Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS-II)

Second Session

Paris, 6-9 June 1995

UNESCO

In this Series	*Languages*
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* For reasons of budgetary constraints, Annexes III to IX remain untranslated.

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1. OPENING

1 The Second Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS) was called to order by the Chairman, Prof. M. Glass, at 10.00 on Tuesday, 6 June 1995, at UNESCO Headquarters. The Chairman welcomed the participants and gave the floor to the Executive Secretary IOC, Dr. G. Kullenberg.

2 Dr. Kullenberg welcomed the participants to UNESCO Headquarters, to IOC and to Paris. He thanked all present for devoting their time to support I-GOOS and noted that an intergovernmental mechanism was very important, in addition to scientific guidance, to develop an activity as ambitious as GOOS. He stressed GOOS progress made so far, especially during the last two years, and highlighted the support provided by Member States and co-sponsoring organizations to the System.

3 Having noted the comprehensiveness of the agenda for the session, Dr. Kullenberg underlined what he considered to be the key issue facing the session, viz. to define priorities within GOOS development, given the scarcity of funds and manpower. He dwelt on a few examples of "important" actions to be undertaken, such as the follow-up of the report by the Ocean Observing System Development Panel (OOSDP), the implementation of a few selected pilot activities, etc. He further emphasized several aspects of GOOS activities that would most likely deserve a good deal of attention, such as a data management and exchange policy, regional prospective in liaison with TEMA questions, relationship with existing systems/bodies and the thorough examination of previous decisions/recommendations made since the establishment of I-GOOS. He referred to the up-coming IOC Assembly where decisions on support and budget allocations would be made.

4 Dr. Kullenberg concluded his introductory remarks by assuring the Committee of the dedicated support of the GOOS Support Office and wishing the session full success.

5 On behalf of the Secretary-General of WMO, Professor G.O.P. Obasi, the WMO Secretariat Representative, Dr. P. Dexter, also welcomed participants to the meeting. He noted the continuing strong interest of WMO in GOOS development and implementation, and reiterated the willingness of WMO to continue to materially support GOOS planning and maintenance. The fact that this support was being provided in the context of overall budget reductions within WMO indicated the importance WMO has placed on GOOS.

6 The WMO Representative then noted that the Twelfth World Meteorological Congress, which was currently taking place in Geneva, was addressing two major issues of potential importance to GOOS: a policy for the future exchange of meteorological data and products; and the programme and budget for the next financial period. He indicated that decisions on the first topic would likely have some effects on oceanographic data exchange under GOOS, and promised to report on these decisions as soon as possible. He then stressed that the programme budget reductions, which were likely to occur in WMO as in other organizations internationally and nationally, should be seen as an opportunity for creative programme development, rationalization and the setting of priorities. He therefore urged the Committee to concentrate its efforts during the coming week and use GOOS achievements over the past year to define a realistic set of priorities and goals for the near future, that can be achieved within the available budgetary constraints. Finally, the WMO Representative wished the Committee an enjoyable and productive session.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

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

2.2 DESIGNATION OF A RAPPORTEUR

8 The Committee designated Dr. G. Needler (Canada) and Ms. Muriel Cole (USA) as Rapporteurs for the Session.

2.3 CONDUCT OF THE SESSION

9 J.P. Rebert, Director, GOOS Support Office, introduced the revised Timetable and reviewed the arrangements and documentation for the meeting.

10 The list of participants is given in Annex III.

3. REPORT ON INTERSESSIONAL ACTIVITIES.

3.1 REPORT BY THE CHAIRMAN OF THE INTERGOVERNMENTAL IOC-WMO-UNEP COMMITTEE FOR GOOS (I-GOOS)

11 Prof. M. Glass, Chairman of I-GOOS, reported on intersessional activities. He recalled Resolution XVII-5 taken at the Seventeenth Session of the IOC Assembly approving all the recommendations of GOOS-I and Resolution EC-XXVII.6 taken by the Twenty-seventh Session of the IOC Executive Council. He described the on-going activities and highlighted the fact that GOOS is now a well accepted concept and that countries have now a clearer view of its content. Some key Committees such as the Joint Scientific and Technical Committee (J-GOOS) and the Strategy Sub-Committee (SSC) have been installed and are working. The SSC held its First Session and provided the outline of a strategic plan for GOOS implementation.

12 He remarked however that many members of the scientific community are still to be convinced that GOOS is not a competing programme but a new system, the building of which requires their skill. Governments must be convinced of the usefulness of GOOS. He stressed the importance of pilot studies in order to prove the concept. GOOS will need help from a wide variety of end users for the correct definition of the products to provide. The Chairman recalled the crucial need for organizational help to build up GOOS at a global level.

3.2 REPORT BY THE CHAIRMAN OF J-GOOS

13 The Second Meeting of the Joint Scientific and Technical Committee of GOOS (J-GOOS) took place in Paris at ICSU premises, 24-26 April 1995. The Meeting was chaired by Prof. Otis Brown, Chairman of J-GOOS. The IOC nominated expert representatives at the Meeting were Dr. G. Holland and Dr. N. C. Flemming. For part of the Meeting, IOC and I-GOOS were represented by the Executive Secretary IOC, Dr. Gunnar Kullenberg, the Chairman of I-GOOS, Prof. Michel Glass, and the Director of the GOOS Support Office, Jean-Paul Rebert. Dr. N. C. Flemming, on behalf of the Chairman of J-GOOS, used notes provided by Prof. Brown and the Draft Report of the Meeting, to brief the Committee on J-GOOS progress.

14 At the Second Session of J-GOOS it was agreed: (i) To establish links between the J-GOOS Scientific Panel on Living Marine Resources and GLOBEC; (ii) To continue the work of the HOTO Scientific Panel, and to further expand and develop the existing report on HOTO; (iii) To work with IODE and IGOSS to identify the cross-cutting Ocean Services needs for GOOS; (iv) To set up a group to work on the first draft of a Science Plan for the Coastal Module; (v) To organize a workshop assessing the OOSDP Report to discuss implementation, and identify scientific and technological priorities; (vi) To complete the draft of a Scientific Strategy Statement for GOOS; (vii) To help set up the Ocean Observing Panel for Climate; (viii) to organize a workshop with GLOBEC on coastal seas, especially in regard to the complex issues of multi-parameter modelling; (ix) To establish links between J-GOOS and the Space Agencies; and (x) To plan to integrate existing observing systems with GOOS in a scientifically controlled manner.

15 J-GOOS discussed extensively the relationship between J-GOOS and I-GOOS. It was concluded that there are distinct and essential tasks for both bodies to carry out, and that there should be regular meetings and/or correspondence between the Chairmen of the two bodies. However, it was stressed that there are many activities which must be carried out by national agencies, or international bodies and agencies not controlled by the sponsors of GOOS, and that both J-GOOS and I-GOOS must avoid the trap of setting up numerous subordinate bodies which cannot feasibly carry out the tasks allotted to them, and which cannot even be allocated sufficient funds for meetings.

16 J-GOOS reviewed in detail the reports submitted by the OOSDP and HOTO Panel. With regard to the LMR and Coastal Modules new groups were established to initiate the work of scientific

assessment and design. With regard to Services, it was agreed that there should be a study of the service requirements of the other Modules, but not a separate scientific assessment.

17 J-GOOS accepted the tasks allocated to it by the GOOS Strategy Sub-Committee Meeting and stressed the importance of establishing credible time-lines or bench-mark dates for implementing different stages of GOOS. If this is not done, it is not possible to co-ordinate the different phases and aspects of work carried out by J-GOOS, I-GOOS and their various subordinate bodies and related organizations and programmes. External time markers are provided by the completion phases of each of the major global ocean science programmes, the launch dates of key satellite missions, and the development of essential models and observing technologies. There was a brief discussion of the means of defining which projects and programmes could be recognized as part of GOOS, and this matter was referred to an intersessionnal correspondence group.

3.3 REPORT BY THE DIRECTOR OF THE GOOS SUPPORT OFFICE.

18 J.P. Rebert, Director of the GOOS Support Office, referred to Document IOC-WMO-UNEP/I-GOOS-II/8, Report of the Director of the GOOS Support Office, which describes the activities of the Office during the intersessionnal period. He gave the current composition and respective duties of the Office staff members, and provided a general overview of their activities related to the implementation of the I-GOOS and J-GOOS Committees and their subsidiary bodies. He highlighted the efforts undertaken to promote GOOS through an active participation in meetings of scientific programmes related to GOOS design and in IOC meetings related to Global Ocean Monitoring. Links were established and strengthened with other global observing programmes such as GCOS and GTOS, through membership of some of their technical panels, as well as with regional organizations having the capacity to be involved in GOOS.

19 However, he noted that a lack of expertise in some areas prevents the Office from fully encompassing all the aspects of GOOS design and implementation. He reiterated the request to Member States to second experts in order to fill these gaps. He stressed the importance at the GOOS Support Office having a permanent Director and drew the attention of the Committee on the need of upgrading the Office's electronic equipment in order to increase effectiveness.

4. REPORTS ON NATIONAL GOOS ACTIVITIES

20 National reports describing existing activities and plans for the GOOS development, as well as national priorities and problems were presented by the representatives of Australia, Brazil, Canada, Chile, China, France, Germany, India, Malaysia, Malta, Norway, the Netherlands, Japan, Poland, Russian Federation, United Kingdom, United States of America. In addition, written reports were submitted by Colombia, Mauritius, Spain and Vietnam. All the reports are reproduced in the Annex IV.

21 All countries reiterated their strong support to the GOOS development required for forecasting global climate change, and changes in the marine environment and its resources, as well as for supporting improved management and decision-making, especially in coastal areas. The participants provided information on their efforts to organize national structures for GOOS implementation and co-ordination among research and operational agencies and user community groups. At present, such co-ordination is provided in many countries through national oceanographic committees and joint GCOS-GOOS groups. A smaller number of countries have established dedicated GOOS groups and committees.

22 Some countries have initiated joint regional GOOS activities within the framework of EUROGOOS, MEDGOOS, NEARGOOS and the Pacific ocean, and at the non-governmental level in programmes related to El Niño monitoring.

23 Reports made clear that at present contributions to GOOS by many countries are carried out through the support of existing operational programmes, such as IGOSS, GLOSS, IODE, and the support to large scale research programmes - WOCE, CLIVAR, OSLR, JGOFS, LOICZ. It was emphasized that international research will continue to supply the information on which the scientific design of the GOOS modules is based.

There is a need for continued development of new technology for ocean and coastal observations and assistance to countries which are lacking such technology.

24 Many countries stressed the need for socio-economic studies to understand, quantify and articulate the economic benefits of GOOS. Such studies have been already initiated in some European countries (within EUROGOOS) and the USA. It was proposed that the countries with experience in such studies 5.1.3pagrovide advice and help through experts and consultants to other countries, particularly developing countries, in organizing socio-economic studies.

25 The Delegate of Brazil reaffirmed the intention of his country to second a specialist to the GOOS Support Office.

5. STATUS OF PLANNING AND IMPLEMENTATION OF THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

5.1 STATUS OF REPORTS BY THE I-GOOS SUBSIDIARY BODIES

5.1.1 The Group of Experts on the Global Sea-Level Observing System (GE/GLOSS)

26 Dr. D. Pugh, Chairman of the IOC Group of Experts on GLOSS, reported on the progress in the implementation of GLOSS and the outcome of the Fourth Session of the Group, held in Bordeaux, 1-3 February 1995. The report of the Fourth Session of the IOC Group of Experts on GLOSS was made available to the participants.

27 Dr. Pugh highlighted GLOSS development and implementation including the scientific aspects of the network, GLOSS strategy and applications of GLOSS data.

28 The meeting of the GLOSS Group of Experts was preceded by the IOC/GLOSS-IAPSO Scientific Workshop on Sea-Level Variability and Southern Ocean Dynamics, which provided a stimulating scientific introduction to the GLOSS Session. A special session on sea-level changes and coastal impacts was held during the BORDOMER Conference followed by GLOSS-IV (6-10 February 1995); it was chaired by Dr. Pugh. GLOSS maintains contacts with IAPSO and IPCC.

29 The GLOSS Strategy as proposed by the Group of Experts, includes the integration of GLOSS tide-gauges and satellite altimetry for monitoring global and regional sea-level variability and the connection of selected GLOSS tide-gauge bench marks to a global geodetic reference system with the use of the Global Positioning System (GP-S). Close contacts have been maintained with the community dealing with the satellite altimetry and GPS, particularly with the International GPS Service (IGS). Information on GLOSS is widely distributed through the World Wide Web initiated in 1995.

30 Application aspects include preparation and wide distribution of sea-level products and data/information services as shown in the report of the Fourth Session of the GLOSS Group of Experts. Regional co-operation in establishing sea-level networks and producing sea-level products was strongly encouraged by the Group.

31 The Group of Experts gave special consideration to TEMA-related activities and encouraged real partnerships among countries as well as the use of extrabudgetary funds, particularly GEF, since the demand for training and technical assistance far exceeds the resources available at IOC.

32 Dr. Pugh then referred to the Plan of Action for 1995-1997 as proposed by the Group of Experts (as shown in Annex VI of the report) and asked the Committee to endorse it for submission to the IOC Assembly. He also pointed out the need for a dedicated post in the IOC Secretariat to develop GLOSS (similar to IGOSS and DBCP co-ordinators) and referred in this connection to the Resolution XVII-V.

33 The following comments and issues were expressed by the participants:

(i) Interaction between GLOSS and IGOSS and use of the GTS for real-time sea-level data exchange need to be further studied and elaborated;

(ii) Close co-operation should be maintained between GE/GLOSS and GOOS bodies in designing GOOS sea-level observing sub-systems, particularly in designing the GOOS Climate Module as proposed by OOSDP as well as in the GOOS Coastal Module;

(iii) The role of GLOSS and satellite altimetry as global systems in responding to the regional and national interests requires further study, particularly in improving predictions of such natural hazards such as storm surges, tsunamis, coastal erosion, inundation, etc. and developing coastal protective measures;

34 **The Committee noted with satisfaction** the progress in the implementation of GLOSS. **The Committee expressed** its support for the strategy, as proposed by the Group of Experts on GLOSS, aimed at integrating *in situ* measurements at GLOSS stations with satellite altimetry and geodesy and preparing global and regional sea-level products required for monitoring and assessment of global changes as well as for regional and national research and practical applications.

35 **The Committee recognized** the potential value of GLOSS for GOOS and **requested** the J-GOOS to assess the role of GLOSS in GOOS and to advise the I-GOOS on this matter.

36 **The Committee felt** that the report of the Fourth Session of the IOC Group of Experts on GLOSS, including the GLOSS Plan of Action for 1995-1997 period, should be directly addressed to the IOC Assembly for consideration and endorsement.

5.1.2 The I-GOOS Strategy Sub-committee

37 The Chairman recalled that the Strategy Sub-Committee had been established following a recommendation of I-GOOS-PS-I and was considered as of the highest priority. I-GOOS-PS-I had indicated that the Sub-Committee should be formed taking into account geographical distribution and include developing as well as developed countries as well as members of the user community be present. This led to the selection of a dozen members to compose the Sub-committee.

38 The Chairman then laid out the main results of the first session of the Sub-committee (Geneva, 27-30 March 1995) as follows:

(i) An Action Plan for GOOS was defined (see item 9);

(ii) An outline of a Strategic Plan for GOOS was prepared (see item 8);

(iii) A GOOS data policy statement was proposed and the necessity of defining a GOOS data management plan highlighted (see item 5.4);

(iv) The need for a GOOS space plan was stressed (see item 5.2.6);

(v) Benefits to be derived from GOOS should be listed and quantified (see item 6.4);

(vi) The wordings "global" and "regional" applied to GOOS complement each other (see item 5.5);

(vii) A good deal of thought was devoted to GOOS coastal and meteo-oceanographic services (see items 5.2.3 & 5.2.5);

(viii) Questions relating to GOOS implementation deserve much attention (see items 8 & 9);

(ix) Staffing and funding the GOOS Support Office is a critical issue (see item 9);

(x) Given the present scarcity of available funds, interim GOOS development and operation should make use of self-funded or no-cost "task teams".

39 It was emphasized that the action items identified by the SSC were aimed at stating clearly, without any attempt of prioritization, what *had to* and *could* be done for GOOS development.

40 **The Committee recognized** that its Strategy Sub-committee had worked very well, that the user community's input was invaluable and that it should continue its work for developing GOOS.

5.1.3 The I-GOOS Panel on Technical Implementation

41 This item was discussed together with the next one.

5.1.4 The I-GOOS Panel on Products and Distribution

42 The Chairman recalled that I-GOOS-PS-I had proposed the establishment of these panels, but that this had proved impossible, due to the scarcity of resources. Regarding the Panel of Technical Implementation the question was raised as to the usefulness of a single panel dealing with all implementation issues as compared with a series of smaller panels each dealing with a specific aspect of GOOS implementation. The Committee considered this question would deserve more thought before being answered and should be passed to the Strategy Sub-committee for further examination.

43 **The Committee considered** it would be premature to insist on the immediate establishment of two additional panels, even though their usefulness was obvious. However, the Committee did consider that it would be beneficial to appoint interim chairmen of these Panels who might be able to carry the prospective work forward. Mr. Gérard was appointed to serve as interim chairman of the Products and Distribution services. The USA agreed to help to seek an interim chairman for the Implementation Panel, not necessarily to come from the USA.

5.2 STATUS OF THE GOOS MODULES

5.2.1 Climate Monitoring, Assessment and Prediction: the Ocean Observing System Development Panel (OOSDP) and its follow-up

44 Dr. G. Needler presented the final report of OOSDP. He highlighted the difficulty of designing an observing system which must be a function of the goals to be met, the time scales under consideration and the instruments available for use. The OOSDP developed a set of goals and sub-goals. They were prioritized and a list of observations to constitute the initial observing system has been given. Five technical background documents accompanying the OOSDP report are to be published.

45 The Second Session of J-GOOS made several recommendations concerning the follow-on of the OOSDP report. In addition ICSU in collaboration with the Joint Scientific Committee for WCRP and the GCOS Planning Office is finalizing the terms of reference of a OOSDP follow-on panel, the Ocean Observations Panel for Climate (OOPC) as proposed by JSTC.

46 The Committee set up a list of participants wishing to receive a copy of the OOSDP final report. The Chairman proposed that a working group working by correspondence be established to examine this document and report their recommendations to I-GOOS for practical implementation. It was further proposed that those persons on the distribution list of the report would constitute this working group. The working group will report its conclusions to the next session of I-GOOS. Dr. A. Alexiou agreed to serve as Secretary for this Working Group.

5.2.2 Monitoring and assessment of living marine resources: the *ad hoc* Panel on Living Marine resources.

47 The Draft Strategic Plan of the *ad hoc* Panel had been reviewed by J-GOOS at its Second Session. The conclusions of J-GOOS were reported by the Chairman of I-GOOS and briefly discussed. Very little progress was noted since the previous session related to the LMR module.

48 The Representative of FAO referred to the importance of information on the status of fisheries resources and that fish populations can be indicators for the health of the ocean and reflect low frequency climate variability. He provided a statement on FAO's interest in collaborating in development of a Living Marine Resources Module for GOOS, based on the mandate, expertise and traditional responsibility of FAO for monitoring status and trends of fishery resources on a global basis as well as the facilities provided by

the FAO regional Fisheries Commissions. He therefore declared FAO's willingness to participate in the work of this Panel.

49 The Representative of ICES highlighted the role that the marine information products delivered by this organization can play within the framework of the implementation of this module. He welcomed the collaboration with GLOBEC. ICES is a co-sponsor of GLOBEC and during the course of this year it will 7establish a GLOBEC Project Office for the North Atlantic, manned by a Professional. This Office will provide an important focus for the involvement of ICES in GOOS activities.

50 **The Committee agreed** therefore on the proposition of J-GOOS to invite GLOBEC to join in organizing a workshop to guide its development of a design philosophy for this module.

5.2.3 Monitoring of the Coastal Zone environment and its changes: GOOS Coastal Module

51 This item was introduced by Dr. Tolkatchev. He presented a summary of the development of the Coastal GOOS Module since the First Session of the I-GOOS and the document 10 entitled "IOC-UNEP-WMO Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change".

52 I-GOOS at its First Session agreed that high priority should be assigned to the development of the GOOS Coastal Module in view of particular practical interests and immediate benefits that would be available from GOOS to coastal states. Observing and monitoring systems in the coastal zone need to be closely connected with the global system as regional and local models need to be connected with global models.

53 The Coastal Module of GOOS requires an integrated approach with regard to various aspects of the ocean observations needed for climate, living and non-living resources, pollution and information needed for integrated coastal zone management. It may have a different approach in different geographical regions depending on practical interests of groups of countries.

54 The First Planning Session of I-GOOS in 1994 recommended to establish an *ad hoc* group on the Coastal Module of GOOS in order to prepare an outline strategic plan for the Coastal Module taking into account existing pilot coastal monitoring activities, the LOICZ science plan and the work of J-GOOS. The ad hoc Group was not set up.

55 The I-GOOS Strategy Sub-Committee in 1995 recommended to J-GOOS to establish a coastal module panel as a matter of priority to prepare the scientific and technical design of this module.

56 At the subsequent session of J-GOOS, it was decided to establish an ad hoc panel for a duration of two years to define the scientific and technical components of the GOOS Coastal Module. According to the definition of J-GOOS *"the coastal module will provide infrastructure for integrated coastal area management, including inter alia living resources questions (e.g. recruitment of fish stocks), health of the ocean issues (e.g. fluxes of land derived contaminants, their transport distribution, fate and effects), and service module functions (e.g. storm surge and wave prediction, evolution of coastal circulation)"*. The composition of the *ad hoc* panel will be determined by the J-GOOS sponsoring agencies in consultation with the J-GOOS Chairman. The Panel was requested to prepare a first draft report before March 1997. J-GOOS-II also proposed the organization of a Workshop in early 1997 (to precede J-GOOS-IV) to help in the formulation of an implementation plan for the GOOS Coastal Module.

57 The participants discussed the need for a global approach to the development of Coastal Module of GOOS. Some participants noted that, due to the difference of oceanographic regimes and of the interests of countries in different coastal regions, a regional approach is indicated. However, the Committee agreed that global approach should be taken in view of the existence of common problems in different coastal regions (particularly the commonality of physical processes) and the need to develop common methodology for observations in the coastal zones as well as to develop common strategy for data exchange within GOOS. Close interaction with all other GOOS modules is also necessary.

58 The **Committee endorsed** the proposals made by J-GOOS and invited J-GOOS sponsoring agencies to provide required financial support for the proposed activities aimed at scientific/technical design of the GOOS Coastal Module and preparation of its implementation plan.

59 The **Committee emphasized** the need to establish close contacts with LOICZ and with scientific groups and projects of the IOC dealing with coastal matters.

60 The **attention of the Committee was brought** to the proposal of Dr. D.Norse, Chairman of the GTOS Planning Group, on collaboration between GTOS and GOOS, particularly within the framework of the proposed GTOS strategy to monitor estuaries, lakes and rivers.

61 **The Committee agreed** that collaboration between GOOS and GTOS is of importance in the planning and implementation of the GOOS Coastal Module and related exchange of data and information and recommended that the Chairman of I-GOOS in consultation with the Chairman of J-GOOS and the sponsoring agencies designate a rapporteur on GOOS-GTOS interaction. The Delegate of USA will propose candidates to the Chairman of I-GOOS. The Rapporteur will be invited to present a report and proposals on GOOS-GTOS interaction to the Third Session of the Committee.

62 **The Committee also reviewed** the progress in the implementation of the IOC-UNEP-WMO-IUCN Coastal Pilot Monitoring activities related to climate change.

Pilot activity on Monitoring Coral Reef Ecosystems

63 The progress and future development of this activity was considered by the IOC-LOICZ-IUCN Expert Meeting on Coral Reef Monitoring, Research and Management held in Bermuda in October 1994. The expert meeting recommended the development of a Global Coral Reef Monitoring Network Activity as part of the GOOS Coastal Module and has prepared a work plan for its development.

64 **The Committee agreed** that the proposed activity might be a potential contribution to the GOOS Coastal Module as well as to the HOTO and LMR modules, and invited J-GOOS to advise I-GOOS on this matter. **The Committee noted with satisfaction** that upon the initiative of the USA on the International Coral Reef Initiative (ICRI), the Secretary of IOC is negotiating with some interested Member States and international organizations the establishment of a position for an international co-ordinator for the Global Coral Reef Monitoring Network activity and his/her location. **The Committee agreed** that it would be important for the Co-ordinator to be fully involved in GOOS activities and panels that address coral reef related matters. The regional workshops on coral reefs that are presently being considered by the organizers of the International Coral Reef Initiative will provide input to J-GOOS.

65 **The Committee suggested** that the GCRMN co-ordinator establish close contacts with I-GOOS and J-GOOS. **The Committee also requested** the Secretary to support the participation of GCRMN experts in the Workshop on monitoring the physical and chemical environment of coral reefs (UK, September 1995) and the Eighth International Coral Reef Symposium (Panama, June 1996).

Pilot activity on Sea-Level Changes and Associated Coastal Impacts in the Indian Ocean

66 The Committee noted with satisfaction the progress in the development of this activity and active participation of the Indian Ocean countries in the Project. The Committee invited the IOC Group of experts on GLOSS to continue providing scientific and technical advice for the project implementation and **requested** the Secretary of IOC to provide the required support for the Training Workshop on Sea-Level Analysis,to be hosted by India in November/December 1995, as well as other related actions.

Pilot Activity on Monitoring Plankton Community Structure

67 **The Committee noted** that this activity was implemented through the OSLR programme and support provided by IOC for the implementation of the Continuous Plankton Recorded Survey being implemented by the Sir Alister Hardy Foundation for Ocean Science (UK). It was noted that this activity is being referred to the LMR Panel.

