global Ocean Observing System.

89 In December 1990 the United Nations passed a resolution inviting UN bodies to provide input and make financial contributions to the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, the first meeting of which was held in Washington, D.C., 4-14 February 1991. It is expected that the final convention will include protocols on issues such as forestry, carbon dioxide emissions, and sea level rise.

90 The Committee adopted Recommendation OPC-IV.5 suggesting that the Assembly offer the continued support of the IOC to this significant international effort.

10. PREPARATIONS FOR THE 1992 UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT

91 The Secretary, IOC, summarized IOC's involvement in preparations for the 1992 UNCED, referencing a Status Report on this subject (Document IOC-XVI/8 Annex 7). The First Preparatory Committee for UNCED invited UNEP, IOC, and WMO to "study ways and means of strengthening observation systems to protect oceans, *inter alia*, through the establishment of a global ocean observing system". Consequently, the Secretariat is preparing a draft paper on this subject for the Third Preparatory Committee meeting in August 1991 and will request the Committee's views on its contents. Additionally, WMO, UNEP, FAO, IMO, and other appropriate international bodies will participate in the review.

92 The IOC is also involved in preparations for UNCED on the subject

of land-based sources of pollution to be discussed at an intergovernmental expert meeting in Halifax, Canada, May 1991. The Secretary IOC will participate, in his personal capacity, in a scientific conference in Vienna (ASCEND-21) in late 1991 being organized by ICSU, the advisor to UNCED on scientific issues, concerning an agenda for science for the twenty-first century.

93 The Committee emphasized the importance of taking advantage of the UNCED process to increase visibility for the role of the ocean and the need for national commitments to a global ocean observing system. Member States should work with their national representatives preparing for UNCED to insure an understanding of marine scientific issues to be addressed. The Committee noted the opportunity presented by UNCED for promoting the transfer of technology to developing countries.

94 The Committee recommended that the Sixteenth IOC Assembly prepare for adoption by UNCED a draft declaration of intent of countries to support GOOS at a national level. A background document would also be prepared to accompany a proposal to UNCED. The Committee adopted Recommendation OPC-IV.4 on this topic.

11. **IOC PROGRAMME ACTIVITIES IN THE FIELD OF OCEAN DYNAMICS AND CLIMATE FOR 1992-1993 AND FUTURE ROLE OF THE COMMITTEE**

95 Dr. A. Tolkachev introduced document IOC/OPC-IV/3 "Proposed Programme on the IOC Activities in the field of Ocean Dynamics and Climate for 1991, 1992-1993" prepared in consultation with the Chairman and Vice-Chairman of the Committee.

96 He invited the Committee to review this document and identify priorities in the field of ocean dynamics and climate for the 1991, 1992-1993 periods to be brought to the attention of the IOC Assembly in connection with the consideration of the IOC Programme and Budget for the 1991 and 1992-1993 periods.

97 The Delegate of Venezuela pointed out the great importance of and expressed full support for the technical assistance and training programme activities outlined in the document, in order to ensure active participation of developing countries in these activities.

98 The Committee, having reviewed the activities proposed in the document and in the light of the discussion under previous agenda items, recommended that the major thrust of efforts of the IOC in this field for 1991-1993 period should be directed towards:

- (i) continued increased support for the implementation of the TOGA and WOCE programmes in co-operation with WMO and ICSU;
- (ii) planning and development of the Global Ocean Observing System (GOOS) (by the GOOS Support Office) under the supervision of the Committee on OPC, in co-operation with WMO, UNEP and ICSU, as appropriate, taking into account scientific advice on climate-related aspects from the CCCO-JSC OOSDP;
- (iii) development and implementation, in co-operation with UNEP and WMO, of the pilot activities for monitoring coastal and near-shore phenomena related to climate change, mainly through IOC regional bodies, UNEP-IOC Regional Task Teams and in co-operation with relevant bodies of IOC and WMO;
- (iv) preparation of contributions and active involvement of IOC in the activities of IPCC and the preparations for the 1992 UNCED;
- (v) strengthening and accelerated development of existing ocean observing and related data management systems (IGOSS, GLOSS, DBCP,

IODE) and strengthening of technical training and assistance programmes activities to enable developing countries to participate in GOOS.

