Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

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

Third Session
Paris, 26-27 June 1997

and the First GOOS Forum

Paris, 25 June 1997

UNESCO

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1. OPENING

1 The third session of the IOC/WMO/UNEP Intergovernmental Committee for the Global Ocean Observing System (I-GOOS) was called to order by the Chairman, Prof. M. Glass, at 09.30 on Wednesday, 25 June 1997, at UNESCO headquarters in Paris. After welcoming the participants, Prof. Glass gave the floor to Dr. G. Kullenberg, Executive Secretary IOC.[1]

2 On behalf of the GOOS co-sponsoring organizations, namely the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP) and the International Council of Scientific Unions (ICSU), Dr. Kullenberg welcomed the participants to the session, to the UNESCO house and to Paris. In so doing, he highlighted the activities that had taken place within the GOOS framework during the last couple of years, and especially underlined the so-called "sponsors meetings", which allowed better co-ordination of action in the field of GOOS development. He further mentioned the present holding of a special UN session devoted to the theme "Five years after Rio", the results of which would have a bearing on progress in GOOS affairs. Dr. Kullenberg highlighted what he considered to be major items to be taken care of for GOOS development, viz: (i) undertaking pilot projects, to demonstrate the feasibility of and the benefits to be derived from GOOS; and (ii) the need of commitments to support GOOS development. In concluding, Dr. Kullenberg wished the session to be successful and assured it would be well supported by the Secretariat staff.

3 Prof. Glass then gave the floor to the Chairman of IOC, Mr. G. Holland, who warmly welcomed the participants to the session and to the First GOOS Forum. He stressed that the GOOS co-sponsoring organizations were well aware of the importance of data and information exchange to science in the development of knowledge and predictive models, to operations in the delivery of forecasts and services, and to decision makers in the form of strategic advice and risk management information. In this context, the GOOS Forum had an important role to play in reviewing progress achieved, in exposing for discussion basic principles, strategies and plans for implementation, and in illustrating the development of GOOS through examples of existing systems that contributed to GOOS, as well as through regional GOOS projects. The future of GOOS was changing, with new directions and a more attractive structure. In particular, it was worth noting how the dialogue between the Committee on Earth Observation Satellites (CEOS) and the various "land-based" observing systems was leading to a more integrated approach to global observing systems, called the Integrated Global Observing Strategy (IGOS). The Chairman IOC concluded in wishing the session every success.

2. IOC-WMO-UNEP-ICSU CONFERENCE ON ACHIEVEMENTS AND OUTLOOK OF THE GLOBAL OBSERVING SYSTEM - FIRST GOOS FORUM

4 Prof. Glass reminded attendees that the Forum was designed specifically to introduce GOOS and its progress to senior representatives of agencies with a likely interest in participating in the implementation of GOOS. GOOS has been in gestation for a few years while initial plans were being developed. A sound, scientifically-based approach has now emerged and the dominant issues have now surfaced clearly. To develop a coherent way forward to the realisation of GOOS it is now necessary to entrain all the potential stakeholders in the design process if GOOS is to succeed. These stakeholders include the governmental, scientific and industrial communities. It is now especially timely to bring into the debate on how to achieve the promise of GOOS the views of the national agencies which will inevitably play the major role in implementing GOOS. This meeting, therefore, is aimed at Governments; other means will be pursued to seek to entrain the scientific and business stakeholders in the process.

5 Professor Glass went on to hope that the presentations on the programme would generate a wide-ranging discussion on how GOOS could and should be implemented, and on what steps should be taken to obtain formal commitments of governments to implementation of the GOOS plan. The Forum potentially may have considerable implications for long-term national and international policy on ocean monitoring and forecasting, as well as on climate forecasting. He then invited the speakers to take the floor.

6 The programme for the First GOOS Forum is attached as Annex 5. Talks were given on GOOSPrinciples; GOOS Strategic Plan; J-GOOS Report on Implementation; Existing Operational in-situ Monitoring;

Prediction and Assessment with Emphasis on ENSO; GLOSS; GOOS Services and Products; NEAR-GOOS; EuroGOOS; US Coastal GOOS; and The Global Ocean Observing System 1998 (The GOOS 1998). The abstracts of papers are attached as Annex 6. Attendees included the I-GOOS-III participants (Annex 3A) and additional invitees from operational agencies (Annex 3D).

7 The presentations made it plain that there have been many positive achievements in recent years that could be considered to be contributions to developing a Global Ocean Observing System. One very obvious achievement is ENSO forecasting, which has been improved through assimilation of subsurface observations. Another of a different kind is the Electronics-IGOSS Products Bulletin, which makes available on-line reasonable quality real-time oceanographic products. These various positive messages are dealt with in the Abstracts in Annex 6, and elsewhere in this report.

8 What follows is a summary of the general discussion which ended the Forum, in which many useful comments were made that will help GOOS planners to focus on key issues for the future. The debate focussed on what is missing, what needs to be improved and what needs to be emphasised. The key points to emerge were as follows (listing of a key point does not imply agreement to it by Member States):

(i) the *GOOS Strategic Plan* should address the needs of Conventions (particularly FCCC, CBD, UNCLOS and the Global Plan of Action on Land-based Sources of Marine Pollution) and regional initiatives (including the Oslo, Paris and Helsinki Conventions and the North Sea Task Force);

(ii) meeting the needs of Conventions and regional initiatives provides a context for governments to commit to GOOS. This is why GOOS is being developed in an intergovernmental way. For instance, GOOS should be addressing the issue of the sustainable development of the oceans (as requested by UNCED);

(iii) ocean colour satellites, as well as the Continuous Plankton Recorder and activities like the Atlantic Meridional Transect, provide useful means of monitoring marine living resources, and hence for meeting some of the requirements of the Convention on Biodiversity;

(iv) GOOS capacity building activities may accord well with the requirements of Part XIV of UNCLOS regarding the transfer of marine technology to developing countries;

(v) GOOS capacity building in developing countries should involve end-users as well as suppliers of information, so as to make the best use of GOOS data, and should be linked to cost-benefit analyses;

(vi) GOOS should be customer-driven, but that did not necessarily imply that the drivers for GOOS implementation and development would be commercial. Much more effort needs to go in at the national and international level to identify the full range of end users' requirements (eg in planning GOOS modules);

(vii) care should be taken in defining the interface of GOOS with industries;

(viii) regional initiatives for the implementation of GOOS should be promoted vigorously; they may be governmental, but do not have to be. Such initiatives may be bilateral or multi-lateral, and could be large scale (eg whole ocean basins) or small scale (eg the Black Sea);

(ix) GOOS participation in EXPO-98 should be encouraged, for instance in the "Pavilion of the Future". The IYO should be used to promote GOOS;

(x) given limited resources it is important to recognise that commitment to GOOS may not necessarily involve expenditure, but rather realignment of existing national and international activities so that they form part of a global system. More effort is required to ascertain how GOOS will capitalise on existing international, regional and national systems;

(xi) links between GOOS and the research community need to be strengthened; GOOS has to be understood as something potentially adding value to rather than competing with research; the symbiotic relationship between research and operations needs to be brought out; implementation of a full scale GOOS will require extensive pre-operational research and development, as in the Global Ocean Data Assimilation Experiment (GODAE);

(xii) the GOOS data policy has to be workable, reasonable and ideally based on the principle of freedom of data and information exchange, to the extent possible. It should be based on the policies of the sponsoring organisations, and should encourage participation in data exchange;

(xiii) GOOS standards should be high; standardisation and calibration will be essential parts of GOOS data exchange, and an inter-calibration exercise was suggested to facilitate this;

(xiv) the data and information panel should be tasked with working out where and how GOOS data should be stored, and should consider ICES and WOCE and other data management systems as well as IGOSS and IODE;

(xv) to avoid the potential for confusion between GOOS and EuroGOOS or any other regional GOOS body it may be desirable to develop a standard Memorandum of Understanding as part of the mechanism of coordination that helps to link institutions together under the global GOOS banner, and to avoid duplication of effort;

(xvi) it was important to clarify what was expected of Member States in the way of commitment to GOOS. Commitments could include contributions by developed states to capacity building to enable all Member States to participate in GOOS. The biggest single problems were likely to be gaining commitments (i) to open ocean (ie non-national) parts of GOOS, and (ii) to the long term maintenance of observing systems of all kinds;

(xvii) in seeking commitment it will be important to recognise that in most countries different government departments carry different responsibilities for marine affairs, and have different agendas to meet different policy goals. In many instances those policy goals tend to be short term, and within the life of one parliament. To gain commitment to GOOS it would be necessary to tailor GOOS products to these differing needs, which would mean extensive dialogue beforehand with departmental representatives. This is an area where national representatives can assist the GOOS Project Office. If this is not done, there is a danger that GOOS investment may be difficult to sustain for the lengthy period required;

(xviii) in many participating countries navies may have a role to play and could be involved in planning and implementing GOOS at the operational level, based on their existing ship resources and knowledge of operational planning and execution of tasks in the ocean. Navies may be a source of valuable environmental data for GOOS. This is a matter for individual nations to pursue, possibly with some assistance from the GPO. In some countries navies already do release environmental data; furthermore some navies play a valuable role in making available XBTs for use from research ships and ships of opportunity.

3. ADMINISTRATIVE ARRANGEMENTS

3.1 ADOPTION OF THE AGENDA

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

3.2 DESIGNATION OF A RAPPORTEUR

10 The Committee designated Mr. S. Piotrowicz (USA) as a Rapporteur for the Session.

3.3 CONDUCT OF THE SESSION

11 Dr. C. Summerhayes, Director, GOOS Project Office, introduced the timetable and documentation for the session . The list of documents is given in Annex IV; the list of participants is given in Annex III.

12 Prof. M. Glass proposed and the Committee agreed to set up two sessional working groups to prepare proposals and draft recommendations for this session:

1. Working Group on the Heads of Agencies Meeting (subsequently referred to as the First GOOS Agreements Meeting); Dr. A. McEwan was invited and agreed to chair the Group.

2. Working Group on GOOS Capacity Building and Socio-Economic Aspects of GOOS. This was subsequently split into two Working Groups:

   (i) GOOS Capacity Building, chaired by Dr.J.Stel;
   (ii) Socio-Economic Aspects of GOOS, chaired by Dr. N. Flemming.

13 Prof. Glass also circulated a list of draft recommendations and resolutions for the consideration of the Committee.

4. REPORT BY I-GOOS CHAIRMAN, J-GOOS CHAIRMAN AND DIRECTOR OF THE GOOS PROJECT OFFICE ON INTER-SESSIONAL ACTIVITIES

14 Prof. M. Glass, the **Chairman of I-GOOS**, reported on inter-sessional activities (Doc. IOC-WMO-UNEP/I-GOOS-III/6) highlighting two important developments, firstly the proposed restructuring of GOOS (Doc. IOC-WMO-UNEP/I-GOOS-III/19), and secondly the growing implementation of GOOS. He drew attention to improvements in the interactions between the GOOS governing bodies and sponsoring organisations over the past two years, as well as the advances in the regional implementation of the system as a whole. Turning to the future, he stressed the importance of holding a high level meeting with the heads of operational agencies proposed for 1998, which was aimed at getting widespread acceptance of and commitment to GOOS principles and basic concepts by participating countries as well as by those wishing to participate in the near future. Important initiatives for the implementation of GOOS included the Strategic Plan, The GOOS 1998, the proposed GODAE project, and also harmonisation with other global systems. Finally, the Chairman of I-GOOS thanked the new Director of the GPO for his enthusiastic efforts towards the planning and implementation of GOOS.

15 In response to a question about the relationship between GOOS and EuroGOOS the Committee agreed that EuroGOOS, like NEAR-GOOS, was an integral part of GOOS. It was noted that the 6 EuroGOOS regional projects have not yet begun formally; they will start officially when funding is won from the EC, to which a number of bids have been made. Nevertheless in most of the EuroGOOS regional project areas there is already considerable operational activity initiated by national and regional agencies. Many models are producing products and there is a wide range of services available.

16 The Chairman stimulated a discussion about the support of new regional initiatives. The committee agreed it was desirable to promote the formation of new regional initiatives as a means of implementing GOOS, and adopted Recommendation I-GOOS-III.1.

17 Prof. O. Brown, the **Chairman of J-GOOS**, presented a comprehensive report (Doc. IOC-WMO-UNEP/I-GOOS-III/7) on the activities that took place during the last inter-sessional period, with emphasis on the Fourth Meeting of J-GOOS and its adopted resolutions and recommendations (Doc. IOC-WMO-UNEP-ICSU/J-GOOS-IV/3). Among those, he noted that J-GOOS endorsed and commended the initiative of the OOPC in developing GODAE, and also approved the output and results of the GOOS Coastal Module Workshop, held in Miami, 24-28 February 1997. He noted consensus among J-GOOS participants that strong and effective actions are required for the implementation of the Coastal and Living Marine Resource Modules of GOOS, and these requirements should be extensively addressed during this I-GOOS Session.

18 Turning to the proposed GOOS restructuring (Doc. IOC-WMO-UNEP/I-GOOS-III/19), the Chairman noted that he welcomed it and expressed his belief that it would contribute to broaden the current J-

GOOS mandate by enhancing membership of the proposed GOOS Steering Committee (GSC) with operational agency representatives, who should be able to assist with and advise upon the implementation of GOOS.

19 In finalising its report, the Chairman of J-GOOS stressed that the increased support made available by sponsoring agencies has been critical for the latest developments of GOOS, but that still additional resource allocations are needed to keep up the momentum.

20 Dr. C. Summerhayes, the **Director of the GOOS Project Office,** presented the results of a progress review of GOOS against its targets (Doc. IOC-WMO-UNEP/I-GOOS-III/20), the results of which will help to set the direction and pace of GOOS for the future. The review was based on a questionnaire. To which there had been a high level of response. The review document contains proposals for the GOOS Steering Committee to begin implementing, including a future regular programme of reviews of GOOS. Many of the problems of GOOS to date had been identified in the review and are already being addressed by the proposed restructuring, by the IOC's creation of a permanent UNESCO post for the Director of the GPO, by the change in emphasis of the GPO to be a more pro-active body (hence its change of name from Support Office to Project Office), by the production of a set of key planning documents (now close to completion), and by the beginning of the implementation of GOOS through the creation of several Pilot Projects. Nevertheless there was still much to be done to promote GOOS, to improve how GOOS functioned, to speed up its implementation, and to build the capacity of less developed states so that they could participate in GOOS fully. The review of progress highlighted the difficulty of finding the resources to continue GOOS implementation at a desirable rate. The review noted that GOOS had achieved widespread recognition, and was stimulating the worldwide development of operational oceanography and the provision of oceanographic services and products of value to communities in participating countries.

21 In his report on inter-sessional activities (Doc. IOC-WMO-UNEP/I-GOOS-III/8) the Director GPO thanked Dr. J.-P. Rebert for the work he had performed as Director of the GOOS Support Office up until the end of February 1997. He noted that GOOS was making steady progress. It has now reached the peak of the planning phase which will culminate in the First GOOS Agreements Meeting in mid-1998. Phase 2 (implementation of demonstrator projects) began with the start of NEAR-GOOS in October 1996. Subsequently, the PIRATA array in the Tropical Atlantic had been declared to be a GOOS Pilot Project, and the GODAE proposal had been accepted as a Pilot Project by both J-GOOS and CEOS. In the USA, 5 projects had been proposed to take the Coastal Module forward. In EuroGOOS, 6 regional projects were being developed. Phase 3 (integration of existing systems) had also begun, with The TAO Array in the Pacific being declared to be a contribution to GOOS, along with the international SOOP network. Aside from these actual contributions to GOOS implementation there was in place a proto-GOOS comprising the components of an eventual global observing system including IGOSS, GLOSS, IODE, DBCP, GTSPP, CMM operational activities (eg VOS), the CPR, and many others. Capacity building has begun with workshops in Goa, India, and Mombasa, Kenya. Space-based requirements for GOOS are being identified through a joint GOOS-GCOS-GTOS Space Panel (GOSSP), and the data and information management needs of GOOS are being developed through a joint GOOS-GCOS-GTOS Data and Information Panel (J-DIMP). The Director stressed the need for the development and publication of the GOOS Principles, the GOOS Strategic Plan, and The GOOS 1998, and of the Data and Information Plan, as key guides for the planners and implementers of GOOS.

22 The Director thanked the following Member States for supporting current staff in the GPO: Brazil for seconding Ms. Trotte; France for having seconded Dr. Rebert; Japan for seconding Ms. Ichiyama; and United States for support for Mr.Alexiou. In addition, the USA, Australia and UK had provided computer support during 1996 and 1997. He corrected the text of his report by noting that Ms.Trotte's main task would not be the Coastal Module, but rather building the international GOOS network and stimulating GOOS operations in Latin America. He ended by noting that the great expectations held of the GPO by Member States will not be met without enhanced assistance from the Member States through (i) staff secondments to assist in planning and implementation; and (ii) earmarked contributions to the GOOS Trust Fund to support planning and promotional activities and capacity building.

5. CURRENT PERSPECTIVES OF GOOS

23 Three principal documents are being developed to govern the design and implementation of GOOS. They are: *The GOOS Principles*

The GOOS Strategic Plan
The GOOS 1998, which is a blueprint for implementation.

24 These three documents are necessary, and have each been prepared by a process of wide consultation and expert drafting. The role of each document, and the relation between them, can be illustrated by analogy with national legislation on complex technical matters. Typically a statutory law is enacted by the national legislature which states broad mandatory principles and objectives which must be achieved. The law empowers various agencies to act. The agencies produce regulations and Directives which have the force of law, and contain more technical detail. Finally, in order to comply with the regulations and Directives, organisations and individuals affected by the law need Manuals, Codes of Practice and Working Documents which contain a great deal of technical information. Typically, national legislative documents remain in force without change for ten years or more. Agency Regulations and Directives remain in force without change for 3-5 years, technical Codes and Manuals may be revised at intervals of 1-3 years, and have up-date sections or amendments circulated even more frequently in order to respond to rapid technical developments.

25 By analogy, the GOOS Principles are equivalent to broad legislation; the Strategic Plan is equivalent to Regulations; and The GOOS 1998 is equivalent to a Working Manual. The concept of legal status should not be stressed in this analogy, but the relative time-scales, details, and degree of technical content can be stressed quite accurately. A complex, long term and intergovernmental organisation such as GOOS requires authoritative documents at these three levels.

5.1 GOOS PRINCIPLES

26 Dr. A. McEwan introduced this agenda item. He recalled that it had been recognized for some time that a set of GOOS Principles concerning the design of and involvement in GOOS were needed to provide coherence to the programme. A draft list of such principles had therefore been developed, initially by the Strategy Sub-committee at its third session, and reviewed by J-GOOS-IV. The principles appear as a set of concise statements that could be understood without great elaboration. Nonetheless, it was felt useful to also prepare explanations of the intent of the principles, in order to avoid any misunderstandings as much as possible.

27 Two sets of principles were defined. The first (design principles) define the overall principles that determine the design of the system and provide a guide for what the design should include and exclude. The second (principles of involvement) is a guide to the conditions that should determine participation in the system, and the elements that determine those conditions.

28 The Committee considered the two sets of principles as excellent and strong enough to lead to a coherent development of GOOS. The Committee therefore decided to endorse and publish them and adopted Resolution I-GOOS-III.1 to that effect. In so doing, the Committee requested that the principles, together with their pertinent explanations, be attached to the Resolution in order to form a self-contained piece of information and further noted that the principles were to be reviewed as and when necessary.

29 The Committee paid special attention to design principle D7 - The management, processing and distribution of data will follow a specified data policy. The Committee considered this principle deserved urgent action, in that a GOOS data policy should be defined as soon as possible. It noted that such a policy should be in line with those already defined and adopted by its sponsoring organizations, and based upon the one already laid out at I-GOOS-PS-I and reviewed at I-GOOS-II. It therefore decided to set up an inter-sessional working group made up of members from: Canada, France, Germany, Japan, Netherlands, the Russian Federation, USA and representatives of the GOOS sponsoring organizations, entrusted with drafting a GOOS data policy for submission to the next I-GOOS session. The work of the group (which would work by correspondence through e-mail) would be initiated by Prof. Dr. D. Kohnke (Germany). The terms of reference of this groups were specified to be:

1. To study the existing data policies of the sponsoring organisations, with a view to identifying differences and points of agreement between them;

2. To develop a data policy statement for GOOS which is consistent with the policies of the sponsoring organisations, bearing the differences in mind, with a view to clarifying how GOOS will develop its data and information management plans.

5.2 GOOS STRATEGIC PLAN

30 The Committee noted with interest the presentation of the draft GOOS Strategic Plan (Doc. IOC-WMO-UNEP/I-GOOS-III/12) made by the Director of the GOOS Project Office. The Committee expressed its considerable appreciation to Dr. A. McEwan (Australia), to the Director of the GPO, and to all the other experts who had been involved in preparing, reviewing and revising the draft, which it considered will provide an essential step in the GOOS planning and development process.

31 It was recognised that the plan represented a working document for guiding future GOOS development, especially at the intergovernmental level, and as such it must be dynamic in nature and revised and updated as GOOS evolves. A few proposals for modifications were made, and the Committee invited Member States to submit further comments and suggestions to the GPO by the end of July 1997, for inclusion in the 1997 version of the Strategic Plan, which should be labelled Version 1.0 of the GOOS Strategic Plan and distributed as soon as possible. UNEP indicated the need for the Plan to refer to the main Conventions and to mention work towards developing as products indicators for sustainable development.

32 The Committee agreed that the plan should in principle be reviewed and updated at each full I-GOOS Session, and requested the GPO to ensure that input to a possible revision be invited from Member States in time for such a review. The Committee's conclusions were adopted in Resolution I-GOOS-III.2.

5.3 PRIORITIES FOR ACTION

33 Dr. P. Ryder presented a summary of the work he has done to date as a contracted consultant under the guidance of a J-GOOS planning group chaired by Dr. J. Woods to develop "The GOOS 1998", a blueprint for implementation. This document will be a natural companion to, and consistent with, the GOOS Strategic Plan, but will provide a higher level of detail to guide GOOS implementers and to encourage investment in GOOS. The Committee agreed that each document has a definite purpose to fill; expressed its satisfaction with Dr. Ryder's progress; and accepted that its Members would be involved in the review process when the final draft had been prepared early in 1998. To demonstrate the linkage between the two documents, the Committee agreed that it would be sensible for both to carry the same initial introductory paragraph in which the nature and roles of the two documents and their relation to one another were explained. Participants expressed a wish that "The GOOS 1998" should be published in ample time for it to be read and digested by the heads of agencies who would be attending the First GOOS Agreements Meeting in the summer of 1998. The Committee's conclusions were adopted in Resolution I-GOOS-III.3.

5.4 MODULE DEVELOPMENT

34 Prof. O. Brown, Chairman of J-GOOS, reviewed the state of planning for the GOOS scientific and technical Modules. He noted that GOOS planners must try to determine the right balance between research and operational observations. He also explained that the modules were devices which served their purpose in the planning stage, but which would not be with us forever. We were now moving into the implementation phase in which the thrust would be thematic rather than modular, two major themes being coastal and global. GOOS would be implemented by nations, largely through bilateral and multi-lateral agreements. Main issues for consideration by the planners are in situ observations, space-based observations, data assimilation, and products.