Pilot activity on monitoring mangrove communities

68 The Committee noted that the UNEP-UNESCO Task Team on the Impact of Expected Change on Mangroves prepared the report on "Assessment and Monitoring of Climatic Change Impacts on Mangrove Ecosystems" published by UNEP in 1994. **The Committee invited** the J-GOOS Panel on the Coastal GOOS Module to advise the I-GOOS on the implementation of this pilot activity.

69 **The Committee invited** UNEP and WMO to consider their possible support for the above mentioned coastal monitoring activities.

5.2.4 Assessment and prediction of the health of the ocean: the *ad hoc* Health of the Ocean (HOTO) Panel

70 The HOTO Panel provided a Strategic Plan for the Assessment and Prediction of the Health of the Ocean for GOOS, which had been examined by J-GOOS at its second session. The Chairman presented excerpts of this Plan and the Committee agreed that, though not as advanced as climate module plans, it could be considered as an excellent starting point for further developments. The delegate of Germany expressed his surprise that the role of regional Conventions had not been taken into account and recommended that the Chairman of I-GOOS contact these Conventions (HELCOM, OSPARCOM, etc.) to seek their support.

71 The recommendations of J-GOOS II concerning the HOTO module that were brought to the attention of the Committee were reviewed and discussed.

72 **The Committee decided** to request the Director of the GOOS Support Office to approach the appropriate bodies of IOC such as GIPME in order to evaluate their ability to respond to recommendations 1, 3 and 5 respectively related to the global inventory of measurement capabilities, reevaluation of methods for category 3 parameters and completion of the Mussel Watch Programme. The other recommendations cannot be currently addressed without the help of appropriate Technical Panels or recourse to external consultancy.

5.2.5 Marine meteorological and oceanographic services: the WMO Commission for Marine Meteorology (CMM)(and the Joint IOC-WMO Committee for the Integrated Global Ocean Services System (IGOSS)

73 **The Committee noted** with interest the results of discussions within J-GOOS and the SSC concerning the GOOS Services Module. In particular, it agreed with the views expressed by both these bodies that the services module essentially cross-cuts all the other modules to address issues such as data and information management, modelling and product generation, and product preparation and distribution. It further agreed that the role of GOOS in this area would therefore essentially be to support the improvement and expansion of services through the provision of enhanced data and products.

74 In order to advance the issues involved in the services module the **Committee felt** it essential to first have detailed background information on existing services, service requirements, deficiencies and future trends. **It therefore decided** to establish an *ad hoc* Working Group on Marine Meteorological and Oceanographic Services, to work by correspondence to prepare this necessary background information.

75 **Resolution I-GOOS-II.1 was adopted.**

76 **The Committee urged** the Working Group to consider in its work a draft definition of what constitutes oceanographic services, with a view to possibly limiting the scope of such services to be dealt with under GOOS.

77 Also under this agenda item, **the Committee noted with interest** the recent activities of the WMO Commission for Marine Meteorology and the joint IOC-WMO Committee for the Integrated Global Ocean Services System. **It recognized** that both these bodies deal directly with the provision of metocean services and that there should therefore be close liaison between them and GOOS in the context of the services module and the general implementation of GOOS. **It also welcomed** the desire on the part of CMM and

IGOSS to further develop this liaison, and agreed that it would be in a better position to determine how interaction and co-operation should develop once the results from the ad hoc group on services were available. At the same time, the Committee welcomed the information provided on recent CMM and IGOSS activities and requested that both bodies to keep it closely informed on similar activities in the future.

78 **The Committee noted** with particular interest the details provided by the Chairman of IGOSS, Prof. Dieter Kohnke, on the IGOSS proposal for the end-to-end co-ordination, on an operational basis, of the XBT observations and in particular of the post-TOGA low density XBT ship-of-opportunity network. The Committee recalled that at I-GOOS-PS-I it had agreed to assume overall responsibility for the maintenance of the post-TOGA Ocean Observing System, and generally for the implementation of the common GOOS/GCOS module, on the basis of the OOSDP report. In this context, **it endorsed** the IGOSS proposal, and **requested** the IGOSS Committee to proceed with its implementation, as a specific contribution to overall GOOS climate module responsibilities. **The Committee strongly reiterated** the need for continual co-ordination, direct reporting and feedback between GOOS and IGOSS in the implementation of the proposal. **It also recognized** that it was now incumbent on GOOS to assist IGOSS in the identification of the resources necessary for the operational maintenance of the XBT network.

5.2.6 GOOS and Space Tools

79 The IOC Remote Sensing Programme Officer, Dr.J. Withrow, introduced this Agenda item and referred to Document IOC/INF-955. He noted that the GOOS remote sensing programme was moving ahead rapidly. Sensor requirements were a high priority because of the long lead times for getting the appropriate sensors into space. The GOOS panels will be a key source of those requirements. GOOS will work closely with other international organizations and programmes to harmonize oceanic sensor activities. The Committee of Earth Observing Satellites (CEOS) will be a key activity and GOOS, as an Affiliate, is well positioned to pass its requirements, both sensor and data, on the satellite agencies. The Affiliates have among themselves initiated a data base describing their sensor requirements. The Group was informed that, while sensor requirements are a priority, access to the data from current sensors is an equal priority. The GOOS panels will define data and product requirements.

80 In order to provide focus for remote sensing activities in the ocean community, CMM, IGOSS and IODE have formed a joint sub-group on Oceanic Satellites and Remote Sensing. This group will cover a wide range of activities related to remote sensing of the ocean from both the sensor and data viewpoints. The sub-group would also look at capacity building and training activities.

81 The meeting was informed of several pilot projects under consideration in remote sensing. The extension of the 1 km land AVHRR project into the coastal zone was outlined along with the potential of this project to work together with other regional activities to provide for a comprehensive activity in capacity building toward sustainable development. Ocean Color was singled out as a parameter that the satellite agencies were looking to IOC and GOOS to develop, especially in the data and information area. The potential for an Indian Ocean altimetry project was also noted.

82 The CEOS emphasis on developing country activities was viewed as an opportunity for GOOS to assist in addressing the needs of the ocean community in developing countries. The meeting was also informed of activities in Ocean Color and regional development of remote sensing products.

83 The report was well received by the Committee. **The Committee noted** the need to continue to focus on the operational aspects of remotely sensed data. There is a need to enhance intersessional activities, including training activities through better communications. **The Committee noted** with interest the efforts by EuroGOOS to develop an agreement on requirements for and access to space based ocean data and products.

84 Further decisions concerning the establishment of a GOOS space plan were taken under item 8.2.

5.3 STATUS OF EXISTING OCEAN OBSERVING AND DATA MANAGEMENT SYSTEMS AND THEIR INTERACTIONS WITH GOOS

85 The Director of the GOOS Support Office presented and briefly commented the document IOC/INF-992 "Status Report on existing Ocean elements and related systems". He emphasized the resolve of the Office to provide some synthesized but useful information to all the Member States and participants in GOOS. He therefore requested the opinion of the Committee on the appropriateness of this report and insisted on the importance of feed-back from users to provide guidance to the Office in its achievement. He mentioned the possibility to establish an on-line information unit to provide continuously updated information of this kind if a strong request was expressed.

86 Several delegations indicated that feed back would be provided after further examination of this document and encouraged the Office to maintain the publication of this report on a yearly basis as well as to attempt to set up an on-line distribution system. The Office will take into account any input to the greatest extent compatible with its current capabilities.

5.4 DATA MANAGEMENT

87 **The Committee was informed** by the programme officer responsible for GOOS data management of the status of the ocean data management systems. He pointed out that IGOSS and IODE are important elements of those systems and that they are ready to accept data management requirements from GOOS. The meeting was provided with an overview of the joint IGOSS/IODE data management system. The Global Temperature Salinity Pilot Project and Ocean Personal Computer Project were described as was how they fit into the data management support system for GOOS. Efforts towards consolidation of to IGOSS and IODE activities were described which should lead to more effective coverage of the data continuum. The overlapping meetings of the IGOSS Operations and Technical Applications group and the IODE Technical Aspects of Data Exchange as well as the recent IODE "Think Tank" meeting were highlighted in this regard.

88 The Global Climate Observing System data management model was described. Within GCOS there is a need for an overarching panel on data to handle to the consolidation of data originating from the atmosphere, ocean and terrestrial communities. The data panel was designed to receive input from the various GCOS science panels and consolidate them. The GCOS data model was described and the various existing ocean data management activities mapped onto it. The connection of the IODE to the ICSU World Data Centre system was particularly noted.

89 The Data Management activities of the Committee on Earth Observing Satellites Working Groups on Data and Network Services mentioned in the presentation on Ocean Remote Sensing was described in more detail. The fact that the satellite agencies would probably lead data system development based on their high data volumes was highlighted as an opportunity for co-operative activity in the transmission and use of both remotely sensed and in-situ data. The level of effort and resources invested by the agencies was a challenge to the Affiliates ability to participate.

90 **The Committee was informed** of the data activities of the IGBP ocean programmes. These programmes were seen as pathfinders in the use of biological data and data from the coastal zones. The existing systems, such as IODE, are working closely with these programmes to insure that these data are effectively integrated into the international systems.

91 **The Committee welcomed** the very informative report on data management activities. It emphasized the need to expand the system to more effectively meet users needs for products and modelers needs for bulk data delivery. Some countries expressed the need for more detailed data requirements from GOOS in order to present to their countries the requirement for the efficient and timely release of GOOS related data. **The Committee noted** the example of WOCE in obtaining access to required data and decided to study this approach.

Data Policy

92 A Draft Data Policy document had been prepared by a corresponding working group consisting of representatives from Australia, Canada, China, France, Germany, Japan, UK and the USA. It

had been reviewedved at SSC-I and was submitted to the Committee for further examination. Discussions being conducted in WMO concerning data policy, and the problems created by the commercialization of data will tend to dictate some of the terms to be accepted by GOOS regarding its data management. However, GOOS has to manage data from many different sectors, some of which have very different requirements and characteristics from meteorological data, including marine meteorology data. In consequence, GOOS must consider the requirements for a data policy which copes with all sectors.

93 GOOS must develop a data policy applicable to long term climate research and monitoring, global change monitoring other than climate, marine biodiversity change, ecosystem disturbance, distribution of contaminants and pollutants, safety of life at sea, warnings and avoidance of hazards at sea and on the coast, prediction of toxic algal blooms, improvement of the management of marine resources and operations, efficiency of marine services, and protection of the environment. Most of these activities have a strong element of public good benefit, and it would be wrong to restrict the flow of information which might, for example, prevent a massive pollution incident, or some other disaster. GOOS therefore needs both a general statement of data policy, which should be as brief and simple as possible, combined with more detailed technical annexes setting out the appropriate methods for managing different data types, and in particular, indicating those variables and parameters to be exchanged as openly as possible in the operational mode.

94 The Committee welcomed the report on data policy. It observed that data policy was being addressed by the parent organizations as well as other international bodies and that it would be important for I-GOOS to pass on a clear summary of its discussions on this subject. **The Committee therefore appointed** a small working group to draft text for presentation to the parent organizations and, in particular, to be included with the executive summary to the IOC Assembly. The text of this draft data policy as prepared by the drafting group is presented in annex V, and should be considered as a working paper as decided by the Committee.

5.5 STATUS OF REGIONAL IMPLEMENTATION OF GOOS

5.5.1 North Pacific Region (TYKKI)

95 Japan described a North Pacific regional programme, the Pacific Ocean Observation and Research Initiative (called TYKKI), which is based on a bilateral agreement with the USA. TYKKI includes 15 projects with participation from both sides, on topics including large scale physical oceanography, technology development, information exchange and management, and ocean chemistry. Details are in the Japanese National report. The purpose of TYKKI is to contribute to the development of GOOS in the Pacific Ocean. The USA concurred with this description of TYKKI, and added its hope that some of the TYKKI projects might evolve to became GOOS Pilot Projects in the future.

5.5.2 European Region (EuroGOOS)

96 EuroGOOS was established at a Foundation Meeting held in Rome on 14 December 1994. The Second Meeting was held in Sopot, Poland, on 30-31 May 1995. There are now 19 Agencies which are Members of EuroGOOS from 13 different European countries. In most of the countries with EuroGOOS Member Agencies there has been discussion concerning the formation of national GOOS Committees, and in a few countries this has progressed to the stage of appointing formal or informal inter-agency GOOS Committees or Working Groups. The objectives of EuroGOOS are set out in the Memorandum of Understanding. IOC and EuroGOOS have reciprocal Observer Status at each other's meetings.

97 EuroGOOS provides a mechanism to support the objectives of GOOS at the local level, the regional European level, and globally. There is a strong emphasis on the development and application of new and existing technology which will allow more efficient observations with minimum cost and staff requirements. It is assumed that the bulk of operational observations will be assimilated into operational numerical models, from which diagnostics and forecasts will be derived. Already there are many examples of operational modelling of some parameters, especially in the Baltic and the North Sea, with collaboration between several Agencies which are members of EuroGOOS.

98 EuroGOOS is concerned with identifying the priorities of data requirements and information services for the users of maritime data and forecasts. Standard survey questionnaires have been prepared, using consistent terminology, which will be mailed to hundreds of potential users of GOOS data in nine of

the countries in which EuroGOOS has Members. The returned information will be compiled on a single data base available to all Members. EuroGOOS is working with space agencies to define the requirements for remote sensed data for operational oceanography, and the nature of trials and tests which will be needed to prepare for the routine assimilation of remote sensed data into operational models.

99 In order to develop the concept of integrated operational oceanography involving many observed parameters and many different outputs and users, EuroGOOS is planning a series of Test Case studies at the sub-regional level. These Test Cases will be developed in the Baltic, the North West European Shelf Area, and the Arctic seas adjacent to northern Europe. The Mediterranean Sea is a special case, since the southern European states have an essential interest in modelling and predicting the Mediterranean, but can only do so in complete co-operation with the non-European Mediterranean states. EuroGOOS will therefore establish links with appropriate organizations to develop a Test Case study for the Mediterranean, which may be called MedGOOS.

100 European Agencies have the capability to conduct operational oceanography on the global scale, and will therefore consider their part in developing the truly global components of GOOS. This will include aspects of remote sensing, and projects involving technology transfer and TEMA activities in collaboration with developing countries. Where there are gaps identified in the global coverage of GOOS, EuroGOOS will be willing in principle to assess the possible contribution which European Agencies might make to carrying out the necessary observations, within the overall context of GOOS planning and the activities of other countries.

101 In September 1996 EuroGOOS will host a major conference in the Netherlands on the Case Studies that have been carried out, the development of operational oceanography, and the promotion of EuroGOOS. A EuroGOOS Handbook is in preparation. The development of regional GOOS programmes in other parts of the world is regarded with interest, and EuroGOOS is pleased to exchange information with NEAR GOOS and other similar organizations with a view to mutual benefits, and improving the development of regional components of GOOS.

5.5.3 North-East Asian Regional GOOS (NEAR-GOOS)

102 This project was initiated by Resolution 57 at the 27th UNESCO General Conference, which called on IOC to establish a regional GOOS activity and in particular to establish a pilot activity in the North-East Asia region. The main objective of this project is to show the possibility of a GOOS type operational activity on a regional basis.

103 Pursuant to this Resolution, in 1994 IOC organized two expert meetings, one in Beijing and another in Bali, to define the framework of the project. As an outcome of the consultations, experts prepared a draft proposal for NEAR-GOOS. An information document regarding this proposal was submitted to the I-GOOS Strategy sub-committee at its First Session in March, Geneva and NEAR-GOOS was given preliminary consideration as a regional GOOS activity.

104 It had been emphasized during previous expert discussions that this project should be officially endorsed by the participating countries and that competent organizations in each participating countries should be designated for the project, with a view to clarifying the official commitment of the countries to the project. It had also been agreed upon that an implementation plan for the project should be prepared by the participating countries and IOC, and that this implementation plan should define the details of the project, such as the specific area of the project and the parameters to be collected and processed.

105 During the SSC, an informal consultation on NEAR-GOOS was held to review the basic policy for the implementation of the project among the participating countries. The consultation agreed to establish an *Ad hoc* group for drafting the implementation plan and elected Dr. Keisuke Taira as the leader of the group. IOC has put in place a fee contract with Dr. Taira and the draft implementation plan is to be ready by mid August. It was also agreed that the implementation plan should be reviewed and approved by the participating countries. It should then be submitted to WESTPAC-III, February 1996, for adoption as an official regional project. In this context, in order to have an initial review and an exchange of views among the participating countries regarding the draft implementation plan, one expert meeting is scheduled later this year.

106 Dr. Taira made a brief review of the present outline of this project. In his review, it was emphasized that a key element of this project is the down-loading of GTS data into an E-Mail Data Base and direct transmission of the observed data to it. The E-Mail data are to be combined with the data submitted in delayed mode.

107 **The Committee appreciated** his efforts to develop a regional component of GOOS as well as the approach used to implement it.

5.5.4 Others

108 No other regional programme was known to be requesting the "GOOS" label, though "MedGOOS" was mentioned during the meeting as a possible pilot programme of EuroGOOS.

5.5.5 Guidelines on Regional approach

109 The US delegation submitted to the Committee a document entitled "Regional GOOS development - The Need for Guiding Principles ?" for consideration. The purpose of this document was to provide guidance to I-GOOS for their acceptance of regional programmes in accordance with some universally adopted principles. **The Commitee unanimously agreed** that, to prevent uncontrolled development of such programmes, a guide was absolutely necessary. Nevertheless, considering that this document raised several issues that had to be carefully examined, **the Committee decided** that a working group would work by correspondence to prepare a document for the next session. This working group will include delegates from Brazil, Canada, China, France, Germany, India, Japan, Russia, Sweden, USA, Russia, Sweden and India. The document should address the issues related to general principles, regional programmes and principles for organization.

6. GOOS INTERACTION WITH OTHER RELEVANT ACTIVITIES/BODIES

6.1 GCOS

110 Dr. T. Spence, Director of the GCOS Planning Office, summarized the status of GCOS and its interaction with GOOS and GTOS, highlighting the completion of the report by the Ocean Observing System Development Panel and referencing the Report of the Chairman of J-GOOS (Doc. IOC-WMO-UNEP/I-GOOS-11/7). This work represents extensive progress on the GOOS Climate module which is also the GCOS ocean component. The Joint Scientific and Technical Committee (JSTC) for GCOS has accepted this report, and plans are being developed for a follow-on effort: an Ocean Observing Panel for Climate (OOPC). The JSTC is defining an "Initial Observing System" consisting of (i) current observing components, (ii) essential enhancements and additions, and (iii) a comprehensive data system. Version 1.0 of the Plan for the Global Climate Observing System was distributed. A data and information management plan is also available, and a space requirements plan will be available soon. On behalf of the JSTC, Dr. Spence requested I-GOOS to provide guidance on how the two groups can work together to accelerate progress on the Climate module.

111 **The Committee agreed** that it is essential to convene the OOPC as a necessary next step to implementation. **The Committee strongly affirmed** that it is not acceptable to wait until other GOOS modules have matured and **noted** the need for a clearer process to ensure the essential observing components are indeed endorsed as GOOS elements.

6.2 SCIENTIFIC PROGRAMMES (GIPME, IGBP, OSLR, WCRP)

112 **The Committee noted** that GOOS had obvious relationships with a number of scientific programmes, such as the Global Investigation of Pollution in the Marine Environment (GIPME) of IOC, IMO and UNEP, the International Geosphere-Biosphere Programme (IGBP) of ICSU, the Ocean Science in Relation to Living Resources (OSLR) of IOC and FAO, and the World Climate Research Programme (WCRP) of WMO, IOC and ICSU. GOOS is tackling questions similar in substance to those tackled by those scientific programmes, but as seen from the operational standpoint. **The Committee agreed** that the question of its relationship to these programmes was essentially that of avoiding duplication of efforts and requested the

GOOS Support Office to keep abreast of developments within the programmes that may be important for GOOS development and/or strategy.

6.3 REGIONAL BODIES

113 There are so many regional organizations involved in marine programmes that the Director of the GOOS Support Office indicated that he was looking for guidance on the practical ways to consider their interests in the development and implementation of GOOS. The Representative of ICSEM described a pilot monitoring progamme on plankton undertaken in the Mediterranean Sea. It was generally agreed that regional bodies of sponsoring organizations should be involved from the beginning in the development of GOOS regional activities. The chairman of I-GOOS will provide the GOOS Support Office with a list of regional bodies to consider. At each of their meetings, a representative of sponsoring organizations of GOOS should introduce the GOOS programme and look for interaction and support that GOOS could get from the regional programme. It was noted that IOC regional subsidiary bodies already were involved and should be maintained as a suitable mechanism.

114 The Representative of ICES, Dr. H.D. Dooley, recalled a recent meeting between the GOOS Support Office director and its Advisory Committee on Marine Environment (ACME). The purpose of the meeting was to explore ways in which it may become involved in GOOS activities. The conclusion of the meeting was very positive and identified relevant interests in all GOOS modules and a distinct role in GOOS data management needs.

6.4 SOCIO-ECONOMIC STUDIES

115 Dr. F. Praderie, Representative of the OECD Megascience Forum, informed the Committee of the recent activities conducted by the Megascience Forum in support of GOOS. The OECD was founded in 1961 and now includes 25 member countries. The Megascience Forum was established in 1992 to stimulate discussion among governments on science policy and to encourage international co-operation. The Forum meets twice a year and holds expert meetings on specific scientific topics. In September 1993 it held a meeting on ocean research, focusing on operational oceanography. It found that GOOS is a major Megascience endeavour, as described in its concluding publication, Oceanography. Subsequently, the OECD has sponsored assessments of two case studies and a study of the methodology of cost/benefit analyses. **The Committee expressed its appreciation** to the OECD for its rapid grasp of the value of large-scale oceanography and for its assistance in articulating the benefits to national governments.

116 Dr. R. Weiher, Chief Economist for NOAA, USA, presented a summary of the results to date of studies done in the USA which have concentrated on the value of climate information on the seasonal time scale. He noted that the impacts and benefits of improved forecasts are international in scope. Studies have focused on the agriculture sector but are being expanded to address the energy supply industries as well as environmental management (e.g., fisheries, water resources). Results indicate that improved forecasts have substantial economic implications, e.g., in the South-East USA along over US$100 million per year could be saved in the agriculture sector with improved forecasts of El Niño events.

117 **The Committee agreed** that such cost/benefit studies are needed regionally and globally to guide investments in GOOS. Developing countries such as Chile and Malta were given as examples.

118 Dr. N. Flemming, Representative of the U.K., described efforts underway to conduct surveys of user needs and to identify the socio-economic benefits of GOOS in the European region. He affirmed that such studies need to be done in different economic and environmental situations and, by analogy, applied globally.

119 Five types of Socio-Economic Studies were considered:

(i) Global aggregate analysis of the scales of maritime industries and services (OECD Megascience Forum, and some USA studies).

(ii) National and State level assessments of percentage of GNP attributable to maritime industries and services (Australia, USA, Massachusetts, UK).

(iii) Economic cost-benefit studies of the land-based effects of marine prediction of climate fluctuations (USA, OECD), and single industry response to improved operational data flow (USA, UK, OECD).

(iv) Analysis of the economic theory and methodologies in public good economics of global marine information systems (OECD).

(v) Customer reviews and surveys to identify what operational marine parameters are required by industry, regulating authorities, and other user groups (UK, ESA, EuroGOOS).

120 **The Committee noted** that, in view of pending policies threatening the full availability of data, the true value of freely-exchanged GOOS data must be clear. Such studies described are considered of the highest priority.

121 **Resolution I-GOOS-II.2 was approved.**

7. CAPACITY BUILDING

122 **The Committee recalled** its discussions at I-GOOS-PS-I on the importance to GOOS of establishing a major capacity building activity to help ensure that all countries could participate in the implementation of GOOS and also share in its benefits. **It further recalled** the draft recommendation prepared by I-GOOS-PS-I for the establishment of an I-GOOS Panel on Capacity Building (PCB), and noted with appreciation the offer by the Netherlands of a contribution over five years to the GOOS Trust Fund, specifically to act as "seed money" for the development of GOOS Capacity Building.

123 In general discussion on this item, the following issues were raised:

(i) Difficulties in identifying funding at the present time in the regular budgets of the GOOS Sponsors to support the PCB;

(ii) Capacity Building is essential for GOOS, but must be directed towards operational implementation and operational applications, based on clearly identified needs and activities;

(iii) Although a coherent GOOS plan does not yet exist, nevertheless operational oceanography is developing rapidly in many parts of the world and it is already possible to identify areas in which capacity building activities could contribute to GOOS;

(iv) Many capacity building activities must be conceived and implemented through the joint efforts of developing and potential donor countries;

(v) Many developing countries had considerable difficulties in identifying and specifying their capacity building requirements, and these requirements could vary widely within countries, from country to country and from region to region;

(vi) A regional approach to GOOS capacity building, involving also the regional bodies of IOC, WMO and UNEP, as well as external regionally-based bodies, was generally the most effective and most acceptable, for both developing countries and potential donors;

(vii) A series of regional workshops on capacity building and GOOS implementation may be the most effective way of sensitizing developing countries to the benefits of GOOS, as well as helping them specify their capacity building requirements;

(viii) Supplementary (non regular budget) funding would be required to implement such workshops, which should be directed to a number of regions that together encompass all the developing countries.

124 On the basis of these considerations and others raised in the discussion, **the Committee agreed** on the need to implement, as a first step, a series of regional workshops on capacity building and

GOOS implementation. It therefore **decided** to appoint a Steering Group to plan, identify funding for and implement such workshops. This Steering Group should subsequently synthesize the results of the workshops and, on this basis, prepare specific proposals on GOOS capacity building for the further consideration of I-GOOS.