99 The Committee adopted the Programme of Work for 1991-1993 as given in Annex V and emphasized that those activities, particularly related to GOOS planning and technical assistance and training activities in support of GOOS will require substantially increased support to IOC from UNESCO and IOC Member States.

100 The Committee recommended to hold the Fifth Session in March 1992 in conjunction with the Second Session of the IOC-WMO Intergovernmental WOCE Panel, prior to the Twenty-fifth Session of the IOC Executive Council.

101 The Committee also instructed the Chairman and Vice-Chairman of IOC/OPC in consultation with the Secretariat to keep under continuing review the progress in the implementation of the proposed actions and provide advice to the Secretary and IOC Governing bodies on the need for additional efforts and activities.

12. ADOPTION OF THE REPORT

102 The Committee adopted the Summary Report and Recommendations of the Session.

103 It agreed to submit an Executive Summary and Recommendations of the Session to the Sixteenth Session of the IOC Assembly.

13. CLOSURE

104 The Session was closed at 14.00 hours on 1 March 1991.

ANNEX I

AGENDA

1. **OPENING**
2. **ADMINISTRATIVE ARRANGEMENTS**
 - 2.1 **ADOPTION OF THE AGENDA**
 - 2.2 **DESIGNATION OF A RAPPOORTEUR**
 - 2.3 **CONDUCT OF THE SESSION**
3. **REPORT ON THE INTERSESSIONAL ACTIVITIES**
 - 3.1 **REPORT OF THE CHAIRMAN AND SECRETARY ON THE INTERSESSIONAL ACTIVITIES**
 - 3.2 **REPORT OF THE CHAIRMAN OF SCOR-IOC COMMITTEE ON CLIMATIC CHANGES AND THE OCEAN**
4. **WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)**
5. **TROPICAL OCEAN AND GLOBAL ATMOSPHERE PROGRAMME (TOGA)**
6. **GLOBAL OCEAN OBSERVING SYSTEM (GOOS)**
 - 6.1 **GLOBAL SEA LEVEL OBSERVING SYSTEM (GLOSS)**
 - 6.2 **PLANNING OF THE GLOBAL OCEAN OBSERVING SYSTEM**
 - 6.3 **PLANNING OF THE GLOBAL COASTAL OBSERVING SYSTEM: A DRAFT PROPOSAL FOR A LONG-TERM GLOBAL MONITORING SYSTEM OF COASTAL AND NEAR-SHORE PHENOMENA RELATED TO CLIMATE CHANGE (UNEP-IOC-WMO)**
 - 6.4 **NEW TECHNOLOGY**
7. **PROPOSED PROGRAMME ON COASTAL OCEAN CIRCULATION DYNAMICS AND FLUXES**
8. **OTHER RELEVANT INTERNATIONAL AND NATIONAL PROGRAMMES**
9. **THE WMO-UNEP INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE AND THE SECOND WORLD CLIMATE CONFERENCE: IMPLICATIONS FOR IOC AND ITS ROLE IN THE FOLLOW-UP**
10. **PREPARATIONS FOR THE 1992 UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT**
11. **IOC PROGRAMME ACTIVITIES IN THE FIELD OF OCEAN DYNAMICS AND CLIMATE FOR 1992-1993 AND FUTURE ROLE OF THE COMMITTEE**
12. **ADOPTION OF THE REPORT**
13. **CLOSURE**

ANNEX II

ADOPTED RECOMMENDATIONS

Recommendation OPC-IV.1

GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

The IOC Committee on Ocean Processes and Climate,

Recommends to the IOC Sixteenth Assembly that the Assembly review and approve the following draft resolution:

Draft Resolution on a Global Ocean Observing System:

Considering that a Global Ocean Observing System (GOOS) will play a central role in addressing issues such as global climate prediction and sea level rise, as well as the regional and coastal problems of Member States,