5.4.1 Coastal Module

35 Planning had begun in the Coastal Module. An ad hoc workshop chaired by Dr. N. Flemming had been held in February in Miami, and pointed the way forward. It was now necessary to establish a Coastal Module Panel to develop a GOOS Plan for the coastal environment. The Committee considered the question of whether or not this Panel should be a joint GOOS-GTOS planning group. Because GTOS and GOOS were at very different stages of development in their planning for coastal region activities it was felt that it would be premature to call for a joint group now, but that at some point in the future, when GTOS planning in the coastal area was further advanced, there would be merit in considering joint GOOS-GTOS working groups to address particular issues involving the land-ocean boundary. In the meantime it was agreed that there should be GOOS representation on GTOS coastal planning groups and vice versa to ensure coordination and communication. The UNEP representative (Dr. A. Dahl) noted that GTOS will look at its needs from the land side first and work toward convergence with GOOS coastal module after it has defined its requirements. UNEP has a responsibility to determine how activities on the land side affect the ocean side. UNEP also pointed out that GOOS coastal planners should take into consideration activities taking place in the Regional Seas programme, which could be learned from and built upon. Dr.Dahl indicated that

UNEP might be prepared to provide some resources to enable the Coastal Panel to go forward, not least because of the importance of the Global Plan of Action on Land-Based Sources of Marine Pollution. The Committee noted that the new Panel should build strong links with the LOICZ research programme to ensure the development of soundly based plans for coastal seas.

36 A recommendation was made to form a Coastal Panel without delay (Recommendation I-GOOS-III.2).

5.4.2 Living Marine Resources (LMR) Module

37 Following two ad hoc advisory panel meetings, J-GOOS now considers it timely to move to full-scale planning for this module. FAO is interested in joining as a sponsor of the LMR Panel, the major focus of which would be the health of the resource, and the development of operational deliverables useful to a range of customers. As in the case of the Coastal Panel, it would be the job of the LMR Panel to determine through dialogue with end users precisely what those deliverables should be. It was noted that this activity will be supported by joint efforts of the GOOS Project Office and the IOC programme on OSLR.

38 A recommendation was made to form a LMR Panel without delay (Recommendation I-GOOS-III.2).

5.4.3 Health of the Oceans (HOTO) Module

39 Prof. Brown reported that a new panel had been formed to begin the implementation of HOTO Pilot Projects; the HOTO Panel Chair had visited several countries in S.E.Asia to discuss the possibilities of starting a HOTO Pilot Project there.

5.4.4 Climate Module

40 The OOPC was moving towards implementation of recommendations made by the OOSDP. The major development being proposed was the Global Ocean Data Assimilation Experiment. (GODAE), which will be a GOOS version of FGGE. GODAE will capitalize on satellite data, which is why it has been seized upon by CEOS as a Pilot Project.

41 J-GOOS has adopted the idea of a Global Core System which will encompass the development of global ocean modelling and data assimilation. GODAE is an element of this Global Core System. Other elements of such a system would be elements of presently existing observational systems like SOOP, DBCP, and GLOSS etc. Dr. P. Dexter, representative of WMO, pointed out that the OOPC had influenced planning of SOOP, DBCP and GLOSS, in the spirit of building on what exists. A meeting is needed between OOPC, IGOSS, IODE, and CMM to determine how to make best use of existing systems.

42 Dr.Flemming, Director of EuroGOOS, reminded members that acoustic thermometry is a promising technique for future ocean monitoring for climate change. Japan informed members that through its TRITON (Triangle Trans-Ocean Buoy Network) it is extending the TAO array into the western tropical Pacific and into the Indian Ocean.

43 Members were warmly supportive of the GODAE concept as an essential aid to operational forecasting systems for the ocean. Data assimilation activities are taking place in many states, but effort was needed at the global level. Members were advised that despite its origins within the OOPC, GODAE is not simply a climate-based experiment, but a necessary development for GOOS overall.

44 Recommendation I-GOOS-III.3 was adopted to take GODAE forward.

5.4.5 Services Module

45 In his presentation on GOOS Modules, Prof Brown noted that two excellent reports had been produced for J-GOOS: one on waves, another on ice. J-GOOS had recommended that J-DIMP be made responsible for GOOS services, in line with the continuing effort to consolidate existing bodies (see 5.5, below).

5.5 OCEANOGRAPHIC AND MARINE METEOROLOGICAL SERVICES

46 The Committee noted with interest and appreciation a report on the present status of oceanographic and marine meteorological services, presented by Mr. J. Guddal (Norway), Chairman of the ad hoc group which it had established on this subject at the second session. It recognised that a wide range of such services already exist, prepared and delivered by various operational agencies, including, in particular, national Meteorological Services, on the basis of professionally constructed and operated "product line" systems. It further recognised that extensive interest from end users was an important property of these services and that many were being delivered on a commercial basis, either by government agencies or private companies. At the same time, there continued to be deficiencies in the infrastructures for collecting observations and managing streams linking observing systems to models and products, as well as lack of standardisation and regulation of product quality, presentation and delivery.

47 On the basis of this review, the Committee agreed that GOOS should take full advantage of these existing products and services to promote the existing and potential future economic and social value of GOOS, and of an enhanced ocean observational data and improved data exchange and delivery infrastructure. It recommended that GOOS should work with existing operators of observing networks and modelling centres to strengthen this infrastructure and standardize procedures, as well as to greatly enhance the involvement of end users in the process. The joint IOC/WMO Committee for IGOSS and the WMO CMM were requested to consider taking actions along these lines.

48 In the context of existing products and services, the Committee noted with interest a presentation by Prof. Y. Tourre (IGOSS Scientific Advisor) on the Electronic IGOSS Products Bulletin (E-IPB). This bulletin provides on-line access to a range of operational ocean products and data, sponsored by various centres, through a single web site (http://rainbow.ldeo.columbia.edu/igoss/productsbulletin/). All products are in standard format, but may be downloaded and re-processed in various ways. They are updated monthly and key features of oceanic behaviour are highlighted.

49 The Committee expressed its appreciation and congratulations to Dr. Tourre and to IGOSS for this valuable resource, which it strongly endorsed as a very tangible contribution to GOOS, which should be used as much as possible to promote GOOS, not just among oceanographers but in the wider potential user community. Steps need to be taken to get the E-IPB accepted as a contribution to GOOS. In this context it recommended that a demonstration of the capabilities and potential of operational oceanography, based on the E-IPB and possibly other facilities, should be prepared for presentation to the Conference of the Parties to the FCCC, Kyoto, Japan, in late 1997. Efforts should be made to widen the user base away from the scientific community.

50 The Committee further noted the need to expand the interpretation of existing science products in terms of user-related products, and recognised the existence of web sites maintained by other operational ocean programmes and groups, such as the DBCP (http://dbcp.nos.noaa.gov/), which also provided on-line access to real-time data and products.

51 The Committee reiterated the importance to GOOS of existing systems and bodies managing the collection, exchange and delivery of operational ocean data and products, such as CMM, IGOSS and the DBCP. At the same time it recognised the importance of better coordinating and consolidating these disparate activities, to assist the development and implementation of GOOS in a coherent and cost-effective way. In this context it noted with interest the proposal which had been presented by the President of CMM to the WMO Executive Council in 1996, concerning a possible co-sponsorship of CMM by the IOC. Following agreements by the Executive Councils of both WMO and IOC that the issue should be studied in more depth, a preliminary report on closer cooperation in the work of CMM was presented to the 12th session of CMM (Havana, March 1997). The CMM recognised the potential value of such closer cooperation, at the same time noting that many difficult issues remained to be addressed. It therefore recommended that a detailed study of the question should be made, with a view to presenting a full proposal for consideration by the governing bodies of WMO and IOC in 1998. This recommendation was subsequently approved by the WMO Executive Council.

52 The Committee strongly endorsed the conclusions and recommendations made by CMM on this subject and recommended that the forthcoming IOC Assembly should also endorse the continuation of the study, to result in a single consolidated report to both IOC and WMO in 1998.

53 The Committee noted that data and information within an end-to-end system leading to services and products lay at the heart of GOOS. Members noted that to further the development of GOOS data and information management it had been agreed by I-GOOS and J-GOOS that GOOS representatives should participate with GCOS

and GTOS in a joint Data and Information Management Panel (J-DIMP) with the object of producing a data and information management plan capitalising on the GCOS Data and Information Management Plan. They endorsed the notion that J-DIMP provide a forum for discussion between GOOS, IODE and IGOSS on the way forward in data and information management in support of GOOS. To make progress in implementing phase 3 of GOOS (integration with existing systems), the Committee considered it was timely for the managers of GOOS, IGOSS, IODE, CMM and other global data and information generating and management systems to come together to decide how to take this phase forward. They recommended that the Chairmen of IGOSS and IODE be invited to the first meeting of the GOOS Steering Committee to make progress in discussions on how to make the best use in GOOS of the existing structures and elements of IGOSS and IODE for the collection, management, archiving and dissemination of data and information, and for the design and delivery of services and products based on those data.

6. THE INTEGRATED GLOBAL STRATEGY: REVIEW OF THE GOOS SPONSORS PROPOSALS AND CONSEQUENT RECOMMENDED STRUCTURAL CHANGES IN GOOS GOVERNING BODIES

54 The Committee expressed strong support for the restructuring proposed by the GOOS sponsors and the SSC-III to bring GOOS more in line with the other G3OS bodies (Doc. IOC-WMO-UNEP/I-GOOS-III/19). The Committee reviewed the proposal for restructuring and the terms of reference of the proposed GOOS Steering Committee (GSC) and agreed it should take responsibility for GOOS planning and provide oversight for the implementation process. It noted with approval that the GSC should be composed of scientists from academia and government laboratories as well as people from operational agencies, the increasing number of the latter being needed as GOOS moves into the implementation phase. It noted that J-GOOS IV has approved the restructuring. It decided not to be specific about the composition of the GOOS Steering Committee (GSC) but to allow it to develop its composition to meet its terms of reference. A minor change was made to one of the terms of reference, which were then accepted.

55 The Meeting approved Resolution I-GOOS-III.4, including the Terms of Reference contained in its Annex.

7. PREPARATION OF HIGH LEVEL MEETING FOR 1998

56 The initial proposal for a high level meeting with governments and agencies to obtain commitments to GOOS implementation was first made by I-GOOS-II. At SSC-III it was recommended that such a meeting take place in 1998 in conjunction with the International Year of the Ocean, and that the three key planning documents (GOOS Principles, GOOS Strategic Plan, and The GOOS 1998) be developed forthwith to be available at that meeting. The committee was invited to consider this proposal and to:

1. decide on the establishment of an implementation group dedicated to the preparation of such a meeting;
2. formulate recommendations to the sponsoring agencies about convening such a meeting, and consider the financial implications; and
3. approve preparation of a brochure.

57 This matter was considered by the sessional working group chaired by Dr.McEwan. The working group considered that the ultimate objective of the meeting was to obtain the greatest possible international interest in and commitment to GOOS, by adopting two main goals which could be achieved by informing countries on the anticipated user benefits; the concept, principles and structure of GOOS; and the nature and specifics of commitments to participate. The two goals are:

1. to obtain commitment to the concept and principles of GOOS from governments;
2. to obtain the commitment of national agencies to GOOS through their designating specified national resources and efforts as being components of GOOS.

58 The working group considered that the most appropriate outcome at the governmental level might be the signing of a Memorandum of Understanding relating to the GOOS Concept and Principles. Agencies may find it difficult to make nationally binding commitments to GOOS, yet may be favourably disposed towards GOOS. Their

participation may take many forms, including the contribution of observational elements (eg sea-level observations), and pilot programmes (eg NEAR-GOOS, GODAE). It might be effective to solicit agency commitments to objectives related to GOOS-outcomes (eg establishment of a Pacific array for seasonal forecasting).

59 Many agencies may find benefits in identifying components of their existing programs and activities as contributions to GOOS. Such contributions would assist in the incremental development of GOOS, and should be encouraged. Agencies should also be encouraged to offer appropriate pre-existing national activities as part of the commitment process. It was important to stress that GOOS was not a competitor with existing systems but should be designed to take advantage of them.

60 The working group recommended that the meeting be titled the First GOOS Agreements Meeting, recognizing that not all states would sign up initially. It also recommended that an Organizing Committee was needed quickly to address:

* Access to national networks;
* Resources (a serious short term requirement)($150,000 might be required);
* Documentation (eg packaging the present documentation in a simpler form);
* Length, Timing, Venue etc.

61 The Committee welcomed the report of the working group, and agreed with the strategy of allowing commitments in form of existing national programmes as long as the programmes complied with the GOOS principles, and with a MOU as one possible outcome. The committee noted that key decisions that would have to be made early on by the organizing committee would be how to handle invitations, how and whom to approach for addition resources, the construction of an attractive brochure, and synchronisation with the 1998 International Year of the Ocean. The committee agreed with the recommendation that there should be a First GOOS Agreements Meeting in 1998. A key component to obtain commitments would be the timely production of the document "The GOOS 1998" to provide a basis upon which governments could commit. There would need to be a dialogue between the organizing committee and governments in order to make them aware of the need to commit and to assist them in identifying their commitments. This could also help to preserve funding of important GOOS-related programmes in danger of being cut. In any case the commitment of governments to the principles and objectives of GOOS would provide a framework in which national GOOS representatives could work to obtain the required resources. The meeting noted again that the 1998 International Year of the Ocean will provide an excellent backdrop for this effort by increasing public awareness of the oceans in general and GOOS in particular. GOOS would have to be presented in terms of policy making so that the governments can relate to it. This would need to be done through demonstrations of GOOS results. GOOS would have to be presented as developing by an incremental approach and not as a costly top down global initiative.

62 It was agreed that the Organizing Committee would have to produce a detailed and costed plan. Presentations to accompany the meeting should include concrete results of ocean observing, and might well include the Electronic IGOSS Products Bulletin, and information about ENSO prediction. The Organizing Committee should be chaired by an I-GOOS Officer, and the GPO Director should be a member of it.

63 Venues for the high level meeting were discussed. Holding the meeting in conjunction with another meeting could make it easier to attract key decision makers and reduce costs. On the other hand it could overshadow the GOOS meeting and reduce its impact. If the Agreements Meeting were tied to another meeting, that meeting would have to be at an equal level.

64 The Meeting approved Recommendation I-GOOS-III.4 to take this matter forward.

8. CAPACITY BUILDING

8.1 CAPACITY BUILDING

65 Dr. J.Stel (Holland), Chairman of the ad hoc panel on GOOS Capacity Building, introduced this topic (Doc. IOC-WMO-UNEP/I-GOOS-III/15), reviewing the ongoing and planned activities of the panel, in particular the outcomes of the regional workshops recommended by I-GOOS-II. The committee was invited to formulate recommendations on the development of GOOS capacity building and its relation to the TEMA activities of IOC,

WMO, and UNEP. Dr. Stel reported on the results of the sessional Working Group on Capacity Building, which he chaired.

66 Dr Stel explained that the basic objective for the workshops is to discuss regional settings, scientific plans, capacity building, organization and financing for projects or initiatives to be collectively put in place. The Goa Workshop (November 1996) had focussed on awareness building and priority setting, whereas the Mombasa Workshop (March 1997) had focussed on planning a five-year marine scientific Plan with emphasis on the Coastal Zone. The Committee expressed its appreciation for the results obtained in the two regional Capacity Building Workshops.

67 The Working Group also discussed plans for future workshops in Malta, Brazil, South Pacific and possibly the Caribbean, and endorsed the need for expert missions to assess the needs in those various regions.

68 With respect to regional capacity building initiatives, it was noted that countries like Brazil and Chile, with long coast lines spanning different climatic zones may also be considered as having special needs. There was a clear need to involve the IOC and other sponsors regional organizations in promoting capacity building.

69 The outcome of the TEMA Group of Experts meeting (May 1997) was also reviewed by the Group and the TEMA Framework Plan for utilisation in GOOS Capacity Building was commended. It was recommended that the IOC's TEMA group and budget should be more involved in GOOS Capacity Building.

70 Capacity building activities within the WMO marine programme, and the CMM Working Group on Education and Training, and also considered to be complementary to GOOS capacity building. We should therefore try to extract the benefits of synergy from these parallel systems. The President of CMM suggested that the Chairman of the CMM Working Group on Education and Training be kept informed on GOOS capacity building activities and where appropriate be invited to participate in parts of the planning and field work.

71 Turning to the IYO, Dr. J. Stel told the Committee about progress towards publishing a special issue of Marine Policy on Capacity building in a Changing Global Setting, which had been endorsed by IOC. Preparations are on schedule, and most proposed authors had agreed to participate. The release of this publication is expected by early 1998 during the IYO. He also introduced to the Committee the concept of OCEANS 98, which is promoting educational awareness during the IYO. During the Committee's discussion on the IYO it was agreed that efforts needed to be made to gain GOOS a high profile during the IYO, and Recommendation I-GOOS-III.7 was adopted.

72 The Committee recognized that due to the changing approach in capacity building, in which the role of the IOC's TEMA and regional bodies will be strengthened, the terms of reference for the *ad hoc* Capacity Building Panel should be revised for approval by the Committee. The revised Terms of Reference, which were approved by the committee are presented in Annex IX.

73 The Committee adopted Recommendation I-GOOS-III.5 regarding the way in which capacity building should be taken forward.

8.2 COST BENEFIT ANALYSIS

74 Because it is widely believed to be necessary to carry out cost-benefit analyses in order to identify the advantages of investing in GOOS, the committee was invited to review progress in evaluating the socio-economic benefits of GOOS as recommended by I-GOOS-II (Resolution I-GOOS-II.1) and further elaborated by the Second Planning Session of I-GOOS.

75 Socio-economic (cost-benefit) analysis was considered by a sessional working group chaired by Dr. N. Flemming (UK). It was agreed that cost-benefit analysis should be used as a tool in the development of GOOS capacity building, especially in some developing countries where the complete user community is yet to be identified. However, cost-benefit analysis has a more global dimension than capacity building.

76 It was agreed that cost-benefit analysis is important for the development of robust and credible methods for estimating the value of marine services and industries, as well as the socio-economic benefits of GOOS. There was particular reference to climate forecasts and services in the Coastal Zone. The Working Group noted initiatives taken by the Inter-American Institute and by EuroGOOS to conduct cost-benefit analysis in the Americas, Europe and the Mediterranean.

77 A task-force to promote a series of studies and workshops on cost-benefit analysis was recommended by the Working Group. The Task Force will draw its membership from attendance at the sessional working group chaired by Dr. Nic Flemming (UK) on Costs and Benefits. Attendees included: Brazil, Canada, Chile, China, Japan, Netherlands, Norway, Russian Federation, Spain, UK, USA, EuroGOOS, IOC/TEMA, CCOP/SOPAC. These people/organizations/Member States may be prepared to be members of the Cost-Benefit Task Force. There was a need in addition to involve UNESCO's social scientists in this exercise, and the GPO was asked to arrange this.

78 The committee approved Recommendation I-GOOS-III.6 as a means of taking forward the work on cost-benefit analysis.

9. PLAN OF ACTION FOR 1997-1999

79 The Director of the GPO introduced this agenda item in referring to the GOOS Draft Work Plan and Budget for 1998-1999 (Doc. IOC-WMO-UNEO/IGOOS-III/9)) and restricting himself to the part entitled "GOOS Activities". He explained that the figures in the work plan were those considered to be necessary to develop GOOS during the next two years along the lines recommended by J-GOOS and I-GOOS. Whereas a budget of some $1.5million was identified to meet these objectives, only about $0.75million was likely to be available from IOC Regular Programme funds, ICSU, WMO and UNEP, leaving a shortfall of some $0.75million which would have to be found through external means (eg by donations to the IOC's GOOS Trust Fund).

80 The Director drew the attention of the committee to the fact that up until now, and despite Member States evident interest in GOOS (which had been described by a previous IOC Assembly as the jewel in the crown of IOC) there had been very few donations to IOC by Member States of Trust Funds earmarked for GOOS activities. Bearing this in mind the Director suggested three courses of action:

1. for Member States to re-appraise their entire portfolio of IOC Trust Fund allocations with the objective of achieving a balance of investment across IOC including GOOS. He recognized that this would lead to some current IOC programmes getting less, and GOOS getting more (as opposed to practically nothing at present) but felt that now that GOOS is speeding up and being implemented at long last, Member States need to recognize that this new and higher level of activity must be resourced;

2. for the GPO to prioritise the budget items in consultation with the Chairmen of J-GOOS and I-GOOS;

3. for the GPO to develop proposals for funding those high priority items which represented new as opposed to ongoing high priority activities, and for these proposals to be presented for consideration for funding by single Member States or small groups of Member States, or sponsors, or other appropriate bodies;

81 The Director noted that attempts were being made to keep costs down by keeping the growing number of committees small through combining forces with GCOS and GTOS, but that nevertheless with the arrival of CEOS and the IGOS concept, which GOOS had to exploit, there was a much increased demand on staff time to service these various panels. In this context two things were vital:

1. that Member States continue to second staff to the GPO (as has the USA, France, Japan, and Brazil recently);

2. that the present level of expertise in the GPO does not diminish (which means recruiting a GOOS/GLOSS expert to replace Dr. Tolkatchev, and ensuring the continuance of contracts for Dr. Withrow to carry forward the GOOS data and information management and space plan initiatives).

82 The Committee considered it was not in a position to proceed with prioritization and agreed with the Director's suggestion that this be done by the GPO with appropriate consultation. It suggested that some 20% of the expenditure anticipated on meetings could be saved if Member States would agree to fund the participation of their experts in such meetings, and if Member States offered to host meetings. It also agreed that attempts should be made to increase the amount of GOOS-earmarked funding made available by Member States to the IOC Trust Fund. It further agreed that all present staffing levels should not be diminished in the GPO. An initial prioritization of the budget by GPO staff, also taking into account the request by members for a 20% cut in meeting costs, led to a revised total requirement of $1.0 million for the biennium, some $400k of which would have to come from external sources via the GOOS Trust Fund.

83 The Committee considered, as an example of a proposal for funding specific items, a detailed proposal to develop a GOOS Data and Information Management Service (DIMS), and to solicit voluntary contributions from Member States to fund it. It expressed agreement with this way of presenting such proposals, and made suggestions to improve this particular proposal.

84 The Director pointed to a particular problem in funding capacity building. The IOC TEMA programme receives funds to undertake TEMA activities, which are geared to capacity building. GOOS has a capacity building panel. The two operations had not been linked, and thus there had been no investment from the IOC's TEMA programme in GOOS capacity building. He suggested that a reasonable proportion of the IOC's TEMA programme budget should in future be devoted to GOOS capacity building, since GOOS was a programme of global scale in which there was an evident need for TEMA activities. The Committee agreed that TEMA funds should contribute to GOOS Capacity Building. The point was made that GOOS should exploit the IYO to push implementation through capacity building.

85 Recommendation I-GOOS-III.8 was adopted.

10. ELECTION OF CHAIRMAN AND VICE CHAIRMEN

86 Dr. Angus McEwan (Australia) was elected unanimously as Chairman, and Drs. Francois Gérard (France) and Vladimir Ryabinin (Russian Federation) as Vice-Chairmen. Dr. Michel Glass, the out-going Chairman was warmly thanked by the Committee for his long and valuable service to GOOS.

11. NEXT SESSION OF THE I-GOOS

87 The next session of I-GOOS will take place in Paris immediately before the IOC Assembly in 1999.

12. ADOPTION OF THE REPORT

88 The Committee adopted the Executive Summary and Recommendations and Resolutions.

13. CLOSURE OF THE SESSION

The session closed at 17:30 hours on Friday June 27th.