125 **Resolution I-GOOS-II. 3 was adopted.**

8. STRATEGIC PLANNING

8.1 REVISION OF "THE APPROACH TO GOOS"

126 **The Committee noted** that, pursuant to a decision of the first Planning Session of I-GOOS, the Strategy Sub-committee had to review and update at its first session the document "*The Approach to GOOS*". The SSC considered it was not worthwhile making any "major" modification to the document, since it is expected to be replaced in the near future by other documentation (including a more "popular" and glossy brochure, and if possible a much more comprehensive loose-leaf "*GOOS Handbook*"). The SSC, nevertheless, undertook to modify slightly the structure of the document (i.e. its table of contents), to amend the text as it felt necessary, and to change the title to "*Towards Operational Oceanography: the Global Ocean Observing System (GOOS)*". That revised version was submitted to the Committee for comments, eventual approval and follow-up as necessary.

127 **The Committee** first **considered** that it was not in a position to review the document in any detail at its meeting, and that such an exercise should be done intersessionally by an *ad hoc* working group working by correspondence. Second, **it recognized** that such a review, including improving and polishing the present text, should, as already agreed by the SSC, be the last one for that specific document. Finally, **it considered** the document as having an internal status with regard to GOOS, which implied it had no longer to be approved or endorsed by I-GOOS governing bodies. It should from now-on be considered as a kind of transition between the previous "*Approach to GOOS*" and the next generation of documents to be produced. Its present revision should be undertaken within the overall process of developing a strategic plan for GOOS, the document itself being considered as a general philosophical introduction to GOOS. In this context, **the Committee recalled** that the SSC, in preparing the *Outline of a Strategic Plan for GOOS*, had stated under Action I A 1: "*For the present, the revised document **Towards Operational Oceanography: the Global ocean Observing System (GOOS)** is accepted as a first description of GOOS, although it insufficiently defines the system.*"

128 As for the procedure to review the revised document, **the Committee decided** that the *ad hoc* intersessional working group referred to above should establish itself in sending comments and/or amendments to Mr. Y. Tréglos (E-mail: y.treglos@unesco.org). Mr. Tréglos in turn would provide those who would request it with a copy of the working paper submitted to SSC-I, where the deletions, changes and/or additions from the previous version of "*The Approach to GOOS*" are highlighted through some typographic conventions. **The Committee further fixed** the deadline for the revision exercise on 30 November 1995, in order *inter alia* that the SSC could have a look at the revised version at its Second Session (tentatively, first quarter of 1996). In any case, the "*final*" *revised version of the document should be submitted to I-GOOS-PS-II for* eventual approval.

8.2 THE GOOS STRATEGIC PLAN

129 The Committee welcomed the report of the Strategy Sub-Committee (SSC) First Session (Geneva, 27-30 March 1995), and reviewed the SSC recommendations contained in the Outline Strategic Plan (Annex IX of the report). **The Committee agreed** with the overall approach proposed by the SSC and examined actions to be taken.

130 Concerning action I.A.2 "Design and produce a GOOS Handbook", **the Committee designated** Dr. Ryabinin to act as Rapporteur, in order to define a comprehensive manual containing all information necessary to countries for understanding and participating to GOOS.

131 **The Committee discussed** the SSC recommendation II.B.1 contained in the Outline Strategic Plan concerning staff requirements for the GOOS Support Office.

132 While recognizing and appreciating the valuable contribution of the Interim Director of the GOOS Support Office, **the Committee emphasized** that it is critical and essential that a UNESCO permanent position designated at the level of D-1 be established. The present state of development of GOOS, and the importance of GOOS as viewed by participating Member States, requires the appointment of a permanent Director and other staff dedicated to fulfilling the expectations of Member States and the responsibility assumed by the IOC in leading GOOS development.

133 **The Committee examined** recommendation III.B.1 related to the commonality of observing elements and establishment of priorities among them. **The Committee decided** to establish an *ad hoc* Priorities Working Group to work by correspondence and to call for a GOOS Priorities Agreement Meeting, to be held in Washington and hosted by the USA, in May 1996. Dr N. Flemming and Dr. M. Briscoe will prepare an initial draft by correspondence which will be sent to the other members of the working group at present composed of delegates of Canada, Chile, France, Germany, Russia and the USA, and later sent to representatives of other countries, including developing countries.

134 **Resolution I-GOOS-II. 4 was adopted.**

135 **The Committee discussed** Action III.B.3 requesting the development of a GOOS Space Plan based on the model of the GCOS Space Plan, as the first articulation of GOOS needs for the Climate module, but covering the needs of all the modules. **The Committee decided** to establish an intersessionnal task team to address this issue, using the approach suggested by the SSC. The Secretary of this task team will be M. J. Withrow, and UK and USA will designate experts as members of this task team. J. Withrow will contact other experts willing to participate to the work of this group.

136 Recommendation III.C.1 related to technical aspects of observational elements, such as list of parameters, standards, accuracies, codes, protocols and data management, will be addressed by the working group established by Resolution **I-GOOS-II. 1.**

9. PLAN OF ACTION FOR 1995-1997

137 **The Committee noted** that the 18th IOC Assembly will consider and prepare a draft IOC programme and budget for 1996-1997 period. **The Committee requested** the GOOS Support Office to prepare a GOOS Plan of Action for the 1996-1997 period with assessments of the financial implications on the basis of recommendations, resolutions and proposals of this Session and of those of J-GOOS II Session. The Chairman was requested to bring this plan to the attention of the IOC Assembly as well as other sponsoring agencies for required support. **The Committee stressed** that during the 1995-1997 period, highest priority should be given to scientific/technical design and planning of GOOS modules.

138 **The Committee requested** the IOC Secretary to prepare an IOC draft Programme and Budget for 1996-1997 to clearly separate the activities related to I-GOOS, GLOSS, DBCP and other operational activities from those directly relevant to GOOS design and planning.

10. REVIEW OF RESOLUTIONS AND RECOMMENDATIONS OF THE IOC-WMO-UNEP COMMITTEE FOR GOOS AND OF RELEVANT RESOLUTIONS AND DECISIONS OF THE GOVERNING BODIES IOC, WMO AND UNEP

139 The Committee reviewed previous recommendations and resolutions taken at I-GOOS-I meeting and I-GOOS-I Planning Session.

140 **Resolution I-GOOS-II.5 was adopted.**

11. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMEN OF THE IOC-WMO-UNEP COMMITTEE FOR GOOS

141 Prof. Michel Glass, France, was reelected Chairman of this Committee. Two Vice-Chairmen, Dr. A. McEwan, Australia, and Mr. B.N. Krishnamurthy, India, were also elected.

12. DATES AND PLACES OF THE NEXT SESSION AND PLANNING SESSION OF THE IOC-WMO-UNEP COMMITTEE FOR GOOS

142 The next I-GOOS Planning Session will be held in Washington, USA, 16-17 May 1996, following the GOOS Priorities Agreement Meeting.

143 The next I-GOOS meeting will be held in Paris in May 1997.

13. ADOPTION OF THE REPORT

144 **The Committee reviewed** and **adopted** the Summary Report and its Resolutions.

14. CLOSURE OF THE SESSION

145 The Session was closed at 20.00h, on 9 June 1995.

ANNEX I

AGENDA

1. OPENING

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

2.2 DESIGNATION OF A RAPPORTEUR

2.3 CONDUCT OF THE SESSION

3. REPORT ON INTERSESSIONAL ACTIVITIES

3.1 REPORT BY THE CHAIRMAN OF THE INTERGOVERNMENTAL IOC-WMO-UNEP COMMITTEE FOR GOOS (I-GOOS)

3.2 REPORT BY THE CHAIRMAN OF THE JOINT IOC-WMO-ICSU SCIENTIFIC AND TECHNICAL COMMITTEE FOR GOOS (J-GOOS)

3.3 REPORT BY THE DIRECTOR OF THE GOOS SUPPORT OFFICE (GOOS/SO)

4. REPORTS ON NATIONAL GOOS ACTIVITIES

5. STATUS OF PLANNING AND IMPLEMENTATION OF THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

5.1 STATUS OF / REPORTS BY THE I-GOOS SUBSIDIARY BODIES

5.1.1 The Group of Experts on the Global Sea Level Observing System (GE/GLOSS)

5.1.2 The I-GOOS Strategy Sub-committee (SSC)

5.1.3 The I-GOOS Panel on Technical Implementation (PTI)

5.1.4 The I-GOOS Panel on Products and Distribution (PPD)

5.2 STATUS OF THE GOOS MODULES

5.2.1 Climate monitoring, assessment and prediction: the Ocean Observing System Development Panel (OOSDP) and its follow-up

5.2.2 Monitoring and assessment of living marine resources: the *ad hoc* Panel on Living Marine Resources (LMR)

5.2.3 Monitoring of the coastal zone environment and its change: the intersessional *ad hoc* Group on the GOOS Coastal Zone (COZO) Module and the IOC-UNEP-WMO Coastal Pilot Monitoring Activities (coral reefs, sea level, plankton, mangroves)

5.2.4 Assessment and prediction of the health of the ocean: the *ad hoc* Health of the Ocean (HOTO) Panel

5.2.5 Marine meteorological and oceanographic services: the WMO Commission for Marine Meteorology (CMM) and the Joint IOC-WMO Committee for the Integrated Global Ocean Services System (IGOSS)

5.2.6 GOOS and Space Tools

5.3 STATUS OF EXISTING OCEAN OBSERVING AND DATA MANAGEMENT SYSTEMS AND THEIR INTERACTIONS WITH GOOS

5.4 DATA MANAGEMENT

5.5 STATUS OF REGIONAL IMPLEMENTATION OF GOOS

5.5.1 North Pacific Region
5.5.2 European Region (EUROGOOS)
5.5.3 North-East Asian Regional GOOS (NEAR-GOOS)
5.5.4 Others
5.5.5 Guidelines on Regional Approach

6. GOOS INTERACTION WITH OTHER RELEVANT ACTIVITIES/BODIES

6.1 GCOS AND GTOS

6.2 SCIENTIFIC PROGRAMMES (GIPME, IGBP, OSLR, WCRP)

6.3 REGIONAL BODIES

6.4 OECD MEGASCIENCE FORUM

7. CAPACITY BUILDING

8. STRATEGIC PLANNING

8.1 REVISION OF "THE APPROACH TO GOOS"

8.2 THE GOOS STRATEGIC PLAN

9. PLAN OF ACTION FOR 1995-1997

10. REVIEW OF RESOLUTIONS AND RECOMMENDATIONS OF THE IOC-WMO-UNEP COMMITTEE FOR GOOS AND OF RELEVANT RESOLUTIONS AND DECISIONS OF THE GOVERNING BODIES OF IOC, WMO AND UNEP

11. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN OF THE IOC-WMO-UNEP COMMITTEE FOR GOOS

12. DATES AND PLACES OF THE NEXT SESSION AND PLANNING SESSION OF THE IOC-WMO-UNEP COMMITTEE FOR GCOS

13. ADOPTION OF THE REPORT

14. CLOSURE OF THE SESSION

ANNEX II

RESOLUTIONS

Resolution I-GOOS-II.1

AD HOC WORKING GROUP ON MARINE METEOROLOGICAL AND OCEANOGRAPHIC SERVICES

The IOC-WMO-UNEP Committee for I-GOOS,

Noting:

(i) The Summary Reports of I-GOOS-PS-I, I-GOOS-SSC-I and J-GOOS-II;
(ii) The Outline GOOS Strategic Plan,

Recognizing:

(i) That many of the benefits of GOOS for Member States will occur through the provision of enhanced or new marine meteorological and oceanographic services;
(ii) That a large range of such services exists already, provided by national meteorological and oceanographic agencies and by private industry,

Considering that it is necessary to have an overview of existing services, user requirements, major deficiencies and development trends to aid the decision-making process on requirements for services development under GOOS,

Decides to appoint an *ad hoc* working group on marine meteorological and oceanographic services to work by correspondence, with the following terms of reference:

(i) Review existing marine meteorological and oceanographic services and prepare a classification and summary review on the basis of criteria such as geographical location and coverage, type (data, nowcast, forecast, hindcast, etc.), parameters, user groups or applications, temporal coverage, etc,;

(ii) Collaborate with other ongoing review activities (*e.g.* those under EuroGOOS) to prepare a concise summary of user requirements, as well as data and information management, for marine meteorological and oceanographic services;

(iii) On the basis of these reviews, prepare an assessment of existing inadequacies in marine meteorological and oceanographic services (*e.g.* data availability, modelling capabilities, understanding of physical processes, product presentation, *etc.*);

(iv) Assess also development trends in existing marine meteorological and oceanographic services from the point-of-view of both service providers and users;

(v) Through the Chairman of the group, collaborate with and serve on the J-GOOS *ad hoc* group on the Services Module;

(vi) Provide a preliminary report for the consideration of I-GOOS-PS-II in mid-1996, and a final report for I-GOOS-III;

Invites Mr. Johannes Guddal (Norway), to serve as Chairman of the group;

Further invites the Delegates from: Brazil, Canada, China, France, Germany, Japan, Malaysia, Russia, Sweden, United Kingdom/EuroGOOS and the United States of America, to constitute the core membership of the group;

Agrees that the group should consult as widely as possible in its work, including through the addition of other members as necessary;

Requests the Secretary-General of WMO and the Executive Secretary IOC to provide support for the Chairman of the working group in his work, within the available budgetary constraints.

Resolution I-GOOS-II.2

SOCIO-ECONOMIC STUDIES AND SURVEYS OF THE BENEFITS AND COSTS OF GOOS

The IOC-WMO-UNEP Committee I-GOOS,

Noting that the over-riding objectives of GOOS as set out in the GOOS MOU and as referred to in Agenda 21 of UNCED, concern the practical benefits to Member States in terms of economics, protection of the environment, social amenities, and climate monitoring and forecasting,

Considering that technical and economic expertise are needed to evaluate the socio-economic benefits which might accrue to each Member State, and that the profile of benefits will differ from one Member State to another;

Recognizing the urgent need for Developing Countries to have access to methodology and resources to conduct socio-economic studies which demonstrate the benefits for their populations from GOOS;

Decides to support the following actions:

(i) to work through the I-GOOS Steering Group on Capacity Building and to use its regional workshops and the Regional Bodies of IOC to conduct trial economic surveys of the applications of GOOS data products in Developing Countries at the invitation of Member States, as requested to the GOOS Support Office;

(ii) To promote the conduct of more detailed case studies of the technical aspects of obtaining socio-economic benefits in a representative number of Developing and Developed Member States at the invitation of Member States, as requested to the GOOS Support Office;

(iii) To convene an international technical workshop on the methodologies and on-going studies for evaluating the costs and benefits of GOOS at global, regional, and local levels, and requests the Chairman of I-GOOS to approach the appropriate senior staff in OECD with a view to joint sponsorship of this workshop;

(iv) To welcome the offer of Chili, Malta, UK, and USA to collaborate with I-GOOS and OECD, in order to seek sponsorship and to appropriate external sources of funding for the socio-economic studies referred to in paragraphs (i). (ii), and (iii) above;

(v) To encourage publication of the results of the studies referred to in paragraphs (i), (ii), and (iii) above and make them available to Member States so that the methodologies can be applied elsewhere;

(vi) To establish a corresponding group to work on the tasks listed in paragraphs (i)- (v) above in the inter-sessional period;

(vii) To continue to foster an exchange of information with the GCOS Working Group on Socio-Economic Benefits.

Resolution I-GOOS-II.3

CAPACITY BUILDING
INCREASING THE INVOLVEMENT OF ALL MEMBER STATES IN GOOS

The IOC-WMO-UNEP Committee for I-GOOS,

Noting the final report of the First Planning Session of I-GOOS (Melbourne, April 1994), in particular the draft recommendation on an I-GOOS Panel on Capacity Building,

Considering:

(i) that GOOS can only be successfully implemented through the combined efforts of all Member States;
(ii) that Member States in turn will benefit substantially from GOOS;
(iii) that all Member States should also be involved in the GOOS planning process;
(iv) that requirements for and interests in GOOS vary from region to region, country to country and even within individual countries;
(v) that capabilities to contribute to and benefit from GOOS vary widely among countries and regions.

Recognizing:

(i) that certain GOOS implementation actions are already evident, in advance of full and detailed GOOS plans, which will require input from all Member States;
(ii) that many Member States require assistance in defining capacities needed for GOOS involvement;
(iii) that a regional approach to capacity building for GOOS implementation is the most appropriate for many Member States, including potential donor States;

Considering further that additional information on Member States' requirements is needed before a formal approach to capacity building for GOOS can be adopted,

Agrees that a series of regional GOOS Development Workshops should be organized, to focus on furthering the involvement of developing countries in GOOS, including in particular: (a) involvement in the GOOS planning process, (b) benefits to be gained from GOOS by regions and individual Member States, (c) minimal capacity requirements, including human resources, for participation in GOOS;

Decides:

(i) to establish an *ad hoc* Workshop Steering Group, with the following terms of reference:

(a) to plan, seek funding for and convene, in co-operation with the regional bodies of IOC, WMO and UNEP, regional workshops to assess developing country requirements in order to facilitate their potential participation in GOOS;

(b) to synthesize the results of these workshops and, on the basis of this, prepare concrete proposals on GOOS capacity building, for the consideration of future I-GOOS sessions;

(ii) that this *ad hoc* Group should work primarily by correspondence;

(iii) that, if possible, a first workshop should be held within 12 months, with a report to be given to I-GOOS-PS-II;

(iv) that the Group should be composed of one representative each from: Chile, China, India, (Kenya), Malaysia, Netherlands, USA;

(v) that the Group should be chaired jointly by the representatives from India and the Netherlands;

Requests the Executive Secretary IOC, the Secretary General of WMO and the Executive Director of UNEP to assist the Steering Group in its work, within the available budgetary resources.

Resolution I-GOOS-II.4

GOOS PRIORITIES AGREEMENT MEETING

The IOC-WMO-UNEP Committee I-GOOS,

Noting that governments are sponsoring or are considering many ocean observation and application programmes for purposes such as marine pollution monitoring, short-range climate prediction, coastal meteorology and marine forecasting, coral reef data collection, global sea-level, and others,

Considering:

(i) GOOS is the agreed intergovernmental framework to plan, co-ordinate, and implement the multinational, regional, and global aspects of these efforts;
(ii) global economic pressures that require the setting of priorities and the careful consideration of current and future contribution to GOOS,

Recognizing:

(i) the actions of J-GOOS to develop the detailed scientific aspects of the GOOS modules;
(ii) that certain priority programmes of observation, capacity building, and information management can begin to be implemented in their initial stages, and the importance of implementation of initial, high-priority aspects of GOOS, even before all scientific plans of all modules are complete and final;
(iii) that it is timely for I-GOOS, the formal intergovernmental body charged with examining needs, setting priorities, agreeing to implementation plans, to take actions formally to begin GOOS,

Agrees that a two-step process should be initiated to:

(i) identify the core set of priority activities which will constitute the initial GOOS programme;
(ii) make formal agreement to the support of those activities; and,
(iii) enable later commitments to future activities as planning and needs evolve;

Decides :

(i) to establish immediately an ad hoc Priorities Working Group to work by correspondence to prepare an initial Implementation Plan containing the recommended set of initial activities:

   (a) the Plan to be developed with input from J-GOOS would include to the extend possible the status of current efforts or planning for each recommended activity, the current and likely costs, the possible participants, and the demonstrated or anticipated benefits;

   (b) the activities would be three categories:

      (1) ongoing, but which need to be continued,
      (2) ongoing, but in need of expansion, and
      (3) new;

   (c) the Working Group would solicit and taking into account comments, on its draft set of recommendations, from Member States and others;

   (d) the Plan would be distributed to Member States and other interested parties by October 1st, 1995;

   (e) the membership of the Priorities Working Group will be decided later on;

(ii) to call for, in May 1996, a GOOS Priorities Agreement Meeting, at which participating nations and organizations would respond to the Initial Implementation Plan by being encouraged to make commitments to the various activities proposed;

The meeting will be held May 14-15, 1996 in Washington DC, hosted by the USA, immediately prior to the next Planning Session of I-GOOS, May 16-17, 1996, also in Washington DC.

Resolution I-GOOS-II.5

REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE IOC-WMO-UNEP COMMITTEE FOR THE GLOBAL OCEAN OBSERVING SYSTEM

The IOC-WMO-UNEP Committee I-GOOS,

Considering that Resolution I-GOOS-PS-I.2 adopted at its first planning session is presently obsolete,

Noting:
(i) that the proposed I-GOOS Technical Implementation Panel has not been establishedas yet;
(ii) the action taken by its co-sponsoring organizations on the Recommendations adopted prior to its Second Session,

Decides:
(i) to reaffirm the validity of Resolution I-GOOS-PS-I.1;
(ii) Not to keep in force Resolution I-GOOS-PS-I.2;
(iii) Not to keep in force Recommendations I-GOOS-I.1 through 3 and I-GOOS-PS-I.4 to 5;
(iv) To keep in force Recommendations I-GOOS-I.4 through 6 and I-GOOS-PS-I.1 through 3, and to publish their texts in the report of its Second Session.

ANNEX III

LIST OF PARTICIPANTS

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ANNEX IV

NATIONAL REPORTS

AUSTRALIA

1. AUSTRALIAN CO-ORDINATION OF GOOS ACTIVITIES

Since 1992, Australia has co-ordinated its activity in GCOS and GOOS through a system intended to provide lines of correspondence to the intergovernmental bodies at all relevant levels. It also integrates national activity towards GCOS, GOOS and (when appropriate), GTOS in order to avoid confusion in the sponsorship of apparently similar observing activities, and provides a national focus for the prioritization and promotion to government of these activities.

The system involves:

1.1 A national GCOS/GOOS Steering Committee comprising representatives of the Marine Agencies, the Bureau of Meteorology, the Department of Environmental and the Academy of Science (Chair Dr R. Green).

1.2 A national GCOS/GOOS Working Group (GCOS/GOOS WG) comprising representatives of the main atmospheric and marine observing agencies, universities and user groups (Chair D. Gauntlett, Vice Chair A. McEwan).

1.3 Expert Subgroups for GCOS and GOOS composed of representative experts in Atmospheric and oceanic Observation. The GOOS-ESG is chaired by Dr N. Smith, who is also a member of J-GOOS and has served on OOSDP.

The last meeting of the GCOS/GOOS WG was held on the 14 April 1994, contiguous with the meeting in Melbourne of the first I-GOOS Planning Session. The GOOS-ESG last met on the 14 February 1994.

2. NATIONAL CO-ORDINATION OF OCEAN OBSERVATIONS AND DATA

Australian activity in federal Government agencies is coordinated through the informal Heads of Marine Agencies (HOMA) group. There also exists a formal Commonwealth Spatial Data Committee (CSDC), responsible for spatially referenced geophysical data both marine and terrestrial.

In recognition of the developing need for GOOS-linked marine data as well as the declaration of the Australian EEZ in November 1994, HOMA and CSDC have established a joint Marine Data Group (MDG) under the chairmanship of Dr A. McEwan. A series of Technical Advisory Groups reporting to the MDG are planned to provide the detailed advice and specification of observation requirements of specific types of marine data. At present, only the Technical Advisory Group on Oceanographic Data Management (TAGODM) has met, and is providing advice on the provision of physical oceanographic data by the Australian Oceanographic Data Centre (AODC) which is a Royal Australian Navy establishment and the Responsible National Ocean Data Centre (RNODC) for Australia.

Recent initiatives (see below) within the national Department of Environment Sport and Territories (DEST) have seen the creation of a National Marine Information System (NATMIS) intended to provide processed environmental information, primarily for Australian Coastal Seas, for the purpose of environmental management. A structure has now been devised which will integrate this system with the MDG, thereby providing a framework of co-ordinated and quality-controlled marine observations using electronic distributed information networks.

3. NATIONAL DEVELOPMENTS RELEVANT TO GOOS IMPLEMENTATION

3.1 POST -TOGA

CSIRO, which has developed and maintained the VOS program of XBT development for TOGA, has undertaken to maintain its contribution to the program from its base research appropriation, to the degree that these resources permit, on an annual basis.

It is likely that the existing tropically focussed network will be modified to include a greater proportion of extra-tropical lines from Australian ports.

3.2 SEA-LEVEL NETWORK

The National Tidal Facility receives a substantial proportion of its support from a Climate Change research Program appropriation, which will be maintained for the current triennium ending in 1997.

3.3 OCEANS - EEZ

A major initiative has been undertaken by the CSIRO Division of Oceanography in collaboration with the Bureau of Meteorology to develop numerical modelling products which will provide a dynamical description of the EEZ regions of Australia on an operational basis, using advanced methods of assimilation of historical data, remotely sensed data and *in situ* observation.

This development aligns closely with concepts being actively considered by J-GOOS for the Coastal module.

3.4 THE COASTAL ZONE INITIATIVE

An initiative advanced by DEST has very recently succeeded in gaining $A53M in government support over three years for the protection and management of Australian Coastal Zones.

Details on disbursement are not yet available but apart from the NATMIS initiative mentioned above, some resources should be available for the establishment of operational observations in Australian Coastal oceans. The linkages described in (1) and (2) above will be used to ensure consistency with the broader GOOS strategy.

3.5 BUREAU OF METEOROLOGY (BOM) INITIATIVES IN OCEAN OBSERVATION

As part of a strategic development of its role as prime national agency for operational oceanographic observation the Bureau has gained resources for climate prediction, a part of which will be used for supporting the development of national GOOS plans and for the enhancement of ocean observations in the Australian region.