Recognizing that development of the Global Ocean Observing System is one of the most significant challenges facing the Commission,

Recognizing further that this system must be built on existing programs and capabilities and must be continually updated and improved in response to results of ocean research programmes and development of new technology,

Decides to undertake development of a Global Ocean Observing System (GOOS);

Charges the Committee on Ocean Processes and Climate (C/OPC) to oversee and assure effective coordination of planning and development of the GOOS, taking into account scientific advice received from the CCCO-JSC Ocean Observing System Development Panel;

Establishes a GOOS Support Office with the functions outlined in Annex I to work under the direction of the Secretary IOC;

Endorses the concept of a Steering Committee and Planning Office for a Global Climate Observing System (GCOS) and agrees to work with other interested international organizations to establish and support such a Committee and Office;

Agrees that the GOOS Support Office should form the oceanographic component of the proposed GCOS Planning Office;

Invites the WMO, UNEP, and ICSU to cooperate with the IOC in the planning and development of the GOOS and to coordinate their existing ocean observing programs and systems with those of the IOC within the context of the GOOS;

And

Requests the Director-General of UNESCO and urges Member States to provide staff and financial resources needed for the planning and development of the Global Ocean Observing System and particularly for establishment of the GOOS Support Office by July 1991.

Appendix to Recommendation OPC-IV.1
FUNCTIONS OF THE GOOS SUPPORT OFFICE

The GOOS Support Office will:

1. Review and analyze scientific and observational requirements for the GOOS and prepare draft recommendations as to how the Global Ocean Observing System should be implemented to meet these needs;
2. Review and analyze existing and new ocean observation and data management systems and capabilities and prepare draft recommendations for their modification, expansion, and/or improvement in support of the GOOS;
3. Identify requirements for technical assistance and training related to the GOOS; and
4. Assist the C/OPC and the Secretary IOC to interact with other international organizations, as appropriate, on GOOS-related issues.

Note: Approval of this resolution was preceded by a review of:

- (i) IOC Resolution XV-4 and EC-XXIII.5 on the need to design and plan a global ocean observing system;
- (ii) WMO Resolution EC XLI-II on the need for development of a global ocean observing system in support of climate monitoring, prediction, and research;
- (iii) the recommendations of the Intergovernmental Panel on Climate Change and the Second World Climate Conference as regards to the need to establish a Global Climate Observing System; and
- (iv) the UNESCO's Third Medium-Term Plan (1990-1995) that states that *"the development of ocean services will be greatly accelerated leading to a 'global integrated ocean observing system' ('World Ocean Watch'), in support of marine research and ocean use, as a common service to Member States and their scientific community"*.

and by a review of the following proposals received by the Fourth Session of the Committee on Ocean Processes and Climate:

- (i) the Summary Report of the First Session of the IOC *ad hoc* Group of Experts on an Ocean Observing System (Washington DC, USA, 6-7 September 1990) and the document "Toward a Global Ocean Observing System: A Strategy" prepared by the *ad hoc* Group of Experts;
- (ii) the report of the First Session of the Joint CCCO-JSC Ocean Observing System Development Panel (Alexandria, Virginia, USA, 10-12 September 1990);
- (iii) the Proposal on the Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change, prepared by the UNEP-IOC-WMO Meeting of Experts (Paris, 10-14 December 1990) and the recommendations of the meeting;
- (iv) the proposal for a Global Climate Observing System (GCOS) prepared by an *ad hoc* group sponsored by WMO, IOC and ICSU (Winchester, UK, 14-15 January 1991); and
- (v) the Status Report on existing ocean elements and related systems (Doc. IOC/INF-833).