ANNEX I

AGENDA

1. OPENING

2. IOC-WMO-UNEP-ICSU CONFERENCE ON ACHIEVEMENTS AND OUTLOOK OF THE GLOBAL OBSERVING SYSTEM - FIRST GOOS FORUM

3. ADMINISTRATIVE ARRANGEMENTS

3.1 ADOPTION OF THE AGENDA
3.2 DESIGNATION OF A RAPPORTEUR
3.3 CONDUCT OF THE SESSION

4. REPORT BY I-GOOS CHAIRMAN, J-GOOS CHAIRMAN AND DIRECTOR OF GOOS SUPPORT OFFICE ON INTERSESSIONAL ACTIVITIES

5. CURRENT PERSPECTIVE OF GOOS

5.1 GOOS PRINCIPLES
5.2 GOOS STRATEGIC PLAN
5.3 PRIORITIES FOR ACTION
5.4 MODULE DEVELOPMENT

5.4.1 Coastal Module
5.4.2 Living Marine Resources (LMR) Module
5.4.3 Health of the Oceans (HOTO) Module
5.4.4 Climate Module
5.4.5 Services Module

5.5 OCEANOGRAPHIC AND MARINE METEOROLOGICAL SERVICES

6. THE INTEGRATED GLOBAL STRATEGY: REVIEW OF THE GOOS SPONSORS PROPOSALS AND CONSEQUENT RECOMMENDED STRUCTURAL CHANGES IN GOOS GOVERNING BODIES

7. PREPARATION OF HIGH LEVEL MEETING FOR 1998

8. CAPACITY BUILDING

8.1 CAPACITY BUILDING PANEL
8.2 COST BENEFIT ANALYSIS

9. PLAN OF ACTION FOR 1997-1999

10. ELECTION OF CHAIRMAN AND VICE-CHAIRMEN

11. NEXT SESSION OF THE I-GOOS

12. ADOPTION OF THE REPORT

13. CLOSURE OF THE SESSION

ANNEX II

RESOLUTIONS/RECOMMENDATIONS

A. RESOLUTIONS

Resolution I-GOOS-III.1
GOOS PRINCIPLES

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

Having reviewed the document IOC-WMO-UNEP/I-GOOS-III/11 "The Principles for a Global Ocean Observing System (GOOS)" presented by the Vice Chairman of GOOS,

Recognising that this set of principles will serve as a initial set of basic rules for the design and implementation of the system by agencies, governments and others, thereby providing coherence to the programme,

Noting that a first draft was developed at the 3rd session of the Strategy Sub-Committee, and further revised and approved in principle by J-GOOS-IV,

Emphasizing that it is essential that the Principles be published prior to the proposed First GOOS Agreements meeting in 1998,

Endorses the Principles as attached in the Annex;

Invites the GOOS scientific and technical bodies to apply these principles in designing and planning GOOS;

Invites participating countries, operational agencies and others to follow the principles in implementing GOOS; and

Requests the Director of the GOOS Project Office to publish the Principles and distribute them widely.

Resolution I-GOOS-III. 2
GOOS STRATEGIC PLAN

Having reviewed the draft GOOS Strategic Plan (Document IOC-WMO-UNEP/I-GOOS-III/12) presented by the Director of the GOOS Project Office,

Observing that minor revisions need to be made, and that this document is consistent with the companion document, GOOS 1998,

Emphasizing that because implementation is now taking place it is essential that the Strategic Plan be published this year to provide much needed guidance to designers and implementers of Pilot Projects and other manifestations of GOOS,

Emphasizing that the Plan must be published soon so as to be widely circulated and absorbed before the proposed Agreements meeting in 1998,

Recognising that as GOOS evolves so must the Strategic Plan, and that therefore what is published now will be Version 1.0,

Invites Member States to provide their suggestions for improvements to the document to the Director of the GOOS Project Office by the end of July 1997, and asks that he forms a small editorial group to finalise the document by September 1997;

Charges an Executive Group comprising the Chairman and Vice Chairmen to act on the behalf of I-GOOS to approve

the final draft for publication;

Agrees that the Strategic Plan Version 1.0 be published and distributed widely before the end of 1997; and recognised as a policy document for ongoing GOOS development;

Invites GOOS scientific and technical bodies to apply the Strategic Plan in designing and planning the elements of GOOS; and

Invites Member States, operational agencies and others to apply the Plan in implementing GOOS.

Resolution I-GOOS-III. 3
GOOS 1998

Having considered the outline of "GOOS 1998", formerly titled "The Realization of GOOS: Priorities for Action" (Document IOC-WMO-UNEP/I-GOOS/13),

Recognising that this document, requested by J-GOOS-III, will be in agreement with, and provide the technical details required to implement, the GOOS Principles and the Strategic Plan, and that the implementation details will be up-dated through regular consultation,

Noting that at J-GOOS IV it was agreed that the document would be completed in early 1998 for review by the wider community including the operational agencies,

Invites GOOS scientific and technical bodies, participating countries, and operational agencies to contribute fully to the revision process in completing the document, with a view to facilitating use of the document in the implementation of GOOS;

Requests that a final draft be ready for the first meeting of the GOOS Steering Committee in April 1998, with a view to printing in May 1998 and distribution prior to the First Agreements Meeting in summer 1998.

Resolution I-GOOS-III. 4
GOOS RESTRUCTURING

Recognising that GOOS is moving from the planning phase to the implementation phase and that there is therefore a need to change the structure and make up of its managing bodies to meet the new demands being placed on it,

Noting the proposal by the Sponsors Group for the G3OS for a harmonization of G3OS structures, and by the Strategy Sub-Committee (SSC-III) for a restructuring of GOOS to bring it in more in line with the structures of the other G3OSs (GCOS and GTOS),

Edorses the proposal for the merging of J-GOOS and the Strategy Sub-committee of I-GOOS to form a GOOS Steering Committee which will provide I-GOOS with a mechanism for the inter-sessional planning, implementing and monitoring of GOOS;

Notes that J-GOOS-IV accepted this proposal;

Endorses the terms of reference for the GOOS Steering Committee as proposed by the Sponsors (listed as an Annex to this recommendation)

B. RECOMMENDATIONS

Recommendation I-GOOS-III.1
SUPPORT OF NEW REGIONAL GOOS INITIATIVES

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

Noting that the implementation of GOOS can often be more effectively established through the cooperation of regional Member States, where common needs can be addressed and observing systems coordinated more effectivel,

Noting that NEAR-GOOS began its implementation phase in October 1996,

Agreeing that the establishment of GOOS should be encouraged at the regional level,

Observing that efforts to create regional initiatives are moving quickly in EuroGOOS, that regional initiatives are currently being developed in S.E.Asia, and that there is scope for the development of GOOS projects in the near future in the Caribbean, the South Pacific (SOPAC), the Indian Ocean, and around Latin America and Africa,

Recommends the development of regional initiatives and projects consistent with the Principles and Strategic Plan of GOOS, so as to advance the implementation of an operational GOOS;

Invites Member States to take actions to prepare such projects wherever possible;

Charges the Secretariats of the sponsoring organizations, and regional organizations, to work with Member States to promote development and implementation of regional GOOS initiatives, building on existing systems and conventions where possible.

Recommendation I-GOOS-III. 2
MODULE PLANNING

Noting the major potential role of GOOS in supporting the management of coastal areas,

Noting the importance of living marine resources for human well-being,

Having heard the report of the Chairman of J-GOOS,

Recognizing the importance of developing implementation plans for the coastal and living marine resources modules,

Supports the arguments for establishing specialized design panels in those two fields;

Requests the Member States to provide the means to enable those panels to function so that plans like the existing HOTO plan can be produced in the next 2 year period;

Recommends that the planners take account of existing regional systems, and aim to devise systems that will produce products and services;

Observes that the coastal module should develop where possible in concert with GTOS, and that in due course a joint GOOS-GTOS planning group for the coastal zone might be appropriate.

Recommendation I-GOOS-III. 3
GLOBAL DATA ASSIMILATION EXPERIMENT

Considering that there is a demand for the implementation of operational forecasting systems for the ocean,

Recognizing that it is necessary to prepare such systems through experimental research, which will involve the development and enhancement of observing systems, numerical modelling, and data management frameworks,

Supports the concept proposed by the OOPC of a Global Ocean Data Assimilation Experiment;

Encourages Member States to participate in the planning for and support of this experiment as part of their contribution to the development of GOOS;

Requests the planners to build as much as possible of the experiment from existing observational systems.

Recommendation I-GOOS-III. 4
FIRST GOOS AGREEMENTS MEETING 1998

Noting recommendations of the I-GOOS-II, I-GOOS-SSC-III and of the GOOS Sponsoring Agencies that a high-level GOOS meeting should be convened to encourage interest and obtain commitment to GOOS by governments,

Recommends that a First GOOS Agreements meeting be convened in conjunction with the International year of the Ocean and held in the summer of 1998;

Recommends that the objectives of the meeting should be to:

() obtain agreement from governments to the concepts and principles of GOOS as defined in the planning documents;
(ii) Obtain commitments from national agencies to contribute to the implementation of GOOS;

Recommends that an Organising Committee chaired by an I-GOOS Officer be established to plan the meeting;

Requests the Director of the GOOS Project Office, in conjunction with the Organising Committee (of which he should be a Vice-Chairman), to prepare the agenda, time-table and venue for the meeting, and make the practical arrangements for it;

Invites the governing bodies of the GOOS sponsoring agencies to provide necessary financial support for the meeting, and to assist in finding external resources;

Recommends that the organising committee direct particular attention to the preparation of appropriate briefing and publicity material for the meeting, including a new explanatory brochure and necessary details of potential contributions to implementation.

Recommendation I-GOOS-III. 5
GOOS CAPACITY BUILDING

Recognizing the need to encourage participation in GOOS by the largest possible number and widest possible range of Member States,

Accepting that in the initial stages it would be desirable to promote GOOS through Capacity Building Workshops, while aiming to provide more direct and practical forms of assistance to developing Member States,

Noting the success of the Capacity Building Workshops in Goa in late 1996 and Mombasa in early 1997, and also noting that at the I-GOOS-PS-II/3 in May 1996 in Washington DC, the execution of a series of capacity building workshops was endorsed,

Recalling that Malta had offered to host the Mediterranean workshop, and Brazil had offered to host the Latin American one,

Noting the high interest in GOOS expressed by the South Pacific region at the 1996 SOPAC meeting as well as the similar support expressed at the 1996 WESTPAC meeting,

Observing that the experience of the GOOS Capacity Building team had led to recommendations to the TEMA Group of Experts for a more focused approach to TEMA by IOC,
Recommends that a very high priority be given to implement the workshops at Malta (November 1997), in the southern Pacific (early 1998), IOCARIBE (1998) and South America (1998). Also recommended that expert

missions are performed when necessary and that the capacity building role of IOC's regional bodies should be strengthened.

Recommendation I-GOOS-III. 6
COSTS AND BENEFITS OF GOOS

Recognizing that to obtain funds for programs like GOOS it is important to establish robust and credible estimates of the costs and benefits of the system and its components;

Noting that the NOAA-IOC workshop on costs and benefits held in Washington in May 1996 and the report of I-GOOS-PS-II accepted the recommendations that there should be a program to determine the costs and benefits of GOOS in three regions:

- South-east Africa,
- the Mediterranean (including North Africa), and
- Latin America;

Noting the linkage between analysis of costs and benefits and support for capacity building,

Observing that EuroGOOS is supporting GOOS activities in the Mediterranean and will participate in the Mediterranean workshop in Nov - 1997 (see DR 5),

Noting that the Inter-American Institute is initiating a program to study climate change and its socio-economic impacts on the coastal zone,

Recognizing that experience exists in several Member States for the economic analysis of marine industries and services, climate forecast applications, and market and non-market benefits of coastal resources,

Recommends that a series of workshops, studies and surveys be conducted as soon as possible, in association with Capacity Building activities where appropriate, and that funds be solicited for this work;

Recommends that a small Task Force be established to promote and plan these studies, solicit funds, ensure that the work is carried out, and report on progress to the GOOS Steering Committee;

Welcomes the agreement in principle that Member States represented in the sessional Working Group on Costs and Benefits will form the initial membership of the Task Force, and that the Chairman of the Task Force shall be selected from this group in consultation with the Director of the GPO.

Recommendation I-GOOS-III. 7
INTERNATIONAL YEAR OF THE OCEAN

Noting that 1998 has been declared the International Year of the Ocean,

Recognising the stimulating role of the IOC-endorsed OCEANS 98 project, and noting the opportunities offered by its educational activities,

Noting that these stimuli will lead to a promotion of all marine activities,

Noting also that the importance of the ocean environment to our daily lives can be demonstrated best through the application of ocean science and knowledge in the form of forecasts and services,

Requests IOC and the other sponsoring organisations to give a high profile to operational oceanography in general, and GOOS in particular in all major IYO events;

Requires the Director of the GOOS Project Office to represent GOOS in the preparation of submission for the IYO, and to create an inter-sessional working group to help prepare GOOS presentations.

Recommendation I-GOOS-III. 8
GOOS PLAN OF ACTION FOR 1998-99

Having considered the draft plan of action for the 1998-99 biennium presented by the Director of the GOOS Project Office (Document IOC-WMO-UNEP/I-GOOS-III/9),

Invites the Governing bodies of the GOOS Sponsoring Agencies to note the proposed plan and consider means for providing the financial support required for the implementation of the proposed activities,

Urges Member States to provide earmarked contributions to the GOOS Trust Fund to ensure the implementation of the proposed actions;

Urges Member States to second appropriate staff members to the GOOS Support Office to assist in the implementation of the proposed actions.

Annex to Resolution I-GOOS-III. 2

A - THE GOOS PRINCIPLES

1. DESIGN PRINCIPLES

D1. GOOS is based on a plan designed to meet defined objectives on the basis of user needs.

D2. The design assumes that contributions to GOOS are long term.

D3. The design will be reviewed regularly.

D4. The design allows for flexibility of technique.

D5. GOOS is directed towards global problems and/or those ubiquitous problems benefiting from global observing systems.

D6. The design covers the range from data capture to end products and services.

D7. The management, processing and distribution of data will follow a specified data policy.

D8. The design takes into account the existence of systems outside GOOS that can contribute to and/or benefit from GOOS.

D9. The design takes into account quality assurance procedures.

2. PRINCIPLES OF INVOLVEMENT

P1. Contributions to GOOS will be compliant with plans developed and agreed on the basis of the above design principles.

P2. Contributions will be compliant with a defined GOOS data policy.

P3. Contributions should reflect an intent for sustained observations.

P4. Standards of quality will apply to GOOS contributions.

P5. Implementation will be effected using existing national and international systems and organisations where

appropriate.

P6. Implementation will be incremental and progressive, whilst bearing in mind the long term goals.

P7. Participation in GOOS implies an undertaking to help less-developed countries to participate and benefit.

P8. Participants will have full autonomy in the management of their contributions to GOOS.

P9. Contributing nations and organisations will reserve the right to determine and limit their contributions to GOOS.

P10. Use of the GOOS 'label' implies conformity with the relevant principles of GOOS.

B - EXPLANATIONS OF THE GOOS DESIGN PRINCIPLES

Principle D1. GOOS is based on a plan designed to meet defined objectives on the basis of user needs.

This principle states foremost that GOOS from its conception, is a planned system for the acquisition and value-added application of a specific subset of observations gathered according to a designed strategy. It is not an opportunistic assembly of whatever ocean observations are offered for contribution by participating countries. The plan will therefore state (or at least outline) the observations that are required for each particular objective, and should where possible define how they would be applied to the needs of users. Applications should include the 'public good' where there is a defined socio-economic basis. Observations that qualify for inclusion as contributions to GOOS will, by definition, be of a kind and quality applicable to the defined objectives and end-use.

Principle D2. The design assumes that contributions to GOOS are long term.

GOOS is founded on the concept of an observing system that is ongoing or of an indefinite lifetime, in the same sense as the system of global meteorological observations. Although it will inevitably include observations gathered and sponsored for a limited duration and for differing purposes, the design will assume that such observations will be selected and contributed as part of a continuum that assembles to create a long-term, systematically structured and quality-controlled dataset.

Principle D3. The design will be reviewed regularly.

GOOS will evolve as plans consolidate, alliances form, commitments are made, needs become better defined and prioritised and technology improves. In addition, an essential element of the observing system must be the continual evaluation of the system design through the analysis of its products. Thus, to ensure that implementation proceeds continuously and effectively, the system design will require frequent review and adaptation.

Principle D4. The design allows for flexibility of technique.

GOOS is aimed at the assembly of a data set of specific oceanic variables. Depending on the capability of the participating observing agencies and the advance of technology, the method of observation of these variables will differ. The design should not unnecessarily restrict the technique used for observation provided its standard is adequate for the purpose.

Principle D5 GOOS is directed towards global problems and/or those ubiquitous problems benefiting from global observing systems.

Among the range of needs for systematic observation of the marine environment on all scales, there is a subset of needs that can be most effectively addressed through cooperation within GOOS. Some depend on a scheme of related observations; such as are required for the changing climate of the large-scale ocean or for a pollutant stressing the capacity of large parts of the ocean. Others are generic, common or dependent and can be facilitated and in some cases only made possible by a globally coordinated or globally designed and facilitated system of observations. Even needs that are dependent only on local observations, as is the case for many coastal applications, may benefit greatly from data products that are generated as part of a globally coordinated system. The thrust of the GOOS design should be to service this subset of needs without prejudice to existing systems operating outside of the GOOS framework.

Principle D6. The design covers the range from data capture to end products and services.

The end-to-end concept implies a known or definable pathway of connections between a basic observational element and the end use or purpose to which the observation (or information derived from it) is applied. Typically, each type of ocean observation has a range of potential applications, and most applications have the need for more than one observation type. In designing a system to serve a given range of end-uses, it is important to know how the observation would be used, processed and combined with other observations to deliver an observational 'product' of value to the end user. The GOOS design must therefore be concerned not only with how observations should be made but the steps and operational and scientific products (eg technology and models) required for their end use.

Principle D7. The management, processing and distribution of data will follow a specified data policy.

In concert with the policies of IODE, IGOSS and GCOS, and following the data management plan for the World Weather Watch of the WMO, commitment is required by GOOS participants to establishing, maintaining, validating, making accessible, and distributing high quality, long term data meeting internationally agreed standards. Preservation of GOOS data is required in suitable archives following appropriate procedures and criteria for data acquisition and retention, and should include information about data holdings. Data should be processed to a level which is generally suitable for the generation of operational products and for research, and described in internationally accessible on-line computerised directories that can also be made available by other means. GOOS contributors are responsible for full, open and timely sharing and exchange of GOOS-relevant data and products for non-commercial activities. Exchange implies that donation by individual nations gains access to data from others as well as to products derived using all available data, such that the benefit of cooperation exceeds the cost.

Principle D8. The design takes into account the existence of systems outside GOOS that can contribute to and/or benefit from GOOS.

A cornerstone of GOOS development is that it will be built to the greatest extent upon existing systems of observation and data management, national, regional and global This requirement is vitally important for the most effective use of global resources. By the same token, these systems have their own defined purposes and goals outside GOOS and these goals cannot necessarily be deflected to the delivery of GOOS. GOOS must therefore be designed to 'co-exist' and interact cooperatively and to mutual benefit with the other systems. As a particular example, to the present time, most interior ocean physical observations have been made through individual research projects or in connection with global research programs like TOGA and WOCE. These provide valuable data sets to GOOS and could in turn benefit from GOOS observations, although in many respects they are inappropriate for incorporation into a GOOS implementation framework. Systems like IGOSS, GLOSS and IODE are presently structured as central points for the management of specific data types collected by national agencies for reasons that will often be outside the scope of GOOS. Their operations could be adapted and/or expanded to the management of a subset of data that contributes to GOOS.Principle

Principle D9. The design takes into account quality assurance procedures.

The incorporation of quality assurance (qa) procedures as an integral part of the GOOS plan represents a departure from the practice of existing observing systems, which in some cases apply qa processes but not as part of the observation design and acceptance strategy. Without quality assurance procedures, the great promise of global data sets to address specified problems will certainly not be met. Several of the principles stated above, for example D2, D3 and D4, address the need for strong oversight of the observing system and its continued review with an eye to assessing and improving its effectiveness. Quality assurance is a fundamental part of that effort.

C - EXPLANATIONS OF THE GOOS PRINCIPLES OF INVOLVEMENT

In order to assist nations and national agencies to decide whether they are willing and able to participate in the implementation of GOOS, there needs to be a set of principles that define the nature of participation, in terms of the 'requirements' of GOOS as conceived and consistent with the foregoing Design Principles.

Principle P1. Contributions to GOOS will be compliant with plans developed and agreed on the basis of the above design principles.

Consistent with Principle D1, GOOS is designed and implemented according to a plan or series of plans. There will be a great deal of latitude in the way nations participate in GOOS. However, it is very important for the coherence and orderly development of GOOS as well as the optimisation of cooperation between countries and the delivery of benefits, that all contributions are made with the clear intent to comply as closely as possible with these plans.

Principle P2. Contributions will be compliant with a defined GOOS data policy.

Principle D7 indicates that data policies will be defined for GOOS. The success of GOOS depends critically upon the implementation of these policies. It is therefore necessary that compliance with these policies is a prerequisite to effective participation, recognising that the benefits of GOOS will flow primarily from the reciprocal exchange of data and products between countries.

Principle P3: Contributions should reflect an intent for sustained observations.

Nations contributing to GOOS will be understandably reluctant to make an open-ended commitment to GOOS. However, it needs to be recognised that the benefits of GOOS, and indeed the whole concept, depend upon the collation of data sets that are continuous and sustained. Thus, this principle requires affirmation of an intention that, subject to changing circumstances, observations submitted as part of GOOS will be sustained.

Principle P4: Standards of quality will apply to GOOS contributions.

Participants should be aware that GOOS will not be a repository of any data that might be contributed to it. GOOS data will be subject to quality testing to ensure its capacity to meet GOOS requirements. Contributors will be encouraged to apply the agreed quality assurance procedures.

Principle P5. Implementation will be effected using existing national and international systems and organisations where appropriate.

There are a number of international organizations and agencies responsible for the coordination of ocean data collection and its storage. It has been accepted from the start of GOOS that for reasons of efficiency, such bodies, which include IGOSS, DBCP, GLOSS and the IODE, will be used whenever possible to implement GOOS. At the same time it is recognised that these bodies exist to serve purposes outside of GOOS. Therefore GOOS will not substitute for them or subsume their function. The principle implies the effective use of existing systems, and that the proliferation of new systems and organisations to serve GOOS alone will not be encouraged. At national level observation systems exist primarily to serve defined national objectives. In many cases these systems could be expanded or adapted to meet GOOS requirements. The principle therefore encourages nations and agencies to facilitate their participation in GOOS through these systems, rather than requiring the creation of new systems.

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Principle P6 Implementation will be incremental and progressive, whilst bearing in mind the long term goals.

The implementation of GOOS will occur gradually as nations and agencies decide to submit part of their existing ocean observing effort and put in place new systems as contributions to GOOS networks. It will take time for regional alliances to take shape and new resources to be committed for GOOS as the benefits become apparent. Also, GOOS will evolve as techniques and technologies change and its scope extends, and it is realistic to expect that full implementation will take many years. This principle makes it clear that participation should not be inhibited by the lack of implementation of the complete observing system, and that incremental contributions are effective additions to the whole.

Principle P7 Participation in GOOS implies an undertaking to help less-developed countries to participate and benefit.

Consistent with the global nature of GOOS and its purpose to serve all humankind there is an obligation to enable all nations to participate in and benefit from GOOS. Without external assistance and cooperation, few countries are well-equipped to establish observing systems to meet the requirements of GOOS or to derive full benefit from the enhanced knowledge and the management tools that GOOS will create. Therefore the undertaking to assist these countries where possible to become capable and effective partners in GOOS is incorporated as a core principle of GOOS participation.

Principle P8 Participants will have full autonomy in the management of their contributions to GOOS.