3.6 IMPEDIMENTS TO PROGRESS

3.6.1 Fiscal restraint

The Australian Government is exerting strong fiscal constraints. New resources are available only by means of "New Initiative proposals" presented by the relevant government departments and subject to scrutiny through the expenditure review process, thereby require broad departmental support. Normally these initiatives can only gain support on a triennium basis.

3.6.2 The Government profile of GOOS

The concept and value of GOOS is widely understood and supported within the primary Australian technical and research agencies concerned with oceanic observations and data. However, there still remains the need for an effective mechanism for communicating the purpose of GOOS in terms of national benefit to the wider government constituency. Priority is likely to be given to national environmental rather than global ocean observing objectives, although the above-mentioned co-ordinating processes will assist in aligning

these with GOOS. The generation of economically beneficial products from existing involvement in ocean observation is seen to be a responsibility of the national research community, and supported as such.

A secondary difficulty is the fractionation of responsibility for marine observations between several government departments both state and federal. The developments described in (1) and (2) may in time overcome this difficulty, but not in the short term.

Summary

Australia has developed a significant level of interest and commitment to GOOS at a 'technical' level and a number of recent initiatives will provide the capacity to integrate with a larger, coordinated GOOS framework, as well as implementing observations that serve Australia's interest in the use and protection of its regional oceans.

However, the fiscal climate and the lack of a palatable and widely attractive rationale for GOOS will remain serious impediments to gaining secure funding for GOOS related observations on an operational basis.

BRAZIL

Brazil attributes high priority to the development of GOOS at national level, mostly oriented by a scientific basis and built upon existing operational programmes, such as IGOSS, GLOSS, IODE and lately, by the Data Buoy Co-operation Panel (DBCP).

The Directorate of Hydrography and Navigation (DHN) has been co-ordinating ocean service activities in Brazil since 1968, with respect to the country's participation in IOC. Numerous operational, technology and research activities are already underway, most of them related to long-term goals and plans of the international GOOS.

The on-going activities in Brazil that are particularly relevant to the development of GOOS are:

- the integration of the National Oceanographic Data Bank to research institutes and universities and the development of a relational database;

- systematic collection of surface temperature and salinity data;

- systematic collection of sea-level data along the Brazilian coast and oceanic islands;

- systematic collection of temperature vertical profile data with XBT, among others.

The major DHN products and activities that will soon be contributing to GOOS are:

- generation of daily sea surface temperature and salinity maps;

- generation of a global scale wave model for the South-Atlantic ocean, based upon weather forecast predictive models;

- systematic oceanographic and meteorological data collection through drifting buoys and remote platforms, among others;

The GOOS-related scientific activities developed in Brazil represent our efforts towards WOCE, OSLR, TOGA and now the recently developed CLIVAR. Those activities, that are brought together by a Committee that operates under the Ministry of Science and Technology, are continuously recognized as important elements for the monitoring of the South-Atlantic Ocean.

A key step in establishing a successful global monitoring programme is the co-ordination of policies between the participating agencies of GOOS, at the national level. Bearing this in mod, a national

committee to co-ordinate and integrate Brazilian activities towards GOOS, irrespective of their scientific or operational basis, will soon be created. The Committee, of interministerial nature, is believed to represent the basic strategic concept to cope with the ca. three million square nautical mile maritime area to be permanently studied and monitored.

In essence, Brazil fully supports the development of GOOS, specially through a substantive increase in the efficiency and practicality of the already existing international observing systems that have to be integrated to the existing and planned national observing ones. It is believed that through an appropriate support from IOC, specifically in what concerns TEM and its capacity building efforts, all IOC Member States will be able to perform their specific roles, with respect to the detection and forecast of important environmental and oceanographic conditions in their maritime areas of interest.

CANADA

The first formal I-GOOS meeting took place in April 1994. Many of the international developments concerning the scientific design of GOOS and the structure for its implementation that have occurred since the first meeting have been relatively recent and thus detailed consideration by nations, including Canada, as to how they might best contribute to GOOS in the longer term has not been feasible.

The climate module is by far the most developed of the modules of GOOS, especially with the completion of the report of the Ocean Observing System Development Panel and its recent consideration by J-GOOS. As reported at I-GOOS-I, Canada is seeking resources for contributions to the climate module of GOOS within the context of GCOS, and an ad hoc GCOS task group was established in the spring of 1994 under the chairmanship of Mr Geoff Holland. This task group has essentially completed its work and its report will be submitted to the Canadian Climate Program Board and the Canadian Global Change Program Board in June of this year. Among its recommendations is that a permanent Canadian GCOS Committee be formed within the Canadian Climate Program.

The report of the Canadian ad hoc GCOS Task Group contains descriptions of existing climate observing systems within Canada and off its coasts. It presents the socioeconomic benefits that Canada can obtain from supporting GOOS for various sectors of Canadian activity such as agriculture, energy, fisheries, health, transportation, water resources, etc. The report also includes recommendations regarding a Canadian contribution to GCOS to the extent that is feasible given the state of international GCOS planning and the uncertainty of Canadian funding. Roughly one half of the required resources identified are for ocean observing system support, reflecting the fact that, like most nations, Canada has limited operational systems providing climate data off-shore. Following the recommendations of the OOSDP and the particular needs off Canada's coasts, resources would be needed to implement enhanced surface and upper ocean measurements using VOS and buoys, geocentrically positioned tide gauges, hydrographic sections, autonomous floats, monitoring of large scale ice flow, etc. As international planning progresses, priorities could be modified in the interest of the overall climate module of GOOS.

As the requirements for the Health of the Ocean, Living Marine Resources and Coastal modules are better defined by J-GOOS and its panels, Canada has the intention to seek the resources for future GOOS commitments. However, since consideration is already being given to the observing systems required in the territorial waters off Canada's Pacific, Arctic and Atlantic coasts in support of fisheries and the regulation of marine pollution, some observing system research and development is already in place through support of programs such as NAFO. Canada is also, for example, a participant in GLOBEC.

International research will continue to supply the information on which the scientific design of the modules of GOOS is based. Canadian institutions and scientists are active participants in most of the relevant programs which include WOCE, JGOFS, GEWEX, and GLOBEC and is participating in the planning for LOICZ and CLIVAR. Canada will also continue to support the planning activities of GOOS and GCOS.

In addition, Canada supports the operational programs of the IOC and believes that they, and the IOC itself, can only be strengthened through their use where possible in the implementation of GOOS.

CHILE

Since we are an active member of IOC, Chile, once more, considers with interest the positive evolution of the new orientation that IOC activities have been following for the last years, which for sure means a better future.

During the present session, we have received updates which indicate success regarding the excellent level of IOC active programmes which constitute the development of the new objective defined by GOOS.

We feel and hope that we are not wrong in thinking that this effort to develop GOOS does not only represent a futuristic vision of the scientific community, but is simply a priority for the whole world population. This is why we will strongly support the GOOS development as far as it is possible for us to do it.

In this connection, our first action has been to appoint a permanent National Contact Point for GOOS, acting directly through the Representative of Chile for IOC.

Furthermore, within the National Oceanographic Committee (its President is also the Representative of Chile for IOC), a working group has been defined to co-ordinate national activities for GOOS an, in principle, may better serve this programme.

In regard of this action, I would like to point out that in Chile, the National Oceanographic Committee co-ordinates and implements all oceanographic activities through Working Groups, formed by experts from the 23 Member entities of the Committee, including public and private programmes which will be co-ordinated nationally through a body that respond directly to the National IOC Representative. Thus, the national and international co-ordination for GOOS exists according to IOC established regulations.

About the GOOS Developing Plan Project, the Delegation of Chile considers that priority should be given to modules with regard to the resources and the importance of the programmes, whatever the deadline of the implementation. Thus, every country performs each module according to defined priorities and available resources.

Elsewhere, Chile is implementing ocean observing activities for TOGA-WOCE-GLOSS-IGOSS-IODE-IGOFS programmes, which will be kept after the experiments as permanent observing system activities in the future, according to GOOS needs.

Finally, we are glad to inform you that since January 1993, our fleet has a new oceanographic Research Vessel AGOR "Vidal Gormaz" (ex US "Thomas Washington") which will allow us to better support IOC programmes, mainly those of GOOS.

CHINA

The Global Ocean Observing System (GOOS) is an important, international system for ocean observations nowadays. The initiative of GOOS goes in line with the development of contemporary marine sciences. GOOS, being an inevitable outcome of the evolution of the world's marine sciences and reflecting a new trend of development, was endorsed by UNCED held in 1992, and was included in "Agenda 21". China supports the establishment of the GOOS system and will duly fulfill her obligations.

Systematic ocean observations in China originated in the 1950s. Up to now, China has basically established an ocean observing system which is capable of meeting the basic needs of ocean-related activities. Over 80 million sets of oceanographic data, which is about 80,000 megabytes, have been accumulated and a network for data collection, processing, analysis and product distribution has been set up.

A great variety of services have been provided to customers in the fields of integrated ocean management, marine environmental protection, ocean resource exploitation, disaster prevention and reduction, and scientific research. Nevertheless, the existing system, as a result of certain weak links and inadequacy, needs to be further improved and upgraded. China will endeavour to align the development of the system with that of GOOS in a co-ordinated manner.

Recent activities in China related to GOOS include:

1. China, paying great attention to UNCED "Agenda 21", has formulated "China's Agenda 21" and is preparing "China's Ocean Agenda 21". China has made great efforts to give publicity to GOOS so as to promote public awareness of GOOS, to increase GOOS social impact and to gain more support from the central government and relevant organizations.

2. China is drafting a programme for the establishment of a new ocean observing system which will be interfaced with GOOS. This programme is intended to be included in China's Ninth Five-Year Ocean Plan and China's Ocean Strategic Plan up to the year 2010.

3. China has prepared a project proposal for "the concept Study for the Draft Master Plan for China's Ocean Observing System" so as to guide the development of China's ocean observing system in a steady and orderly way.

4. China is conducting study for planning the establishment of China's marine ecological monitoring network and is taking effective measures to enhance monitoring and surveillance of discharges of pollutants from the land-based sources into the sea.

5. Since 1988, China has been uninterruptedly providing average sea-level data from coastal stations to Hawaiian Sea-Level Data Center once per month.

6. China successfully hosted an expert consultation meeting on North=East Asian regional GOOS in Beijing in August 1994.

GOOS is an ambitious project which can be realized by concerted efforts of all Member States. We are now confronted with common opportunities and challenges. China is ready to co-operate with relevant international organizations and countries on such issues as the establishment of the NEAR-East Asian Regional GOOS system am other related issued.

COLOMBIA

The national GOOS-related activities are carried out on the basis of:

(I) **The Colombian participation in international projects and programmes related to I-GOOS, such as:**

- Action Plan for the Protection of the Marine Environment and Coastal Areas of the South-East Pacific (CPPS/PNUMA);
- Action Plan of the Wider Caribbean Environment Programme (UNEP);
- LOICZ, through the International Institute for Global Change;
- Study of the El-Niño Regional Phenomenon;
- Activities of the IOC Sub-Commission for the Caribbean.

(II) **Registered activities and/or national initiatives as national components for fisheries or regional plans, such as:**

- National Programme for Research and Monitoring of the El-Niño Phenomenon in the coastal areas of Colombia;

- National Strategy for Coastal and Marine Biodiversity in the Colombian Caribbean and Pacific regions;

- Proposal for the formulation of an integrated marine science policy in the framework of a sustainable development;

- National Marine Information System - INFOMAR;

- National Plan for the Development of Marine Science and Technology - CCO/COLCIENCIAS.

The activities mentioned in (i) are interdependent to international programmes giving scientific bases to GOOS. For example:

- Within the SE Pacific Action Plan, Colombia has been participating since 1983 in the sub-regional co-ordinated research and monitoring programme on marine pollution (CONPACSE) in areas of special interest. Since 1989, it is also part of the Regional Group on the impact of climatic changes on coastal and marine ecosystems, and since 1992, Colombia is participating in the Environmental Management Plan for the Coastal Zone, aimed at developing a methodology for further integrated management of the regional coastal zone. COMPACSE is part of the UNEP Programme for Oceans and Coastal Areas.

Within the Action PLAN for the Caribbean Marine Environment, Colombia is participating since 1985 in the Joint CEPPOL/IOCARIBE Programme as well as in the joint UNEP/IOC activities on Climate Changes.

Colombia also takes part in the International Oceanographic Data and Information Exchange System (IODE) of IOC.

Colombia has been participating for more than one decade in the Study of the Regional El Niño Phenomenon - ERFEN (supported by IOC and WMO) - and has established a National Technical Group for ERFEN, co-ordinated through the Comisión Colombiana de Oceanografía (CCO).

Regarding LOICZ (Land-Ocean Interaction in the Coastal Zone), which is a declared project of the International Geosphere-Biosphere (IGBP) Programme, a National Technical Committee for LOICZ has been established, within the framework of the Interamerican Institute for Global Change. The Academia Colombiana de Ciencias Exactas y Naturales (Colombian Academy for Physical, Natural and Exact Sciences) has been designated to act as LOICZ National Focal Point.

The above-mentioned activities are connected with the following international programmes which provide scientific bases for GOOS: the World Climate Research Programme (WCRP), the TOGA-Pacific Tropical Ocean Project, the Health of the Ocean initiative, the World Ocean Circulation Experiment (WOCE), etc..

National programmes are developed in the context of UNCED's Agenda 21 (Chapter 17), encompassing national actions which further complete or implement regional/national programmes providing support to GOOS. Some of them are the following:

National Research and Monitoring Plan on the El Niño Phenomenon in the Colombian coastal zone

This Plan represents the ERFEN national component which in turn provides support to the TOGA/Pacific activities, among others. It is a recent national initiative (started in 1994) at present at a planning stage, which co-ordinates the actions of five national institutions. The Comisión Colombiana de Oceanografía will be the co-ordinator of the Plan.

National Strategy for Coastal and Ocean Biodiversity in Colombia

This Strategy is a proposal prepared by the CCO with the support of COLCIENCIAS and the Ministry of Environment, with a view to strengthen the coastal and ocean component in the framework of the National Strategy for Biodiversity, which is complementary to the provisions of the Biological Diversity Convention and the UNCED Agenda 21, Chapter 17. Its strategy includes political, legal, institutional, capacity-building and training aspects. The strategy is part of a National Plan for Integrated Management of the Coastal Zone, recommended in the strategy guidelines.

Integrated Ocean Policy

Due to its characteristics, the Integrated Ocean Policy constitutes a basic element which strongly intends to participate in national activities supporting directly or indirectly GOOS. This policy aims at incorporating the ocean and its resources in the economic and social development of the country, and eliminating isolated and sectorial approaches to the ocean and its resources. An action started by the CCO in 1993 in the framework of a direct inquiry carried out at the national/international level, made feasible the elaboration of draft guidelines on ocean policy for Colombia.

National Oceanic Information System - INFOMAR

Following the initiative of the CCO, with the support of COLCIENCIAS, the first National Oceanic Information System is being implemented in Colombia at CCO headquarters. In the context of GOOS, this System will provide support to IODE activities and other international information and data exchange systems.

National Ocean Science and Technology Development Plan

Colombia has a National Plan, in force until the year 2,000, focused on marine research activities. This Plan is co-ordinated by the CCO and aims at supporting the institutional activities. More than 64 national institutions have been participating in this Plan, with nearly hundreds investigations carried out in diverse fields of ocean science and technology.

In the context of these national activities whereas at local, regional and global levels, Colombia has been and will go on contributing to the Global Ocean Observing System, through:

(i) Collecting oceanographical, biological and meteorological basic information with a view to improving the prediction models on Climate Changes;

(ii) Sampling systematic measurements of pollutants in several environment matrices, in support of the Health of the Oceans measurements and reports;

(iii) Performing methodical and technical tests focused on environmental management of the coastal area in order to facilitate integrated planning and management of the coastal zone;

(iv) Collecting basic information on coastal and marine biodiveristy in the Colombian offshore and coastal waters, etc.

FRANCE

GENERAL

This report does not present the French oceanic activities which can be related to GOOS. Contributions to IGOSS, IODE, GLOSS, etc, because nothing has significantly changed since the Planning Session in Melbourne (April 1994). The reader may refer to the final report of this meeting, to get the pertinent information. We will focus here on topics related to the definition of the national structures for GOOS.

NATIONAL RECOGNITION OF GOOS

Last twelve months have been dedicated to promote GOOS towards the Scientific Community and towards Government Authorities.

a) Early 1994, a National GOOS office has been installed under the authority of a steering committee gathering the Directors of the seven national agencies carrying oceanic activities. This office is responsible for establishing proposals for the French contribution to the system.

b) GOOS has been recognized as a programme of interest by the Inter-Ministerial Committee for the Sea, which asked for detailed and costed proposals, preliminary to any further decision.

c) Advertising material has been written and largely distributed at national and international level.

d) A scientific workshop on GOOS has been convened in may 1994, in order to promote the GOOS concept towards the national scientific community. This workshop has been successful, as it has allowed to get the support of scientists for a development of a contribution to GOOS a few number of objectives federating national efforts,

e) Following the workshop, a Scientific Committee and six Task Groups have been established, with the objective to produce and evaluate costed project proposals to be submitted to government authorities at the end of 1995. The items to be analyzed are six :

   (i) Contribution to the Climate module of GOOS, with special attention to the tropical ocean;

   (ii) Development of modelling and forecasting tools for oceanic services on the Atlantic and its adjacent seas;

   (iii) Identification of key parameters to be observed and sampled for modelling and prevision of living resources evolution;

   (iv) Definition of a comprehensive system for coastal zones monitoring, based on the experience gained in existing national operational monitoring activities;

   (v) Definition of the observing system pertinent for physical oceanography, including space missions, *in situ* measurements and modelling centres;

   (vi) Necessary technological development related to the instrumentation dedicated to operational oceanography.

At the time of I-GOOS II, we have then established a coherent set of co-ordinating structures aiming to federate the efforts of the national agencies around of practical projects. Items i) to iv) above are related to GOOS modules, the last two being dedicated to a transversal approach of ocean monitoring.

This structure will enable the GOOS Office to make proposals and submit them to government and to the general user community, as national challenges for operational oceanography as well as key contribution to the international efforts under the framework of IOC, WMO and UNEP.

REGIONAL ACTIVITIES

Simultaneously, the GOOS National Office is involved in the development of regional activities. IFREMER, the principal French agency for oceanography, is one of the initial members of EuroGOOS, representing the other agencies to this forum. Other initiatives have been taken in order to establish the basis of a co-operation around the Mediterranean, within a MedGOOS informal structure.

GERMANY

In the medium-term plan for marine research and technology, the German Government has expressed its willingness to participate in the planning and development of the Global Ocean Observing System (GOOS). In the context of GOOS, the main area of interest for German governmental institutions is the North Atlantic Ocean and adjacent seas. German priorities in GOOS relate to: (i) heat content and heat transport in the North Atlantic Ocean, (ii) sea-level rise, (iii) wave conditions and forecasting, (iv) ship routing, (v) water quality and marine environmental conditions in the North and Baltic Sea, (vi) the impact of climate changes on ecosystems in the North and Baltic Sea, and (vii) climate changes world-wide, with special emphasis on Europe. Operational marine services of the German National Meteorological Office (DWE) are working at local, regional and global scales. Research institutes operate in the entire Atlantic Ocean, Indian Ocean, and in the two polar regions.

The Bundesamt für Seeschiffahrt und Hydrographie (BSH - Federal Maritime and Hydrographic Agency) serves as the German GOOS Secretariat. It co-ordinates the German activities within GOOS, it communicates with the German GCOS Office (DWD), ant it liaises with relevant international organizations and programmes. Discussion about the establishment of a German GOOS Committee and a scientific advisory group has been deferred until the approval of a national status report about potential contributions of German institutions of GOOS. This status report will be completed in July 1995.

The status report identifies the main areas of potential participation in GOOS. During the foreseeable future Germany's contribution to the two modules "Health of the Ocean" and "Coastal Zone" will be almost identical with its activities within the regional conventions for protecting the marine environment from pollution (Paris, Oslo and Helsinki Conventions). SO far, the capabilities of German institutions to participate, in an operational mode, in the "Living Resources" module are the least developed and therefore must be strengthened.

German institutions continue to participate in research projects, such as WOCE, JGOFS and BALTEX, and in operational programmes like the Integrated Global Ocean Services System (IGOSS), the ship-of-opportunity programme, the International Oceanographic Data and Information Exchange (IODE) and World Weather Watch (WWW). The BSH has started to work a transatlantic hydrographic section on 48°N, on a more or less regular basis (about once every two years), to monitor the heat content and the heat transport in the North-Atlantic Ocean and its changes.

There are plans to hold a workshop, later this year, to identify the scientific details of a German contribution to GOOS and the technological requirements. The BSH is the German Member of the EuroGOOS initiative and supports the involvement in GOOS on the European level.

The rationale for GOOS has been widely publicized in Germany through various publications:

(a) A coloured brochure entitled "GOOS - *Ziel und Bedeutung* (GOOS - Goal and Importance) has been printed and distributed in 1,900 copies,

(b) An article was published in the *Mitteilungen der Deutschen Gesellschaft für Meeresforschung* (Proceedings of the German Society for Marine Research);

(c) GOOS was presented at the BSH Symposium "Actual Problems in the Marine Environment" (Hamburg, 23-24 May 1995).

INDIA

1. INTRODUCTION

Details of a number of national programmes having potential to support GOOS were presented in the First Session of I-GOOS held in Paris, February 1993 and First Planning Session of I-GOOS held in Melbourne, April 1994. The names of such programmes are mentioned below for recapitulation.

1.1 **Marine Satellite Information Service (MARSIS)**, going on since 1991, generating data and data products on Sea-Surface Temperature, Potential Fishing Zone forecasts, Coastal Zone Information system, Mapping of Coral Reefs and Mangroves, Mapping of Coastal Wet Lands, etc..

1.2 **Sea-Level Monitoring and Modelling (SELMAM)**, going on since 1992, to establish modern tide-gauges at 13 selected locations in Indian coast and fine scale mapping of coastal areas.

1.3 **Coastal Ocean Monitoring and Prediction System (COMAPS)**, going on since 1990, to keep a watch on the health of the coastal waters.

1.4 **Joint Global Ocean Flux Studies - JGOFS (India)**, going on since 1993 for studying biogeochemical process of Arabian Seas for assessing ocean-atmosphere carbon/dioxide exchange.

1.5 **National Ocean Information System (NOIS)**, for collection, archival, processing and dissemination of ocean parameters to end-users.

1.6 **Drifting Buoy Programme**, for collection of *in situ*, real-time data on Sea-Surface Temperature and wind pressure for validating data derived from satellite.

1.7 **Survey of Living Resources**, to collect oceanographic data and relate it to the abundance and dynamics of living resources.

2. NEW PROGRAMMES FORMING SUPPORT TO GOOS

2.1 **National Met-Ocean Data Buoy Programme**: the Governmental of India has approved in principle the implementation of the Data Buoy Programme. India proposes to procure 15 State-of-the-art data buoys and to deploy 12 of them at selected locations in the EEZ. The Indian satellite INSAT will be used for communication. The installation of buoys is expected to start from early 1996.

2.2 **Dedicated Ocean Satellite:** India is proposing to launch a dedicated ocean satellite coinciding with the International Year of the Ocean, 1998.

2.3 **Land-Ocean Interaction in Coastal Zone (LOICZ):** A brain-storming session was held in April 1995, and a national programme is being designed for implementation.

3. NATIONAL MECHANISM FOR GOOS IMPLEMENTATION

The programmes describes above are all independent and the implementation of each one is overseen by a monitoring committee of experts. The products generated having application potential are also disseminated by nodal institute executing the programme. All the data generated from the programmes will go into NOIS (1.5). All the programme executing agencies are urged to adopt latest state-of-the-art technologies for collection of samples and for measurements conforming with the international protocols. As already reported, the National Committee which oversees the NOIS is also designated to oversee the setting up of Indian GOOS programme.

4. REGIONAL/INTERNATIONAL CO-ORDINATION

4.1 South-Asia Regional Seas Programme: The plenipotentiaires of the South-Asian maritime countries of India, Bangladesh, the Maldives, Pakistan and Sri Lanka met in New Delhi, on 24 March 1995, under the aegis of the marine environment programme of the United Nations Environment Programme (UNEP) and discussed and finalized a regional action plan for the protection of marine environment in the South-Asian Seas Region.

The finalized plan endeavours to assess the environmental problems of the region and seeks to direct action for the promotion of sustainable development and scientific management of regional marine and coastal resources. It is felt that the framework would act as a basis for a regional network of co-operative activities and projects of mutual interests.

The following priority areas were identified for future course of action:

* Integrated coastal zone management;
* Development and implementation of national and regional oil and chemical spill contingency planning;
* Human resources development through strengthening regional centres of excellence;
* Protection of the marine environment from land-based activities.

4.2 Dissemination of Potential Fishing Zone Information to Sri Lanka

Sri Lanka has expressed desire to receive Potential Fihsing Zone forecasts from India covering Sri Lanka waters. India has agreed to provide the same. Mechanism for dissemination of information is being worked out.

5. GOOS STRATEGY/MISCELLANEOUS PROBLEMS

The actual implementation of GOOS by taking up of work as per five GOOS modules has not started. Though some data products are disseminated for coastal communities, the major effort of developing predictive nodels in climate change and its effect on short/long-term forecasts of fisheries production is yet to begin. National Institutes have been identified for this purpose. The groups in these institutes need collaboration with international groups through IOC for developing national, regional and global models.