Recommendation OPC-IV.2

SUPPORT FOR THE WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)

The IOC Committee on Ocean Processes and Climate,

Recalling Resolution XV-2, which established Institutional Arrangements for WOCE, including the setting up of the Intergovernmental WOCE Panel (IWP),

Noting the Report of the First Session of the IOC-WMO Intergovernmental WOCE Panel (IOC-WMO/IWP-I/3),

Taking into account the findings and recommendations of the above Panel, which met 22-25 October 1990,

Reaffirms the importance of WOCE for climate change studies;

Endorses the Panel's recommended Actions for the WOCE Scientific Steering Group, Member States and Intergovernmental Bodies;

Urges Member States which have already made commitments to WOCE to meet these fully, maintain their timing and momentum, and enhance them where possible;

Calls upon Member States not currently doing so to consider how they can initiate support to WOCE;

Requests the WOCE IPO in collaboration with the IOC and WMO Secretariats to assess how well data acquisition activities such as the WMO World Weather Watch, IGOSS, IODE, DBCP, and GLOSS are meeting WOCE requirements, and to report its findings through the IWP to the OPC;

Instructs the Secretariat, in collaboration with the WOCE Scientific Steering Group/International Project Office to circulate to Member States a scientifically justified statement accompanying specific requests for resources/assistance in implementation of this call for further support;

Recognizes that the Committee on Earth Observations Satellites (CEOS) which was created in 1984 as a result of recommendations from the Economic Summit of Industrialized Nations is an appropriate focal point for international coordination of those global change activities associated with space-based Earth observations and related data management; and

Instructs the Secretariat to offer IOC assistance to CEOS, with a view towards maintaining simultaneity between WOCE field programmes and satellite missions of ERS-1, TOPEX/POSEIDON, and ERS-2 as well as enhancing and focussing space agency Earth Observation mission planning on oceanographic requirements.

Recommendation OPC-IV.3

GLOBAL SEA LEVEL OBSERVING SYSTEM (GLOSS)

The IOC Committee on Ocean Processes and Climate,

Having reviewed the Summary Report of the Second Session of the IOC Group of Experts on GLOSS,

Having also reviewed the Report and recommendations of the IOC Workshop on Sea Level Measurements in Antarctica,

Welcoming the publication and widespread distribution of the GLOSS Implementation Plan, with the strong emphasis on co-operation with governmental and non-governmental organizations,

Recognizing the need for continued central co-ordination of GLOSS activities by the IOC Secretariat,

Noting the contents of the Male' Declaration on Global Warming and Sea Level Rise adopted by the Small States Conference on Sea Level Rise and the statement of the Venice Conference "Impact of Sea Level Rise on Cities and Regions",

Further noting with satisfaction the success of the 8th sea level training course for specialist from English-speaking countries in Bidston, UK and the first sea level training course for specialists from French-speaking countries in Brest, France,

Expresses its gratitude to the Governments of the USA, USSR, UK and France for the excellent arrangements for the hosting of the above meetings and training courses;

Also expresses its gratitude to the Governments of Germany and Sweden for the continued efforts to assist countries of West Africa in the installation and maintenance of tide gauges in the framework of GLOSS;

Endorses the Summary Report and Recommendations of the Second Session of the IOC Group of Experts on GLOSS;

Recommends that the IOC Assembly, at its Sixteenth Session:

- (i) consider and approve the GLOSS Work Plan for 1991-1993 as proposed by the Second Session of the IOC Group of Experts on GLOSS;
- (ii) urge the Director-General of UNESCO and IOC Member States to provide or identify sources of funds and staff required for implementation of the GLOSS Work Plan, particularly its technical assistance and training programmes;
- (iii) instruct the Secretary IOC to provide necessary support: a) for GLOSS participation in the follow-up to the Male' Declaration and the Venice Conference; b) for the Workshop on "Causes and Consequences of Sea Level Changes on the Western Indian Ocean Littoral Coasts and Islands" to be convened in Mombasa, 24-29 June 1991;
- (iv) invite the Chairmen of IOC Regional Subsidiary Bodies to consider the development of GLOSS regional components at the forthcoming meetings; in particular invite the Chairmen of WESTPAC, and IOCINDIO to consider designating GLOSS Regional Co-ordinators for their regions;
- (v) urge the Member States to provide sea level data from GLOSS stations to the international data centers without delay in accordance with the provisions of the GLOSS Implementation Plan and the requirements of ongoing scientific programmes and forthcoming satellite altimetric measurements, and inform the Secretary IOC on their plans to install and/or reactivate the high priority GLOSS stations, as determined by the Group of Experts on GLOSS;
- (vi) emphasize to Member States the importance of evaluating critically the accuracy of the sea level measurements using established and newly developed technology.