GOOS will be implemented be nations and their agencies. While GOOS is planned and coordinated internationally, it is recognised that the way in which observations are gathered, resourced and managed differs widely between nations and agencies. This principle is an assurance that GOOS has no role in these internal processes, and its influence will be confined to the encouragement of adherence to the quality assurances protocols, data exchange policy, etc according to the other GOOS Principles.

Principle P9: Contributing nations and organisations will reserve the right to determine and limit their contributions to GOOS.

As a corollary to Principles P6 and P8, this principle affirms that, although the success of GOOS will depend on long-term and indefinitely sustained observations, nations must always retain full control of the resources and contributions they make to GOOS.

Principle P10: Use of the GOOS 'label' implies conformity with the relevant principles of GOOS.

The GOOS acronym is already in widespread use and, in the absence of overarching GOOS plans and principles, has become associated with a variety of national and international activities. Some of these lack any effective association with the intended global system. This principle indicates the intention to ensure the quality and dependability of GOOS programs and the consistency and coherence of GOOS development by requiring all activities using the GOOS 'label' to comply with the fore-stated GOOS Principles.

Annex to Resolution I-GOOS-III. 4

TERMS OF REFERENCE OF THE GOOS STEERING COMMITTEE

1.1 The GOOS Steering Committee shall:

(a) be responsible for all the scientific and technical aspects of GOOS design, and undertake appropriate activities to support the design process;

(b) coordinate and take responsibility for GOOS planning and provide oversight of the implementation process, on the basis of the scientific and technical design, and of intergovernmental requirements and resources as expressed through I-GOOS;

(c) provide guidance to the Director of the GOOS Secretariat in the duties to be performed by the GOOS Secretariat staff;

(d) submit reports to the sponsoring organisations and to I-GOOS at appropriate times.

1.2 Specifically, the GOOS Steering Committee will:

(a) establish subordinate bodies, as appropriate, with as far as possible the chairs being selected from among the membership of the GOOS Steering Committee;

(b) identify observational requirements ("user needs") and products in co-operation with I-GOOS; define design objectives; and recommend co-ordinated actions by the sponsoring organisations and other relevant organisations and agencies;

(c) advise the Intergovernmental Committee for GOOS (I-GOOS) on all scientific and technical aspects of GOOS as well as on resource requirements, and take into account the proposals of I-GOOS in this regard;

(d) collaborate with the steering committees of the other global observing systems (GCOS and GTOS) and with other appropriate bodies;

(e) review and assess the progressive development and implementation of the components of GOOS;

(f) identify and encourage research efforts, in close co-operation with the on-going research programmes (such as IGBP and WCRP) in order to promote studies of importance for the development of GOOS;

(g) encourage the development of new technologies needed for GOOS.

ANNEX III

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A. I-GOOS-III

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ANNEX IV

LIST OF DOCUMENTS[1]

Document Code	Title	Item	Language
WORKING DOCUMENTS			
IOC-WMO-UNEP/I-GOOS- III/1 prov.	Provisional Agenda	3.1	E F S R
IOC-WMO-UNEP/I-GOOS-III/1 Add. prov.	Provisional Timetable	3.3	E only
IOC-WMO-UNEP/I-GOOS-III/2	Annotated Provisional Agenda	3.1	E F S R
IOC-WMO-UNEP/I-GOOS-III/3 prov.	Summary Report of the Session (to be prepared during the Session)	14	E only
IOC-WMO-UNEP/I-GOOS- III/4 prov.	Provisional List of Documents (this Document)	3.3	E only
IOC-WMO-UNEP/I-GOOS-III/5 prov.	Provisional List of Participants	-	E only
IOC-WMO-UNEP/I-GOOS-III/6	Report of the Chairman I-GOOS	4	E only
IOC-WMO-UNEP/I-GOOS-III/7	Report of the Chairman J-GOOS	4	E only
IOC-WMO-UNEP/I-GOOS-III/8	Report of the Director of GOOS SO	4	E only
IOC-WMO-UNEP/I-GOOS-III/9	Draft Plan of action for 1997-1999	11	E only
IOC-WMO-UNEP/I-GOOS-III/10	Progress Report on the existing Ocean Observing and Data Management Systems	5	E only
IOC-WMO-UNEP/I-GOOS-III/11	Draft GOOS Principles	5.1	E only
IOC-WMO-UNEP/I-GOOS-III/12	Draft GOOS Strategic Plan	5.2	E only
IOC-WMO-UNEP/I-GOOS-III/13	Realization of GOOS: Priorities for Action	5.3	E only
IOC-WMO-UNEP/I-GOOS-III/14	GOOS high level meeting 1998: proposal	7	E only
IOC-WMO-UNEP/I-GOOS-III/15	GOOS Capacity Building	8.1	E only
IOC-WMO-UNEP/I-GOOS-III/16 (G 3OS/SG.1/2)	Report of the Sponsors Group for the Global Observing Systems (GCOS, GOOS and GTOS)	6	E only
IOC-WMO-UNEP/I-GOOS-III/17	Terms of reference for G3OS Joint Panels (Space Panel, Data and Inf. Panel)	6	E only
IOC-WMO-UNEP/I-GOOS-III/18	GOOS National Activities	-	E only

[1] This list is for reference only. No stock of these documents are maintained, except for the Executive Summary Report.

IOC-WMO-UNEP/I-GOOS-III/19	GOOS Structural Re-Organization	6	E only
IOC-WMO-UNEP/I-GOOS-III/20	GOOS Progress Report	5	E only
IOC-WMO-UNEP/I-GOOS-III/21	Report of the *Ad hoc* Working Group on Marine Meteorological and Oceanographic Services	5.5	E only
IOC-WMO-UNEP/I-GOOS-III/22	Action Sheet on I-GOOS-SSC-III decisions	11	E only
IOC-WMO-UNEP/I-GOOS-III/23	Action Sheet on I-GOOS-PS-II decisions	11	E only
IOC-WMO-UNEP/I-GOOS-III/24	Provisional Programme of the First GOOS Forum	2	E only

INFORMATION AND REFERENCE DOCUMENTS

IOC-WMO-UNEP/IGOOS-III/3	Report of the Second Planning Session of I-GOOS Washington DC, USA, 16-17 May 1996	-	E only
GOOS/SSC-III/3	Report of the Third Session of the Strategy Sub-Committee of I-GOOS Geneva, 27-29 January 1997	-	E only
	Report of the IOCINDIO Regional Workshop on Capacity Building for GOOS Goa, India, 18-19 November 1996	-	E only
IOC-WMO-ICSU/J-GOOS-IV/3	Report of the Fourth Session of the Joint Scientific and Technical Committee for GOOS Miami, USA, 23-25 April 1994	-	E only
GCOS-GOOS-WCRP/OOPC-II/3	Report of the Second Session of the Ocean Observations Panel for Climate (OOPC) Cape Town, South Africa, 11-13 February 1997	-	E only
IOC/WESTPAC-NEAR-GOOS-CC-II	Report of the Second Meeting of the Coordinating Committee for the North-East Asian Regional GOOS (NearGOOS) Bangkok, Thailand, 14-16 May 1997	-	E only
IOC/INF-1044	A Strategic Plan for the Assessment and Prediction of the Health of the Ocean: A Module of the Global Ocean Observing System (1996)	-	E only
IOC/GE-GLOSS-V/3	Report of the Fifth Session of the IOC Group of Experts on GLOSS Pasadena, USA, 19-21 March 1997	-	E only
IOC/INF-	GCRMN Strategic Plan	-	E only
IOC/I-GOOS-III/Inf.1	Joint IGOSS/IODE Data Management Strategy	-	E only

	NOAA-IOC Workshop on Socio-Economic Aspects of the Global Ocean Observing System: Assessing Benefits and Costs of the Climate and Coastal Modules Bethesda, Maryland, May 15, 1996	-	E only
IOC/INF-	Status Report on Existing Ocean Elements and Related Systems, 1996	-	E only
	Report of the Coastal Module Workshop Miami, 24-28 February 1997	-	E only
	Report of the International Conference "*In situ* Observations for the Global Observing Systems" Geneva, 10-13 September 1996	-	E only
EG 96.43.15.1.97	EuroGOOS Annual Report 1995-1996	-	E only
	EuroGOOS Brochure	-	E only
	EuroGOOS Strategic Plan	-	E only
	EuroGOOS Implementation Plan	-	E only

ANNEX V

NATIONAL REPORTS

AUSTRALIAN PLANNING TOWARDS GOOS

Planning of Australia's participation in GOOS is occurring through the Australian GCOS/GOOS Joint Working Group, which comprises senior representatives from a range of relevant disciplines and organizations, supported by two Expert Sub-Groups. A GOOS Expert Sub-Group provides scientific oversight for the development of an Australian contribution to GOOS, as well as advice on implementation. The other Sub-Group addresses the Global Climate Observing System. At the beginning 1996 a GCOS/GOOS Secretariat was established within the Australian Bureau of Meteorology to support the work of the Joint Working Group and Expert Sub-Groups.

COMPONENTS OF AN AUSTRALIAN OCEAN OBSERVING SYSTEM

The needs of Australia and the existing and potential users of an Australian regional observing system provide the principal motivation for the design strategy of the Australian contribution to GOOS and drive, albeit indirectly, its implementation. A significant difference from international planning is the extension of the coastal zone module to include the in-shore environment (estuaries, mangroves, dune systems etc.) and its restriction to within a few kilometres of the coast.

The domain of interest which have been considered by the GOOS Expert Sub-Group are given in the table below. The climate initiatives (1 and 2) are being developed either by individual agencies or within climate change and/or oceans policies. A Coastal Monitoring System being developed as part of the Commonwealth Coastal Policy is being used as the framework for developing 5 and 8 and parts of 4 and 7 (see Coastal Zone below). Existing systems, principally within the Bureau of Meteorology, will be used to develop 3. Data management is being developed under the guidance of the Commonwealth Spatial Data Committee and specialist task groups. A new National Oceans Policy currently being developed will, it is hoped, facilitate the development of the other elements. Remote sensing will form a very important component of the observing system for most of the elements.

Table: Elements of an Australian contribution to GOOS

Component	Issues
1. Short-range climate prediction	Effects on Australian climate of variability in the Pacific Ocean (ENSO) and variability in the Indian Ocean
2. Climate monitoring and climate change detection	A high quality sea-level network, Routine monitoring with hydrographic sections, water mass formation
3. Regional oceanography and marine services	SST, wind stress and surface heat and freshwater flux Sea state analyses and forecasts, surface currents Physical effects on coastlines, sand transport, sedimentation, etc
4. Biogeochemical fluxes and forcing	$_pCO_2$, nutrients -principally on land-sea boundary
5. Habitats and communities in coastal waters	Ecosystems, Biodiversity The Great Barrier Reef
6. Open ocean pelagic ecosystems	Habitats. Population and community monitoring
7. Fisheries recruitment	Stock assessment
8. Monitoring contaminants and pollutants	Algal toxins. Herbicides and pesticides
9. Data management	Data acquisition, quality control and distribution. Product and service management, Archiving
10.Emerging technologies	Floats, altimetry, ocean colour, autonomous biological/chemical sensors

CLIMATE MONITORING AND PREDICTION

Climate research and an operational need for a permanent ocean monitoring system (mainly for observing and predicting Australian climate variability associated with the El Ñiño phenomenon) have guided the development of the plan for the climate component thus far. Australia's contribution will include monitoring of the upper layers of the tropical and subtropical oceans, selected sea-level sites, production of various SST and surface flux products (as well as contributions to the associated data sets) and operational ocean analysis and climate prediction models.

For the ship-of-opportunity programme (SOOP), an agreement has been reached between the CSIRO and the Bureau of Meteorology to transfer the low-density expendable bathythermograph (XBT) lines operated by Australia from a research to an operational system run and funded by the Bureau. The Bureau of Meteorology has implemented an operational El Ñiño prediction model (Kleeman, 1995) which in part depends on the SOOP data.

THE COASTAL ZONE

In 1994, the Commonwealth Government developed and released the Commonwealth Coastal Policy which included, among other things, an initiative to establish a Coastal Monitoring System. The System will be based on a continental-scale monitoring network and a complementary local monitoring programme. The announcement of this Policy effectively defined the path toward implementation of parts of the coastal zone component of Australia's contribution to GOOS. The Policy has made possible a start toward implementation of significant monitoring elements, principally with regard to the health and evolution of the coastal zone and its ecosystems, and provides the basis for a general regional network consistent with the aims of GOOS.

The Coastal (Zone) Monitoring System will have three major elements: a national directory of monitoring programmes and a user needs analysis; a coastal monitoring network; and a local community based programme. The national directory of monitoring programmes, in the form of a computer metadatabase, aims to improve the access of resource managers to the data they need and contribute to the development of integrated coastal monitoring programmes. The aims of the coastal monitoring network are to monitor the impacts of human activities within particular coastal regions, provide long-term baseline data to meet policy, management and environmental reporting needs and to develop functional models for co-ordinating, aggregating and integrating coastal monitoring at various scales. A small pilot network of monitoring sites is being established as an initial step, with two sites having been established to date, and a third expected to commence soon.

REGIONAL OCEANOGRAPHY AND MARINE SERVICES

An ocean analysis system, known as Oceans-EEZ is being developed by the CSIRO Division of Marine Research. It will combine ocean data, including satellite atlimetry, surface observations from drifting buoys and ships, and temperature profiles from XBTs, with computer modelling to provide a comprehensive description of the entire EEZ, predicting ocean currents, temperatures, salinities and sea-level. Initial work will concentrate on two regions: the Tasman Sea, providing a greater understanding of the East Australian Current; and the Indian Ocean between Australia's north-west and Indonesia, investigating the influence of sea surface temperatures on rainfall variations across Southern Australia. It expected that this system will be put into operational use in collaboration with the Bureau of Meteorology. It will make a contribution to the operational services module of GOOS, providing services to ocean engineering, environmental management, fisheries management, marine emergencies, shipping and defence. It will also provide data for climate monitoring and prediction.

STATE OF ENVIRONMENT REPORTING SYSTEM

The development of a national state of the environment reporting system to support Australia's National Strategy for Ecologically Sustainable Development also presents opportunities for implementing some GOOS components. Draft key indicators for reporting on estuaries and sea have been classified into seven groups: habitat extent; habitat quality; renewable products (living resources); non-renewable products (minerals etc.); water and sediment quality (nutrients, turbidity); integrated management (e.g. tourism, beach stabilisation); and ecosystem level processes (sea-level and SST). It is clear that there is considerable overlap between these and the GOOS elements identified above, and this development is also being closely monitored by the GOOS Expert Sub-Group.

FUTURE DIRECTIONS

The Commonwealth Government is currently developing a National Oceans Policy, which will incorporate a Marine Science and Technology Plan. The major focus of the policy will be the conservation and sustainable development of Australia's ocean resources, particularly within its EEZ. Issues such as marine pollution and living marine resources are obvious candidates for attention by the policy, and monitoring of the physical environment and the ocean's role in climate change (in so far as it is relevant to Australia) have also been flagged as likely components. As such, the policy and plan is expected to provide a vehicle for the implementation of many of the non-coastal zone components of the Australian GOOS contribution.

It is intended to consolidate the current draft Australian GOOS scientific plan with priorities identified in other relevant plans, such as those for the state of the environment reporting system noted earlier, to produce a short document promoting an Australian Ocean Observing System as an element of the Marine Science and Technology Plan. This system will integrate and build on existing elements such as those described earlier. If implemented, it will form the basis of Australia's contribution to GOOS. The document is expected to be complete by August 1997 and will also provide a basis for Australia's response at the planned GOOS Commitments Meeting.

BRAZIL

1. The Interministerial commission for the resources of the sea (CIRM) approved on April 30th, 1997, the Brazilian pilot programme for GOOS; it defines our intentions in relation to GOOS; the buoys national programme (PNBOIAS) is an integrated and inseparable part of it;

2. Provision of about US$200,000 (two hundred thousand American dollars) for PNBOIAS, to acquire and launch fixed buoys and drifters;

3. A new implementation plan will re-structure the Brazilian GLOSS programme, comprising maintenance of our tidal network, with nine tidal stations (three on oceanic islands, three in the southeast-southern part of Brazil, two on the east coast and one in the North region); and

4. Designation of a Brazilian scientific researcher, Miss Janice Romaguera Trotte, to the GOOS Project Office, where she will be working as an associated expert for two years, with her expenses paid by the Brazilian government.

CANADA

Since I-GOOS-II, a number of developments have taken place that should in the future enhance Canada's ability to make a significant contribution to GOOS when it enters a period of implementation. Determination of the exact form of any Canadian contribution to GOOS awaits future international planning leading to a more complete design of GOOS, especially of the Living Marine Resource, Health of the Ocean and Coastal modules. It will also depend on how well Canadian monitoring programmes now being put in place conform with the requirements of the global programme and on the resources available for new commitments during a period of financial restraint.

At the time of I-GOOS-II, it was reported that an ad hoc GCOS Task Group under the chairmanship of Mr. Geoff Holland had essentially completed its preparation of a report outlining the contributions that Canada might make to GCOS and the economic and social benefits of doing so. This report was subsequently submitted to, and approved by, both the Canadian Climate Board and the Canadian Global Change Program Board. The report has been published and is available on request. It still provides the basis for consideration of contributions to the common ocean climate module of GOOS and GCOS. Of the proposed contributions about half were recommended for the ocean component of GCOS.

In late 1995, a permanent GCOS Committee was formed, also under the chairmanship of Mr. Geoff Holland, and responsible to the two Boards. It s membership includes representatives from government departments that might make contributions to GCOS and/or receive its benefits as well as from related agencies and organizations with environmental concerns. The Committee has met twice and is organizing its work so as to be an effective advocate for GCOS, including its ocean component.

Recognizing the importance of operational oceanography and of obtaining long-term systematic observations of the marine environment on the Canadian continental shelves as well as of the adjacent off-shore regions, plans are being made to establish ocean monitoring programs on both the east and west coasts. These will be built on existing observational systems, some designed to monitor living resources and others to support research. While obtaining environmental data in support of assessing the health of Canadian fisheries and for their management will be a strong consideration in designing the monitoring network, a wide variety of environmental concerns, similar to those leading to the objectives of GOOS, will influence the final network. It is to be expected that as GOOS requirements are better defined in the coastal regions, it will be found that elements of the Canadian coastal observing systems will be natural contributions to global GOOS. A willingness exists in Canada to make Canadian observing systems compatible with the needs of GOOS, GTOS and GCOS where that is feasible.

An example of the utility of operational oceanographic modelling has been provided by Kieth Thompson and his colleagues at Dalhousie University. Using tide gauge observations and predicted winds, an operational model for the continental shelf off Nova Scotia is being run routinely for the purpose of providing surface current predictions which are available on a web home page. While this activity was initiated for the purpose of providing surface currents in the event of oil spills or accidents at sea, the results are useful for a variety of marine problems. (NOTE THIS REALLY NEEDS TO BE CHECKED FOR ACCURACY BY KIETH)

Lastly, Canada continues to support global research programs of the IOC and IGBP, such as WOCE, JGOFS, GLOBEC, CLIVAR, etc.. These programmes form the present and future scientific basis for the design of GOOS. Canada also supports the operational programmes of the IOC, for example by operating the data centre for the GTSPP and drifters within the IODE structure, and recognizes the need for the IOC to have sufficient resources to support its operational programmes on behalf of GOOS and the broad interests of international oceanography.

CHINA

The GOOS programme is one of the most important programmes undertaken by the world ocean community today. Its successful implementation will definitely play an important role in ocean science research, protection and exploitation of marine living resources, marine environmental protection, study and prediction of global climate change, natural disaster reduction and sustainable development of marine economy.

The Chinese government fully recognizes the importance of GOOS and is willing to work with all participating nations for a successful implementation of the programme.

The following are some of the work China has done over the past few years:

1. In accordance with the spirit of UNCED Agenda 21 and China Agenda 21, the Chinese government has prepared its Ocean Agenda 21, which clearly states that a well-structured, sophisticatedly-equipped, multi-functional, three-dimensional observing system be established in China and the GOOS system in China be closely linked with the international GOOS;

2. As one of the sponsors of NEAR-GOOS, China has been actively promoting the implementation of the NEAR-GOOS programme. So far, a delayed-mode data base has been set up in the National Oceanographic Data Centre of the State Oceanic Administration (SOA) and some historical data from coastal stations and Nansen stations have been put into the data base on a trial basis. Efforts are being made to set up a real-time data base at the National Marine Environmental Forecasting Centre of SOA. The real time data base is expected to be operational soon;

3. In order to expedite the development of marine observing system, China has recently prepared a Master Plan for the Development of Coastal Stations, a Master Plan for the development of Marine Environmental Forecasting Services. Emphasis has been paid to the upgrading of instruments for coastal stations and technical innovation has been underway on hardwares and softwares for data buoys;

4. China has been providing monthly averaged water level data to the Sea-Level Centre in Hawaii;

5. The Ships of Opportunity Programme is experiencing difficulties in China and the fleet involved in the programme is shrinking. In order to provide more data to GOOS, China is now conducting a survey on the status and problems of the fleet. Corrective measures will be developed to strengthen the Ship of Opportunity Programme;

6. Monitoring of marine ecological system is a weak link in China's marine monitoring. Therefore, study is being conducted on the establishment of China's marine ecological monitoring network.

COLOMBIA

I. INTRODUCTION

This executive report was prepared by the Colombian Commission of Oceanography (CCO), acting as National Coordinator for the GOOS National Technical Committee, on the basis of data provided by institutions which are members of the Committee which aims at informing the First GOOS Forum (Paris, 25-27 June 1997) on the activities carried out in Colombia in relation to GOOS.

II. BACKGROUND

As a follow-up of the Consejo Nacional de Oceanografía statement regarding the Advisory Technical National Committees for the Commission - based on the IOC Assembly agreements, the Comisión Colombiana de Oceanografía established in 1995 a Technical National Committee for the Observation of the Ocean - GOOSCOL. On the national scale, this Committee follows the GOOS objectives, and according to its institutional possibilities, helps support the global system. At present, the Committee is constituted by the following institutions:

- Dirección General Marítima - DIMAR
- Centro de Control de Contaminación del Pacífico - (Center for pollution control in the Pacific (CCCP)
- Centro de Investigaciones Oceanográficas e Hidrográficas - CIOH (Oceanographic and Hydrographic Research Center)
- Instituto de Investigaciones Marinas - INVEMAR (Institute of Marine Research)
- Instituto de Meteorología y Estudios Ambientales - IDEAM (Institute of Meteorology and Environment Studies)
- Instituto Nacional de Pesca y Acuicultura - INPA (National Institute for Fisheries and Aquaculture)
- Facultad de Biología Marina, Universidad Jorge Tadeo Lozano (Faculty of Marine Biology)
- Departamento de Biología Marina, Universidad del Valle (Department of Marine Biology, University "del Valle")
- Instituto Nacional Geologíco Minero - INGEOMINAS (National Geological Institute of Mines).

III. ACTIVITIES

National capacities and kind of information produced for the GOOS (GOOSCOL)

According to information available, at present, the participation of Colombia in GOOS is the following:

A. Comisión Colombiana de Oceanografía (CCO): National system of marine information - INFOMAR;

B. Instituto Nacional Geológico Minero (INGEOMINAS) - (Ref. our correspondence No. 1645 of July 1996):

- Measure and provision of information on physico-chemical oceanographic parameters.
- Nutrients (phosphorus and nitrogen) - Determination by visible spectrophotometer and infrared;
- Dissolved oxygen (modified Winklen);
- Total petroleum hydrocarbons, light and polycyclic aliphatics (high resolution liquid gas chromatography);
- ST: salinity gas temperatures through thermogas.
- Transport of sediments.
- Heavy metals by atomic absorption. Generation of hydrocarbons and plasma.
- Coastal geology.