6. CONTRIBUTION OF GOOS

6.1 Incremental Costs

Large-scale dissemination of oceanographic data has not yet started in India. At present, each agency who wants to take up economic or social development activity in the sea or coastal zone, collects data specific to site and implements the projects. Examples are data for offshore platform constructions, ports development, coastal aquaculture, etc. Thus most of the users demand site specific data which at present is not available. It is expected that when mathematical models are developed to convert data of deep sea for application in shallow waters or for near coast applications or for sit specific applications, it would then be possible to market oceanographic data. At present, one area where data generated under MARSIS are applied to economic activity, is fishing. Potential Fishing Zone forecast derived from NOAA data are being used by fishing community. By use of PFZ information, the turn-around time of fishermen and thereby consumption of diesel is reduced. The catch per unit effort in PFZ areas is also found to be more.

6.2 Measurements performed

The data generated in India are those collected during the course of implementation of national programmes such as those mentioned at para 1. of this report. Most of the measurements fall within the EEZ, except in the case of programmes like JGOFS. The major parameters are temperature, current salinity profiles, waves, tides, winds, nutrients, water colour, CO_2 trace metals, hydrocarbons, etc.

6.3 Data Exchange

The Government of India has set up a Committee to advise on the policy of data exchange. The work of the Committee is continuing.

6.4 Products prepared and disseminated

The following products are being disseminated nationally through the programmes mentioned para 1.

(i) Sea-surface temperature;
(ii) Potential Fishing Zone information;
(iii) Tidal predictions;
(iv) Report on pollution of coastal waters;
(v) Coral reef maps;
(vi) Mangrove maps;
(vii) Coastal wet land maps;
(viii) Maps on fishing grounds.

JAPAN

1. INTRODUCTION

Japan has established the repeated hydrographic sections in the adjacent seas and in the western North Pacific Ocean since 1960's and will utilize the recent world impetus to maintain and enhance the existing ocean observing system. For the development of the GOOS, Japan recognizes the importance of establishing an interactive scheme among basic researches, technology development and the operational programmes.

In Japan, several Ministries and Governmental Agencies are taking part in GOOS and conducting the related activities. The Ministry of Education, Science and Culture, and the Science and Technology Agency have been supporting basic studies and technology development to establish the GOOS. Various operational activities have been carried out by Governmental Agencies, Prefectural Governments, and universities. The Japan Meteorological Agency has been in charge of oceanographic observations with initiatives in IGOSS and GLOSS, and recently established its El Niño Monitoring Center. The Hydrographic Department, Japan Maritime Safety Agency, is operating Japan Oceanographic Data Center of IODE, and conducting oceanographic observations and marine pollution monitoring. The Japan Fisheries Agency is responsible for living resources and for related marine environmental issues, while making remarkable contributions to monitoring of the coastal zone and the ocean.

The Environmental Agency has been carrying out pollution monitoring in the coastal zone. The Ministry of Posts and Telecommunications has been observing rainfalls,oil pollution, and offshore currents by using satellites, and airborne and coastal radars. The Ministry of Construction has been conducting various researches on sea-level rise and its socio-economic impact from the view point of coastal zone conservation.

It should be stressed that Japan has been actively participating in training, education and mutual assistance (TEMA), and technology transfer in marine sciences and services within frameworks of IOC/WESTPAC, and by various international and bilateral co-operation programmes. Japan provides the opportunities for scientists and technicians in the WESTPAC region to participate on-board training and to attend seminars on process and management of oceanographic data.

This report, prepared by the Liaison Conference on GOOS of the Inter-Ministries and Agencies, describes the Japanese GOOS activities in 1995.

2. THE NATIONAL MECHANISM FOR DEVELOPMENT OF GOOS

The National Committee for IOC, the National Commission for UNESCO of Japan, is the focal point of the IOC activities as a whole for national and international co-ordination. The official correspondence and international co-ordination with the IOC Secretariat regarding GOOS have been done under the responsibility of the Committee. The Committee has established recently the NEAR-GOOS Working Group of the Inter-Ministries and Agencies for development of the implementation plan of the North-East Asian Regional GOOS, in Japan Sea, East China Sea and Yellow Sea.

The Liaison Conference on GOOS of the Inter-Ministries and Agencies provides a forum among the Governmental GOOS members for the further co-ordination of the GOOS-related activities. The Sub-Committee for GOOS, National Committee for SCOR of Japan Science Congress, is co-ordinating scientific aspects of the GOOS.

3. PARTICIPATION OF THE GOVERNMENTAL ORGANIZATIONS IN PLANNING, DEVELOPMENT AND IMPLEMENTATION OF GOOS

3.1 MINISTRY OF EDUCATION, SCIENCE AND CULTURE (MONBUSHO)

Monbusho, which supports research activities at the universities, has promoted many international research programmes such as WCRP and IGBP. The basic studies towards establishment of GOOS is carried out for five years from 1993 to 1997. Monbusho will keep supporting researches which lead to development of GOOS through Scientific Grants in-Aid and the budget of universities.

The GOOS activities at universities are co-ordinated by the Center for International Cooperation, established in 1994 at the Ocean Research Institute, the University of Tokyo.

3.2 SCIENCE AND TECHNOLOGY AGENCY (STA)

STA is the co-ordinating agency for ocean research and development, and has participated in the existing international ocean research programmes by funding the institutions. Furthermore, STA has directly supervised, and funded the Japan Marine Science and Technology Center (JAMSTEC) and the National Space Development Agency of Japan (NASDA).

3.3 JAPAN METEOROLOGICAL AGENCY (JMA)

The Japan Meteorological Agency (JMA), one of national organizations responsible for oceanographic observations and services as well as the authorized national meteorological service, has been actively contributing to each module of GOOS, in particular, to the climate module and the ocean service module. The JMA will further improve the existing activities and develop coupled ocean-atmosphere models to predict El Niño events and climate change.

The JMA will actively participate in the NEAR-GOOS project being planned for the waters adjacent to North-eastern Asia. Within the project, the JMA is expected to provide participating members with oceanographical and meteorological data obtained in its operation through electronic telecommunication systems on a real-time basis.

3.4 JAPAN MARITIME SAFETY AGENCY (JMSA)

The Hydrographic Department of JMSA is a representative authority in Japan for marine surveys and observations, and also operates the Japan Oceanographic Data Center (JODC). The department produces and provides products necessary for navigation, such as nautical charts, tidal tables, biweekly oceanographic bulletins, etc. from data obtained by its extensive hydrographic and oceanographic surveys and observation operations. It is also one of the responsible organization for marine pollution monitoring. Utilizing its superb research capacity, the Department has actively participated in various operational and scientific programmes. It is planned that the Department will positively contribute to the development and implementation of the GOOS, based upon its extensive experiences and contributions of operational ocean monitoring around Japan.

The Japan Oceanographic Data Center, which is one of the most active national oceanographic data centers in the International Oceanographic Data and Information Exchange of UNESCO/IOC, has been serving the community as the sole comprehensive oceanographic data center in Japan. The JODC is the R-NODC of the WESTPAC, and will contribute to the NEAR-GOOS.

3.5 JAPAN FISHERIES AGENCY (JFA)

The Fisheries Agency is the authority responsible for living resources and related environmental issues of marine and fresh water realm. National Fisheries Research Institutes are engaged in the researches of physical and chemical environment and its relation to primary and secondary biological productivity as well as of various aspects of fishery resources participating in the international research activities. Monitoring of the change in biological activity of aquatic creature and their environment are also made in relation to the global environment change.

3.6 ENVIRONMENTAL AGENCY

The major mission of the Environmental Agency is to promote environmental administration in comprehensive manner. The Water Quality Bureau is responsible for water quality management. The Nature Conservation Bureau is concerned with marine environment with particular attention to the marine ecosystem. The Environmental Agency co-ordinates environmental research activities undertaken by the governmental research institutions. The National Institute for Environmental Studies attached to the Environmental Agency has conducted researches on marine environment.

3.7 MINISTRY OF TRANSPORT (MOT)

Ports and Harbors Bureau is observing natural condition in coastal area of Japan to construct ports and coastal facilities. Wave observation has been operated on offshore network stations.

3.8 MINISTRY OF POSTS AND TELECOMMUNICATIONS (MPT)

The Communications Research Laboratory (CRL) is a VLBI (Very Long Baseline Interferometry) technical development center of International Earth Rotation Service (IERS). The CRL developed an ultra small VLBI station with Geographical Survey Institute (GSI) by the support of the Environment Agency. The idea is to connect tide-gauge by VLBI technique to remove the crustal movements from the record of tide in each station, when monitoring the mean sea-level change. Since international co-operation is essential for this observation, this activity is extended under the U.S. Japan Conference on Natural Resources Panel (UJNR) to have co-operative work in the Pacific Ocean area. The VLBI experiments will be continued with transporting the small VLBI station to tide-gauge stations to connect each position to the global reference co-ordinate.

3.9 MINISTRY OF CONSTRUCTIONS (MOC)

Ministry of Construction (MOC) has conducted various researches through the Geographical Survey Institute, to assess the effects of rapid sea level rise (SIR) and collected basic information of the coastal sea area.

4. ACTIVITIES RELATED TO GOOS TO BE SUPPORTED OR IMPLEMENTED BY THE GOVERNMENTAL ORGANIZATIONS

4.1 MINISTRY OF EDUCATION, SCIENCE AND CULTURE (MONBUSHO)

4.1.1 Basic Studies towards Establishment of GOOS (1993-1997)

The International Co-operative Research Programme on Global Ocean Observing System, sponsored by the Ministry of Education, Science and Culture, Japan, has been carried out at the Japanese universities since April 1993. The programme is to be funded for five fiscal years to 1997. Basic studies to establish the GOOS are made on the key elements, especially in understanding, describing and forecasting of the oceanic processes. Observations, numerical modeling, and technical developments are carried out in the following research subjects.

Subject 1. Evaluation of oceanic transport of heat and material in the North Pacific Ocean

Heat and volume transports of the ocean circulations are observed by using moorings of current meters and inverted-echo-sounders, the CTD casts, acoustic drop-sondes, and the satellite altimeters in two sections across the Kuroshio, off Shikoku and on the Izu Ridge, and in one section across the subarctic gyre. In June 1993, four multi-path inverted echo-sounders to detect volume transport and the path location of the Kuroshio were moored over the Izu Ridge. In October 1993, 24 current meters and 9 inverted echo-sounders were moored at 9 stations of Shikoku. These moorings are recovered and redeployed in 1994. Ship-borne and towed ADCPs, and XBT are used in the cruises. Turbulent processes which affect the ocean currents and heat flux are studied by using a towed thermistor chain. (Ocean Research Institute, University of Tokyo, 5 year-programme, 1993-1997).

Subject 2. Evaluation of fundamental elements of the oceanic processes

Fluxes of sensible heat, latent heat, and momentum across the sea surface are estimated by the satellite data, and they are validated by using the data from ships and buoys. The surface fluxes are governing the close coupling between ocean and atmosphere, and they are fundamental to drive ocean circulations. Analysis of historical data is made to select key areas to be monitored operationally, (Graduate School of Science, Tohoku University, 5 year-programme, 1993-1997).

Subject 3. Design of ocean observing system aided by high-resolution models of the ocean circulations

Numerical models on the general and regional circulations are developed to identify the key elements and locations for monitoring. The models are essential both for interpolations of the data because the ocean observations with uniform spatial and temporal scales all over the ocean are impractical, and for forecasting because the observations can describe an oceanic state at the present and in the past. (Graduate School of Science, University of Tokyo, 5 year-programme, 1993-1997).

Subject 4. Monitoring techniques to obtain time series data on the ocean environment

An efficient and reliable technique to analyze dissolved gases and radio active nuclei is developed to monitor budget of greenhouse gases and deep circulations. Field observations are made at selected stations with a time interval sufficient to monitor changes in the ocean environment. (Graduate School of Environmental Earth Science, Hokkaido University, 4 year-programme, 1994-1997).

Subject 5. Monitoring of ocean currents and biomass abundance by using new techniques

Biological activities and their environments are essential to understand the material cycles in the ocean. An acoustic technique and an algorithm for the satellites data processing are developed to evaluate plankton density and biological environments. Current fields are monitored by the acoustic Doppler current profiles (ADCP) and inducted voltage of a submarine cable across a strait. (Ocean Research Institute, University of Tokyo, 4 year-programme, 1994-1997).

4.1.2 International Co-operative Researches

The development of the Global Ocean Observing System (GOOS) by the Monbusho has been done in the International Scientific Research Programmes, and the subjects on going are as follows.

1) Mid and Deep Circulation in the Japan Sea : 1994-1995

International co-operative research cruises by Russian ships are carried out in the Japan Sea by participants from Russia, Korea and Japan. The CTD casts with water samples are made for hydrography and tracer studies. Current meter moorings, tracking of satellite drifters, and current profiling by towed ADCP, are made. International symposia are held for the study. (J-H. Yoon, Research Institute for Applied Mechanics, Kyushu University, Kasuga, Fukuoka 816).

2) Physical studies on the Global Ocean Observing System: 1995-1997.

The goal of the GOOS is investigated by exchanging scientists internationally in the field of physical oceanography. Scientific and technical problems in estimation of oceanic transport of heat and mass, in the direct measurement of them based on ocean acoustics, and submarine cable measurements of telluric potential difference, and application of satellite data, are main subjects. (K. Taira, Ocean Research Institute, University of Tokyo, Minamidai, Nakano-ku, Tokyo 164).

3) Variability of Western Boundary Currents : 1995-1997.

Recent studies by high resolution numerical models on the ocean general circulation have revealed that the western boundary currents of the North pacific Ocean, such as the Kuroshio, is driven by not only wind curl over the ocean but also by the interaction of the bottom topography with the baroclinic fields formed in the winter season. The models are improved by taking into the tidal mixing process and by validation with the current measurements made by U.S.A., Australia, China, Russia, and Japan (T. Yamagata, Graduate School of Science, University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113).

4.2 SCIENCE AND TECHNOLOGY AGENCY (STA)

4.2.1 Introduction

STA has been co-ordinating *"the Pacific Ocean Observing and Research Initiative (TYKKI)"* in co-operation with the United States since 1993, in order to enhance the activities on observation and research in the Pacific Ocean. This co-operative work will contribute to develop the GOOS in this region (The details are shown in Appendix).

By using the Special Co-ordination Funds for Promoting Science and Technology, STA has supported the development of a multi-purpose, automated moored buoy system with capability of easy deployment and multi-parametric observation, and the development of real time transmission of the observed data via satellites on a routine basis for weather forecast.

4.2.2 The Japan Marine Science and Technology Center (JAMSTEC)

1) Tropical Ocean Climate Study

JAMSTEC has been carrying out oceanographic observations in the western Pacific Ocean. One objective is to observe variabilities taking place in the upper ocean. JAMSTEC has observed an annual variability in the very wide area of western equatorial Pacific. It has been observed that the current structures of the Equatorial Undercurrent, and the North Equatorial Counter Current have changed annually in association with ENSO. The studies on current variability are important to understand the mechanism of the change in the water temperature and salinity and the current variabilities in the equatorial region of the western Pacific Ocean.

2) Indonesian Throughflow Research Related to WOCE

As a part of the WOCE programme, JAMSTEC has been observing the Indonesian Throughflow since 1992. JAMSTEC made CTD casts and measurements of salinity, dissolved oxygen and nutrients of samples sea water. Subsequently, hydrographic analysis of the collected data has resulted in a much better understand the distribution of water masses between Mindanao and New Guinea and the deep water properties in the southernmost Philippine Basin.

3) Kuroshio and Its Recirculation Research

JAMSTEC has been carrying out measurement of volume transport of the Kuroshio at Tokara strait, where the Kuroshio runs off to the Pacific Ocean from the East China Sea. JAMSTEC plans to deploy subsurface mooring buoys to study Kuroshio recirculation at the eastern side of Izu-Ogasawara ridge, south of Japan.

4) Arctic Ocean Research

JAMSTEC has been conducting meteorological, glaciological, and oceanographic observations in the mid-Arctic Ocean, and Chukchi and Bering Seas which are the marginal seas of the Arctic and Pacific Oceans, respectively.

5) Material Cycle in the Marginal Seas

As a part of an international co-operative research project on ocean fluxes in the marginal seas (Marginal Sea Flux Experiment in the West Pacific-MASFLEX), JAMSTEC has been studying the fate of suspended and settling particulate matter in the East China Sea and its adjacent seas. The first phase of the project lasted from 1992 to 1994. The second phase has started in 1995 and will end in 1996.

6) Deep Sea Ocean Flux Study

JAMSTEC has been studying the impact of hydrothermal activity on the chemistry of the ocean. By utilizing not only a conventional research vessel but also a submersible in the Okinawa Trough, water sample, suspended matter, settling particle and bottom sediment have been collected since 1992 to evaluate material flux from the hydrothermal vents and to understand the processes of material transportation at methane radionuclides, and heavy metals.

7) Ridge Flux Study

JAMSTEC is now involved in the Ridge Flux Project, aiming at quantitative estimation of the total energy and mass flux from the interior of the earth to hydrosphere and atmosphere through geophysical, geological and geochemical observation on the bottom of the mid-oceanic ridges and active back-arc basins. In 1994, diving cruises using Shinkai-6500 were carried out at TAG Site on the Mid-Atlantic Ridge and the southern East Pacific Rise in collaboration with the U.S.A. The long-term seafloor monitoring stations were also established during the cruise for recovery one year later.

8) Primary Production Research

JAMSTEC has started a programme to observe phytoplankton and its primary production in equatorial upwelling regions and in the western Pacific Ocean using the ocean LIDAR (laser radar), in addition to the traditional measurement methods. This research programme helps to build data set of phytoplankton distribution originated from the data of satellite-borne ocean colour sensors which are received at a ship-board satellite receiving station.

9) Zooplankton Research

JAMSTEC has been studying a measurement technique to obtain vertical profiles of size and density distribution of the zooplankton. JAMSTEC is planning to use the technique of in-situ measurement to study the processes in the lower tropic region and in Japanese coastal waters.

10) Research and Development on Ocean Observation System

JAMSTEC has been researching and developing the following net ocean observation systems:

a) Ocean Acoustic Tomography System
b) Ocean LIDAR System
c) Surface Mooring Buoy Network
d) Ice Ocean Environment Buoys
e) Large Size Research Vessel

4.2.3 The National Space Development Agency of Japan (NASDA)

Research and Development of Satellite Remote Sensing

The National Space Development Agency of Japan (NASDA) has developed and launched the R/S satellite to observe the sea surface temperature, ocean colour, sea surface wind, and so on, and conducted analysis of satellite oceanography using both foreign and Japanese earth observing satellites. Also, NASDA has developed the Earth Observation Information System (EOIS) for easier public access to the earth observation data.

4.3 JAPAN METEOROLOGICAL AGENCY (JMA)

The JMA operates six observational vessels in the seas adjacent to Japan and the western Pacific Ocean for oceanographic and marine meteorological surveys. The JMA has been conducting oceanographic observations along the fixed lines in the waters around Japan every season for more than 50 years, and in the western North Pacific from the south coast of Japan to the equator over 25 years on a semi-annual basis. Recently, oceanographic surveys in the western North Pacific has been expanded from twice per year to three or four times per year. These observations cover the fields of physical, chemical and biological oceanography as well as marine meteorology, aerology and radar meteorology. The observations of greenhouse gases and ozone depleting substances are implemented under the framework of the Global Atmosphere Watch (GAW) of WMO, and the observed data is distributed through the World Data Center for Greenhouse Gases (WDCGG) operated by the JMA to users all over the world. The marine pollution monitoring is being made under MARPOLMON of IOC.

The JMA operates 66 tidal stations along the coast of Japanese Archipelago and remote islands for the monitoring of tsunami and storm surge as well as long-term variations of sea level. Monthly mean sea-level data of nine tidal stations of the JMA are provided to GLOSS of IOC and to the IGOSS Sea-Level Programme in the Pacific (ISLP-Pac).

The JMA is recruiting merchant ships to be equipped with XBT observation facilities to collect subsurface temperature data in the Pacific Ocean and the Indian Ocean. Furthermore, marine meteorological data, sea surface temperature and ocean surface current data are collected from merchant ships and fishing boats. As one of responsible members of WMO Marine Climatological Summaries Scheme, the JMA is publishing the statistics of marine meteorological elements for the North Pacific.

The JMA operates four moored ocean data buoy in the seas adjacent to Japan to obtain three-hourly meteorological and oceanographical data on a real-time basis via the Geostationary Meteorological Satellite (GMS) of the JMA. The JMA experimentally initiated the deployment of drifting buoys in the western North Pacific to monitor sea surface temperature and ocean currents through the Argos system.

The GMS, stationed at 140E above the equator, provides the information about distribution and height of cloud, upper and lower winds inferred from cloud motion, and sea surface temperature.

The El Niño Monitoring Center of the JMA collects marine meteorological and oceanographic data through the Global Telecommunication System (GTS) of WMO as well as from Japanese governmental organizations and universities. The Center issues the "*El Niño Monitoring Report*" containing a summary of oceanic and atmospheric conditions in the equatorial Pacific and the "*Monthly Ocean Report*" containing latest data/information on El Niño and relevant meteorological/oceanic conditions for the domestic and foreign users on a monthly basis. The Center, in co-operation with the Forecast Department of the JMA, has been operating the Ocean Data Assimilation System (ODAS) since the beginning of 1995. Some products of the ODAS appear in the "*Monthly Ocean Report*". The Center is also in charge of the IGOSS Specialized Oceanographic Center (SOC) for the Pacific Ocean to collect and to process wide-ranging oceanographic data, and to disseminate products through the Meteorological Radio Facsimile Broadcasting of the JMA and the "*Monthly Ocean Report*" on an operational basis.

The JMA is developing coupled ocean-atmosphere models to predict El Niño events and climate change on an operational basis.

4.4 JAPAN MARITIME SAFETY AGENCY (JMSA)

4.4.1 Ocean Survey

The Hydrographic Department, JMSA, is regularly conducting oceanographic observation of ocean current, water temperature, salinity, etc., in and around Japanese waters and publishes various products including bi-weekly oceanographic bulletin. As a part of the implementation of WESTPAC Programmes, Japan Antarctic Research Expedition (JARE), etc., the Department is also carrying out observation of ocean currents, water temperature, etc., and such precise observation of deep sea currents by using oceanographic mooring systems and drifting buoys in the North Pacific ocean and the Southern ocean. It also participates in the WOCE programme and has completed the one-time P2 line.

4.4.2 Marine Pollution Survey and Monitoring

In and around Japanese waters, major bays and harbors, as well as in the western Pacific area, mid-latitude areas in the North Pacific Ocean, and the Southern Ocean, the Hydrographic Department, JMSA, is carrying out marine pollution survey and monitoring of sea water, bottom sediment, oil, PCB, heavy metals and radioactive materials for their concentrations and interannual changes. In order to find diffusing conditions of pollutants, observation of deep sea current is also being conducted.

4.4.3 Tidal Observation

In order to monitor the sea level, the Hydrographic Department, JMSA, has been carrying out tidal observation at 28 tide stations widely distributed in Japan and the station at the Showa Base in the Antarctica, which contributes to GLOSS and WOCE.

4.4.4 Oceanographic Data and Information Services

The Japan Oceanographic Data Center (JODC) has been serving as the sole comprehensive oceanographic data bank in Japan, collecting, processing, managing and supplying various marine data and information. The JODC also acts internationally as an organization representing Japan in the International Oceanographic Data and Information Exchange (IODE) system and as the Responsible National Oceanographic Data Center (RNODC) for IOC/WESTPAC Programme, IGOSS, MARPOLMON, and ADCP. In recent years, JODC has also been contributed to the global climate programmes such as WOCE AND JGOFS.

4.5 JAPAN FISHERIES AGENCY (JFA)

4.5.1 Oceanic Research

1) Annual variation of surface layer temperature in the tropical seas (1987)

   The hydrographic observations have been made by the fisheries experiment and the fisheries training vessels of the local governments in the tropical area of the Pacific and Indian Ocean to establish the temperature observation network by means of fishing boats being in operation in these areas (partly in co-operation with TOGA).

2) Oceanographic structure and biological productivity in the North Pacific Ocean and the Kuroshio/Oyashio area (1990-1994).

   Physical, chemical and biological observations were made under the WOCE programme to elucidate the relationship between ocean and the lower trophic level biological productivity.

3) Circulation of the terrestrial and the ocean origin materials in the marginal seas (1992- 1996)

   Amounts of the production, consumption and spatial transportation of the materials are evaluated in the marginal seas and adjacent areas (JGOFS).

4) Exploration of Kuroshio and adjacent areas (1986-1996)

The co-operative study with China has been made since 1986. Relationship between the plankton production and spatial accumulation of pelagic fish eggs and larvae and the physical structure of ocean is studied.

4.5.2 Researches on Environmental Issues

1) Environment monitoring with fishing boat (1992-1996)

This project is to monitor the various elements of atmosphere, sea water, marine animals and floating particle on board the operating fishing boats in the Pacific, Atlantic and Indian Oceans.

2) Evaluation of pollutant influencing on the coastal creatures (1992-1996)

This project intends to explore the rapid detecting method for the chronic toxicity due to the harmful pollutants in marine fishes.

3) Ultraviolet effect on phytoplankton growth (1993-1995)

4) Preservation of coral reef ecosystems (1994-1996)

The coral reef ecosystem of the Ryukyu Islands and the monitoring methods are studied.

4.5.3 Living Resources Research

Numerous research projects on marine and fresh water living resources have been operated under the direction of Fisheries Agency. Representative ones are as follows:

1) Fish resources investigations in the northern North Pacific (partly 1995)

Ecological and biological investigations for salmonids, Alaskan pollack, squids, etc., are carries out.

2) Fish resources investigations in the far seas (partly 1953).

Ecological and biological investigations for the resources of demersal and pelagic fishes are made in the North Atlantic, tropical Pacific.