Recommendation OPC-IV.4

UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (UNCED)

The IOC Committee on Ocean Processes and Climate,

Considering the requirements for a new and expanded Global Ocean Observation System to respond to the needs for Climate Prediction, and other coastal and ocean activities,

Recognizing further the need to have commitments by Member States to implement a continuous and comprehensive Global Ocean Observation System,

Recognizing the opportunity afforded by the 1992 UN Conference on Environment and Development,

Recommends that the IOC Assembly produce a draft declaration of intent for adoption at the 1992 UNCED that would commit countries:

- (i) to agree that continuing ocean observations are essential to respond to the needs of global climate and the economic environmental marine concerns of national and regional bodies;
- (ii) to encourage the implementation of national programmes and activities contributing to a comprehensive and continuous ocean observation system;
- (iii) to support the international co-ordination and operation of the system;
- (iv) to support the international research programmes contributing to the effective design and implementation of the GOOS;
- (v) to mobilize and encourage the transfer of technology, training and resources to Developing Countries to enable widespread co-operation in the GOOS;
- (vi) to recognize, develop and implement the use of satellites and other automated and advanced technology for use in global ocean observations;

Recommends further that the declaration also calls on the Intergovernmental Oceanographic Commission to serve as the appropriate UN organization to lead the intergovernmental effort in co-operation with the WMO and other interested UN Agencies;

Recommends further that a non-technical document be prepared to accompany the declaration of intent that would:

- (i) give a brief description of the importance of the ocean environment to the nations of the world;
- (ii) describe the need for a new and improved global ocean observing system to respond to the needs of climate, weather, marine environmental quality, coastal and ocean activities, and utilization of living marine resources;
- (iii) outline the possible national and international scope of the system;
- (iv) identify existing systems, their strengths and deficiencies;
- (vi) describe the role of the international research programmes;

- (vi) describe the links with the SWCC negotiations;
- (vii) identify the role of the UN and international organizations.

Recommendation OPC-IV.5

PROTECTION OF GLOBAL CLIMATE FOR PRESENT AND FUTURE GENERATIONS OF MANKIND

The IOC Committee on Ocean Processes and Climate,

Welcoming United Nations General Assembly (UNGA) resolutions 43/53 of 6 December 1988 and 44/207 of 22 December 1989 which recognized that climate change is a common concern of mankind,

Noting with satisfaction that United Nations General Assembly resolution 45/212 of 21 December 1990 established an Intergovernmental Negotiating Committee for the preparation of a framework convention on climate change, containing appropriate commitments, and any related instruments that might be agreed upon, and invited relevant bodies of the United Nations system to make appropriate contributions to the negotiating process,

Taking into account the progress made at the First Session of the Intergovernmental Negotiating Committee which was held in Washington on 9 January 1991,

Recommends that the IOC Assembly at its Sixteenth Session, **expresses** its continued interest in contributing, as appropriate, to the negotiating process for the preparation of a framework convention on climate change, and any related instruments that might be agreed upon.