C. Centro de Investigaciones Oceanográficas e Hidrográficas - CIOH
(Re. our correspondence No. 589 DCIOH, July 1996).

- Oceanographic and hydrographic information through INTERNET;
- Research on aromatic hydrocarbons;
- Marine meteorology.

D. Fisheries and Aquiculture National Institute - INPA
(Re. our correspondence No. 2672 of 7 July 1996)

- Provision of information on small pelagic organisms.

E. Institute of Hydrology, Meteorology and Environmental Studies - IDEAM
(Correspondence No. 11-130, 13 August 199)

The Institute is able to transmit information in real-time on the following topics:

- Sea-level (coastal measures *in situ*);
- Sea-surface temperature (coastal measures and by AVHHR, infrared band);
- Marine Meteorology (from coastal station);
- Real-time communications through the WMO global system of telecommunications.

F. Institute of Marine Research - INVEMAR
(Our correspondence No. DGI/SIM/OPM Santa Marta, 13 Feb. 1997).

- (Global System of Marine Environment Information), under preparation.

G. Centro de Control de Contaminación del Pacífico - CCCP
(Ref. correspondence 578, 6 September 1996).

- Hydrobiological information (processed on Compaq Presario CDS 724 PC and package QPRO and STST, and Compaq Presario 425 PC through SEASOFT Software).
- Biological information. Information on abundance of species diversity through QPRO and STRAGRAPHICS packages, and distribution graphs, and abundance according to depths.
- Information on chlorophyll "A".

The record of oceanographic cruises in the Colombian Pacific between 1990 and 1996 is attached, following information provided by the Centro de Control de Contaminación del Pacífico.

GERMANY

1. ORGANIZATIONAL STRUCTURE

National responsibility for the Global Ocean Observing System (GOOS) rests with the Federal Ministry for Transport (BMV). The Bundesamt für Seeschiffahrt und Hydrographie - BSH (Federal Maritime and Hydrographic Agency) in Hamburg has been charged with the Secretariat for GOOS related matters. Germany's principle position will be defined by BMV in consultation with other Ministries concerned.

2. ACTIVITIES SINCE I-GOOS-II

Rostock Workshop

In April 1996, a Workshop took place in Rostock with the objective to start the dialogue between academic oceanographic institutions, federal and state agencies involved in marine affairs, and Germany's marine technological industry aiming at the design of the concept of a German contribution to GOOS.

The Workshop concluded

(i) that German as a highly developed country must take responsibility in monitoring the global ocean;
(ii) that the ocean is an important component in the climate system;
(iii) that the ocean, as a transport medium, has an outstanding importance for Germany's economy;
(iv) that the protection of human being against the sea, the protection of the marine environment, and a sustainable exploitation of marine resources in a responsible manner need the actual knowledge about the prevailing ocean conditions and their future changes;
(v) that the German GOOS participation shall focus on the North Atlantic Ocean and adjacent Seas, particularly the Northsea and the Baltic Sea;
(vi) as there is an intensive participation of Germany in the regional conventions on preventing marine pollution and in biological survey programmes of the International Council for the Exploration of the Sea (ICES), no additional monitoring activities can be expected from Germany in this respect, for the coming foreseeable years. However, the German data collected in these programmes will be made available for GOOS purposes, if required.

The proceedings of the Rostock Workshop are published in the series "Berichte des Bundesamtes für Seeschiffahrt und Hydrographie, No.9" (Reports of the BSH).

Seminar on GOOS Technology

As a follow-up of the Workshop in Rostock a Symposium took place in November 1996 which specifically looked into technological aspects of GOOS. The Seminar which was organized by the German Society for Marine Technology (GMT) dealt with technological requirements in marine research and operational oceanography. National and European programmes for sponsoring marine technological development and the role of SMEs in that process were discussed.

The Seminar established four working groups to deal with technological aspects of the GOOS Modules for Climate, for Living Resources, for Monitoring the Coastal Zones and Health of the Ocean, and for Operational Services. The groups work under the following generic terms of reference:

(i) to assess the scientific goals of the various GOOS Modules and to identify existing technological deficits;
(ii) to develop the basis for technological innovations in operational oceanography;
(iii) to assess the national and, where possible, the international requirements for new technology;
(iv) to stimulate integrated project proposals for the development or innovative marine technology.

2. DEFINITION OF THE GERMAN PARTICIPATION IN GOOS

The BSH has started to define the German operational contribution to GOOS. The plan is to have the German programme plan ready by the end of 1997, so that Germany will be in a position to offer a nationally co-ordinated and agreed contribution at the "Heads of Agency Meeting" in 1998.

3. EUROGOOS

The BSH is the German Member of EuroGOOS. Its main interest lies in the test cases for the Baltic Sea and the Northwest European Shelf, and in the development of technology for GOOS.

4. GENERAL

Germany is interested in an accelerated planning and implementation process of GOOS which requires a re-organization of the existing GOOS structures and a more effective integration of the ixisting operational maritime meteorological and oceanographic programmes.

INDIA

(Prepared by Mr. B.N. Krishnamurthy, Director,
Dept. of Ocean Development, Government of India)

1. INTRODUCTION

India has presented national reports on GOOS related activities during the Sessions I and II of I-GOOS. These reports describe in detail the operational and research programmes in oceanography with a key role played by the Department of Ocean Development and implemented collectively by various national laboratories, like the National Institute of Oceanography, the National Institute of Ocean Technology and other institutes/organizations under CSIR, Dept. of Space, Indian Council for Agricultural Research , Department of Science & Technology, etc. and with two ships: the Oceanographic ResearchVessel Sagar Kanya and the Fisheries Ocean Research Vessel Sagar Sampada. They are briefly recapitulated as follows:

- **Marine Satellite Information Service (MARSIS)** is under implementation since 1991 and data products such as sea-surface temperature, potential fishing zone forecast, mapping of coral reefs and mangroves, shore-line changes, etc. have been generated and disseminated to end users.

- **Sea-Level Monitoring and Modelling (SELMAM)** is under implementation since 1992 and modern tide-gauges at 8 selected locations in the Indian coast have been established and fine scale mapping of a segment of the Indian coast prepared.

- **Coastal Ocean Monitoring and Prediction System (COMAPS)** is going on since 1990 and the health of coastal waters is monitored.

- **Joint Global Ocean Flux Studies (JGOFS India)** is going on since 1993 and the studies in the Arabian Sea are completed.

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

- **Drifting Buoy Programme** for collection of *in-situ*, real-time data on sea-surface temperature and wind pressure for validating data derived from satellite is continuing.

- **Survey of Living Resources** to collect oceanographic data and relate it to the abundance and dynamics of living resources is continuing.

- **Under the TOGA programme,** XBT observations in the seas around India were carried out using ships-of-opportunity in the Madras-Andaman and Calcutta-Andaman routes to study the thermal structures of the equatorial Indian Ocean.

- **RNODC** at NIO/Goa is in operation.

New Programmes proposed for Implementation

During the next five years, the following projects relating to GOOS would be implemented.

2. OCEAN OBSERVATION AND INFORMATION SERVICE (OOIS)

In addition to the implementation of the basic research programmes, India launched several national programmes as described in the introductory part of this report. The objectives of the programmes were primarily to identify and provide information to coastal fishermen community, ports and coastal industries, coastal zone management authorities, etc. These programmes have received positive response from the user community. In order to boost the ocean services further, the Department of Ocean Development has formulated an integrated programme: "Ocean Observation and Information Service (OOIS)" for implementation through 1997-2002 coinciding with India's IX Five Year Plan. The OOIS consists of four major components, viz:

(i) Ocean Information Services (OIS)
(ii) Ocean Observation Systems
(iii) Satellite Oceanography and
(iv) Ocean Dynamics and Modelling.

All these would be implemented utilizing the expertise at national institutes, the leading one being the National Institute of Oceanography, Goa.

2.1 OCEAN OBSERVATION SYSTEMS (OOS)

This programme is primarily designed for generation of oceanographic and meteorological data from the seas around India. The OOS envisages deployment of moored data buoys, drifting buoys; current meter array-moorings, XBT/SCTD at selected tracks with a view to generate *in situ* data with reasonably good spatial and temporal coverage. One of the major components already launched under the scheme is the National Met-Ocean Data Buoy. The National Met-Ocean Data Buoy system envisages to acquire long-term data on surface meteorological and oceanographic parameters from the coastal and deep waters of the Arabian Sea; Bay of Bengal and Indian Ocean, with a view to improve short and long-term weather forecast and for application in the developmental activities in coastal and ocean sectors.

A set of twelve (12) moored met-ocean data buoys would be deployed in the seas around India. Eight will be moored in the coastal waters and four in the off-shore waters. All the buoys will be equipped with the state-of-the art sensors for the measurement of various meteorological and oceanographic parameters viz. wind, atmospheric temperature, atmospheric pressure, waves; sea-surface temperature, salinity and currents. In addition, the 4 buoys to be deployed near four major ports of India would be equipped with water quality sensors to measure chlorophyll, radioactivity, turbidity, hydrocarbons, nutrient and dissolved oxygen. The project is proposed to be implemented over a period of 3 years, by 1999, and would continue in operation further onwards.

2.2 OCEAN MODELLING AND DYNAMIC (OMD)

In order to exploit the ocean resources in a sustainable way and make use of the benefits/costs effectively, it is important to understand the dynamics of the oceanographic and meteorological processes of the northern Indian Ocean. Although the general large scale oceanographic processes in the northern Indian Ocean are well known, the seasonal and inter-annual variations in particular to climate change are relatively less understood, partly due to paucity of data. Knowledge on dynamic processes of ocean is an essential prerequisite for prediction of ocean state which can be accomplished through generation of wide-range of ocean models. Further, the fundamental requirements for ocean state forecast are time-series oceanographic observations and numerical large-scale ocean models. The data generated under OOS would be utilized for the ocean modelling as complementary to Data Buoy programme and used for developing ocean state forecast and other models. The programme is also to develop Basin Scale dynamical and biological coupled model (OGCM), Air-Sea-Land interaction and coupled models, intermediate coupled models, coastal circulation model. These models are expected to forecast currents, monthly and mean temperature, salinity and tidal circulation in the short-term and inter-annual and decadal variability in the long run.

2.3 R & D SATELLITE OCEANOGRAPHY

The programme is designed to develop regional algorithms for retrieval of oceanic data from satellite sensors, and simulation models to undertake data assimilation studies. It also includes campaigns to validate the satellite sensors and also to define further satellite sensor requirements.

In addition to this, the implementation of the programmes relating to International Biosphere-Geosphere Programme (IGBP), such Joint Global Ocean Flux Study (JGOFS-India), Land-Ocean Interaction in the Coastal Zone (LOICZ) will be also continued. The Indian component of JGOFS was launched in 1993, to assess the carbon flux in the Arabian Sea and to determine whether the Arabian Sea acts as a source or sink for atmospheric carbon-di-oxide through bio-geo-chemical studies.

2.4 OCEAN INFORMATION SERVICES

It is a service-oriented programme aimed at generating and disseminating ocean data products on operational basis. A separate and dedicated centre called the Indian National Centre for Ocean Information Service (INCOIS) would be established at Hyderabad in Central India. It will be and operational centre equipped with computing facilities and supporting infrastructure and human resources for generating and marketing user-oriented coastal and ocean data products like sea-surface temperature, potential fishing zone information, coastal maps on coral reefs, mangroves, wetlands, shallow bathymetry maps, oceanic eddies and upwellings, wave heights and directional spectrum, surface winds, ship routings, etc. The Centre will work in close lines with National Institute of Oceanography, National Institute of Ocean Technology, National Data Buoy Centre and other leading institutions of India. INCOIS will continuously interact with user organizations like fisheries, ports, meteorology, coastal industries, coastal zone authorities, etc. for improving the format and specifications of data products. INCOIS would also issue experimental Ocean State Forecast on the lines of atmospheric weather bulletins for the benefit of agencies involved in fishing, navigation, offshore works, ports, etc, advance warming, search and rescue operations. The forecast is to aim at predictions 3 to 5 days in advance covering ocean state like waves, winds, surface currents, eddies, SST, etc.

3. INTEGRATED COASTAL AND MARINE AREA MANAGEMENT (ICMAM)

The Agenda 21 adopted in UNCED (1992) emphasizes the need to adopt the concept of Integrated Coastal Marine Area Management (ICMAM) for sustainable utilization of coastal and marine resources and prevention of degradation of marine environment. This is best achieved through integration of activities prevalent in the land, coastal and marine areas. The Department of Ocean Development is the Nodal Department in Government of India, to oversee the implementation of Chapter 17 of Agenda 21 dealing with oceans, seas, semi-enclosed water bodies and estuaries.

A number of coastal establishments like ports, harbours and activities like waste disposal prevalent in the coastal areas have impact in local and neighbouring areas. The data collected under the COMAPS Programme and information from other sources indicate degradation of coastal and marine environment in a few areas and beginning of same at a number of other locations. These locations include certain critical habitats. In order to prevent further degradation of coastal and marine environment and habitats, India has proposed to introduce the concept of ICMAM. The Department of Ocean Development and the Ministry of Environment & Forests (MEF) have been considering the development of a suitable notification like Ocean Regulation Zone (ORZ) wherein a provision to give a legal framework to adopt the concept ICMAM is proposed to be incorporated.

From 1997 onwards, the DOD is planning to undertake infrastructural development and capacity building activities. The proposed aspects will focus on development of expertise in ICMAM-oriented activities, and dissemination of knowledge gained to the users like coastal states through organized training programmes. Towards accomplishing these objectives, the following priority activities will be undertaken:

(1) Determination of designated use of coastal waters.
(2) Development of GIS based information system for critical habitats containing all information necessary to prepare management plans.
(3) Determination of waste load allocation based on waste assimilation characteristics of selected estuaries.
(4) Development of EIA guidelines for major coastal developmental activities and processes.
(5) Development of model ICMAM plans for selected locations.

Out of 5 priority activities proposed as above, assistance from the World Bank in the form of International Development Association (IDA) credit has been obtained for projects 2 to 5 under the project "Integrated Coastal Marine Area Management" through an umbrella project on "Environment Capacity". The duration of the capacity building project is for a period of five years. In order to utilize the expertise and knowledge gained under the capacity building projects and also to continue the training on development of ICMAM plans to the coastal states on a long-term basis, the DOD is planning to set up a National Facility on ICMAM under which it is also proposed to sponsor a Post-graduate course on ICMAM in India.

4. OCEANSAT

In March 1996, India launched the next series of Indian Remote Sensing (IRS-P3) Satellite particularly for the oceanographic studies. IRS-P3 carries the two remote sensing payloads, viz. (i) "Modular Optoelectonic Scanner (MOS) (ii) Wide Field Sensors (WiFs). The payload related to ocean colour, i.e. MOS, is a multispectral imaging Spectrometer, designed for mapping the chlorophyll, suspended matter in the sea-water and measurement of aerosol.

Currently, the validation experiments of the sensor are being carried out through Sea-truth data collection. The launching of Oceansat-1 is slated for mid-1998 in commemoration with the International Year of the Ocean. The Oceansat-1 will consist of Ocean Colour Monitor (OCM) and Multi-frequency Scanning Microwave Radiometer (MSMR) payloads. These payloads are useful for studies of the ocean colour/chlorophyll and sea-surface temperature, atmospheric water vapour and surface temperature even during the cloud condition. Following Oceansat-1, India is also planning to launch Oceansat-II with major ocean payloads, viz. OCM, Scatterometer, Altimeter and Thermal Infrared Radiometer.

5. INDIA's COMMITTMENT AND INVESTMENT ON GOOS

India is implementing and has proposals to implement several programmes relating to GOOS. By virtue of these, GOOS stands already established in India. Government has already spent large funds and has committed to spend more on these programmes. One of the most useful Ocean Observing programme is the National Met-Ocean Data Buoy programme for which alone the committed funds are Rs.370 million. India has budgeted to spend about Rs.1000 million on Ocean Observation and Information Services (OOIS) for the next five years.

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 Nino 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 Environment Agency has been carrying out pollution monitoring in the coastal zone and adjacent seas of Japan. 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 cooperation 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 coordination. The official correspondence and international coordination 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 coordination of the GOOS-related activities. The Sub-committee for GOOS, National Committee for SCOR of Japan Science Congress, is coordinating scientific aspects of the GOOS.

NEAR-GOOS has come in to operational phase on 1 October 1996, as a result of Resolution of WESTPAC-III in February- March 1996 according to the Operational Manual adopted by the First NEAR-GOOS Coordinating Committee in September 1996. The manual is published by IOC and Japan Oceanographic Data Center in English and by Japan Meteorological Agency in Japanese.

Japan Science Congress established the GOOS Sub-committee within the National Committee for SCOR, to investigate a long term observational system for the ocean. In March 1997, the Sub-Committee published a report, 93 pages in Japanese, to propose a system based on the Report of OOSDP.

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 coordinated by 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 coordinating agency for ocean research and development, and has participated in the existing international ocean research programs 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 ocean
service modules.

JMA is actively participating in the NEAR-GOOS project. Within the project, JMA provides participating members with oceanographical and meteorological data obtained in its operation through the NEAR-GOOS Real Time Data Base that JMA operates.

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 programs. 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 has been operated DMDB, delayed mode data-base in 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. Monitorings of the change in biological activity of aquatic creature and their environment are also made in relation to the global environment change.

3.6 ENVIRONMENT AGENCY

The major mission of the Environment Agency is to promote environmental administration in comprehensive manner. The Water Quality Bureau is responsible for water quality management including coastal seas and EEZ of Japan. The Nature Conservation Bureau is concerned with marine environment with particular attention to the marine ecosystem such as the coral reefs. The Environment Agency coordinates environmental research activities undertaken by the governmental research institutions which are studying marine pollution or environmental conservation issues. The National Institute for Environmental Studies attached to the Environment Agency has conducted researches on marine environment of both global and regional scale.

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 cooperation is essential for this observation, this activity is extended under the U.S. Japan Conference on Natural Resources Panel (UJNR) to have cooperative 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 coordinate.

3.9 MINISTRY OF CONSTRUCTION (MOC)

Ministry of Construction(MOC) has conducted various researches through the Geographical Survey Institute, to assess the effects of rapid sea level rise (SLR) 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, SPORTS AND CULTURE (MONBUSHO)

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

The International Cooperative Research Programme on Global Ocean Observing System, sponsored by the Ministry of Education, Science, Sports 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.ü@The results of the programme are to be published in an English monograph after an international review during WESTPAC Scientific Symposium in February 1998. An International Cooperative Research Programme on NEAR-GOOS is proposed to carry out ocean forecasting in the marginal seas.

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. Ship-borne and towed ADCPs, and XBT are used for comparison. Observations of currents and density fields are made in the Subarctic gyre of the North Pacific. 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 Program 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 program 1993-1997)

Subject 3. Design of ocean observing system aided by high-resolution model 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 program 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 program 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 profilers (ADCPs) and inducted voltage of a submarine cable across a strait. (Ocean Research Institute, U of Tokyo, 4 year program 1994-1997)

4.1.2 International Cooperative Researches

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. A proposal on Marine Environment in the Southeastern Asian Tropical Seas, is submitted to include training cruises for International Year of 1998.

1) Repeated Survey of Oceanic variability between Japan and Australia by a Volunteer Observing Ship

This program is planned as part of the J-GOOS (Japanese-Global Ocean Observing System) Program. On September 20, 1996, an 150 kHz RDI BB-ADCP was equipped at the bottom of a newly constructed, mineral transport ship (289 m in length) which runs with a cursing speed of about 16 knots and called "First Jupiter". The first commercial cruise to Port Headland in western Australia started on January 23, 1997 after two test cruises between Kure and Nagoya, Japan. The round trip operation to Port Dampier in western Australia started February 22 and has just finished as the second commercial cruise on April 2. The third commercial cruise with two-month duration will start on April 6, 1997 toward South Africa. We acquired a nice data set to calibrate a misalignment between the ADCP transducer and the ship gyrocompass when the ship passed the Seto Inland Sea, Japan with 30-100 m depths during the first and second test cruises. For the first commercial cruise, we lost three quarters of the data due to careless operation of ADCP. Data acquisition was perfectly successful for the second commercial cruise with an improvement of the system. (Arata Kaneko, Faculty of Engineering, Hiroshima Univ., akaneko@ipc.hiroshima-u.ac.jp)

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, taira@ori.u-tokyo.ac.jp)

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) Mussel Watch: Marine Pollution Monitoring in Asian Waters: 1997-1999

As the Asia-Pacific project of the International Mussel Watch, monitoring, collection and analysis of hazardous chemicals and substances in the coastal marine areas of India, Vietnam, Indonesia, Malaysia, Philippine, Taiwan, Republic of Korea, Thailand, and others will be made by Japanese research group and the invited researchers from these countries. Activity for capacity building is also included in the project. (S. Tanabe, Faculty of Agriculture, Ehime University, shinsuke@agr.ehime-u.ac.jp)

4.2 SCIENCE AND TECHNOLOGY AGENCY (STA)

4.2.1 Introduction

STA has been coordinating "the Pacific Ocean Observation and Research Initiative (TYKKI)" in cooperation with the United States since 1993, in order to enhance the activities on observation and research in the Pacific Ocean. This cooperative work will contribute to develop the GOOS in this region (The details are shown in Appendix).

By using the Special Coordination 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 change in regional distribution of the heat content which must have a large effect on the climate change. JAMSTEC has also started to deploy subsurface mooring buoys equipped with ADCP to monitor 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 program, JAMSTEC has been observing the Indonesian Throughflow since 1992. JAMSTEC made CTD casts and measurements of salinity, dissolved oxygen and nutrients of sampled 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. The project has ended in 1996.

3) Kuroshio and Its Recirculation Research

JAMSTEC carried 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 deploys subsurface mooring buoys and uses a current profiler equipped with a ferry, 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 started in 1995 and has ended 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 of methane, radionuclides, and heavy metals. The project has ended in 1996.

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 program 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 program helps to build data set of phytoplankton distribution originated from the data of satellite-borne ocean color 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 new 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 satellites to observe the sea surface temperature, ocean color(ADEOS/OCTS etc.), sea surface wind(ADEOS/NSCAT),

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)

JMA operates six marine meteorological ships in the seas adjacent to Japan and the western Pacific Ocean for oceanographic and marine meteorological surveys. JMA has been conducting oceanographic observations along the fixed lines in the waters around Japan every season for more than 50 years, and from south coast of Japan to the equatorial region in the western North Pacific over 30 years on a semi-annual basis. Recently, oceanographic surveys in the western North Pacific have been expanded from twice to four times per year. These observations cover the fields of physical, chemical and biological oceanography as well as marine meteorology, aerology and radar meteorology. Of these, observations of greenhouse gases and ozone depleting substances are implemented within the framework of the Global Atmosphere Watch (GAW) of WMO, and the observed data are distributed through the World Data Center for Greenhouse Gases (WDCGG) operated by JMA to users all over the world. The marine pollution monitoring is being made under the MARPOLMON of IOC.

JMA deploys three moored ocean data buoys in the seas adjacent to Japan to obtain three-hourly meteorological and oceanographical data via the Geostationary Meteorological Satellite (GMS) operated by JMA on a real-time basis.

For monitoring of tsunami, storm surge and unusual tide, JMA operates 84 tidal stations in coastal area and islands. JMA enhanced its capability installing the huge tsunami observing apparatus at 76 sites and ultrasonic tide gauges at 10 sites in 1996. In this connection, it is particularly worthy of note that JMA initiated sea level observation by a pressure-type gauge at Minamitorishima in March 1996. Monthly mean sea level data of the 10 tidal stations are provided to GLOSS of IOC and to the IGOSS Sea-Level Programme in the Pacific (ISLP-Pac).