4.6 ENVIRONMENTAL AGENCY

4.6.1 Marine Pollution Survey and Monitoring

The Environmental Agency has conducted various surveys which are required in promoting environmental administration for protection and preservation of the marine environment. The Environmental Agency has carried out marine pollution monitoring of waters around Japan since 1975. Water temperature, salinity, concentration of nutrient salts, heavy metals, etc., in the sea water are monitored at the stations on the lines which cross the ocean currents around Japan and extend from the coast to the designated waste dumping areas in the open sea. Concentration of heavy metals in the bottom sediment and zoo plankton are also monitored. In order to grasp the environmental pollution situation by chemical substances,the Environmental Agency conducts every year the environmental monitoring of the water, bottom sediment, fish and shellfish in the coastal zones.

At local level, the prefectural governments monitor annually the water quality of public water areas, i.e., rivers, lakes, coastal waters, ports and harbors, etc., and the results of the monitoring are compiled by the Environmental Agency.

4.6.2 Researches for Marine Environmental Protection

Global Environmental Research Programme of the Environmental Agency has supported a research project on ocean environment and marine pollution since 1990. In FY 1994, this project was conducted with the participation of eleven national institutes and seven universities. The project consists of four sub-projects: (i) mass flux from the coastal waters to the shelf waters in the open ocean, (ii) evaluation of the material cycle, the biological uptake and the accumulation of pollutants in the marine ecosystems, (iii) studies on environmental changes based on the global mapping of satellite ocean colour data, and (iv) studies on the preservation of coral reef ecosystem.

4.7 MINISTRY OF TRANSPORT (MOT)

The Port and Harbor Research Institute (PHRI) analyses the Nationwide Ocean Wave information network for Ports and Harbors (NOWPHAS) observed wave data and publishes the result as an annual reports since 1970. PHRI also contributes to the exact offshore tsunami profiles of the 1993 Hokkaido-Southwest-Earthquake and 1994 Hokkaido-East-off-Earthquake for Tsunami disaster prevention.

4.8 MINISTRY OF POSTS AND TELECOMMUNICATION (MPT)

4.8.1 Ocean oil pollution detection by Airborne Imaging Radar

The Communications Research Laboratory (CRL) developed an 9.5 GHz Side-Looking Airborne Radar (SLAR) system for the surveillance of the oil pollution over the ocean in 1986. SLAR has a very high sensitivity in oil slick detection over the ocean. CRL also has been developing the 9.5 GHz airborne high resolution Synthetic Aperture pollution, and to observe current and so on.

4.8.2 The HF Doppler radar system for measurement of ocean current

CRL developed an High Frequency (2.5 MHz) Doppler radar system for continuous measurement of ocean current distributions and sea status over a wide range. In the actual observation, dual ocean radars are located at the seashore for the monitoring ocean current vector.

4.8.3 Airborne laser altimeter for sea ice measurement

CRL developed an airborne laser altimeter to measure the distribution and its height of sea ice in an accuracy of an order of cm. The experiments were made in February 1992 and 1993 for the sea ice of the Sea of Okhotsk.

4.9 MINISTRY OF CONSTRUCTION (MOC)

The MOC is conducting following researches through Geographical Survey Institute (GSI). The GSI developed a method for assessing socio-economic loss in an inundated area. Pilot study has been performed in the areas of Nagoya, Japan, and Bangkok, Thailand. To discriminate net sea level rise from crustal deformation, GSI connected some tide gauge stations to global datum using VLBI and GPS. To seek more efficient way, the GSI developed portable VLBI station in co-operation with Communications Research Laboratory, Ministry of Posts and Telecommunications. The GSI has conducted *"fundamental Survey of the Coastal Area"* since 1972. On the basis of the research, GSI compiled maps useful for counterplan against flood, conservation and LANDSAT TM images, GSI studied change in natural environment especially the damage of coral reefs by red soil.

The Coastal Movements Data Center (CMDC) was established in 1966 as an organization that uniformly compiles tidal data from tide gauge stations of Japan Meteorological Agency, Hydrographic Department, Geographical Survey Institute and others.

MOC is also conducting researches on Deformation of coral reef by the enhanced storm surge by sea level rise through Public Works Research Institute.

MALAYSIA

The economy of Malaysia has been experiencing high growth for the past few years. This growth has brought an increase in shipping activities, especially along the coastal water of Sarawak and Sabah, where the transport infrastructure of these two Malaysian states are not as efficient as that in Peninsular Malaysia. Increasing investment in oil exploration and exploitation activates in deeper Malaysian water by foreign oil companies are attracted by existing political stability of the country coupled with its favourable investment clirnate. The growing affluence of Malaysians has led to more leisure cruises as well as marine sports in our waters. Rapid development of residential estates and condominiums as well as infrastructures are also evident along the coastal zone.

The government has embarked on various projects, some in concert with consultants to develop geographic information system to monitor the changes of and the impact on the coastal environment in Malaysia as a result of the above mentioned activities and development. Data on land use is easily available to such GIS systems and such GIS demonstrations on local environment have always emphasized on monitoring of land use. However, in Malaysian context, there is a lack of data on marine parameters as input to such GIS.

Ad hoc marine datasets do exist in various agencies of local universities. These were mainly gathered through short cruises or field studies for research, consultancy studies or international co-operative programmes. In order to ensure a sustainable development of our resources in the Malaysian coastal zone, a proper monitoring system of the marine environment is required. The present ocean observing system is Malaysia is inadequate and further efforts are required towards achieving this goal.

THE MALAYSIAN OCEAN OBSERVING SYSTEM

1. Malaysian Meteorological Service

The Malaysian Meteorological Service (MMS) is the local database center for waves and marine meteorology. It acquires the data via its Voluntary Observing Ships (VOS) programmes and co-operation with the oil companies. Recently, there has been an increase in the request of this data from MMS for various purposes such as cable laying or pipe laying, enquiry on sinking of vessels in costal water of Sabah and Sarawak and consultancy.

MMS has set up Port Meteorological Offices at Port Klang (Peninsular Malaysia), Port Bintulu (Sarawak) and Port Kota Kinabalu (Sabah). At present, a total of 103 merchant vessels have been recruited to participate in the VOS programme. The main problem encountered is to encourage the ship officers to transmit their observations in real-time. MMS has close co-operation with the oil companies operating in the coastal water of Malaysia. Sarawak Shell Berhad (SSB) operates a network of ocean observing system in the coastal water of Sarawak and Sabah, and it sends its data to MMS via fax. Todate, this network of SSB represent the best ocean observing system in the country. The national oil companies which has a number of Peninsular Malaysia platforms in the coastal water of east coast of Peninsular Malaysia did not have similar network. Nevertheless, MMS managed to get the co-operation of their staff at two of these platforms to make observations and transmit the data in real-time.

To enlarge the data source, MMS sets up a meteorological station at an atoll in the South China Sea. Staff of a lighthouse located in the Straits of Malacca is also recruited to make observation of wind and sea state and the observations are transmitted by radio to MMS.

WMO recently proposed the setting up of a SEACAMP (South East Asia Center for Atmospheric and Marine Prediction). Comments have been received by WMO from the ASEAN countries, and WMO will call a meeting of the members of ASEAN to discuss the subject. There will he further discussion among members of ASEAN before the project receives its blessing.

2. The Malaysian Mapping and Survey Department (MMSD)

MMSD has completed the installation of a network of tidal stations along the coast from Peninsular Malaysia to Sabbah. It will proceed to link up this stations soon. The tidal data has been submitted by MMSD regularly to IGOSS Sea Level Pilot Project (ISLPP) Center at Hawaii.

3. The Hydrography Department of the Royal Malaysian Navy

This Department has been responsible for the implementation of the ASEAN-Australian Regional Ocean Dynamics in the Malaysian water. The acquired tidal data from the various tide gauges as well as the data on current profiles acquired from an ADCP in the Straits of Malacca are now archived in Australia.

It is also the national ocean data center and has acquired the Royal Australian Navy's Hydrocomp System. The Department has recently carried out a few cruises in the northern Straits of Malacca to acquire CTD data during different wind regimes.

4. Fishery Department

The Fishery Department has recently started deployment of drift buoys to acquire SST in the coastal water of east coast of Peninsular Malaysia. Such data will be used to validate the SST profiles derived from its own NOAA system.

The department has been monitoring the bloom of toxic dinoflagellate in the coastal water of Sabah for some years. This effort was taken because of the frequent occurrences of red tide.

MALTA

INTRODUCTION

In a coastal state like Malta which lacks in material land resources, the enhanced utilisation of the sea as an alternative to the already established land based activities certainly represents an asset for the future economic strength of the country.

In order to seccessfully achieve such a goal some key elements have to be considered. These can be essentially grouped into two fronts:

(i) to co-ordinate the very often conflicting sea-related activities according to a scheme of integrated marine resource management, and

(ii) to ensure the updated and timely application of Science and Technology to the marine industry in order to keep it abreast with recent developments, open to innovation, competitive and aimed to enhance and diversify the process of economic growth.

The application of Science and Technology to the marine sphere has been in fact indicated as a top priority issue in the Science and Technology document recently approved by the Maltese Government. The impact of new technologies in the marine field has widened the range of applications. The new functions that are performed at sea today are numerous and varied; this has led not only to the need of an improved suite of sea services, but also to new trends in the tapping of ocean resources together with correlated new technical requirements.

However, with the exception of aquaculture and sea transportation and communication, marine industrial development in our country still needs to reach optimal levels or in some cases effectively kick off. Participation in international programmes such as GOOS are looked upon as a source for the importation and moulding of new technologies to suit local applications.

Moreover, in an insular system of limited dimensions such as the Maltese archipelago, one must also more rigorously ensure that the choice of technological systems meets certain standards of environmental protection. Mis-management of sea resources, especially in such vulnerable cases as that of small islands, can in fact easily lead to irreversible environmental degradation and to a general deterioration of the coastal zone with enormous adverse social effects.

Such concerns cannot be tackled withourt a well-establishe collection of the baseline data on the marine environment. Sound resource management needs to be based on a firm basis of scientific data and information. Unfortunately such a database for the coastal seas of the Maltese Islands is still far from completion. The challenge ahead our country in this field is that of establishing adequate marine scientific research facilities in order to accomplish this task as well as provide the means for monitoring capabilities such as in the areas of marine pollution, loss of biodiversity, degradation of ecosystems, beach erosion and the impact of global climate change and sea level rise.

This underlines the efforts which are currently being exercised in our country with an aim of establishing the sound infrastructural bases that lead to the prognosticated developments in marine affairs and to an enhanced provision of oceanographically related services. To complement these initiatives the capacity building of institutions active in the Marine Sciences needs to be pursued through well-identified goals in the area of human resource training.

MARINE RESEARCH ACTIVITIES IN MALTA

Research activities in the marine sciences in Malta are currently conducted by separate organisations.

There is no Marine Research Centre yet on the island although arrangements are being made and funds are being sought in order to possibly build one in the near future. There is also no National Research Fund which can adequately distribute financial support for comprehensive studies.

The agency names, fields of research and type of activity are given in Table 1.

Location

The choice of the site adequate for the building of the National Marine Sciences Station was made according to certain basic criteria:

- A continuous sea-water supply is required and it is essential to locate the station in a sea area which ensures sufficient flushing and good water quality.
- The station must be built on low-lying land in order to reduce pumping costs and in an area with close access to the sea especially for the easier handling of heavy gear and quick transfer of samples to the laboratories.
- The station must be sufficient distant from industrial, urban and touristic areas while at the same time it is close enough to the main scientific centres on the island.

A team of experts from the University of Malta have identified the rocky area close to the Madliena Tower, in a coastal strip to the West of the Grand Harbour as being an ideal site for the Station.

In the preliminary building plans which are currently being finalised, it is estimated that a two-storey construction on a land area of 1000 square metres (excluding parking place and link road facilities) will be required.

THE NATIONAL MARINE SCIENCES STATION

- ***A brief historical note***

This project is being undertaken in the light of an Advisory Mission Report submitted to the

Government of Malta in 1986 by the Intergovernmental Oceanographic Commission (IOC), and following preliminary discussions with the Ministries responsible for Transport, Communications and Technology and for the Environment. This project has been indicated amongst the top priority actions requested in the Science and Technology Policy document issued by Government. This project is also being proposed on the bases of past experience gained from the Fort San Ludjan Marine Station of the then Royal University of Malta, which was operative in the 70's.

- ***The aims of such a Station***

The National Marine Sciences Station is certainly a national need in tems of the scientific basis, structure and capability essential for the sound exploitation of the various marine resources. Such an institution is a precondition for the integrated management of the coastal zone and of the marine space under national jurisdiction. It will put science and technology at the service of marine policy formulation, and provide the necessary tools for drawing guidelines and quantified assessments related to new developments in both coastal and offshore areas as well as to the environmental monitoring of already existing activities.

The Station will also enable the University of Malta to expand its range of activities in the marine sciences by providing the laboratory space, equipment and fieldwork capabilities that are necessary to promote the on-going programmes as well as facilitate research in areas that are truly yet to be initiated.

The Station will provide a venue for training courses, seminars and conferences related to the sea and will enable foreign experts to be hosted by the Station on an exchange bases and allow our scientists to work and interact with the highest levels of knowledge and technology.

On a Mediterranean scale, the National Marine Sciences Station aims to become a depository of oceanographic documents and data and to eventually grow into a centre of information and exchange for the Mediterranean countries.

THE MEDNET PROJECT

Through an EU-funded AVICENNE Project entitled Data Processing for a Mediterranean Automated Environment Monitoring Network (MEDNET), the Malta Council for Science and Technology and the Euro-Med Centre on Insular Coastal Dynamics are also developing together with French (IFREMER, MORS, ENVIRONMENT) and Cypriot (Department of Fisheries) partners, the essential components for a network that can serve as a tool for both data and information networks in the Mediterranean.

The project is an offspring of a mother project in France, called RAVEL, in which a series of monitoring stations will be deployed along the French coastal area with an aim of establishing a network for the measurement and real-time transmission of physico-chemical parameters including temperature, salinity, dissolved oxygen and pH which are measured with currently available sensors. Other parameters indicative of the general water quality, such as turbidity, chlorophyll and pheopigments, ammocia, nitrates, nitrites, phosphates, and even sulphides, which can be toxic for maine life, will be slso taken into consideration even through in situ measuring equipment are not all currently available. These parameters will be the subject of special research, such as the miniaturisation of laboratory apparatus, eventually to be integrated into the stations. Continuous measurement of turbidity (by nephelometry) and chlorophyll (by flourimetry) is currently possible Frequent measurement of nitrate balance is also available.

The full range of parameters measured by the stations will ensure the detection in real time of any abnormal variations in the conditions of the marine habitat and thus presents an ideal system in cases such as for the protection of livestock rearing (aqua culture), in the monitoring of "water quality" (pollution), the risk in the appearance of toxic algae, or other cases where the determination of critical thresholds are essential.

A prototype solar-powered buoy has already been constructed and successfully deployed in 1994. The buoy samples water from various selected depths by means of a pumping system and uses state-of-the-art electronic systems and sensors for on-board direct measurement. Such a system allows certain sensors which are sensitive to fouling to be hosted in the buoy itself in order to avoird direct continuous contact with

the marine environment; moreover sensors are distributed in modular compartments and can be conveniently recalibrated and/or replaced regularly withourt the need of retrieving the buoy on land or stopping data registration.

The present MEDNET project aims to adapt the MAREL network for the Mediterranean and to develop some of its key components. The planned configuration of the networks as shown in schematic form in the accompanying diagram, is expected to make full use of existing structures and mechanism for oceanographic data management and exchange and will support the NODCs (here referred to as National Co-ordinating Centre) of the IODE system.

On a national scale the system consists of a network of Local Controls Stations (LCC) each of which responds to the National Co-ordinating Centre. Each Local Control Centre will maintain a continuous remote control on the monitoring stations for which it is responsible and from which it acquires data.

Utilising a PC486-based system with Windows NT as a multitasking operating system an SQL server as database system, and a user-friendly graphical interface enabling menu-driven instruction, the LCC will maintain connection between the various components of the system. Data management at an LCC will comprise data prevalidation and visualisation, precise recording of metadata and eventual archival in a local database system.

The setup of the Mediterranean Network also avoids the need of a large central processing Centre. Besides the unnecessary huge investment requires for such a Centre, the heavy demand for the services which it will have to supply and the eventual extensive use of international telecommunication links which it would require, one must also consider problems related to restrictions on the international distribution of sensitive data and information; constraints may also be imposed by political issues as well as by physical factors such as the different telecommunication services that are available from the Mediterranean countries.

On the other hand, a central co-ordinating point must be available to end-users that require information beyond their national limits. This role will be fulfilled by the Mediterranean Control Centre (MCC) which will not archive actual data but instead keeps an updated directory on the current data holdings in the various LCSs connected on the network. The MCC will also provide a directory service listing all the institutions that are ready to process end-user data.

End-user requests may in fact require high-level processing and the MCC will be able to offer an end-user access to competent Mediterranean agencies that can offer such services. Besides establishing a mechanism of interchange between end-users and LCSs, the MCC will also present the end-user with a coherent interface that allows functions including browsing and basic on-line processing tools.

MEDNET is not presented here as a project per se but mainly as a tool and a platform that can be utilised for all types of oceanographic data/information and including historical data.

WAVE MONITORING PROJECT

- ***Historical and Organisation of Wave Monitoring***

  The inception of the Malta Freeport in Marsaxlokk Harbour required the determination of vessel downtime for marketing purposes and marine operations inside the harbour. A computer model was thus developed to analyse the wave climate. On the basis of this model and records of vessel observations on the wave climate around Malta a prediction was made on the downtime along the berths. To refine the predictions and determine the actual wave parameters required in particular for the design of Terminal 2, a wave monitoring programme was considered necessary.

  The Malta Freeport decided to contract the wave monitoring programme to the Coastal Management Company Ltd. (CMC) which is operating the equipment and interpreting the data on a regular basis. The equipment was installed and commissioned in Summer 1992.

- ***Wave Monitoring Devices***

  The programme consists of observations of the waves by electronic equipment at four locations. Each of the four instruments is equipped with sensors to determine the relevant wave characteristics on an hourly basis, 7 days a week. Due to the irregular nature of the wave pattern, the sensors are detecting the fluctuations of the water surface for a period of approximately 20 minutes. So each hourly observation is basedon the actual behaviour of the water surface during this preceeding period.

  Two of the four instruments are of the so called buoy-type which are selected to determine the wave characteristics in the open sea. The buoys with a diameter of about 0.8 m float on the water surface anchored by a line to the bottom. The sensors follow all accelerations of the buoys and thus allow for determining relevant wave parameters, such as:

  - significant and maximum wave height
  - significant and maximum wave period
  - average wave direction
  - statistical wave pattern information

  The other two measuring devices are pressure gauges suitable for measurements in confined waters. These sensors determine the elevation of the surface from the water fluctuations incurred. The wave parameters recorded by the sensors are identical to those collected by the buoys except for the wave direction.

- ***Consequential benefits***

  During the initial stage, the data collection and thus the location of the equipment will be focussed on the urgent requirements of the Malta Freeport. Later on, part of the equipment could become available for detailed investigations at other locations around Malta.

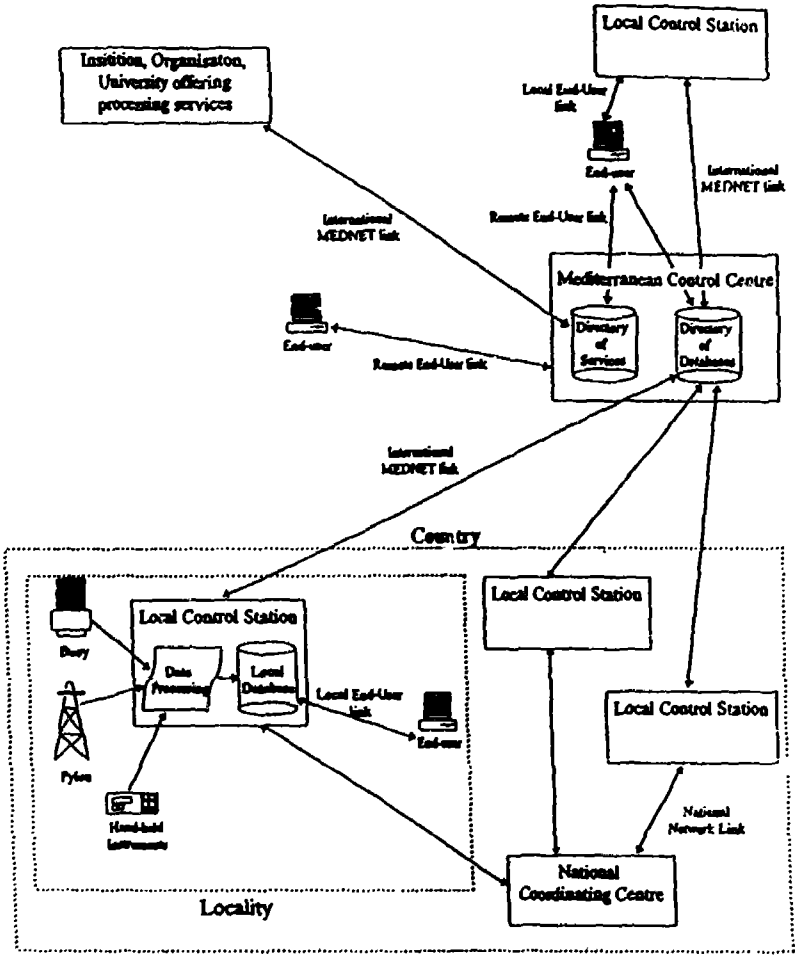
  Throughout, one of the offshore buoys will remain in place at a location some 10 km east of Delimara Pt (Eastern tip of Malta). This station will act as a "reference" station for any investigation in the near shore zone off the Maltese Islands.

  During the first stage of observations the wave monitoring system will be limited to collection and analysis of observed data. Based on the correlations established from the observations, the next phase of the wave monitoring programme will include wave climate predictions.

TABLE 1

Agencies	Research Fields	Special Studies
Department of Biology University of Malta	Coastal ecology	■ Ecology of shallow water benthos with collection of data on: - species, abudance - habitats - water quality, sediments
	Aquaculture	■ Production of live foods for marine fish larvae ■ Fish nutrition ■ Technology related to rearing of new species ■ Submersible/semi-submersible cages for offshore farming
	Marine ecotoxicology	■ Monitoring of environmental levels of marine pollutants ■ Lethal toxicity levels for a range of pollutants on a range of organisms
	Marine botany	■ Distribution and phenomenology of sea-grass meadows ■ Faunistics and biogeography of the Central Mediterranean
Hydrographic Office, Malta Maritime Authority		
	Hydrography	■ Coastal Bathymetry ■ Water level recording
Marine Resources Network, Malta Council for Science and Technology	Meteorology/ Physical Oceanography	■ Seiches and shelf resonances ■ Phenomelology of T, S and currents in coastal waters ■ Hydrodynamical modelling
Euromed Centre on Insular Coastal Dynamics (F.I.S.)	Coastal geomorphology	■ Beach profiling ■ Granulometry
Department of Geography, University of Malta	Land use studies	■ Rock type ■ Erosion
Remote sensing Station	Image processing	■ Aerial photo-interpretation
Malta Freeport Company Limited	Wave climate	■ Wave climate studies

Schematic diagram of the MEDNET Configuration



MAURITIUS

Mauritius is an insular country and many its socio-economic activities are strongly influenced by the Ocean. Consequently, the development of the Global Ocean Observing System (GOOS) is being followed with great interest.

Mauritius is already contributing to the different components, albeit to a varying degree, to the GOOS. It is intended to enhance its participation in these areas and take initiatives in other programs of the system in the future.

Global Sea-Level Observing System (GLOSS)

Mauritius has established two sea-level stations at Port Louis (Mauritius) and Port Mathurin (Rodrigues) in 1986. These stations were upgraded in 1991 and sea-level data is now being transmitted in real time via Meteosat to the TOGA sea-level centre in Hawaii. Hourly values are compiled from the continuous sea-level records and forwarded to the University of Hawaii for archiving. Mean monthly values are sent regularly to the Permanent Services for Mean Sea-Level (PSMSL) in Biston, U.K.

A cell for monitoring and analysis of sea-level (CMAS) has been set up within the framework of the IOC-UNEP-WMO Global Long-Term Monitoring System for Coastal and Near-Shore Phenomenon related to Climate Change in order to secure high level sea-level data. Many studies have been conducted to understand the variability seen in the data. More sophisticated analysis will be conducted in the future using a commonly agreed approach among the CMAS's of the Indian Ocean region to identify trends in the context of Global warming and sea-level rise in order to formulate authoritative statement on these issues for the benefit of policy-makers.

Climate Monitoring, Assessment and Prediction

Mauritius maintains first class meteorological stations manned by meteorological personnel at St. Brandon (16°S 59°E) and Agalega (10°S 57°E) atolls to monitor the climate of the marine environment. Two meteorological stations of international standard are also located very near the coast in Mauritius and Rodrigues (19°S 63°E) providing hourly meteorological data of high quality for climate assessment.

Seasonal outlook of the cyclone season is prepared and published regularly in November since 1989. It is distributed to all socio-economic sectors affected by climate.

However, ocean data such as sea-subsurface temperature which are essential input in the forecast model is clearly lacking in the region. Much hope is placed in the development of GOOS in the region to provide such data for the model.

Procedures for the purchase of a wave rider buoy for Datawell b.v. of the Netherlands have been completed.

Monitoring and Assessment of Marine Living Resources

Mauritius is a member of the IOCINCWIO Group of Experts of the Ocean Services for living resources and participated in the GE First Meeting (Mombasa, July 1994). It will participate activeiy on this topic in the region.