ANNEX III

LIST OF PARTICIPANTS

I. PARTICIPANTS FROM
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ANNEX IV

LIST OF DOCUMENTS¹

Document Code	Title
WORKING DOCUMENTS	
IOC/OPC-IV/1	Agenda
IOC/OPC-IV/1 Add.	Timetable
IOC/OPC-IV/2	Annotated Provisional Agenda
IOC/OPC-IV/3	Summary Report of the Session
IOC/OPC-IV/4	Revised Provisional List of Documents
IOC/OPC-IV/5	List of Participants
IOC/OPC-IV/6	Report on Intersessional Activities
IOC/OPC-IV/7	Summary of comments on the "Strategy for the Development of Global Ocean Observing System"
IOC/OPC-IV/8	Proposed Draft Programme on the IOC Activities in the Field of Ocean Dynamics and Climate for 1992-1993
IOC-XVI/8 Annex 3	Toward a Global Ocean Observing (GOOS): A Strategy
IOC-WMO/IWP-I/3	Summary Report of the First Session of the IOC-WMO Intergovernmental WOCE Panel (Paris, 22-24 October 1990)
-	Recommendations, Declaration and Proceedings of the Second World Climate Conference (Geneva, 29 October - 7 November 1990)
IOC/GE-GLOSS-II/3	Summary Report of the Second Session of the IOC Group of Experts on GLOSS (Miami, USA, 22-26 October 1990)
IOC/INF-829	Summary Report of the First Session of the IOC <i>ad hoc</i> Group on a Global Ocean Observing System (Washington, DC, 6-7 September 1990)
CCCO-JSC/OOSDP-I/3	Summary Report of the First Session of the CCCO-JSC Ocean Observing System Development Panel (Washington, DC, 12-14 September 1990)
IOC-XVI/8 Annex 4	Proposal on a Long-term Global Monitoring System of Coastal and Near-shore Phenomena related to Global Climate Change (Executive Summary)
UNEP-IOC-WMO/GCNSMS-I/3	Summary Report of the UNEP-IOC-WMO Meeting of experts on Long-term Global Monitoring System of Coastal and Near-shore Phenomena related to Climate Change including the proposal on GCNSMS (Paris, 10-14 December 1990)

¹ This list is for reference only. No stocks of these documents are maintained, except for the Summary Report.

Document Code	Title
WMO-IOC/ITB-IV/3S	Executive Summary and Recommendations of the Fourth Session of the WMO-IOC Intergovernmental TOGA Board (Geneva, 8-11 January 1991)
SCOR-IOC/CCCO-XI/3	Report of the Eleventh Session of the SCOR-IOC Committee on Climatic Changes and the Ocean (CCCO) (Paris, 28 May - 1 June 1990)
IOC-XVI/8 Annex 7	Status Report on IOC involvement in the preparation of the 1992 United Nations Conference on Environment and Development (UNCED)
IOC-XVI/8 Annex 1	Proposed Programme on Coastal Ocean Circulation Dynamics and Fluxes
IOC-XVI/8 Annex 8	Proposal on the Draft Programme and Budget for 1992-1993
IOC-XVI/8 Annex 9	Report of a WMO-IOC-ICSU <i>ad hoc</i> Meeting on the Global Climate Observing System (Winchester, UK, 14-15 January 1991)
IOC Workshop Report No. 68	International Workshop on Marine Acoustics (Beijing, China, 26-30 March 1990)
INFORMATION DOCUMENTS	
WCRP Special Report WMO/TD No. 357	Summary Report of the Third Session of the WMO-IOC Intergovernmental TOGA Board (Geneva, 9-12 January 1990)
IOC/INF-833	Status Report on the Ocean Observing Systems
IOC Workshop Report No. 69	IOC Workshop on Sea Level Measurements in Antarctica (Leningrad, USSR, 28-31 May 1990)
IOC/OPC-IV/Inf.1	Land-Ocean Interactions in the Coastal Zone (LOICZ) (A proposed Core Project of IGBP)
IOC/OPC-IV/Inf.2	Male's Declaration on Global Warming and Sea Level Rise
IOC Technical series No. 35	Global Sea Level Observing System (GLOSS) Implementation Plan
-	GLOSS Brochure

ANNEX V

PROGRAMME RELATED TO THE IOC COMMITTEE ON OCEAN PROCESSES AND CLIMATE
(1991, 1992-1993)