JMA is recruiting merchant ships equipped with XBT observation facilities cruising in the Pacific Ocean and the Indian Ocean to collect subsurface temperature data. Furthermore, JMA is making an effort to have more merchant ships and fishing boats report more data on marine meteorology, sea surface and subsurface temperature and ocean surface current. As one of the responsible members of WMO Marine Climatological Summaries Scheme, JMA is publishing the statistics of marine meteorological elements for the North Pacific.

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

JMA collects marine meteorological and oceanographic data through the Global Telecommunication System (GTS) of WMO. These data are also reported to JMA by Japanese governmental organizations and universities. JMA issues the "Monthly Ocean Report" containing latest data/information on oceanic conditions for the domestic and foreign users and the "El Nino Monitoring Report" (in Japanese) containing a summary of oceanic and atmospheric conditions in the equatorial Pacific for domestic users on a monthly basis. JMA has been operating the Ocean Data Assimilation System (ODAS) since the beginning of 1995 and some products of the ODAS appear in the "Monthly Ocean Report".

JMA 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 on high frequencies and the "Monthly Ocean Report" on an operational basis.

JMA started the operation of the NEAR-GOOS Real-Time Data Base (RTDB) according to the Operational Manual of the NEAR-GOOS Data Exchange. More than 1,000 oceanographic data reports per day are transferred from the computer system of GTS to the RTDB. To encourage various Japanese organizations in participating in the data exchange, JMA translated the Operational Manual of the NEAR-GOOS Data Exchange into Japanese and printed 1,000 copies for distribution.

For the safety of ship's navigation, JMA issues forecasts and warnings on marine weather as well as forecasts on ocean waves in the vicinity of Japan and the western North Pacific. In addition, JMA issues forecasts and information on sea ice in winter. Another responsibility of JMA is to disseminate meteorological forecasts and warnings for the western North Pacific and the South China Sea to ship via the INMARSAT under the Global Maritime Distress

and Safety System (GMDSS). Furthermore, JMA is making an effort to establish an operational schedule to issue information to support the activity for combating marine pollution (oil spill) in case of emergency under the framework of Marine Pollution Emergency Response Support System (MPERSS) conducted by WMO.

JMA plans to start in October 1998 El Nino forecasting on an operational basis, and coupled ocean-atmosphere models are being developed for the use of El Nino forecasting.

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 Programs, 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 program and has completed the one-time and P8 lines. It initiates oceanographic observations including CTD, XBT, Drifters in the subarctic gyre in the North Pacific a 5 years programme starting from 1997.

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 29 tide stations around Japan, which are telemetered to the head office and the station at the Showa Base in the Antarctica, which contributes to GLOSS and WOCE.

4.4.4 Oceanographic Data and Informational 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 Program, IGOSS, MARPOLMON, and ADCP. In recent years, JODC has also been contributed to the global climate programs such as WOCE and JGOFS. The JODC has been organising the training course on oceanographic data management every year since 1982, in support of IOC and the Japanese Fund-in-Trut. This training course will be shifted to the NEAR-GOOS training course from 1997.

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 net work by means of fishing boats being in operation in these areas.

2) Oceanographic structure and biological productivity in the North Pacific Ocean and the Kuroshio/Oyashio area(1997-2001).

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) Exploration of Kuroshio and adjacent areas(1986-1999)

The cooperative 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 are studied.

4.5.2 Researches on Environmental Issues

1) Ultraviolet effect on interrelationship between phytoplankton and zooplankton

The influence of enhanced UV-B radiation on the interrelationship between marine phytoplankton and zooplankton was investigated.

2) Monitoring methodology for marine pollution by hazardous chemicals accumulated in organisms (1997-2001)

This project intends to establish the methods to evaluate the marine pollution by hazardous chemicals by determining the chemicals accumulated in marine organisms such as mussel, fish, and squid.

3) Preservation of coral reef ecosystems (1997-1999)

On the biodiversity in coral reefs around the Ryukyu Islands, its structure and function are investigated, and methods of its evaluation and monitoring technique are developed.

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 1955-)

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

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.

3) Comprehensive study of the variation of the oceanic environment and fish populations in the North-western Pacific(1997-2002)

This project intends to clarify the influence of the oceanic environment, phytoplankton and zooplankton to the resources variation of walleye pollock and saury, and to develop ecosystem forecasting models through food chain.

4.6 ENVIRONMENT AGENCY

4.6.1 Marine Pollution Survey and Monitoring

The Environment 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 zooplankton are also monitored. In order to grasp the environmental pollution situation by chemical substances, the Environment 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 Environment Agency.

4.6.2 The Survey of Biological Environment on Coastal Area

The locations, areas and types of tideflats, seaweed beds and coral reefs were investigated in 1978 and 1989-1992, by field survey or using aerial photographs and/or other materials. Then existing and disappeared areas of tideflats, seaweed beds and coral reefs in 1989-1992 have been plotted on 1:200,000 scale maps.

4.6.3 Research projects for Marine Environmental Protection

Global Environment Research Program of the Environment Agency has supported research projects on ocean environment and marine pollution since 1990. In FY 1996, 14 national institutes and 24 universities have conducted 4 research projects; (1)Impact of environmental load through large river on marine ecosystem in Bohai and East China Seas, (2)Studies on movement of hazardous chemical in east-Asian seas, (3)Study on the detection ecological changes and land-based loading effects in the Asian marginal seas, and (4)Studies on preservation of coral reef ecosystem.

On the other hand, Center for Global Environment Research(CGER) of National Institute for Environmental Studies are conducting the marine environmental monitoring programme such as the marine pollution

monitoring and green house gas exchange between the atmosphere and ocean using ships-of-opportunities and the analysis of pollutants concentrated in the marine organisms.

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 TELECOMMUNICATIONS (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 9.5GHz airborne high resolution Synthetic Aperture Radar(SAR) since 1993. This imaging radar will be useful to monitor marine oil 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(25MHz) 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 cooperation with Communications Research Laboratory, Ministry of Posts and Telecommunications. By March in 1997, GSI extended its GPS' continuos observation network to 887 GPS stations. As the result, vertical movements of all tide gauge of GSI are monitored with GPS observation continuously. 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 of coastal environment, coastal fishery etc. Using aerial-photographs, Multi MSS, 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.

APPENDIX

PROJECTS OF PACIFIC OCEAN OBSERVATION AND RESEARCH INITIATIVE (TYKKI)

1. Projects on ocean observation and research

1) Arctic-Subarctic Pacific
- Deformation of Arctic Pack Ice Field
- Air-sea/Ice-sea Interactions in the Chukchi Sea
- Water Circulation and Flux Study in the Okhotsk Sea
- Bering Air-sea Interaction Study

2) Subarctic-Subtropical Pacific
- Subarctic Gyre Experiment in the North Pacific Ocean

3) North-West Pacific
- Heat and Materials Transport from the Kuroshio Extension by Meso-scale Eddies East of Japan

4) Subtropical-Tropical Pacific
- Tropical Ocean Climate Study
- Ocean Modeling Utilizing Three Dimesional Ocean Observation System, Space-based and Acoustic Tomography Technology
- Observation Research for Primary Production and Carbon Flux over Equatorial Upwelling
- Long-term Thermal Field Monitoring in the Tropical Area and Subtropical Gyre

5) Uncertain
- The Study on Ocean Conditions and Current Variability
- Prediction of Variability of Oceanographic Condition
- In Situ Sea Level Monitoring
- Cost-benefit Analysis of Large Mooring Buoy Arrays
- Coral Reef Research, Monitoring and Information Management
- Chemical Tracers in the Pacific Ocean

2. Projects on Development of Observation Techniques and Information Exchange System

1) Observation Techniques
- Evaluation of Giant Magnetostrictive Source
- Development of the Measurements for Greenhouse Gases and the Analytical Procedures for the behavior of the gases
- Improvement, Development and Deployment of Surface Drifter
- Establishment of Vertical Reference Frame for Mean Sea Level Change in the Pacific Ocean
- Inter-comparison of Absolute Gravity Meters
- Development of Deep Ocean Tsunami Gauges

2) Information Exchange System
- On-line Oceanographic Data System for Mooring Buoy
- Intensification of Global Ocean Data Collection System
- Development of On-line Data Base for Oceanographic Data

NIGERIA

1. PROJECT TITLE: SEA-LEVEL RISE MONITORING AND EFFECTS ON THE NIGERIAN COASTAL ZONE

The Nigerian Institute of Oceanography and Marine Research (NIOMR) operates two tidal gauges installed at the mouth of the Lagos harbour. The Next Generation Water Level Measuring System (NGWLMS) consists of an acoustic type tide-gauge with a meteorological station. The system was provided by NOAA who also assisted NIOMR with training of staff who operates in the station. The tidal-gauge is downloaded weekly and data collected include water level, atmospheric and water temperature, wind speed and direction, wind gust, barometric pressure and tidal data. Data is processed in NIOMR, while raw data is sent to NOAA, Washington D.C., the Permanent Service for Mean Sea-Level in Bidston, U.K. and the TOGA (Tropical Oceans and Global Atmosphere) Sea-Level Centre, Honolulu.

Tidal data are also compiled regularly from the analogue tide-gauge.

2. PROJECT TITLE: RESEARCH INTO COASTAL EROSION

The objective of this project is to identify areas along the Nigerian coastline that are most vulnerable to erosion and also measure the actual rates of erosion and oceanographic parameters responsible for the erosion rates.

Beach profiling and collection of data on physical processes in the littoral zone of Bar Beach, Victoria Island, Lagos was carried out. Such data include, current speed and direction, wave height, sediment load and transport, wind speed, direction and gust, barometric pressure. Other areas along the Nigerian coastline where erosion rates have been determined include Awoye located in the Transgressive mud coast in the west: Forcados, Escravos, Brass and Bonny in the Niger Delta and Ibeno-Eket, and Innua Abasi on the Strand coast in the easternmost part of the country.

3. PROJECT TITLE: SHIPBOARD ENVIRONMENTAL DATA ACQUISITION SYSTEM (SEAS III)

The objective of the Shipboard Environmental Data Acquisition System (SEA III) is to collect oceanographic, meteorological and environmental data in the Worls's Oceans as part of the World Climate Research Programme. The equipment for this project was supplied by NOAA and consists of computers, GPS, transmitters and XBT.

The project involves the collection of data on depth, water temperature, wind speed and direvtion, atmospheric pressure, cloud type, cloud height, surface visibility and swells along the Route AX14 (Lagos-Rio-Lagos) on a voluntary observing ship-Clipper Sao Louis. NIOMR Scientists downloads the data transmitted on diskette whenever the vessel arrives Lagos which is usually once in six weeks. The downloaded data is analysed by NIOMR to produce depth and temperature profiles.

4. PROJECT TITLE: INTEGRATED COASTAL ZONE MANAGEMENT

This project aims at gathering environmental data in the Nigerian coastal and marine areas which will be used as input in the development of an integrated coastal area management strategy for the sustainable exploitation of the coastal area and its resources.

The project involves a literature survey of all published materials on the Nigerian Coastal Area. Such data include: physical characteristics, meteorologic and oceanographic parameters, coastal resources, socio-economic activities, population structure and dynamics, land use, environmental problems, Institutional framework and legislations, conflicting uses of the CZ and Environmental Impact Assessment process.

The data collected from this survey will be evaluated and analysed and data will be fed into the GIS data base. The data will be used to formulate an Integrated Coastal Area Management Plan and development of strategies for implementation.

NORWAY

Norway support the GOOS initiative and will continue to participate in the work to further develop operational aceanography within the framework of all the five modules of GOOS. Operational oceanography includes, as we see it, all regular and routine acquisition of ocean data and/or model information with the aim to make and disseminate regular products such as forecasts, nowcasts (status reports) and hindcasts (past states, trends and changes).

NATIONAL MARINE ENVIRONMENTAL MONITORING SYSTEM

The Norwegian monitoring system consists of observations from fixed locations, fixed transects, regular regional coverage, ships-of opportunity and buoys. It includes monitoring of coastal processes, such as eutrophication, algea blooms and pollution as well as monitoring ocean climate, sea-ice and biological production including the commercially important fish stocks.

Nowcast products are daily real-time observation, weekly situation reports of e.g. sea-ice and algae concentrations and annual assessment reports on the environmental quality and the conditions of the commercial fish stocks.

Forecasts for the future ocean conditions will be given either on regular basis or to cover acute situations. The regular forecasts cover parameters such as waves, water level, currents, algae and the expected conditions of the fish stocks. Statistical climatic temperature forecasts are published annually for the ocean areas of interest for fisheries. Extreme forecast may include the probability of extreme waves or water levels, harmful algae blooms, sea-ice and oil drift.

Hindcast consist of analysing trends in the historical development in processes such as the general circulation system, formation of deep or bottem water, the carbon cycle or the global/regional climate change by analysis of time series, by model sumulations or by a combination thereof.

In order to deliver useful products to the different marine users, it is important to communicate with these and learn their needs. Contacts are therefore vital with the offshore industry, shipping, coastal navigation prots, fishereis, environmental protection agencies and so on.

RECENT DEVELOPMENT

The following three research institutions have become members of the European Association for GOOS (EuroGOOS): Institute of Marine Research in Bergen, the Norwegian Meteorological Institute in Oslo and the Nansen Environmental and Remote Sensing Centre in Bergen. Norway also participate in the European Workshop on Fixed Monitoring Network in the North Sea Region (SeaNet).

In January 1997 a Norwegian Committee for GOOS (NorGOOS) was established with the aim to co-ordinate both national and international GOOS relevant activities. Members of the committee are both research institutions and private companies. A NorGOOS plan drawing guidelines for the future development of the Norwegian GOOS activities, will be finalized later this year.

POLAND

The Poland supports GOOS and its active in its development, concentrating mainly on the regional components like the EuroGOOS and the Baltic GOOS. Two polish institutions are members of the EuroGOOS. We are also engaged in planning of the Baltic Test Case of EuroGOOS.

The main activity in operational oceanography in Poland are deveoted towards the Baltic Sea area. The following large international projects which Poland is engaged in can be mentioned here:

1. The Baltic Monitoring Programme under the Helsinki Convention; the five years periodical assessments of the state of the sea are published regularly. Project for the Polish Coastal Zone Monitoring (1995-2010) has been worked out and approved.

2. The BALTEX which is the GEWEX regional project; Plan for the Main BALTEX Experiment (BRIDGE) has been worked out. The DIAMIX (Diapicnal Mixing) field experimen has been elaborated and the pilot experiment is under way.

3. BASYS (Baltic Sea System Studies) with the goal to better understand the functioning of the Baltic Sea as a whole, the ecosystem including.

4. The Polish-German project to study the influence of the Odra river water discharge on the Pomeranian Bight ecosystem.

Besides this the national activity includes:

(a) Regular cruises recording physical, chemical and biological parameters for the long-term monitoring of changes.

(b) Monitoring of pollution in the coastal waters and modelling of transport of pollutants.

(c) Sea-level observation along the polish coast, and of modelling probably sea-level changes connected to the climate warming.

(d) Monitoring of sea-shore changes and protection of the coast.

Outside the Baltic Sea worth to mention is Polish engagement in research and monitoring of changes in the Arctic Seas oceanography and climate. Poland participate in the VEINS and ACSYS programmes.

The organizational matters are still at the development stage. We are reorganizing our GOOS Committee trying to involved more broad representation of marine industry and shipping. Excellent co-operation of the Baltic oceanographers and the Baltic States in general provides goos basis for the unified system of operational oceanography here.

RUSSIA

Overviews of the Russian Federation contribution to GOOS were given in the reports submitted to the First Planning Session of I-GOOS (Melbourne, April, 1994) and the Second Session (Paris, June, 1995). These reports include the developments that have taken place since I-GOOS-II (Paris, June, 1995).

An important prerequisite for the development of national GOOS activities is related to allocation of adequate resources, and the most important source of funds is the national budget. The concept of "operational oceanography" was laid as the cornerstone to the new Federal Programme "World Ocean" (FPWO), which is being developed in the Russian Federation. Several subprogrammes of this major federal programme are directly linked to GOOS activities. Therefore future activities in support of GOOS in Russia are to be supported in future through the federal budget.

The concept of FPWO was developed in 1996. During the year 1997 a comprehensive plan for the overall implementation FPWO will be prepared. In 1998, the first, highest priority actions are envisaged under the FPWO umbrella, and since 1999, FPWO is to be implemented on a full scale. GOOS concept is explicitly mentioned in the plan and deployment of oceanographic observational system is given a high priority in FPWO.

Since 1996, the Roshydromet has been carrying out a project on co-ordination of GOOS related activities. Six institutes take part in it including:

- the Hydrometcentre of Russia (HMC of Russia);
- the Arctic and Antarctic Research Institute;
- the Far East Research Hydrometeorological Institute (FEHRI);
- the State Oceanographic Institute;
- All-Russian Hydrometeorological Institute-World Data Centre (WDC);
- the St-Petersburg Branch of the State Oceanographic Institute.

Main objectives of the project are the development of a programme for the Roshydromet participation in GOOS and a national scheme of marine data processing.

The Russian Federation supports the idea of GOOS proliferation and globalization through regional activities and participates and/or is going to participate in several regional GOOS programmes. The FEHRI with assistance of the HMC of Russia and WDC is co-ordinating the national activities with respect of NEAR-GOOS. Recently, a national NEAR-GOOS programme was developed at FEHRI. Main attention is now paid to the modernization of coastal observing stations that should report to NEAR-GOOS Real Time Data Base. A consortium of Russian institutes is planning to join EuroGOOS. First priority is given to the Baltic and Arctic Test Case activities. Also, there are plans to develop a marine services system for the Black Sea.

UNITED KINGDOM

The Executive Secretary of IOC in his letter dated 27 March 1997 invited Member States to provide written statements on national planning activities related to GOOS and achievements since the Second Session of I-GOOS in May 1996. This brief report does not repeat details of ongoing observing programmes which have been given in earlier reports*. Instead it focuses on the activities of the United Kingdom GOOS Action Group which operates under the auspices of the Inter-Agency Committee on Marine Science and Technology (IACMST).

IACMST is a Government Committee which reports to the Chief Scientific Adviser through the UK Office of Science and Technology.

The Chairman/Rapporteur of the Action Group is Dr. Howard Cattle of the UK Meteorological Office. Membership includes representatives of the Sir Alister Hardy Foundation for Ocean Sciences, the Natural Environment Research Council, the Northern Ireland Office, the Hydrographic Office, the Environment Agency, the Scottish Office, the Ministry of Agriculture, Fisheries and Food and the British National Space Centre.

Substantial progress has been made with the inventory of UK marine observations which was updated in 1996. Plans are being developed for an interactive site on the Internet where the information on observations is fed in by a variety of Operating Agencies. However, there are problems of data compatibility and open access which have not yet been resolved. The target date for publications is now the third quarter of 1997.

The Action Group has also considered developments within EuroGOOS. Three UK Agencies participate in EuroGOOS: the Meteorological Office, the Environment Agency and the Natural Environment Research Council. Other Government Departments have contributed to discussions on the requirements for operational data and forecasts over the North West European Shelf, the EuroGOOS Ferry Studies and mechanisms for a co-ordinated UK input to SeaNet fixed monitoring station in the North Sea. Several members of the Action Group attended the First International EuroGOOS Conference and Exhibition at The Hague in October 1996.

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* A full inventory is available from the UK Action Address: Dr. David Pugh, Southampton Oceanography Centre, Empress Dock, Southampton SO14 3ZH.

In order to improve co-ordination among the various marine observing systems funded by different Departments within the UK Government, the IACMST has organized a one-day workshop at the Foreign and Commonwealth Office on 5 June 1997 on the theme of "The UK Contribution to Observing European Seas". The aim was to present the totality of the UK observing programme to senior people from the various funding Departments as a first step towards establishing better co-operation and co-ordination. Representatives of interested European countries were also invited to the meeting. The final discussion session was on the theme of EuroGOOS and its contribution to the overall global ocean observing system.

UNITED STATES OF AMERICA

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1. OVERVIEW

1.1 INTRODUCTION

In 1996 the U.S. continued a broad range of programs that produce large quantities of ocean data demanded by the public. While these programs are geared to a *product* (e.g., a seasonal climate forecast, an assessment of the health of coastal waters) rather than a *process* (e.g., observation), the programs constitute a contribution to GOOS.

The following report includes descriptions of selected programs.

1.2 NATIONAL RESEARCH COUNCIL REVIEW

In 1996 the National Research Council of the National Academy of Sciences convened a Committee on GOOS to provide guidance to Federal agencies and impetus to U.S. efforts toward implementing GOOS. The Committee recommended cost-benefit analyses and other socio-economic studies to determine which GOOS efforts are worth pursuing, with what priority, with what objectives, and at what level. The Committee also urged "a serious commitment to international cooperation while taking a leadership role to encourage development of a GOOS that will address the nation's needs and priorities" (National Research Council, 1997). The Committee's report reiterated recommendations of its first GOOS study completed in 1994, that the U.S.:

- Convert relevant parts of the TOGA research observing system to operational status
- Maintain and improve global measurements of absolute and relative sea level, surface wind stress, sea ice extent and concentration, and continuation of satellite altimetry missions
- Maintain and improve the monitoring of sea surface temperatures and salinities, upper-ocean thermal and salinity structure, and temperature and salinity structure at select deep ocean sites
- Identify and commit resources to a selected set of time-series stations and programs, as "permanent" sections, stations, and moored and drifting instrument deployments to be repeated over the long term both in and out of the tropics
- Fully implement the International Mussel Watch
- Support ongoing efforts to determine the health of coral reefs worldwide such as the United Nations sponsored Global Coral Reef Monitoring Network
- Proceed with site selection and establishment of initial estuarine and coastal index sites for coastal U.S. GOOS implementation
- Support the acquisition and processing of satellite ocean color data

1.3 PROGRESS IN IMPLEMENTING AGENDA 21

In April 1996 the United Nations Commission on Sustainable Development met to review the progress made on responding to the needs described in Chapter 17[1] of Agenda 21. The U.S. reported on its extensive system of university, public, private, and industrial centers addressing a full range of topics and its involvement in GOOS. Specific activities that were described are summarized in the report below. The U.S. concluded that "consensus on ways to address the shared resources of the marine and coastal areas is leading to the concomitant resolve on the part of nations to take the actions necessary to pursue the protection and sustainable use of those resources."[2]

Broad national coordination among relevant agency activities is accomplished through the National Science and Technology Council, which has established clear goals for science and technology investments. Its Committee on Environment and Natural Resources is responsible for coordination of interagency environmental efforts.

The International Coral Reef Initiative (ICRI) is an example of more focused targeting of existing programs and resources. Through ICRI a more integrated strategy toward coral reefs has been adopted. Initiated by the U.S. in

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[1] Protection of oceans, all kinds of seas including enclosed and semi-enclosed seas, coastal areas and the protection, rational use and development of their living resources; covers the need the need for GOOS in the context of addressing critical uncertainties for the management of the marine environment and climate change

[2] Submission of the United States to the United Nations Commission on Sustainable Devlopment, Agenda 21, Chapter 17 (Oceans), undated

1994, ICRI aims to facilitate and encourage collaboration and partnerships among governments, multi-lateral development institutions, commercial interests, and non-governmental organizations to support the preservation and sustainable use of coral reefs and related ecosystems. A U.S. national coral reef initiative includes the U.S.-flag Pacific and Caribbean. More information on the ICRI relationship to GOOS is given below.