Monitoring of the Coastal Zone Environment and its Change

A pilot project on vulnerability of the coastal zone to sea-level rise sponsored by UNEP is being implemented with the participation of all relevant ministries institutions/Organizations. Monitoring of the shoreline has already been conducted at a site in the southern part of Mauritius.

Mauritius is participating in the U.S. Country Study to address climate change in the various sectors on Vulnerability and Adaptation assessment including coastal resources. A work plan providing details about the activities in this area has been submitted in April 1995 to the U.S. country management team. These activities include aerial video mapping of the coastline changes, survey of the shoreline at specific sites, estimation of coastal erosion using the Bruun rule. This project is expected to be completed in September 1996.

Mauritius is already actively involved in the IOC/IOCINCWIO coastal erosion and sea-level programme. Mauritius is planning to take an active part in LOICZ activities in this region.

Assessment and Prediction of the Health of the Ocean

The Ministry of Fisheries and Marine Resources carries out regularly analysis of water quality in the coastal region around Mauritius. It is also taking part in the IOC Algal Bloom programme.

Marine Meteorological and Oceanographic Services

Mauritius is a preparation member for the provision of weather forecast and meteorological warnings for area bounded by latitude Eq-30°S and longitude 55°E-95°E within the framework of the Global Maritime Distress and Safety System (GMDSS).

Mauritius has been designated as responsible member for the new WMP Marine pollution Emergency Response Support System for the above area to provide at short notice specific meteorological/oceanographic information in case of marine pollution accident.

Tidal prediction, an output derived from the software package of the TOGA sea-level centre is distributed widely for navigation and other coastal activities purposes.

The NETHERLANDS

The Netherlands support the GOOS initiative and the activities of I-GOOS and J-GOOS in this matter. The Dutch interests concentrate on the climate module, the coastal zone and capacity building activities. As a low lying country, the Netherlands have an extensive and well-known expertise in the field of coastal protection and coastal zone management, as well as in the underlying basic marine science issues.

On a national level, a co-ordinating committee for GOOS has been set up. The membership is a mix of scientific institutes, governmental organizations and industry. Such a mix is highly successful within the EUREKA Programme Euromar. In developing GOOS, contributions from these three sectors are foreseen. The National Committee is chaired by the National Institute of Coastal and Marine Management (RIKZ) of the Ministry of Traffic, Transport and Public Works.

The Netherlands welcomes a multinational and regional approach in GOOS. Last December the RIKZ and the Netherlands Geosciences Foundation (GOA) of the Netherlands Organization for Scientific Research (NWO) became members of the European Association for GOOS (EuroGOOS). Dutch experts also initiated an inventory of the existing monitoring networks which operate in the North Sea in order to optimize the use of the present networks. The activities of a group of international experts in this matter were concluded in April 1995. A report is available on request.

The Netherlands experts are playing an active role in a a number of Eureka/Euromar projects such as the Seawatch Europe monitoring and forecasting system. Through the OECD a benefit-cost analysis of the Seawatch Europe system is underway. A first draft of the analysis was discussed at the April Seawatch Europe Advisory Board meeting in The Hague. Observers from EuroGOOS, EU/MAST, GOOS and the OECD participated in this meeting. As in any benefit-coast analysis of megascience projects such as GOOS, there are some methodological constraints in the application of a benefit-cost analysis. However, the benefit-cost ratio of some (commercial) aspects of the Seawatch system are very favourable. The final report to the OECD will be ready in July and will then become available through the OECD.

Ocean-going research activities in the Netherlands relevant to GOOS are the Dutch participation in WOCE and JGOFS. A medium-term plan of the marine activities in the Netherlands is under development. GOOS and research of the coastal zone, continental shelf and the northern Atlantic Ocean are priorities.

The Netherlands made a financial contribution to the IOC Trust Fund for GOOS. The contribution should be used for capacity building activities within GOOS.

NORWAY

Norway has participated in the planning phase of GOOS. On the first meeting of IOC Committee for GOOS (I-GOOS-I) in February 1993, Norway presented possible Norwegian input to GOOS. The following elements may be part of this:

1. Ocean Monitoring and Forecasting Service (HOV)

In 1991 the Ocean Monitoring and Forecasting Service (HOV) was established as a four-year development project. HOV could be regarded as a national equivalent to GOOS. HOV developed largely as an operational service covering a wide range of oceanographic products; waves, surges, arctic sea-ice, transport of nutrients, pollution and algae. End uses were found both within the industry and different governmental bodies. Unfortunately, this development project ended in the end of 1994 due to lack of funding. At present, the possibilities for reestablishing HOV as a co-operation between the Institute of Marine Research, the Norwegian Meteorolgocial Service and the State Pollution Authorities are being investigated. The intention is to shape this new HOV in such a way that it serves as a GOOS instrument at national level,

2. National Marine Environmental Monitoring System

The national monitoring system consists of the following components:

(i) Coastal monitoring of near-shore ocean climate, eutrcphication and algal blooms.

(ii) Pollution monitoring with the main emphasis on organic contaminants, trace metals and radioactivity.

(iii) Monitoring offshore ocean climate and biological production.

3. Annual Environmental Assessment Report

Based on the monitoring system an annual environmental quality status report is published. The elements included are: ocean climate, biological production, pollution situation, special events such as harmful algal blooms and ocean climate forecast with possible biological implications. The forecasts are based on statistical/empirical methods.

4. On-going and planned relevant research activities

Several research programmes are believed to be relevant to GOOS, especially those carried out in the Nordic Sea and the Barents Sea.

It is a general interest in Norway to participate in the further development of the GOOS concept. The scientists and the National Research Council have proposed to establish a National GOOS Committee and to support IOC-GOOS Trust Fund. However, no final decision on these matters have been taken from the governmental side.

POLAND

The Polish governmental and academic institutions carry out research within the following international projects:

(i) **Greenland Sea Project**: repeated hydrographic sections in Norwegian-Barents Sea Confluence Zone, in Greenland and Norwegian Sea, with special attention to the Arctic Front.

(ii) **Monitoring of the Baltic Sea as contribution to the Helsinki Convention.** The Project for the Polish Coastal Zone Monitoring (1995-2010) has been worked out and will be implemented.

(iii) **BALTEX, which is the part of the Joint Global Ocean Flux Study (JGOFS)**: research on energy and matter fluxes between atmosphere and the ocean, aerosols generation and intensity in particular.

Besides, the following researches are maintained in the Baltic Sea:

(a) Regular cruises recording physical, chemical and biological parameters for long-term monitoring of changes;
(b) Sea-level observations at the Polish coast;
(c) Meteorological observations along the coast and at sea.

Polish scientists participated in the planning for the Baltic Sea Ecosystem Research Projects: (a) initiated by the European Union (Mast III) and (b) the World Bank within the USA proposed Large Ecosystem Concept.

We hope to participate in the implementation of both projects.

Lot of attention is paid to modelling: models of the Baltic Sea and other regions are being worked out.

Research on: climate ant its long-term changes, climate prediction, protection of the polish-shoreline, impact of global climate changes on regional and coastal ecosystems is carried out or planned.

The organizational problems are not solved yet. The Institute of Oceanology PAS has signed the EUROGOOS Memorandum of Understanding and actively participates in its work. We are still in the process of identification of institutions which can contribute to GOOS and possible sources of financial support. The organizational structures will be farther discussed in June. We expect to establish the Polish Committee on GOOS by the end of this year.

RUSSIAN FEDERATION

Russia supports the overall concept of GOOS because implementation of this major oceanographic programme will eventually lead to improving the efficiency of all marine and ocean related activities, it will create a strong basis for the concept of sustainable development, and will help in improving marine ecological situation.

General description of Russian Federation national contribution to GOOS was given in a report presented at the First Planning Session of I-GOOS (Melbourne, Australia, April 18-21, 1994). Participation in GOOS related activities is given high priority in the country and all possible support for its extension is offered.

National GOOS-related activities are co-ordinated by the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), which is a national agency responsible for provision of services based on observational environmental information. In the national I-GOOS 1994 report, it was stated that a National Committee for GOOS would be established under the auspices of the

Roshydromet. The committee has not been established yet, and its future status and rank is being considered now. It will depend on how GOOS will develop and strengthen itself as well as on what decisions regarding GOOS will be adopted by relevant UN and other international agencies and organizations.

It is likely that there are some perspectives of GOOS acceleration and development, which hopefully will foster participation in it of more countries. Slightly simplifying the matter it is possible to say that all they are related to better understanding of (i) what data and how they will be made available for international use by countries participating in GOOS; and (ii) what of oceanographic data products, and in which form/way they will be available for a country participating in GOOS.

In this context it is relevant to note that development of GOOS data policy and management should be considered as the highest priority. Global oceanographic data coverage actually means that GOOS data will be collected to certain extent from exclusive economic zones (EEZ) of riparian countries. Therefore the interest of a country to take part in GOOS will mostly depend on practical benefits, which will follow from the open and, probably, free release of oceanographic data in its EEZ to the international community. Coastal zone of a country may be not long. In such case its economy and ecology does not strongly depend on processes and changes happening far from its coasts. It means that the country will not be concerned much with global oceanographic data coverage. At the same time, the global coverage is essential for climate studies, assessment of global change consequences, and for some special research studies.

Subsequently, it is desirable to consider some new dimensions in GOOS development in order to make it more attractive for nations. Besides global data coverage, which is crucial for variety of ocean components of climate studies, higher priority should be given to GOOS capability to deliver data products for any part of the ocean irrespectively of its geographical location. In addition to organization and strengthening powerful and dedicated real time oceanographic data processing centres, developing countries must have opportunities to develop their own capabilities of data acquisition and processing. Hence, countries' capacity building should be one of highest priority GOOS objectives.

GOOS concept envisages that GOOS data and data products are available for all nations. However, it is known that meteorological data and services commercialization issues are being actively discussed at WMO. Oceanographic analyses and predictions strongly depend on meteorological information. In this regard, Russia finds it desirable to consider how GOOS should be developed under the conditions of meteorological data commercialization.

Operational GOOS being a system of oceanographic data collection, processing and distribution, is to be to a great extent similar to World Weather Watch Programme of the WMO. WWW implementation became reality because of two major reasons. Firstly, all the three WWW sub-systems were scientifically and technologically designed and put into operation. Secondly, governments had taken necessary responsibilities for the systems implementation, operation, support, and development. The scale and cost of such undertaking can hardly be over-estimated. Some documents on GOOS envisage start of the GOOS pilot phase in 1997 and full operational GOOS launch in 2007. Taking into account overall complexity of the documentation, which is to cover all regulatory and technological aspects of the system operation, noting probable consequences of meteorological information commercialization, understanding that countries wish to have their own benefits from GOOS activities in their EEZs, its preparation should also be of highest priority, and should start on a possibly wider scale as urgently as possible.

Realizing diversified objectives of the five GOOS modules Russia envisages wider participation of various national agencies and organizations in the national GOOS programme. For example, activities connected to the Living Marine Resources Module or Health of the Ocean Module most probably will be conducted by organizations of the Russian Federation Committee for Fisheries, which has, like the Roshydromet and the Russian Academy of Sciences have, its own research fleet. There are some perspectives that interested organizations of the State Committees for Geology and Water Resources Management and, possibly of other agencies, will also be among Russian GOOS participants.

SPAIN

GOOS-related activities in Spain are of a purely scientific nature and concern to participation in international research programmes such as WOCE and JGOFS. Spain is already involved in a number of ocean observing activities which could be brought into GOOS as it becomes appropriate.

A questionnaire to identify the types of data required operationally by different industries, in order to do a cost-benefit analysis, is being prepared and will be circulated in the near future.

Spain is a Member of EuroGOOS, and the Memorandum of Understanding was signed by the Interdepartmental Commission for Research and Technology (CICYT). The Spanish Institute of Oceanography (IEO) is, by delegation, acting as national representative to EuroGOOS.

UNITED KINGDOM

INTRODUCTION

UK presented reports on national policy and progress in relation to GOOS at the I-GOOS meeting in February 1993, and the I-GOOS Planning meeting in Melbourne in April 1994. UK continues to participate fully in the global marine science programmes (WOCE, JGOFS, LOICZ) and in IOC programmes and committees (GLOSS, DBCP, IGOSS, IODE, GEBCO and TEMA) which are related to GOOS.

ADMINISTRATIVE DEVELOPMENTS

During the last 12 months the Inter Agency Committee for Marine Science and Technology (IACMST) appointed three working groups to analyze aspects of UK participation in GOOS and Euro-GOOS, the development of operational oceanography generally in UK sea areas of interest, and the national management of marine data. IACMST includes the following national agencies: Fisheries (2 agencies), Transport, Environment, Trade and Industry, Natural Environment Research Council, Naval Oceanographic Research, Meteorological Office, and Overseas Development Agency. The IACMST has close links with other agencies, such as the Office for Science and Technology, British National Space Centre, National Rivers Authority, and nature conservation agencies. The working groups have just reported to IACMST after making extensive analysis of the existing UK activities in operational oceanography, national marine data requirements, the economic and social benefits of GOOS, and the best mechanisms for achieving the goals identified by UK agencies and industries.

IACMST is now combining the recommendations of the three groups to produce a policy and mechanism for furthering the development of operational oceanography in UK, and formalizing inter-agency participation in GOOS. This process will be concluded during summer 1995.

RESEARCH, OPERATIONS AND PLANNING

A UK delegate participated in the I-GOOS Strategic Sub-Committee, involving considerable preparatory correspondence and drafting. A representative from UK also attend the J-GOOS meeting as a member of the IOC delegation. UK continues to provide the Chairman for GLOSS, which is a component of GOOS. UK experts have worked on the analysis of the economic case for GOOS, preparing studies for OECD, and contributing a major section to the OECD publication "*Megascience Forum: Oceanography*", published in August 1994. Within the UK market IACMST conducted workshops on the potential user needs for operational data produced by GOOS, and in particular produced reports on "*Soft coastal engineering*", "*Ship routing and long distance towing*", and "*Marine water quality management*". In each case the reports show the data types required by industries and regulators, the time and space scales required, and timeliness of delivery, as well as the economic and social benefits anticipated. The benefits are then compared with probable costs, though not yet with full cost-benefit analysis at net present value. Although these studies are preliminary, they illustrate

clearly that there are very practical benefits from GOOS data products, and that the practical communities who work at sea are ready to use these products. Some of the results of these investigations are described in the paper on GOOS presented at the 2nd IOC International Conference on Oceanography at Lisbon in November 1994.

An essential contribution to the development of GOOS is the completion of the final stages of WOCE. UK hosts the International Project Office for WOCE, and this provides an opportunity to discuss the question of how to ensure a smooth transfer of the knowledge and expertise gained from WOCE to the operational community of GOOS. Parts of this transition may be facilitated by the intermediate developments of CLIVAR.

UK WOCE has included surveys of the Drake Passage, the Bellingshausen Sea, WOCE Hydrographic Programme Line A11, the Antarctic Deep Ocean Experiment (ADOX) and the Southwest Indian Ocean Experiment (SWINDEX). During 1995 moorings have been deployed across the Agulhas Current as a contribution to the WOCE Hydrographic Programme in the Indian Ocean, and these moorings will be recovered in early 1996. In May 1995 the WHP Line A23 from the Weddell Sea northwards to Rio de Janeiro was completed. UK scientists have participated with scientists from other countries in comparing repeated sections across the North Atlantic which show both warming and cooling events on decadal timescales, and at different depths in different regions.

UK institutions continue to work on advanced ocean modelling and coupled ocean-atmosphere modelling on a range of time and space scales. Development of adequate models is essential for the global programme of GOOS itself, and in order to produce high resolution operational products in coastal shelf seas and on the coast. The Proudman Oceanographic Laboratory is developing very high resolution models of shelf seas, while the James Rennell Centre for Ocean Circulation has developed the eddy resolving Atlantic Isopycnic Model (AIM). More recently work has progressed on the Ocean Circulation and Climate Advance Model (OCCAM) and the Global Isopycnic Model (GIM). The Meteorological Office has run the Forecasting Ocean Atmosphere Model (FOAM) in a prototype form that produces analyses of the ocean, assimilating observations received in real time on the GTS of WMO. The Met. Office has continued to develop its regional and global coupled models. Accuracy of its operational wave forecasts has been improved by changes to the wave and atmosphere models. Plans have been made to run a model of currents on shelf seas (developed by POL) to assess its usefulness for forecasting on the European Shelf. Operationally the storm and tide warning service, using the surge model, has continued to provide accurate and timely warnings.

The review of national marine data management has underlined the key role of the British Oceanographic Data Centre (BODC), which contributes to the IODE system of IOC. BODC has been playing an active role on the European scale, supporting data management in the DG-XII Marine Science and Technology (MAST) programme, and in discussions on the development of GOOS at the European scale.

Technological developments in UK oceanography relevant to GOOS include continued development of the Autosub Autonomous Underwater Vehicle (AUV) by NERC. A demonstration vehicle is due for trials in early 1997, after which further decisions will be taken in view of scientific and operational demand for AUVs.

UK government agencies with responsibility for marine services and regulation have demonstrated their commitment to the concept of operational oceanography by becoming Members of the European Association for GOOS (Euro-GOOS). The Meteorological Office, Natural Environment Research Council (NERC) and National Rivers Authority, have joined Euro-GOOS. Reports from Euro-GOOS meetings are fed back through the IACMST mechanism both to help form UK policy on GOOS, and to ensure dissemination of information to all interested agencies and laboratories. Information of GOOS and Euro-GOOS is also transmitted to a range of commercial companies and societies concerned with the promotion of marine science and technology.

UK experts have participated in Workshops organized by the European Space Agency (ESA) to identify the requirements for operational marine and coastal data from remote observing satellites in coming years. This analysis has been linked closely to the requirements of Euro-GOOS.

UK agencies will continue to play an active role in identifying the steps for development and improvement of operational oceanographic services through GOOS and Euro-GOOS. UK identifies benefits

from GOOS at all scales from global, through ocean basin scales, to coastal shelf seas, and local coasts and estuaries. UK agencies and companies have interests world-wide, and wish to co-operate with agencies and companies in other countries, and especially to assist in promoting marine technology capacity in developing countries. At present all the analyses of economic and social benefits of GOOS have been carried out by experts in developed countries and applied to industries and regulatory authorities in developed countries. These analyses suggest that there are good economic and social grounds for persevering with the development and implementation of GOOS. Nevertheless, it is obvious that the way in which GOOS brings benefits to a community will differ significantly from country to country, from one environmental region to another, and between different stages of technical development. UK therefore proposes that further economic studies of the actual way in which GOOS would produce benefits should be carried out in a statistically valid sample of different maritime countries with different environmental, economic, and technological profiles. Such surveys should be carried out within the framework of IOC, at the request of Member States Governments, and in collaboration with other agencies, or by a contractor or consultant.

UK has been active in promoting the concept of GOOS through conferences, papers presented, and articles in the trade and technical press. Brochures and internal reports on aspects of GOOS have been exchanged with experts in other countries, and made available to the IOC GOOS Support Office.

UNITED STATES OF AMERICA

The vision of a Global Ocean Observing System is taking shape as a result of the dedication and perseverance of oceanographers and marine scientists throughout the world. In 1994 the U.S. Achieved modest progress in its efforts to implement national contributions to GOOS. Accomplishments include tentative support for post-TOGA observations for ENSO forecasting, the initiation by the U.S. of an international coral reef initiative, and substantive plans for U.S. Coastal GOOS. The National Research Council of the National Academy of Sciences reviewed the status of U.S. GOOS, strongly supporting the concept and urging vigorous U.S. leadership. A US GOOS Interagency Project Office was also established to staff the effort of the U.S. Interagency Working Group for GOOS.

Current priorities for U.S. GOOS are:

1) Pacific Ocean observations required for operational ENSO forecasts;
2) Coastal U.S. observations required for forecasts of red tides and other toxic algal blooms;
3) Global sea level observations required for prediction of U.S. Coastal effects;
4) Coastal U.S. observations required for critical marine forecasts and warnings.

In addition, three topics are considered crucial to strengthening GOOS underpinnings:

1) Directed research in oceanography and meteorology.
2) Focused development of technology;
3) Management and dissemination of data.

Although the U.S. Believes that GOOS will not be successfully achieved until all modules are effectively implemented, 1994 was a year to focus on defining U.S. Coastal GOOS. This report reflects the conclusions of eleven Federal agencies, state government representatives, industry users, and non-government organizations who met over a period of 11 months. Considerable discussion centered on: (i) what GOOS clients/partners want, 2) why Coastal GOOS is needed, and 3) how Coastal GOOS will be implemented in the U.S. While these questions have not all been definitely answered, a strategic plan has been drafted for further consideration and implementation beginning in 1995. It is hoped that this plan will be a useful example to the international community when it pursues a global Coastal GOOS.

It is critical to understand, quantify, and articulate the economic benefits of GOOS. Through several universities the U.S. is expanding its program of interdisciplinary studies to determine benefits to various industrial sectors of improved ENSO forecasts. Starting with the agricultural sector, additional areas now under study include hydroelectric power supplies and commodities markets.

The U.S. Interagency Working Group for GOOS continued to meet monthly in 1994. With representatives of nine Federal agencies, the group also works closely with the National Science and Technology Council's Committee on Environment and Natural Resources to co-ordinate GOOS planning with other national and international activities. A U.S. GOOS Home Page was established on the World Wide Web: http://www.usgoos.noaa.gov/goos.html with samples of U.S. GOOS Products, programmatic information, and links to other home pages.

VIET NAM

1. INTRODUCTION

Viet Nam is a supporter of IOC/WMO/UNEP/GOOS and has endeavoured to participate in all its activities according to its capabilities.

The activities related to GOOS in Viet Nam have been implemented mostly by the Hydrometeorological Service in co-operation with the Ministry of Science, Technology and Environment; the Ministry of Fisheries; the Ministry of Water Resources; the Ministry of Transports; the National Center of Natural Science and Technology and the Vietnam Navy.

The Director General of the Hydrometeorological Service of the South Republic of Viet Nam is the Viet Nam Permanent Representative to WMO.

2. THE OCEAN OBSERVING SYSTEM

The Hydrometeorological Service (HMS) operates seventeen marine hydrometeorological stations along the coasts and on islands. Eight stations are included in the International Communication Network of WMO. One sea-level station (Quy Nhon station) belongs to the GLOSS network station. Real time data are submitted to the HMS communication centers in Hanoï and Ho Chi Minh City by telex and telephone or mail. The Hanoï Center sends the real time data to the responsible centers of WMO. Monthly mean sea-level at Quy Nhon station is submitted to the Permanent Service for Mean Sea-Level.

Besides coastal and island stations, every year the HMS uses vessels of other Ministries to make marine hydrometeorological observations in coastal waters and offshore.

Recently, in co-operation with the Russian Federation, the HMS carried out oceanographic surveys in Bien Dong Sea. Four moored buoys are scheduled to be operational in 1995. One scientific research ship is under construction and will be launched in early 1996.

3. DATA PROCESSING AND SERVICE SYSTEM

The Marine Hydrometeorological Center (under HMS) is responsible for data processing. The processed data are archived in books and some of them in magnetic tapes, floppy disks and then supplied to users. The Marine Hydrometeorological Center also carries out oceanographic features analysis and scientific research.

The National Hydrometeorological Forecasting Center provides daily marine weather forecast, monthly hydrometeorological bulletin and other products serving the activities in the sea and islands.

ANNEX V

DRAFT DATA MANAGEMENT POLICY FOR GOOS

1. The overall purpose of this policy is to define principles which will facilitate timely, full and open access to quality ocean data contributing to the Global Ocean Observing System (GOOS). GOOS requires an early and continuing commitment to the establishment, maintenance, validation, description, accessibility and distribution of high-quality, long-term data sets gathered on an operational basis. GOOS must transmit, exchange, and process its operational data flow within time limits appropriate to the generation of products and the requirements of model assimilation, prediction and analysis.

2. (i) Timely, full and open sharing of a wide spectrum of GOOS data sets is a fundamental objective.

(ii) GOOS data needed in real-time or in near real-time for assimilation by analytic and predictive models and other projected applications will have to be available in the public domain without any delay, in order to promote safety at sea, assist in the avoidance or prediction of storms and coastal flooding, to promote the safety and efficiency of all maritime activities, to protect the marine environment, and to facilitate short-term climate predictions, and many other purposes.

(iii) GOOS data will be provided at the lowest possible cost to GOOS participants in the interest of full and open access to data. This cost should, as a first principle, be no more than the marginal cost of processing, copying and shipping to fill a specific user request.

(iv) With regard to data archiving, all GOOS data will be archived and made available in the public domain through recognized data centres within one year of collection (chemical, biological and geological data may require longer intervals). For those scientific research programmes contributing GOOS data in which selected principal investigators have initial periods of exclusive data use, data will be made available as soon as they become widely useful.

(v) Preservation of data needed for long-term global ocean programmes is required. For each ocean data parameter, there will be at least one explicitly designated archive.

(vi) International data archives will include easily accessible information about the data holdings, supporting ancillary information and guidance and aids for locating and obtaining the data and, where possible, quality assessments.

(vii) To facilitate exchange, recognized national and international standards should be used to the greatest extent possible for storage and transmission media and for processing and communication of GOOS data sets.

(viii) Detailed GOOS data management plans will be developed in respect of different parameters observed by GOOS, or the different Modules of GOOS. These plans shall be consistent with this Policy. Data Management Plans may be published or summarized as Annexes at this Policy.

ANNEX VI

REGIONAL GOOS DEVELOPMENT - THE NEED FOR GUIDING PRINCIPLES?

As GOOS develops, we are experiencing the creation of a number of regional approaches for GOOS activities, including EuroGOOS and NEARGOOS. Regional approaches have been strongly encouraged since the inception of GOOS as logical means to plan, fund and implement GOOS. Various regional organization structures are being considered; therefore, it is timely to consider the formulation of a set of guiding principles which will describe the relationship of the regional GOOS components to the overall GOOS Program co-ordinated by the IOC, WMO, ICSU and UNEP.