	Project/Programme/ intergovernmental body	Proposed activities and actions	1991	1992	1993
1.	IOC Committee on Ocean Processes and Climate (IOC/OPC)	1.1 4th Session of IOC/OPC 1.2 5th Session of IOC/OPC 1.3 6th Session of IOC/OPC	27.02-1.03 Paris	March Paris	March Paris
2.	WMO-IOC Intergovernmental TOGA Board (ITB)	2.1 4th Session of WMO-IOC ITB 2.2 5th Session of WMO-IOC ITB	8-11.01 Geneva	January	
3.	IOC-WMO Intergovernmental WOCE Panel (IWP)	3.1 2nd Session of IWP		March	
4.	Global Sea Level Observing System (GLOSS)	4.1 3rd Session of IOC Group of Experts on GLOSS 4.2 Sea Level Scientific Workshop for Regional and National GLOSS Contacts		2nd half	2nd half

	Project/Programme/ intergovernmental body	Proposed activities and actions	1991	1992	1993
4.	GLOSS (continued)	<p>4.3 Workshop on Sea Level Rise in the Western Indian Ocean</p> <p>4.4 Workshop on Implication of Climate Change and Impact of Sea Level Rise on the South Asian Sea Region</p> <p>4.5 2nd Workshop on Sea Level Measurements in Antarctic</p> <p>4.6 Workshop on accuracy of sea level measurements</p> <p>4.7 Updating of GLOSS Implementation Plan</p> <p>4.8 Updating of GLOSS Handbook</p> <p>4.9 Sea-Level Training Course * for english speaking countries (Bidston, UK)</p> <p>4.10 Sea-Level Training Course * for spanish speaking countries (Brazil)</p> <p>4.11 Sea-Level Training Course * for french speaking countries (Brest, France)</p> <p>4.12 Sea-Level Training Course * for russian speaking countries (Leningrad, USSR)</p>	<p>Mombasa (Kenya)</p> <p>possibly in Bangladesh or in Pakistan</p>	<p>1st half</p> <p>2nd half</p> <p>2nd half</p> <p>?</p> <p>?</p>	<p>1st half</p> <p>?</p> <p>?</p>

* Subject to the availability of funds.

GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

GOOS Actions and Timetable	1991												1992												
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
1. IOC approval of GOOS strategy & establishment of GOOS Support Office			*				*																		
2. WMO approval of GOOS strategy & establishment of co-ordination mechanism					*																				
3. OOSDP progress report & advice on GOOS design & on present observational requirements for global ocean & climate models				*																					
4. <u>Preparation of Further Documentation on GOOS</u> a. Draft completed b. Review by IGOSS-VI c. Approved by OPC-V & IOC EC XXV d. Approval by WMO EC-XLII									*		*				*				*						
5. Development of Global Climate Observing System a. Establishment of Planning Office & Steering Committee b. Incorporation of GOOS plans							*																		
								c	o	n	t	i	n	u	o	u	s								
6. <u>Preparation of Instrument (with the help of consultants/experts)</u> a. Approval of draft by OPC & IOC b. Approval of draft by WMO c. Review by UNCED PrepComm					*			*							*		*								

GOOS Actions and Timetable	1991												1992													
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
7. <u>Preparation of Second Annual GOOS Status Report</u> by the Secretariat in co-operation with relevant IOC & WMO bodies												*														
8. Co-ordination with Related Activities																										
a. IGOSS (include IGOSS meetings)				*					*		*															
b. IGOM-II				*											*											
c. WOCE													*		*											
d. TOGA						*																				
e. CCCO								*										*				*				
f. UNCED PrepComm										*																
g. DBCP																										
h. IODE activities							*							*												
i. IOC Regional Activities	I	O	C	I	N	C	W	I	O/I	O	C	I	N	D	I	O		*	I	O	C	A	R	I	B	E

LONG-TERM MONITORING PILOT ACTIVITIES FOR COASTAL AND NEAR-SHORE PHENOMENA RELATED TO CLIMATE CHANGE

GCNSMS Actions and Timetable	1991												1992												
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
1. Approval of the Concept, objectives & pilot activities of Long-Term Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change by IOC Assembly by WMO Congress by UNEP Governing Council			*		*																				
2. Preparation of implementation plan for GCNSMS pilot phase (proposed six pilot phase activities)																									
(1) Sea level changes & coastal flooding by UNEP-IOC Regional Task Teams in co-operation with: IOC-WMO C/IGOSS IOC GE/GLOSS IOC Regional bodies	I	O	C	I	N	D	I	O	I	O	C	I	N	C	W	I	O	I	O	C	A	R	I	B	E
(2) Coastal circulation by UNEP-IOC Regional Task Teams in co-operation with IOC Regional bodies: IOC-WMO C/IGOSS & IOC Activities on Ocean Dynamics & Circulation on the Continental Shelf											*														