1.4 U.S.-JAPAN COOPERATION

In March 1996 the U.S. was pleased to participate in the First Joint Meeting of the "TYKKI" Panel under the U.S.-Japan Cooperative Program in Natural Resources (UJNR), the U.S.-Japan Pacific Ocean Observation and Research Initiative (TYKKI), hosted by Japan. A total of 29 projects are underway or pending. In September 1996 the U.S. and Japan signed a charter for a new UJNR Panel, the Coastal Environment Science and Technology Panel. This Panel will be coordinated in the U.S. by the National Ocean Service and in Japan by the Port and Harbour Research Institute. Both sides are now considering proposed cooperative activities under the Panel, which will be categorized as follows:

1) Mitigation of coastal development, wetland preservation, "eco-friendly" coastal facilities, and mathematical models of coastal ecosystems;

2) Technologies for remediating polluted waters and sediments; remediation of eutrophic water; reclamation for waste treatment;

3) Coastal environmental conservation and remediation;

4) Scientific research for understanding and prediction of coastal environmental changes and technologies for observing the coastal environment; and

5) Technologies for environmentally friendly extraction of energy from the coastal ocean.

2. SELECTED COASTAL ASPECTS OF U.S. GOOS

2.1 NATIONAL ENVIRONMENTAL MONITORING FRAMEWORK

A national framework for integrating environmental monitoring and related research was produced in 1996 by the National Science and Technology Council. This framework links systematic observations and monitoring of ecological systems and resources with predictive modeling and process research. At a workshop in September 1996, Vice-President Gore stated:

> "Environmental monitoring is the foundation for the scientific information necessary to make wise decisions key to meeting the twin goals of continued vigorous economic growth and preservation of our magnificent natural heritage for generations to come. Environmental monitoring must also be available to the public to inform them and facilitate their participation in our democracy. The knowledge we gain fro improved monitoring of our rivers, forests, oceans and air is the knowledge we need to make informed decisions. This understanding is one of the pillars of our bridge to the twenty-first century.

This framework includes the establishment of a network of "index sites", integrating existing intensive monitoring and research sites and adding new sites as needed, to provide standard information on major independent and dependent environmental variables that are known to influence economic conditions. Criteria for selection of 10-12 coastal index sites have been developed and selection will take place in 1997.

2.2 U.S. COASTAL GOOS THEMES

Increasingly concerned with the sustainable use of coastal areas, the U.S. has placed a priority on implementing U.S. Coastal GOOS. U.S. Coastal GOOS is defined as an operational system that integrates and facilitates access to *in situ* and remotely sensed coastal observations for reliable assessment, prediction, and management of coastal areas and resources. The U.S. has articulated three goals for U.S. Coastal GOOS planning and implementation:

Sustain Healthy Coasts: To manage more effectively the multiple, and often conflicting, uses of inter-related watersheds and nearshore coastal waters through new institutional arrangements,

economic incentives, and improved information on the values of these areas and the effects of coastal ecosystem degradation.

Mitigate Coastal Hazards: Reduce the risk to human life and property from coastal natural hazards and resultant reductions in financial costs to public and private entities through collaborative hazard mitigation activities.

Safe Marine Navigation: Support and enhance the economic efficiency of maritime commerce and reduce the risks to life, property, and the coastal environment by providing the nation with fundamental marine navigation tools.

2.3 U.S. COASTAL GOOS WORKSHOP- SYNOPSIS

A U.S. Coastal GOOS Workshop was held December 10-12, 1996, in Bethesda, Maryland, to define needs for initial implementation of the Sustainable Healthy Coasts goal. Participants were asked to consider the influences of land use practices, e.g., agriculture and timber activities, on the degradation of water quality, loss of habitat for fisheries, and coastal recreation and tourism. A total of 47 government and university scientists were divided into five working groups: 1) Coastal plain and barrier islands, 2) Rocky coasts/fjords, 3) Urban estuaries/embayments, 4) Inland/semi-enclosed seas/lakes, and 5) River fluxes to the coastal zone. Priority problems, approaches, and design guidelines were defined for each context, and evaluation criteria for pilot projects were proposed. Sites for several pilot projects were also proposed; issues were examined in particular detail for a pilot project in the eastern Gulf of Maine. The types of areas considered by each group were intentionally made generic so that conclusions may be applicable to coastal areas in other parts of the world.

2.4 NOAA MUSSEL WATCH

In 1996, the NOAA Mussel Watch Program published its findings on temporal trends since 1986 in concentrations of trace elements, chlorinated hydrocarbons, and polycyclic aromatic hydrocarbons in mollusks in coastal waters of the U.S. In general, where there are trends they are decreases. The program continues with annual collections of mussels and oysters, the addition of analyses of some contemporary pesticides, and geographic expansion to the U.S. Great Lakes. Comparisons of concentrations from the U. S. program with those from similar national program in France showed that chemicals under restricted use in the U. S. are at lower concentrations. The World Mussel Watch Database has been created with data from observatios gathered from the published literature of trace elements in mussels and oysters from throughout the world. The worldwide median concentrations are similar to those for the U.S. or France. However, the upper concentrations are much higher because, unlike the U.S. or French, the worldwide data set includes entries from programs specifically designed to monitor concentrations near waste outfalls or other point sources of pollution.

2.5 QUALITY ASSURANCE OF ENVIRONMENTAL QUALITY MEASUREMENTS

The Quality Assurance Project of the NOAA National Status and Trends Program seeks to assure that, despite differences among analytical methodologies, data can be compared. NOAA-sponsored intercalibration exercises for trace chemical analysis of marine tissues and sediments continued in 1996. The organic chemical exercise, based at the U. S. National Institute of Standards and Technology, and the trace element exercise, based at the National Research Council of Canada, each had about two dozen participants including some from outside the U. S. Past participants have included laboratories from Monaco, Mexico, Australia, Canada and other countries.

2.6 GLOBAL CORAL REEF MONITORING NETWORK

The IOC-UNEP-IUCN Global Coral Reef Monitoring Network (GCRMN) was established in April 1996 with U.S. policy and financial leadership provided through the International Coral Reef Initiative (ICRI), which began in 1994. Since its inception the U.S. State Dept. has contributed $325K to the global coordination of the network, $100K toward support of Caribbean regional monitoring efforts, and $25K for further development of the monitoring methodology (to incorporate socio-economic indicators (Total: $450K). U.S. support for ICRI and GCRMN has been strong; President Clinton identified ICRI as a model of international environmental cooperation and encouraged further monitoring. The GCRMN now includes a full-time coordinator located in Australia. Funding partners include the U.S. and Australia (in-kind support) for the global coordination and several different donors (U.S., Japan, Sweden, U.K.,

UNEP) for support of the regional monitoring activities. One strength of the GCRMN is its reliance on a broad range of researchers to collect environmental information. Successes to date include:

- Launching a pilot monitoring project with 50 institutes around the world
- Developing a strategic plan based on needs identified by 84 countries
- Obtaining consensus on monitoring methods and protocols
- Starting to train and monitor reefs in three regions
- Developing a global manual to assess socio-economic issues during biophysical monitoring

2.7 MARINE NAVIGATION SAFETY - PHYSICAL OCEANOGRAPHIC REAL-TIME SYSTEM (PORTS) FOR DECISION SUPPORT

The value of goods passing through U.S. ports and harbors now exceeds $500 billion per year. Modern ports are very competitive commercial operations where information upon which rational decisions to balance safety, health of the environment and commercial viability of the coastal community must be made. PORTS is a decision support system to facilitate safe and efficient maritime commerce and effective environmental resource management. PORTS is installed in Tampa Bay, New York/New Jersey Harbor, Houston/Galveston, and San Francisco Bay. PORTS consists of real-time observations of ocean conditions and weather, computer model nowcasts and forecasts of ocean fields, and dissemination of data via a telephone voice data response system and Internet. Measurements of currents, water levels, salinity, temperature, marine winds, and atmospheric pressure are collected at a central data acquisition computer which provides automatically quality controlled data.

PORTS information ensures that an adequate margin of safety is available to larger and larger ships in channels which are being deepened but not significantly widened. PORTS provides information permitting shippers to load their vessels to take full advantage of real-time water levels and channel improvements. PORTS information aids hazardous materials spill prevention and response as well as effective ecosystem health management.

The PORTS InfoHub Concept to integrate information for decision support will be shown during a summer 1997 demonstration of the SmartBridge Project. The National Ocean Service is developing a Coastal Forecast System that will provide longer lead time coastal forcing for PORTS models which can provide regional storm warnings to Mitigate Coastal Hazards, one of three themes of Coastal GOOS.

2.8 FISHERIES MONITORING AND ASSESSMENT

Building sustainable fisheries depends on information collected under GOOS. For example, assessing U.S. fishery resources, improving fishery predictions, and reducing bycatch all rely on resource monitoring using NOAA research vessels, aircraft, submersibles, and fixed-position and drifting buoys, as well as data from cooperating agencies and governments. These observations aid in sampling of biological populations, collection of biological data for ecological modeling and implementing resource surveys to assess fisheries. They are fishery-independent measures of resource abundance. Measurements of water and air temperature, wind, salinity, current, precipitation and air pressure support predictions and analyses needed to build sustainable fisheries.

2.9 OCEAN COLOR AND TEMPERATURE SENSOR (OCTS) ACTIVITIES

In August 1996 the National Space Development Agency of Japan (NASDA) successfully launched its Advanced Earth Observing Satellite (ADEOS). Routine reception of OCTS real-time data for U.S. coastal waters at the Wallops Flight Facility and the Alaskan facility began in November 1996. In accordance with a bilateral agreement, NOAA receives ADEOS data for operational use, and NOAA will generate and distribute ocean color products derived from OCTS real-time data for coastal U.S. waters beginning in September 1997. These products will be available within 12 hours of acquisition and without charge to the user community for non-commercial purposes. NOAA is now soliciting information on product requirements from potential users. Data is presently stored at NASA's Goddard Space Flight Center; operational ocean color products will be stored at the National Oceanographic Data Center, NOAA. Near-real time OCTS data of the U.S. West Coast and Hawaii will be extracted from Mission Data Recorder data received at the Alaska facility. Initial capability to operationally retrieve OCTS data from these two regions is planned for September/October 1997.

2.10 SOCIO-ECONOMIC BENEFITS OF U.S. COASTAL GOOS: THE EXAMPLE OF THE FLORIDA KEYS

Increasing attention needs to be given to the economic aspects of coastal resource management, comparing costs and benefits of various policy options. Many benefits, e.g., of improved water quality, cannot be measured easily in dollars. New concepts to measure the market and non-market value of natural resources are emerging[3]. A survey conducted in 1996 described the economic impact that environmental resources have on the vitality of a local community. The study was funded jointly by federal, state, and local organizations and included queries of over 11,000 visitors to the Florida Keys, who provided detailed information on their activities and spending patterns and rated the importance of environmental attributes of the region. The level of satisfaction indicated by the visitors pointed out that local economic prosperity is dependent on a healthy environment. For example, clear water, the amount of living coral on the reefs, and a visible variety of fish topped the list of important factors determining high satisfaction ratings at 25 facilities. The Florida Keys tourism industry accounts for $1.2 billion each year. Detailed information on the survey is available on the World Wide Web:

http://www-orca.nos.noaa.gov/projects/econkeys/econkeys.html

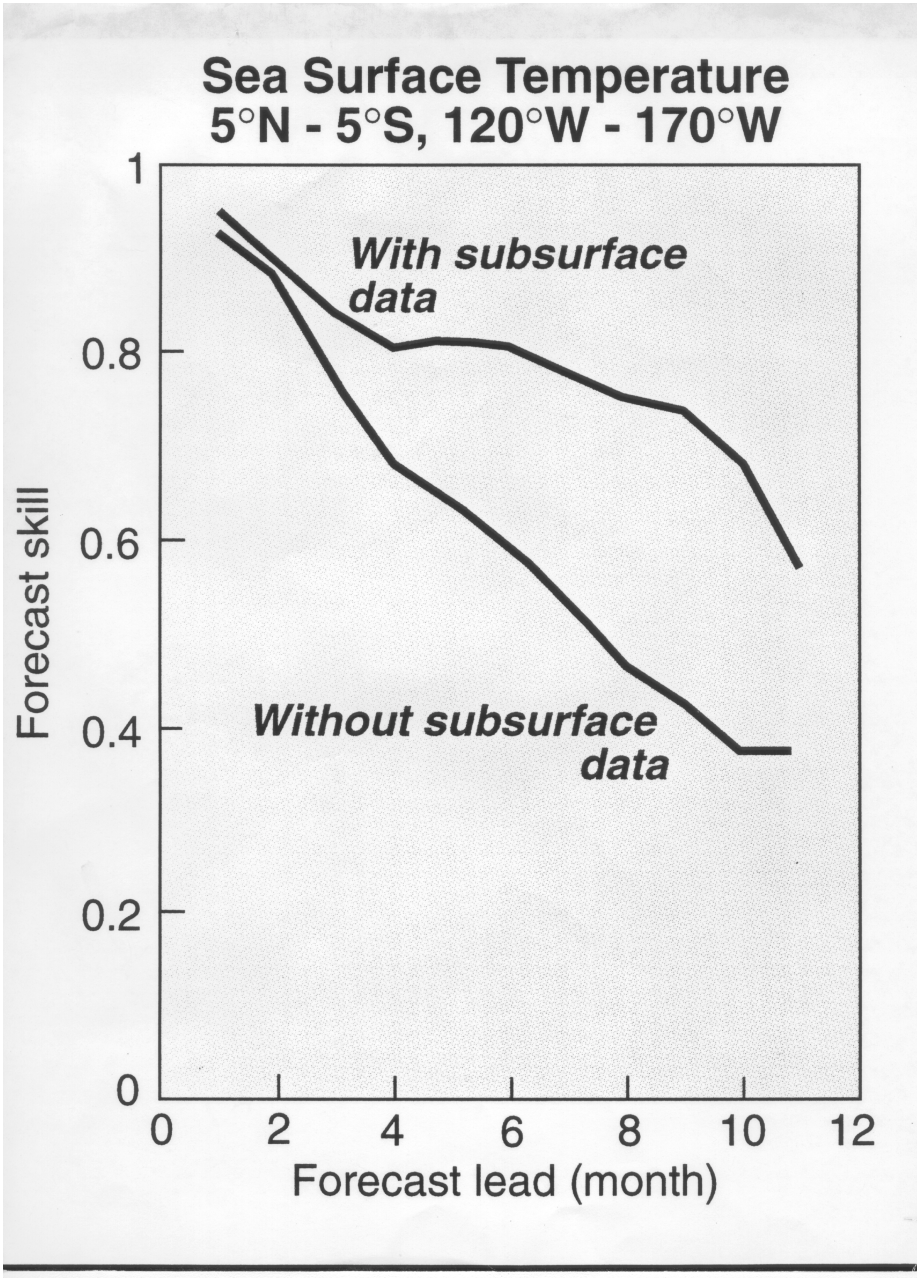
3. SELECTED CLIMATE ASPECTS OF U.S. GOOS

3.1 OBSERVATIONS FOR ASSESSMENT AND PREDICTION PURPOSES

Requirements to provide useful forecasts of weather and climate variability in the United States on seasonal to interannual time scales has justified the implementation of a coupled ocean-atmosphere observing system in the equatorial Pacific for the El Niño-Southern Oscillation phenomenon. An initiative is underway to provide ongoing support for an operational ENSO observing system. Public and private decision-making processes require assessments and forecasts of climate variability on time scales of decades and longer. The process of developing, justifying, and obtaining long-term support for the ENSO observing system may serve as a model for implementing observational programs for assessing long-term climate variability. However, it is also necessary to enhance existing data records in order to address questions impacting policy decisions. Fundamental to any observational program is the expectation that the observing system will evolve as required by the forecast, and in response to analyses and scientific results.

[3] See "Economic Valuation of Coastal Resources", NOAA Coastal Ocean Program, Decision Analysis Series No. 5, June 1995.

Figure 1 indicates the importance of subsurface data to the accuracy of an ENSO forecast. ENSO events, which have a periodicity of 2-7 years, have an enormous impact on U.S. agriculture, energy generation, and water resources, fisheries, and forestry management as well as public health.



3.2 GLOBAL OCEAN DATA ASSIMILATION EXPERIMENT

To advance implementation of the Climate module of GOOS, and the ocean component of GCOS, the U.S. has put a priority on the conduct of a Global Ocean Data Assimilation Experiment (GODAE). The objective of GODAE is to conduct a practical demonstration of real-time global ocean data assimilation in order to provide a regular, complete depiction of the ocean circulation, at high temporal and spatial resolution, and consistent with a suite of remote and direct measurements and appropriate dynamical and physical constraints. GODAE builds upon a set of operational requirements that have been well articulated by the Ocean Observing System Development Panel (OOSDP). GODAE is considered a high priority by the successor group to the OOSDP, the Ocean Observing Panel for Climate. Feasibility studies are proposed for 1998-99, followed by testing, and realization of GODAE in the 2003-05 time period. Sampling of the ocean depth for GODAE will be done by *in situ* observations, which will also be used for calibration of the remote data from space-borne systems such as altimeters, scatterometers, operational meteorological satellites, and ocean color sensors.

3.3 OCEAN CLIVAR

CLIVAR, the internationally-coordinated research program on Climate Variability and Predictability, articulated in its Science Plan questions to be addressed to achieve climate predictability on time sales from seasonal to centennial. Questions concerning the ocean component, following up on the conclusions of the Tropical Ocean-Global Atmosphere Program and the World Ocean Circulation Experiment, are being considered in the U.S. by Ocean CLIVAR (O-CLIVAR). O-CLIVAR relies on existing multi-disciplinary panels for planning and identification of priorities. The focus is on the physical basis of climate variability. The three O-CLIVAR projects which have been defined address: 1) sustained ocean climate observations that might be continued or implemented for an indefinite period to observe climate variation; ocean climate modeling; and ocean process experiments of limited duration designed to understand specific processes to improve models or observational networks.

3.4 VIRTUAL LABORATORY FOR OBSERVING SYSTEM EVALUATION

To meet evolving requirements for global observations needed to support seasonal to interannual climate prediction, a Virtual Laboratory for Observing System Evaluation is being established. The Virtual Laboratory is concerned with the assessment of current and future observing systems, their mix and distribution in space and time, with the development of observing strategies that will maximize the forcast value of observations to predictions, their use in climate monitoring, and essential climate-related research. Initially the focus will be on forecasts of seasonal climate variability over North America up to one year in advance. The Virtual Laboratory will also provide feedback for the development and improvement of data assimilation systems and coupled ocean-atmosphere models. The existing ENSO observing system consisting primarily of the Tropical Atmosphere-Ocean array in the equatorial Pacific, the Pan-Pacific profiler and upper air networks, the global drifting buoy program, and the voluntary observing ship expendable bathythermograph program are major activities included in the initial Virtual Laboratory evaluation. Other major activities to be included initially are remotely sensed sea surface temperature (using the advanced very high resolution radiometer) and remotely sensed sea level derived from TOPEX-POSEIDON. Implementation of changes to existing systems evolving out of the Virtual Laboratory evaluations will require a coordinated international effort.

3.5 INTEGRATED GLOBAL OBSERVING STRATEGY

The United States is leading a multi-national effort to provide an overarching strategy for observations, to allow those involved in the collection of data, both satellite and in situ, to extend their contribution, and assist those requiring information to specify their requirements to realize synergy from the wide range of activities. The Integrated Global Observing Strategy (IGOS) will provide a framework for a coherent set of user requirements so that providers can respond to them. Its aim is to reduce unnecessary duplication of observations and make possible the creation of improved higher level products by facilitating the integration of multiple data sets from different agencies, national, and international organizations. Agencies with responsibility for space-based data acquisition need to commit to a set of observational strategies that transcend national requirements; integration on *in situ* data is also a key element of IGOS.

4. POINTS OF CONTACT IN U.S. AGENCIES CONTRIBUTING TO GOOS

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ANNEX VI

FIRST GOOS FORUM
Paris, 25 June, 1997

PROGRAMME

09.30:	Official Opening of the I-GOOS III Meeting including designation of rapporteurs and statements by sponsors
10.10:	Opening of the First GOOS Forum, and Introduction (M. Glass)
10.20:	GOOS Principles (A. McEwan)
10.40:	GOOS Strategic Plan (C. Summerhayes)
11.00	Coffee Break
11.20:	GOOS Achievements: Implementing GOOS Modules (focusing on the well-developed plans for Climate, and Health of the Oceans) (O. Brown)
11.40:	Examples of Present Global Operations (Ships of Opportunity and Drifting Buoys) (P. Dexter)
12.00:	Tropical Atmosphere Ocean Moored Buoy Array (S. Piotrowicz)
12.30:	Global Sea-level Measurements for GOOS (P. Woodworth)
12.45:	GOOS Services and Products (J. Guddal)
13.00:	Lunch
14.30:	NEAR-GOOS, a GOOS Regional Pilot Project (K. Taira)
14.50:	EuroGOOS, a GOOS Regional Programme (N. Flemming)
15.10:	Coastal GOOS - A US Perspective (C. Ehler)
15.30:	GOOS Realisation (P. Ryder)
16.00:	Coffee Break
16.20:	Next Steps - The Road to Implementation; A General Discussion (led by C. Summerhayes)
18.00:	End

ANNEX VII

FIRST GOOS FORUM - ABSTRACTS OF PAPERS

OPENING AND INTRODUCTION

by Michel Glass
Chairman I-GOOS
IFREMER, France

1. INTRODUCTION

This report covers the intersessional period between I-GOOS II which took place in 1995 and the present I-GOOS III meeting. It may overlap with other reports which have been published during this period.

The purpose of the Chair's report, as compared to the GPO Director's report, is to stress the evolution of the main issues with a particular stress on the policy questions.

The main points which will be reviewed are devoted to :
(i) the definition of GOOS;
(ii) the structure of GOOS;
(iii) the build-up of GOOS.

2. THE DEFINITION OF GOOS

There is a common understanding that GOOS is the initial system which will give birth to operational oceanography, i.e. an oceanography where data are collected on a routine basis, gathered and processed to provide products to end-users. But a lot of questions are raised when one wish to go beyond those general features and define what must be actually performed, taking into account the already existing systems and the achievements of scientific research.

A series of documents has been prepared by G. Needler, A. McEwan and others for review, comments and possible adoption by I-GOOS. It includes :

(i) a paper on the GOOS principles, divided into 2 sections on the design principles and on the principles of involvement to be followed by member states which support GOOS. This paper is needed to ascertain that the national and regional GOOS contributions are as globally coherent as possible;

(ii) a Strategic plan for GOOS based on the first paper which describes the political directions along which GOOS will be developed. This paper will also be reviewed by I-GOOS;

(iii) a third paper prepared by P. Rider under the aegis of J-GOOS and to be published by J-GOOS : the GOOS plan. Based on the first two papers, it will describe how GOOS develops in the following years. This paper is to be produced in 1998, on the occasion of the International Year of the Ocean.

3. THE STRUCTURE OF GOOS

GOOS is a strange animal.

It has been proposed and sponsored by international agencies, intergovernmental (IOC, WMO, UNEP) or not (ICSU). It is managed by two main bodies : I-GOOS and J-GOOS which have few formal links between them and which can report separately to their sponsors. A potential increased complexity occurred with the establishment of a Strategic Sub-Committee, even though its role is clearly defined and its only link with I-GOOS well specified.