EuroGOOS, an informal association fostering European co-operation on GOOS, is not associated with any IOC regional body. It has already considered the need to constitute its status with the overall GOOS Program by exchanging letters with the IOC Secretariat and appointing the I-GOOS Chairman as a liaison to EuroGOOS. Since EuroGOOS is an association of national agencies, the IOC representatives from the region might be different than the EuroGOOS representatives and could have different objectives and views. Also, the EuroGOOS membership does not include agencies from all countries of Europe.

The proposal for NEARGOOS will soon be submitted to I-GOOS and IOC for approval. They plan to have participating countries "endorse" the proposal and it may be viewed as a regional activity under WESTPAC, and funded by WESTPAC and the Japanese WESTPAC Trust Fund. Theoretically, questions could arise concerning the utilization of WESTPAC funds for NEARGOOS , whose membership does not presently include all WESTPAC countries.

Other regional organizations outside the UN system have expressed interest in participating in the GOOS program. These include the South Pacific Applied Geosciences Commission (SOPAC), the Indian Ocean Marine Affairs Cooperation (IOMAC) organization and the North Pacific Marine Science Organization (PICES). They each have differing membership criteria, programs and established rules of procedures and statutes. Their relationship to GOOS therefore might be different than an organization set up to exclusively implement GOOS.

Ideally, one would seek to develop a single set of principles that would apply to all organizations associated with GOOS. Agreeing to, and abiding by the principles would be required of any country or regional organization requesting designation under GOOS. They should at least include:

(i) Agreement to share all data and information in a free and open manner, essentially adherence to the draft GOOS data policy.

(ii) GOOS related activities of the organization should be open to all countries which are members of the United Nations essentially adhering to the membership policies of the IOC, WMO and UNEP.

(iii) Agreement to abide by standards, methodology, data and communication specifications established by GOOS international infrastructures (i.e. I-GOOS, J-GOOS, Implementation Panels, etc.)

(iv) Representation on committees, established by the IOC and other sponsoring agencies to plan and guide GOOS development, will be as observers and be based on procedures developed by the IOC, etc.

(v) In regions having existing IOC Sub-Commissions (i.e. IOCARIBE), countries organizing regional GOOS activities will do so in consultation with the Sub-Commission. If a new regional GOOS organization is established, operating guidelines between the Sub-Commission and the new organization should be developed.

(vi) Funds required to implement strictly regional GOOS activities should derive from countries participating in the activity. Activities undertaken by regional organizations that are "global" in nature and consequently contribute to the international component of GOOS, may be derived from the IOC, WMO, ICSU or UNEP with the express agreement of their member states.

(vii) Countries may participate in, and contribute to, any GOOS activity (Sub-Commission, regional or global) without restriction.

Regional organizations consisting largely of developing countries such as SOPAC, etc. would not be subject to the membership and funding principles. However, the data and standards principles as stated above, would definitely apply. It is expected that some support would be provided by IOC, etc., and by countries in the form of technical assistance to foster the development of GOOS activities in such regions. The obvious benefit to GOOS is the contribution of data, information and products in accordance with GOOS specifications by the regional organization.

As GOOS continues to grow and experience is acquired, it will be necessary to expand the principles and guidelines governing regional organizations and activities. For now, it is recommended that I-GOOS recommend the inclusion of the above principles, and others it might consider appropriate, into a standard protocol for use with all regional GOOS activities.

ANNEX VII

RESOLUTION AND RECOMMENDATIONS OF THE FIRST PLANNING SESSION FOR THE IOC-WMO-UNEP COMMITTEE FOR GOOS (I-GOOS-PS-I) AND THE FIRST SESSION OF THE IOC COMMITTEE FOR GOOS (I-GOOS-I) ADOPTED PRIOR TO THE SECOND SESSION OF THE COMMITTEE

A - RESOLUTION

Res. 1 (I-GOOS-I-PS-I) - IMPLEMENTATION RESPONSIBILITY OF THE COMMON GCOS/GOOS MODULE

The Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS),

Noting

(i) the report of the Third Session of the Joint Scientific Committee for the Global Climate Observing System (JSTC-GCOS),
(ii) IOC Resolution EC-XXV.3 on the commonality of the Ocean Module of GCOS and the Climate Module of GOOS,

Considering

(i) that the common GOOS/GCOS module can only be successfully implemented through the combined efforts of all Member States of IOC, WMO and UNEP,
(ii) that operational design priorities and implementation strategy needs to consider the implementation requirements of all GOOS modules in order to achieve effectiveness and operational efficiency,
(iii) that I-GOOS at its First Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS) has recommended the establishment of the I-GOOS Technical Implementation Panel,

Decides

(i) to refer the implementation of this common GCOS/GOOS module to the I-GOOS Technical Implementation Panel for appropriate action;
(ii) that it urges the Technical Implementation Panel to give high priority to this implementation issue and that it communicate its considerations and recommendations to I-GOOS, J-GOOS and the JSTC for GCOS immediately subsequent to its first meeting.

B - RECOMMENDATIONS

Recommendation 1 (I-GOOS-PS-I) - I-GOOS STRATEGY SUB-COMMITTEE

The Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS),

Noting

(i) IOC Resolution XVII-5 - Global Ocean Observing System (GOOS),
(ii) "The Approach to GOOS", Doc. IOC-XVII/8 Annex 2 rev.,

Considering the urgent need to

(i) develop, refine and continually update a strategic plan for GOOS,
(ii) develop basic policies regarding interaction and co-ordination, both internal and external to GOOS,
(iii) develop advice on the identification and prioritization of resources for GOOS development,

Recommends

(i) the establishment of an I-GOOS Strategy Sub-committee, with terms of reference given in the Appendix to this recommendation;
(ii) that the sub-committee be comprised of the Chairman of I-GOOS, the Chairman of J-GOOS and no more than eight other members selected by the Chairman of I-GOOS in consultation with the secretariats of IOC, WMO and UNEP, to provide both broad, high level representation of marine scientific, industrial and environmental expertise, and also wide regional distribution;
(iii) that the sub-committe be chaired by the Chairman of I-GOOS;
(iv) that membership will normally be for three years and shall be rotated to reflect the projected needs for specialist expertise as they arise;
(v) that the Director of the GOOS Support Office and representatives of the GOOS subsidiary panels or bodies may participate as non-voting members;
(vi) that the sub-committee should meet at least once, and preferably twice prior to I-GOOS-II.

Appendix

I-GOOS Strategy Sub-Committee
Terms of Reference

1. To oversee the development, refinement and periodic updating of a strategic plan for GOOS, which will define:

   - objectives, products and outcomes of the GOOS modules;
   - a broad plan of implementation, including stages, milestones and relevant structural issues; and
   - process of priority setting and review.

2. To develop and recommend basic policies for:

   - coordination and cooperative interaction with other external programs such as GCOS, WCRP, and IGBP (and others) and implementational bodies and activities such as IGOSS, GLOSS, IODE, WWW and others;
   - "crosscutting" issues including:
     - data management
     - regional development; and
   - coordination and balance between internal GOOS activities.

3. To advise on the prioritization, distribution and synthesis of resources to ensure the best parallel development of the GOOS modules in pursuit of the defined objectives.

4. To report to, and advise, the Chairman, I-GOOS, and undertake other tasks defined by the Chairman.

Recommendation 2 (I-GOOS-PS-I) - ESTABLISHMENT OF I-GOOS PANEL ON TECHNICAL IMPLEMENTATION

The Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS),

Noting

(i) IOC Resolutions XV-4, EC-XXIII-5, XVI-8, and EC-XXV-3 on GOOS which call upon IOC to develop GOOS and establish the necessary international co-ordination mechanisms,
(ii) the formal request from JSTC/GCOS that GOOS should implement the ocean component of the climate observing system,
(iii) the formal request from Intergovernmental TOGA Board that GOOS should take responsibility for the continued operational implementation of the post-TOGA observing system and tropical Pacific monitoring system after the end of 1994,

Emphasizing

(iv) that GOOS is an operational system designed to provide standard and consistent global oceanographic data, including biological and biogeochemical data, for the benefit of Member States,

(v) that Member States, international organizations and bodies, existing operational progammes already have considerable experience and capabilities which can be of great assistance in achieving the aims of GOOS,

(vi) that the scientific specifications developed by J-GOOS and the practical applications of the GOOS Modules can be met by a carefully implemented global system of long term observations and models,

Recommends

(i) to establish an I-GOOS Panel on Technical Implementation with Terms of Reference as given in Appendix to this Recommendation;

(ii) to invite the Chairman of I-GOOS and the Secretary IOC in consultation with WMO and UNEP to take actions to establish the Panel in 1994 and appoint its Chairman until the next meeting of I-GOOS on an interim basis;

(iii) that the Chairman and Members of the Panel be appointed by I-GOOS for a minimum of 2 years and a maximum of 8 years;

(iv) that the Panel should consist of no more than 10 members in addition to the Chairman and should meet in plenary session at least once per year;

(v) that the Panel should report to each session of I-GOOS and support the Strategy Sub-Committee with technical information and reports when required;

(vi) that the Panel Task Team be set up for co-ordinating the implementation of an operational system for the continuation of the Post TOGA Observing System to be in place before the end of 1994.

Appendix

I-GOOS Panel on Technical Implementation
Terms of Reference

1. Provide oversight for the implementation of an integrated ocean observation network capable of meeting the GOOS scientific and operational requirements in accordance with the GOOS strategy.

2. Identify the most appropriate means for implementing the elements of GOOS. In the first instance the capabilities and particularly existing systems should be considered. Where requirements cannot be satisfied through existing systems the Panel should seek agents and mechanisms to provide the necessary elements.

3. Oversee the implementation and maintenance of an appropriate information and data management system, including standards and protocols for GOOS.

4. Review and assess the practical implications of new technological systems which may be of help in achieving the objectives of GOOS, or which will improve the effectiveness and efficiency of the various observing systems, subject to the advice of J-GOOS.

5. Establish, as necessary, Implementation Task Groups to address and carry out the specific technical tasks identified by the Panel.

6. Maintain regular working contact with J-GOOS, and its subsidiary bodies, and with other panels of I-GOOS through regular reporting on the progress of implementation of GOOS.

Recommendation 3 (I-GOOS-PS-I) - ESTABLISHMENT OF I-GOOS PANEL ON PRODUCTS AND DISTRIBUTION

The Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS),

Noting that GOOS is an operational system intended to fulfil Member States' needs for ocean products,

Recognizing that the success of GOOS will depend on its ability to identify, anticipate and satisfy the needs of users,

Recognizing further that monitoring of the GOOS system will be necessary to maintain and improve its performance,

Recommends:

(i) to establish an I-GOOS Panel on Products and Data Distribution with the Terms of reference given in the Appendix to this recommendation;
(ii) that membership should consist of a chairman and five members appointed by the Chairman of I-GOOS in consultation with the Secretariats of IOC, WMO and UNEP with due consideration being given to the need for adequate geographical and disciplinary representation and of the desirability of user representation;
(iii) that a sixth member shall be nominated by the Chairman of J-GOOS;
(iv) that the panel will report to each session of I-GOOS;
(v) that the Chairman and members will serve for a minimum of two years and a maximum of four years;

Recommends that the panel should be served by a full time support officer;

Requests the sponsoring organisations and Member States to investigate possibilities for establishing this support post.

Appendix

I-GOOS Panel on Products and Distribution
Terms of Reference

(i) To seek and evaluate user needs from Member States and regional groups and interpret them in terms of products;
(ii) To identify the needs for changes in the GOOS system as required by new products;
(iii) To report on the accuracy and quality of the delivered products and data of the GOOS system with respect to the user requirement;
(iv) To consider and oversee the mechanisms for the generation of products and for the distribution to users of products and data;
(v) To maintain and make available a catalogue of GOOS data, products and services;
(vi) To co-ordinate the socio-economic assessment of GOOS.

Recommendation 4 (I-GOOS-I) - UNEP-IOC-WMO LONG-TERM GLOBAL MONITORING SYSTEM OF COASTAL AND NEAR-SHORE PHENOMENA RELATED TO CLIMATE CHANGE

The IOC Committee for Global Ocean Observing System,

Recalling Resolution XVI-10 of the IOC Assembly by which the Assembly approved a set of pilot activities under the UNEP-IOC-WMO Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change,

Also recalling WMO Resolutions 11 (EC-XLI), 9 (Cg-XI) and 21 (Cg-XI) and UNEP Governing Council Decisions 16/26, 16/27, and 16/41 which express the support of these organizations for co-operating in ocean and coastal monitoring relevant to climate change,

Noting the decisions of the 16th Governing Council of UNEP and 45th WMO Executive Committee by which UNEP and WMO agreed to co-operate and to support the pilot activities,

Noting with satisfaction the progress in developing the implementation plans and initiation of the pilot activities on monitoring of coral reef ecosystems, mangrove communities, plankton community structure, sea level changes and associated coastal impacts and coastal circulation,

Noting also that the Chapter 17 of Agenda 21 calls for systematic coastal observations and the development of procedures for comparable analysis in order to address critical uncertainties for the management of the marine environment and climate change,

Noting however with concern that the available and planned budget of IOC will not allow it to cover the cost of the proposed pilot activities,

Recognizes that the proposed pilot activities can be considered as an important contribution to the development of the GOOS module on Monitoring of the Coastal Zone Environment and its Changes,

Recommends that:

(i) the proposed Joint GOOS Technical and Scientific Panel, in particular, and any scientific and technical sub-group established to address the needs for monitoring the coastal zone environment and its changes, be **invited to review** the pilot activities and provide advice on their implementation in the context of overall strategy of GOOS, taking into account other relevant programmes of IOC, particularly OSLR, OSNLR, GIPME, coastal circulation on the continental shelf, and of UNESCO, particularly COMAR, and of ICSU/SCOR, particularly LOICZ and GLOBEC;

(ii) **Member States be urged** to consider, and inform the Secretary on, their participation in the pilot activities as well as on their possible support of and contribution to the implementation of the pilot activities;

(iii) the IOC Assembly invite UNEP and WMO, as **co-operating agencies**, to continue their support for the implementation of the pilot activities;

(iv) **the Assembly instruct the Secretary** to negotiate with UNEP and WMO for possible joint support for the implementation of the pilot activities, particularly for:

  (a) meetings of the Global Task Teams on Coral Reefs and Mangroves;
  (b) preparation and publication of the methodology manuals for the pilot activities;
  (c) organization of workshops and seminars on the pilot activities with a view to organizing the possible establishment of new task teams for other pilot studies;

(v) the IOC Committee for GOOS keep under review the progress in the implementation of the pilot activities and provide advice to the GOOS Support Staff on actions required by IOC Member States and co-sponsoring agencies.

Financial implications for 1994-95

Required	Anticipated 27C5 (Doc. IOC-XVII/8)
Meetings of the Task Team on Coral Reefs (2) - $50K	
Meetings of the Task Team on Mangroves (2) - $50K	GOOS coastal (6.1.3)
Meetings of experts on Sea Level Project in the Indian Ocean (2) - $50K	$100K
Meetings of experts on Coastal Circulation project (2) - $50K	
Preparation and publication of methodology manuals - $30K	
Workshop on coastal plankton community structure monitoring - $40K	
Consultancy services to advise countries on projects implementation and related training - $100K	
Staff travel - $20K	
Total: $390K	
Expected net short fall: **$290K**	

Recommendation 5 (I-GOOS-I) - GOOS LINKAGE WITH EXISTING PROGRAMMES/ACTIVITIES

The IOC Committee for the Global Ocean Observing System,

Recognizing that the IOC and other international organizations through concerted efforts of their Member States have developed research programmes and ocean services activities which have laid down a foundation and a basic infrastructure for design, planning and development of the Global Ocean Observing System,

Recognizing also that the regional subsidiary bodies established by Member States of the Commission provide an important linkage of particular practical and scientific interests of coastal states to the global programmes and that sub-regional and regional co-operations is emphasized in Chapter 17 of Agenda 21,

Noting that the Sixteenth Session of the Assembly by Resolution XVI-8 recognized that GOOS must be built as far as possible on existing programmes and capabilities and must be continually updated and improved in response to the results of ocean research programmes and the development of new technology,

Noting also that the Eleventh Meteorological Congress by Resolution 21 (Cg-XI) also agreed that the GOOS implementation should be effected as much as possible through a strengthening of existing systems such as the WWW and IGOSS, with the addition of oceanographic satellites and other new technology as it becomes available,

Recognizing the limited human and financial resources available for the GOOS planning and development,

Noting also that "The Approach to GOOS" (Doc.IOC-XVII/8 Annex 2) calls for the establishment of links and consultations with the various bodies dealing with ocean observing and data management systems of IOC , WMO and joint IOC/WMO activities (e.g. GLOSS, IODE, CBS, CMM, IGOSS, DBCP,) as well as research programmes, particularly WCRP, IGBP, OSLR, OSNLR and GIPME/MARPOLMON,

Recommends that:

(i) the IOC Assembly recognize as a priority for GOOS development the strengthening and accelerated development of existing ocean observational and data management activities, particularly IGOSS, GLOSS, DBCP, IODE, MARPOLMON, Musselwatch and CPR and the TEMA components of these programmes and the vital need for adequate support through the provision of required staff and funds;

(ii) the Chairman of the IOC Committee for GOOS arrange for regular consultations with the Chairmen of IOC Technical and Regional subsidiary bodies, particularly IGOSS, DBCP, GLOSS, IODE, GIPME/MARPOLMON, OSLR, OSNLR and TEMA with regard to the design, planning and development of GOOS in general and its modules;

(iii) the Chairmen of IGOSS, IODE, GLOSS, DBCP, GIPME, TEMA, OSLR and OSNLR consider the potential input of their relevant programmes and bodies to the design, planning and implementation of the specific GOOS modules with the view to *inter alia* optimizing the use of existing systems to serve the goals of GOOS,and enhancing these programmes to meet the expected demands of user communities and bring their views to the attention of the Chairman of the IOC Committee for GOOS and Secretary IOC;

(iv) the Chairmen of IGOSS, IODE, GLOSS, DBCP, GIPME, TEMA, OSLR and OSNLR consult with Officers of the IOC regional bodies and advise the IOC Committee for GOOS on the more efficient use of the regional subsidiary bodies for implementation of relevant ocean observational and data management programmes and for the promotion and formulation of project proposals for regional and sub-regional projects to be implemented under the extra budgetary funds (UNDP, GEF and national donor programmes) .

Financial Implications for 1994-95: None

Recommendation 6 (I-GOOS-I) - TEMA IN RELATION TO GOOS

The IOC Committee for the Global Ocean Observing System,

Taking into account and **supporting** Resolution EC-XXV/3 on International Mechanisms for GOOS Development, Annex 1 (iv) concerning training education and technical assistance in the framework of TEMA,

Recalling Agenda 21 (Section E, Chapter 17) of UNCED, which recommended the establishment of a Global Ocean Observing System (GOOS) by IOC in co-operation with WMO, UNEP and other international organizations, and emphasized the need for IOC to develop fully the strategy for providing training, education and technical assistance for developing countries through its Training, Education and Mutual Assistance (TEMA) programme,

Noting also that the results of UNCED Agenda 21 Chapter 34, Capacity Building, expressed the need for endogenous capacity building, particularly in developing countries ..., through (i) human resources development and (ii) strengthening of institutional capacities for GOOS programme implementation,

Recommends that:

(i) TEMA efforts in this regard be directly related to the GOOS programme;

(ii) TEMA strategy in this regard be primarily directed toward a) building long-term commitments and partnerships between developing and developed countries; b) external sources of support, such as donor agencies which usually handle bilateral agreements, be identified by the Chairman of the TEMA Committee and the Secretary of IOC as potential new sources of TEMA multilateral support;

(iii) the existing programmes and activities related to GOOS such as GLOSS, IGOSS, IODE, GIPME, CPR, and DBCP identify their TEMA needs in relation to their ongoing operational programmes including medium- and long-term education, training, equipment needs and requirements;

(iv) developing countries identify their needs for human resource development and infrastructure in relation to GOOS programmes;

(v) the developing countries identify their existing training facilities and institutions for participation in the GOOS TEMA efforts;

(vi) preference be given to utilizing the expertise, infrastructure and facilities already existing in developing countries which in addition to being cost-effective, provide encouragement to developing countries for greater participation in GOOS;

(vii) equal importance be given to mutual assistance (MA in TEMA) particularly in making available state of the art instruments and equipment simultaneously with training and education of personnel from developing countries;

(viii) the IOC Assembly approve the establishment of the GOOS TEMA Trust Fund as part of the IOC Trust Fund in order to support the activities of TEMA within GOOS.

ANNEX VIII

LIST OF DOCUMENTS

IOC-WMO-UNEP/I-GOOS-II/1	Agenda
IOC-WMO-UNEP/I-GOOS-II/1 Add.	Timetable
IOC-WMO-UNEP/I-GOOS-II/2	Annotated Provisional Agenda
IOC-WMO-UNEP/I-GOOS-II/3	Summary Report
IOC-WMO-UNEP/I-GOOS-II/4	List of Documents
IOC-WMO-UNEP/I-GOOS-II/5	List of Participants
IOC-WMO-UNEP/I-GOOS-II/6	Report of the Chairman of I-GOOS (cancelled)
IOC-WMO-UNEP/I-GOOS-II/7	Report of the Chairman of J-GOOS
IOC-WMO-UNEP/I-GOOS-II/8	Report of the Director of the GOOS/SO
IOC-WMO-UNEP/I-GOOS-II/9	GOOS National Activities
IOC-WMO-UNEP/I-GOOS-II/10	IOC-UNEP-WMO Coastal Pilot Monitoring Activities
IOC-WMO-UNEP/I-GOOS-II/11	NEAR-GOOS Development
IOC-WMO-UNEP/I-GOOS-II/12	GTOS Development and Interaction with GOOS (Extract of the Draft of a Proposed GTOS Strategy to Monitor Rivers, Lakes and Estuaries)
IOC-WMO-UNEP/I-GOOS-II/13	Revision of "The Approach to GOOS"
IOC-WMO-UNEP/I-GOOS-II/14	The GOOS Strategic Plan (included as Annex IX of Document IOC-WMO-UNEP/I-GOOS-SSC-I/3)
IOC-WMO-UNEP/I-GOOS-II/15	CMM-IGOSS decisions and activities in support of GOOS
IOC-WMO-UNEP/I-GOOS-II/16	GOOS interactions with existing and planned ocean observing and data management systems/bodies and research programmes

ANNEX IX

LIST OF ACRONYMS

ACME	Advisory Committee on Marine Environment
AVHRR	Advanced Very High Resolution Radiometer
CEOS	Committee on Earth Observing Satellites
CLIVAR	Programme on the Variability of the Coupled Ocean-Atmosphere System and Climate Prediction (WCRP)
CMM	Commission on Marine Meteorology
DBCP	Data Buoy Co-operation Panel
ESA	European Space Agency
EuroGOOS	European Programme for the Global Ocean Observing System
FAO	Food and Agricultural Organization of the United Nations
GNP	Gross National Product
GCOS	Global Climate Observing System (WMO-ICSU-IOC-UNEP)
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility (UNDP-World Bank-UNEP)
GIPME	Global Investigation of Pollution in the Marine Environment (IOC)
GLOBEC	Global Ocean Ecosystems Dynamics
GLOSS	Global Sea-Level Observing System (IOC)
GPS	Global Positioning System
GTOS	Global Terrestrial Observing System (UNEP)
GTS	Global Transmission System
HELCOM	Baltic Marine Environment protection Commission - The Helsinki Commission
HOTO	Health of the Ocean
IAPSO	International Association for the Physical Sciences of the Ocean (IUGG)
ICES	International Council for the Exploration of the Sea
ICRI	International Coral Reef Initiative
ICSEM	International Commission for the Scientific Exploration of the Mediterranean Sea
ICSU	International Council of Scientific Unions
IGBP	International Geosphere-Biosphere Programme: A Study of Global Change (ICSU)
IGS	International GPS Service
I-GOOS	IOC-WMO-UNEP Committee for GOOS
I-GOOS-PS	I-GOOS Planning Session
IGOSS	Integrated Global Ocean Services System (IOC/WMO)
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange (IOC)
IPCC	Intergovernmental Panel on Climate Change (WMO/UNEP)

IUCN	International Union for the Conservation of Nature
JGOFS	Joint Global Ocean Flux Study (SCOR-IOC)
J-GOOS	Joint GOOS Scientific and Technical Committee (IOC-WMO-ICSU)
JSTC	Joint Scientific and Technical Committe
LMR	Living and Marine Resources
LOICZ	Land-Ocean Interactions in the Coastal Zone (IGBP)
MedGOOS	Mediterranean Programme for the Global Ocean Observing System
NEARGOOS	North-East Asian Programme for the Global Ocean Observing System
NOAA	National Oceanic and Atmospheric Administration (USA)
OECD	Organization for Economic Co-operation and Development
OOPC	Ocean Observation Panel for Climate
OOSDP	Ocean Observing System Development Panel (JSC/WCRP)
OSLR	Ocean Science in Relation to Living Resources (IOC-FAO)
OSPARCOM	Oslo and Paris (Conventions) Commission
PCB	Panel on Capacity Building
SSC	Strategy Sub-Committee
SST	Sea-Surface Temperature
TEMA	Training, Education and Mutual Assistance in Marine Sciences (IOC)
TOGA	Tropical Oceans and Global Atmosphere (WCRP)
UNEP	United Nations Environment Programme
WCRP	World Climate Research Programme (WMO/ICSU/IOC)
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment (WCRP)
XBT	Expendable Bathythermograph