Second half

GCNSMS Actions and Timetable	1991												1992											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
(3) <i>Assessment of organic carbon accumulation in surface coastal sediments by UNEP-IOC Regional Task Teams in co-operation with: GIPME (GEMSI/GEEP) IOC Regional bodies</i>	I	O	C	I	N	C	W	I	O	/	I	O	C	I	N	D	I	O						
(4) <i>Changes in plankton community structure by UNEP-IOC Regional Task Teams in co-operation with: OSLR IOC Regional bodies</i>																								
(5) <i>Benthic communities: coral reef ecosystems by UNEP-IOC Regional Task Teams in co-operation with: OSLR ASPEI GIPME IOC Regional bodies</i>	I	O	C	I	N	C	W	I	O	/	I	O	C	I	N	D	I	O						
(6) <i>Terrestrial vegetation: mangrove communities by UNEP-IOC Regional Task Teams in co-operation with: OSLR IOC Regional bodies</i>	I	O	C	I	N	C	W	I	O	/	I	O	C	I	N	D	I	O						

**TECHNICAL TRAINING AND ASSISTANCE PROGRAMME FOR THE
GLOBAL OCEAN OBSERVING SYSTEM (GOOS) DEVELOPMENT
IN 1991-1993**

To facilitate the broad international participation, vital to its success, GOOS must provide a sustained basis for:

an international technical training and assistance programme to support users and involve developing countries in observational and data analysis activities.

For the period 1991-1993 it is proposed to develop and implement GOOS technical training and assistance programme, with the following proposed concrete activities:

1. **Training courses on oceanographic measurements and data interpretation, required for GOOS (level of technicians)**
 - Sea-Level Training Courses for English Speaking Trainees UK, Bidston (annual)
 - Sea-Level Training Courses for French Speaking Trainees France, Brest (annual)
 - Sea-Level Training Course for Spanish/Portuguese Trainees Brazil 1992-1993
 - Sea-Level Training Course for Russian Speaking Trainees 1993
 - IGOS Training Course for different regions (2 Seminars: IOCEA, IOCINCWIO) 1992-1993
2. **Scientific-training Seminars/Workshops (Regional) on the application of ocean data and preparation data products in support of fisheries, coastal zone management and marine environment protection to foster the development of national ocean services for future participation in GOOS in conjunction with the meetings of IOC regional bodies. Additional support will be required, in particular for the IOC-WMO Seminar on IGOS products to bring more scientists from developing countries.**

1991
IOCINCWIO/IOCINDIO
1992
IOCARIIBE
1993
WESTPAC

Tokyo, Japan
April 1991
3. **Provision of expertise, training and standard microcomputer software to individual developing countries on the use of personal computers for the data analysis of deep ocean and coastal data sets required in support of coastal zone management and protection; improved fisheries; engineering activities; marine pollution control; climate studies; and other practical application. This will be done through strengthening support of IOC OCEAN PC Project (preparation of a standard microcomputer).**

1991-1993
(2-3 countries per year)
4. **Training courses on Application of Satellite Remote Sensing to the Marine Environment (for IOC regions).**

1991-1993
Annual

5. Assistance to developing countries in the provision of instruments, their installation and on-spot training (tide-gauges, spare-parts, XBT launchers and probes, etc.). 1991-1993

Implementation of such technical assistance and training programme will need substantial additional financial resources (about 800 thousand dollars for 3 years) and 100% time for a professional staff member of the IOC Secretariat. 1991-1993
Until now the training activities has been organized in selected parts for some years and they are related to existing system and accelerated development.