GOOS obviously needed a restructuring. Indeed, it has been an old request from the I-GOOS Chair. But the solution to this issue was difficult to find, because of the number of interests involved and the number of bodies and institutions implied. The new interest of many international organisations in IGOS (Integrated Global Observing Strategy) has led to a review of the structure of the GxOs and to the recommendation for them to adopt similar structures. It is an opportunity to modify the overall GOOS structure along the following lines :

(i) I-GOOS remains the intergovernmental forum for the implementation of GOOS;

(ii) A GOOS Sponsors Forum brings together the sponsoring organisations with the GOOS officials. They survey the evolution of GOOS and give advice on it, in order to "reconcile the aspirations of the sponsoring organisations for GOOS";

(iii) The GOOS Steering Committee is created by expanding the functions of the present J-GOOS and subsuming the present role of SSC. Its composition will include non-governmental appointees, as well as representatives of agencies.

It can commission Expert Sub-groups to address specific scientific, technical, crosscutting or implementational tasks. They will normally have a limited lifespan and will conclude with an element of GOOS planning.

This new structure takes the benefits from having one well identified Steering Committee (as in GCOS), and an intergovernmental structure (as in I-GOOS). It has been proposed by the SSC, approved by the GOOS sponsors, which have prepared along those lines a revised version of the GOOS M.O.U., and globally approved by J-GOOS. It has to be reviewed by I-GOOS before final adoption.

This proposal new structure should be adopted, because the necessity of having a small committee ready to help the I-GOOS Chairman to put GOOS on a sound track and to prepare the I-GOOS meetings is evident. It is also clear that the potential difficulties or misunderstandings with J-GOOS lead to unnecessary delays in the development of GOOS. The proposed solution can possibly alleviate the problems.

Whatever the structure can be, GOOS cannot work without a strong GOOS Project Office. The present situation is apparently better than in 1995, because a permanent position has been offered to Dr Summerhayes, who took his new job with a spectacular enthusiasm. But he replaced J.P. Rebert who was seconded by France, and other people plan to leave the GPO. Thus the situation could be worse than before, not speaking of the alarming level of the budget.

Is there something that can be done ?

The answer is undoubtedly positive. Some colleagues can be seconded by their countries, following the examples of USA, France, Japan and new Brazil. The other solution is to imagine a kind of decentralised office, with well-defined duties given to appointed people. In any case, if the sponsoring agencies think that GOOS is indeed a very important program or even a flag ship, they should try at least to maintain the manpower for the GPO and the minimum budget needed for GOOS development.

4. THE BUILD-UP OF GOOS

One weakness of GOOS was the lack of concrete projects. Indeed, GOOS already supports existing activities, such as the TAO array and the Data Management Strategy developed jointly by IGOSS and IODE. But the actual development of GOOS needs specific GOOS activities. One can notice with pleasure that the regional development of GOOS has been initiated. NEARGOOS has begun its activities. EuroGOOS is very active and its interest in Europe was clearly marked during the EuroGOOS conference held in The Hague (Netherlands) in October 1996. We also must take into account the US efforts in the coastal zone which have in fact a regional character. Other regional efforts in the Black Sea or in South Eastern Asia are announced. This proliferation of activities is welcome and shows the interest of many coastal nations in operational oceanography. It also raises a potential issue, as a kind of standardisation is needed in order to eventually aggregate all those systems into a global one and to be able to fill the missing parts. It is clearly one of our tasks to organise the compatibility between them.

The other good point is the proposal made by OOPC to have a Global Ocean Data Assimilation Experiment (GODAE). It is an important milestone in the study of ocean forecasting, similar to what GARP has been for meteorology. GODAE will not only test the feasibility of forecasting, it will also pinpoint the difficulties that will have to be faced for global scale operational oceanography.

For the other GOOS modules, with the exception of HOTO, we must admit that the developments have been much slower than anticipated. It shows clearly that the science to be used for a module must have reached a certain level of maturity before leading to operational activities. It shows also that the role of J-GOOS (or its evolution) is of utmost importance in guiding the scientific panels in a direction useful for GOOS. This has begun with the recent meeting on Coastal Zone (Miami, Feb. 1997), and the last J-GOOS meeting clearly marked the willingness to continue to stress the necessity of this kind of meeting.

The other point is capacity building. One must admit that it is clearly a necessity for a global programme, but also that it is difficult to give it a shape. The needs are so different from one country to another that a global capacity building programme is probably meaningless, or at least inefficient. On the other hand, such a programme can probably not be developed for each individual coastal state, as the efforts would be scattered. For these reasons, the right scale is certainly the regional one.

The meetings which took place last year in Goa and Mombasa are a step in the good direction, but it is a major issue for I-GOOS to continue to watch carefully the developments in capacity building and to provide guidance for this fundamental question.

The last main issue is the preparation of a GOOS high-level conference. This meeting, the objective of which is to give an actual kick-off to operational oceanography and to GOOS has already been postponed several times. We are now bound to organise such an event, and in 1998, which is the International Year of the Ocean. We are also bound for a success, which means that the programme and the available documentation must be flawless. Here again, we are going in the right direction with the initiative to write the above mentioned documents. But they must be ready on time, with arguments that are admissible by operational agencies. The help of the GOOS sponsors has been very important in this respect, because they have the detachment and the practice needed for such events. The GOOS Forum of June, 25th, will help in the necessary dialogue with those institutions, but we must admit that next year will be very busy in preparing this decisive meeting.

5. CONCLUSION

GOOS is considered by some as a slowly developing programme. It is only partially true, if we examine this report. The GOOS structure has been refined. A series of documents is nearly completed, which will go from the basic principles to an implementation plan. Some concrete actions have been initiated. And it cannot be denied that GOOS is gaining up speed.

The next step is to ensure a successful 1998 GOOS event and we will be able to say that global operational oceanography is actually born.

THE GOOS PRINCIPLES

by A. D. McEwan
Vice Chairman, I-GOOS
CSIRO Division of Oceanography, Australia

Central to the concept of GOOS is that it is a 'designed' system, gaining great benefit from participation that is in alignment with certain defined principles. These principles both guide the design (what the system itself will be) and the involvement of agencies and nations (what the commitment to GOOS will mean to participants).

The Principles presented and explained here have been drafted by the Strategy Subcommittee of the inter-governmental body for GOOS (I-GOOS), and reviewed by its joint scientific and technical design body (J-GOOS). Forum participants will be invited to comment on the practicality and acceptability of these principles prior to their presentation for endorsement by the GOOS sponsors.

STRATEGIC PLAN FOR THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

by Colin Summerhayes
Director GOOS Project Office
IOC, UNESCO, France

The Strategic Plan for GOOS has been developed at the request of the Intergovernmental Committee for GOOS (I-GOOS), as a means of describing the system, expressing the overall direction in which it should move, and guiding the implementation of GOOS at the national, regional and global level. The Strategy sets out the Vision, Mission, Goals and Objectives of GOOS, explains its design, demonstrates its relation to user needs, shows how it relates to ongoing observational systems, sets out requirements for data and information management and the generation of products and services from those data, recommends methods for establishing GOOS on a regional basis, proposes a programme for regional and local training and capacity building, calls for pilot projects to be developed to begin the implementation process, states the needs for technology development to underpin the system, examines the possibilities for funding the implementation, and defines procedures for management, reporting and review.

A final draft of the Plan has been prepared for presentation to I-GOOS for final approval for printing in 1997. The published Plan will be presented to Heads of Agencies at a Commitments Meeting in 1998. The report represents the efforts of many people over several years. In its final stages, following review by the Strategy Sub-committee for I-GOOS early in 1997, drafting has been the responsibility of Angus Mcewan (I-GOOS Vice-Chair) and Colin Summerhayes (GPO Director).

J-GOOS REPORT FOR THE GOOS FORUM

by Otis Brown
Dean, Rosenstiel School of Marine & Atmospheric Science
University of Miami, USA

The past year has been quite productive for J-GOOS and its subsidiary committees. A broad spectrum of efforts is underway. These include revision of the GOOS structure [Sponsors], drafting of an initial set of implementation alternatives [J-GOOS Planning Group], development of linkages with CEOS to balance space and in situ systems [GCOS-CEOS In situ Observations Committee], surveying of ongoing long term observations [OOPC Time Series Workshop], climate observing system implementation options [Ocean Observations Panel for Climate], and generation of options in the coastal regime [Coastal Workshop].

The J-GOOS Planning Group developed a top-down description of a GOOS Plan ["GOOS 1998"] which will provide synthesis of the underway modules, a menu for initial implementation, and a backdrop for early planning on modules just initiating planning efforts. A notable innovation in the document is the adoption of themes for implementation rather than modules. The 2 themes under consideration are global (large scale) and coastal (local), where each them would include all relevant aspects of the various GOOS modules.

The OOPC effort is progressing quickly toward experimental implementations of various aspects of the planned observing system. Considerable progress has been made working with implementation groups for sea surface data, ship-of- opportunity data, sea level and time series stations. They have identified the need for a demonstration data assimilation activity, termed the "Global Ocean Data Assimilation Experiment" [GODAE]. The OOPC proposes an aggressive plan to address the implementatin of GODAE with a demonstration to be in place by 2003.

On the other hand, the Health of the Ocean Module [HOTO] planning clearly shows the need to broaden the scope of planning to include health and societal impacts, and to develop initial implementation path finders. The HOTO Panel is focussing on implementation of several pilot projects. Living Marine Resources will be planned and implemented in collaboration with the FAO, while the Services aspects of GOOS will be done with the WMO/CMM.

GOOS will be implemented on a national level, not by a centralized international body. Therefore, as we progress towards pilot implementation of GOOS, national participation in this process is critical to an observing system which will realize our ambitious goals.

EXISTING OPERATIONAL *IN SITU* OCEAN MONITORING

by Peter Dexter
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Within the overall context of major programmes of WMO and IOC which have requirements for ocean data, there are a number of existing operational, *in situ* ocean observing networks, each with their own implementation mechanism. Three such networks are the WMO Voluntary Observing Ships, the IGOSS Ships-of-Opportunity, and ocean data buoys. These networks have different histories and management, although there are common themes. Together, however, they very much represent an embryo GOOS.

The VOS are a traditional activity which has existed for more than 150 years, for which the primary task is to provide timely data for operational meteorology and marine services, as well as records of observations for general marine climatologies. Ship recruitment is largely random, though observations are naturally concentrated on the major shipping routes, and it is unlikely that total numbers of VOS will increase significantly in the future. There has always been a general concern about data quality and observing practices, but the requirements for operational meteorology are not as stringent as those for climate studies. The relatively recent realization of the potential value of VOS data to studies of climate variability and climate change has resulted in much more effort being devoted to the quality of observations, to instrumentation and to the recording of various metadata.

Drifting and moored ocean buoys represent relatively inexpensive and flexible techniques for obtaining observations of certain surface and sub-surface variables (including position/current, SST, air pressure, waves, wind, sub-surface temperatures, etc.) from remote ocean areas, in particular where there are no VOS, and/or in coastal waters. The DBCP was established in 1985 to provide global coordination of buoy activities and improve the quality, quantity and timeliness of buoy data available in support of all WMO and IOC programme requirements. It provides a forum for a rapidly expanding dialogue between operational and research scientists, meteorologists and oceanographers. It has always had available the WWW requirements, and for want of better guidance has assumed that if these are satisfied then GCOS/GOOS will be more or less happy. DBCP tries to adjust its strategies in the light of alternative *in situ* sources of the same data.

The IGOSS Ship-of-Opportunity Programme (SOOP) was established specifically to address the question of the long-term, operational maintenance of the XBT SOO network implemented under TOGA/WOCE. The initial designt for SOOP is this network, with scientific input being provided priomarily by the OOPC, and implementation issues being addressed by the SOOP Implementation Panel. It is clear that it will not be possible to maintain the full initial design network, and it is also likely that this design will evolve with experience and scientific understanding. Operational network maintenance will thus depend on priorities set as part of an iterative procedure involving scientific design bodies and the operating agencies. The question of alternative technologies (such as ALACE/PALACE) is also relevant.

As a generalization, all these existing networks require and make use of scientific requirements which are stated as specifically as possible, by variable, in terms of time and space scales, precision and accuracy, although individually they may treat these in different ways as noted. Where possible and where expertise allows, science design bodies should also address observation techniques and what networks of what platforms might best satisfy requirements for different variables, and coordination between science and implementation bodies needs to be well-defined and effective.

The question of funding is also not irrelevant to operational implementation and maintenance of marine observing systems. Clear and forceful justification will be needed even to maintain what we have now, let alone expand to what may be the actual requirements of GOOS and GCOS as they become known. Nevertheless, it is emphasised that we already have in place both operational observing networks and implementation mechanisms which are effective and which provide a core resource for GOOS.

IMPLEMENTING OBSERVATIONS FOR PREDICTION AND ASSESSMENT PURPOSES WITH AN EMPHASIS ON THE ENSO OBSERVING SYSTEM

by S.R. Piotrowicz
Office of Oceanic and Atmospheric Research
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Justifying the implementation and maintenance of ocean observations by a mission agency such as NOAA requires addressing the needs of the diverse community of users of these observations. The requirements of NOAA to provide useful forecasts of weather and climate variability in the United States on seasonal to interannual time scales has justified the implementation of an observing system of the coupled ocean-atmosphere system in the equatorial Pacific for the ENSO (El Niño-Southern Oscillation) phenomenon. Public and private decision-making processes require assessments and forecasts of climate variability on time scales of decades and longer. Data for these purposes is provided through utilization of unprecedented observational resources that been in place for decades; are in place today; assimilation of those data; and establishment of hypothesis-driven observing programs.

THE GLOBAL SEA LEVEL OBSERVING SYSTEM (GLOSS)

by Philip Woodworth
Proudman Oceanographic Laboratory, UK

The Global Sea Level Observing System (GLOSS) is an Intergovernmental Oceanographic Commission (IOC) coordinated programme for the establishment of a global network of tide gauges for application to climate, oceanographic and coastal sea level research. GLOSS can be considered a component of the Global Ocean Observing System (GOOS), and particularly as a major contributor to its Climate and Coastal Modules. During 1996-97, GLOSS objectives were extensively re-assessed by the GLOSS Group of Experts, resulting in a new Implementation Plan for the programme submitted for approval by the IOC Assembly in July 1997.

The Plan defines a GLOSS Core Network (GCN) of around 280 gauges distributed worldwide, designed to provide an approximately evenly-distributed sampling of global coastal sea level variations; a GLOSS Long Term Trends (LTT) set of gauge sites (some, but not all, of which are in the GCN) for monitoring long term trends and accelerations in global sea level, these will be priority sites for GPS receiver installations to monitor vertical land movements; a GLOSS altimeter calibration (ALT) set, mostly islands, to provide an ongoing facility for mission intercalibrations; and a GLOSS ocean circulation (OC) set, including in particular gauge pairs at straits and in polar area, complementing altimetric coverage of the open deep ocean.

GLOSS activities now include a large number of regional projects and products, and a range of international training courses and materials. The Plan has also outlined updated mechanisms for global tide gauge data flow. This presentation will provide information on these developments.

GOOS SERVICES AND PRODUCTS

by Johannes Guddal
Norwegian Meteorological Institute, Norway

A recent survey has shown that GOOS type services asnd products now are available in many countries. These services extend far beyond the scope of traditional marine meteorological forecasting, into more typical oceanographic domains (/waves, surges, current, sea ice, oil spill prediction, water quality, etc.) Service providers are both governmental and private, and their close connections to users and their ability to adapt to users' needs have already proven that operational oceanography has a realistic vision. There are still many areas that need improvement, the most important one is obviously to provide an infrastructure as a backbone to the more national and local services systems. Such an infrastructure would have some similarities to the World Weather Watch, and it would take care of issues like global ocean modelling, data exchange, standardization, priorities for further technological and scientific developments, transfer of technology and knowhow for the benefit of developing countries. Since existing services have proven the realism of

operational oceanography, the major challenge turns out to be the establishment of a future oceanographic, operational infrastructure.

NEAR-GOOS, A GOOS REGIONAL PILOT PROJECT

by Keisuke Taira
Ocean Research Institute, University of Tokyo, Japan

North East Asian Regional-GOOS, NEAR-GOOS, is the international project between China, Japan, Republic of Korea, and Russian Federation, to exchange in real-time mode the marine and oceanographic data in the Northeast Asian marginal seas, East China Sea, Yellow Sea and Japan Sea (East Sea) . The data reported to GTS will be down-loaded to the NEAR-GOOS Real-Time Data Base on the Internet by the Japan Meteorological Agency. Data producers also report directly to the Data Base through the Internet. The data are to be transferred the NEAR-GOOS Delayed Mode Data Base at the Japan Oceanographic Data Center 30 days after observation, for archiving and maintenance.

Through this mechanism, the data producers can share the data, and the observed data are expected to be increased for public use. National Data Bases are to be constructed in each member state for the convenience of users in each nation.

A final goal of GOOS is forecasting of the ocean, or oceanic conditions. For that purpose, the quantity of data at present is too small. Efforts are being made to increase the number of oceanic observations by the member states. The Volume transport of ocean currents is planned to be detecedt by several submarine cables. Numerical models for data assimilation and forecasting are being investigated.

EUROGOOS, A EUROPEAN REGIONAL PROGRAMME

by Michel Gauthier
IFREMER, France

During the past decade the implementation of a European Union policy for the development of the co-operation between European Marine Institutes and Marine Agencies has enabled development and strengthening of European skill and expertise in marine affairs. EuroGOOS, an association founded in 1994, aims to foster this expertise for contributing to the international planning and implementation of GOOS at national, European and global levesl.

The EuroGOOS Plan includes European Regional seas operational and pilot projects, and projects to contribute to the global system. EuroGOOS also aims to foster European expertise for contributing to international aid and capacity building programmes.

COASTAL GOOS + A U.S. PERSPECTIVE

by Charles N. Ehler
National Oceanic and Atmospheric Administration
U.S. Department of Commerce, USA

Monitoring is an essential element of integrated coastal management, the framework through which problems of coastal areas are being attacked increasingly throughout the world. Monitoring provides many of the data that often trigger initial responses to coastal problems and, over time, provides the information that feeds back into assessment activities that produce new information with which management can adapt and adjust.

The challenges of contemporary coastal problems, e.g., the management of land-based sources of marine degradation, the prevention of marine accidents, and the response to natural hazards, require a re-evaluation of existing monitoring activities. For example, in the US only about one cent of each Feceral and State dollar spent on pollution

abatement is spent on monitoring and only 0.2 cent is spent on ambient monitoring. Since no new resources for coastal monitoring appear to be on the horizon, making the most of existing monitoring activities, coupled with a relatively small investment in new, long-term +index+ or reference site monitoring, is a reasonable short-run strategy.

THE GLOBAL OCEAN OBSERVING SYSTEM 1998
THE REALISATION OF GOOS

by Peter Ryder
UK

In order for GOOS to be implemented, individuals, organisations and governments have to be persuaded to invest their time, intellect, material resources and funds, as appropriate, in the venture. Whilst a start can be made on the basis of past investment in related activities and by exhortation based on a grand, compelling vision, ultimately there are two quite hard-edged criteria which must be met. Firstly, it is necessary to establish that there are benefits to be realised whose value exceeds the cost of the realisation, and secondly that the risks, which inevitably will be incurred, are worth running. In general the greater the benefit/cost ratio, the greater the risk that will be tolerated, but most investors, of their own resources at least, are risk averse.

Under the direction of a J-GOOS Planning Group, a document whose purpose is to provide the required persuasion is being prepared. It is entitled 'The Global Ocean Observing System 1998' to emphasise its currency and, by implication, that it is perishable and will require maintenance. The aim is to complete and gain approval of the document to facilitate its presentation and promotion during the central activities associated with 'The Year of the Ocean' in mid 1998.

The basic strategy of the document is:

a) to establish the nature and scale of the benefits which are realisable by implementation of end-to-end ocean observing and data processing systems capable of providing effective information services;

b) to be persuasive that, because of past planning and investment, sound scientific, technical, legal and material foundations exist for such systems and that a safe, progressive further investment and implementation strategy can be adopted to deliver incremental benefits commensurate with prioritised investment.

It is this combination of a long term vision allied to an incremental approach to and limited time horizon of implementation which is designed to give confidence that proposals are well founded and risks are small. Confidence will also be encouraged by demonstrating that the proposals are consistent with the GOOS Principles and with other planning and implementation activities being pursued under the GOOS banner.

The document comprises 8 chapters containing:

Ch.1 THE NATURE OF GOOS - provides a brief easy to read summary of the rationale, scope, essential characteristics and principles of GOOS, culminating in a statement of the vision we have of it.

Ch.2 THE REALISATION PROCESS - explains the strategic approach being taken to international planning and implementation, and the objectives of the document, as outlined above.

Ch.3 THE DESIGN PROCESS - outlines the generic design process. It begins with an explanation of how the modular structure has been used to define sectional end-user needs and their associated scientific and technical modalities. It then introduces the end-to-end process as a means of realising benefit from systematic monitoring of the oceans and seas.

This is followed by an explanation of an inclusive set of variables which are to be measured and the determinants of their sampling and quality requirements; then by a commentary on the requirements of the modelling process. The concept of a regional/local perspective nested within a global framework is then explained. The chapter concludes with a summary and conclusion that this idea of nesting is a safe and sensible way to proceed.

Ch.4 THE FOUNDATIONS OF GOOS - is a major chapter cataloguing the contributing research programmes, economic studies, international agreements and law, user needs (drawn from the modules), the regional

projects, available space based and in-situ observing systems and deployed data processing systems on which GOOS services are and will be based.

Ch. 5 PROTOTYPE PRE-OPERATIONAL SERVICES - reviews the essential features of 5 programmes which illustrate the practical implementation of the generic design. The aims are to demonstrate the reality of the discussion of Ch.3 and that the information services designed to assist solution of particular management problems are problem specific but have common features. The chosen programmes are:

(i) seasonal to interannual prediction;
(ii) managing the problems of the Black Sea;
(iii) management of South African waters - the Benguella project;
(iv) the north-west European Shelf Programme of EuroGOOS;
(v) a global observation and modelling programme serving the needs of climate research and regional services.

Ch.6 ESTABLISHING PRIORITIES - explains how investment priorities are to be established, based either on arguments for scaling up of demonstrated best practice (the experimental approach) or the joint existence of a feasible technique and a realisable benefit or impact (the analytical approach).

Ch.7 PRIORITIES FOR ACTION - proposes priorities for investment based on the above methodology in the context of a small number of themes, to include:

(i) seasonal and interannual prediction;
(ii) coastal and shelf services, meeting the needs of the Coastal, HOTO, LMR and relevant Service Modules;
(iii) global open ocean observation and modelling to serve long-term Climate needs and to extend the predictability of regional services;
(iv) support for planning and implementation by the GPO and regions.

Ch.8 GLOBALISATION - suggests how to harness the benefits of regional initiatives on a global scale, through capacity building and the sharing of data and products; previews the likely next phases of implementation.

ANNEX VIII

GOOS *AD HOC* CAPACITY BUILDING PANEL: TERMS OF REFERENCE

1. Membership of the panel is open to any Member State of the sponsors of GOOS;

2. The panel will work by correspondence whenever possible;

3. The GOOS Steering Committee will select the Chairman of the *ad hoc* panel;

4. The panel will work in close co-operation with the GOOS Project Office, programme manager, programme coordinator, TEMA group of experts for capacity building and the TEMA capacity building unit on all matters pertaining to capacity building;

5. In direct co-operation with the regional subsidiary bodies of IOC, the panel will assess the present level of capability in each region in terms of trained personnel, infrastructure, observation systems, observing equipment, to determine what needs doing to enable them to participate in the GOOS programme;

6. The purpose of the panel is to assess, plan, organize, implement and monitor GOOS capacity building through the IOC and its bodies and relevant organizations of the co-sponsors of GOOS;

7. Upon request of the TEMA Capacity Building Unit, the *ad hoc* panel will review and comment on draft framework plans prepared by regional subsidiary bodies.

ANNEX IX

LIST OF ACRONYMS