



**Intergovernmental Oceanographic Commission**

**Report of the GOOS Review Panel on the  
Structure, Mandates and Modus Operandi  
of GOOS**

March 2003

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# **Intergovernmental Oceanographic Commission**

## **Report of the GOOS Review Panel on the Structure, Mandates and Modus Operandi of GOOS**

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March 2003

### ABSTRACT

The Global Ocean Observing System (GOOS) is by far the largest and most complex of the scientific and technical programmes led by the Intergovernmental Oceanographic Commission (IOC). In order to ensure that projects of this magnitude are being appropriately managed and are moving in the right direction, it is custom and practice to review them at regular intervals to assist them to maintain focus, efficiency and effectiveness in changing times. Bearing in mind that the mandate for GOOS was first set out formally in March 1991 by the IOC Assembly at its sixteenth session (Resolution XVI-8), that the Intergovernmental Committee for GOOS (I-GOOS) held its first session in February 1993, that the implementation of GOOS was considered to have begun with the inauguration of the GOOS Initial Observing System in 1998, and that the first review of GOOS had been made in 1996 and presented to the third session of I-GOOS in June 1997 (Document I-GOOS-III/20), it seemed timely to review the activity again.

In response to a recommendation by the GOOS Steering Committee (GSC) at its fourth session (Chile, March 2001), which was endorsed by the Fifth Session of I-GOOS (Paris, June 2001), the Twenty-first Session of the IOC Assembly decided (Resolution XXI-7) in July 2001 that a review of the organizational structure of GOOS should be carried out by an external independent Review Group during 2002, and repeated every 5 years. This document is the report and recommendations of that Review Group, as presented to the Twenty-second Assembly of the IOC (24 June-4 July 2003).

### **NOTE FOR THE READER**

*This report is not a description of GOOS - it is a comment on a description of GOOS, with suggestions for change. It should be taken as a companion to the documentary description of GOOS of which it is a critique. Such a description is provided in Annex II, which is the text of the Questionnaire used to solicit views on GOOS, and which was based on the paper on "Structure, Mandate and Modus Operandi of GOOS" that had been presented to I-GOOS-V by Angus McEwan. Readers unfamiliar with GOOS should read Annex II first, before the body of the report.*

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March 2003

Dear Dr. Bernal,

On behalf of the GOOS Review Group, I am pleased to submit the Group's evaluation report on the Structure of the Global Ocean Observing System (GOOS).

The Group was appointed by the Chairman of the IOC in February 2002, and I was asked to join it to replace Dr. Geoff Love in April 2002.

We found that GOOS is a major programme of the IOC, and that success in its development and implementation is vital to both the future credibility of IOC and the needs of the wider international community. Considerable progress has been made in establishing GOOS over the past 5 years, an achievement in which the IOC should take pride as the lead agency responsible for these developments. Nevertheless, GOOS and the associated generation and exchange of products are still at a very early stage. GOOS is not yet adequate to meet its main objectives, it is still weak in basic physical observations and especially in accessible products and attention to biological data. The arrangements proposed in the report should help to improve matters. Progress will be slow, and will depend on both incremental and realistic planning coupled with the ability of nations to succeed in coordinating and representing oceanographic activities and interests nationally and internationally. The recent creation of J-COMM will now greatly aid the continued development of GOOS.

In spite of concerns raised over the effectiveness of current structural arrangements, we found the form of such arrangements to be generally well judged. In contrast, the actual terms of reference and to a lesser degree the actual roles of I-GOOS and the GSC are out of line with recent changes, like the formation of JCOMM, and not in all aspects correct for the task. We recommend changes to improve matters, especially to focus the tasks of I-GOOS and its supporting GSC on the strategy and development of GOOS. We also stress the need for GOOS to be explicitly linked to available data and products. And we recommend that JCOMM is provided with the support and resources needed to ensure that it quickly becomes fully effective as the main technical body concerned with coordinating the implementation of GOOS. We recognize the important role that the GOOS Regional Alliances (GRA's) are set to play, and would see value in them having a formal status with the IOC bodies. In fact we have limited our recommendation to only a reporting link due to recognition of the established non-governmental constitution of the GRA's and the expressed wish of many of them to work with, but not be subject to, higher governance.

It has been a pleasure to carry out this evaluation with the support and assistance of the GOOS Project Office. It is clear that much of the success of GOOS in the past 5 years can be attributed to the efforts of the IOC Secretariat, and not least to your personal promotion of GOOS.

Yours Sincerely,  
P. J. Mason (Review Group Chair)  
On behalf of the Review Group  
John G. Field, Ichio Asanuma, K. Radhakrishnan

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## EXECUTIVE SUMMARY

The Global Ocean Observing System (GOOS) is by far the largest and most complex of the scientific and technical programmes led by the Intergovernmental Oceanographic Commission (IOC). The 21st session of the IOC Assembly (3-13 July 2001) decided in Resolution XXI-7 that a review of the organizational structure of GOOS should be carried out by an external independent Review Group during 2002.

The Review Group report on the governance and management of GOOS notes general concern over the effectiveness of current arrangements coupled with great appreciation of the progress made to date in forming GOOS. In spite of the concerns raised, the Group found the structural form of the current arrangements to be generally well judged. It does however find that the actual terms of reference and to a lesser degree the actual roles of the various bodies, are out of line with recent changes and not in all aspects correct for the task. This was raised in its most fundamental form by the J-COMM and IODE being formally outside the terms of reference of the review Group. The report recommends changes to the role of the I-GOOS so as to focus on the strategy and development of GOOS. It is recommended that the I-GOOS meet less frequently while an active management board maintains the inter-sessional activities and reports annually on progress and exceptional issues to the IOC. The need for GOOS to be explicitly linked to available data and products is stressed. The report recommends changes to the terms of reference of the GSC so as to make clear its role as an advisory body reporting to and supporting the I-GOOS. In conducting this role the GSC is expected to provide one of the mechanisms for the GSC sponsors to ensure that their GOOS interests and GOOS related activities link effectively with the development of GOOS. The report also recommends a focus of attention to provide the support and resources needed to ensure that J-COMM quickly becomes fully effective as the main technical body concerned with coordinating the implementation of GOOS. The report wishes to encourage the use of GOOS Regional Alliances both to facilitate coordination of regional contributions to the global observations, and to meet the specific needs for coordination of adjacent coastal zone activities.

The current GOOS is not yet adequate to meet its main objectives, it is weak in basic physical observations and is especially weak in accessible products and attention to biological data. The arrangements proposed only provide a framework for progress, which in the nature of the task will be slow and progressive. Progress will depend on both incremental and realistic planning coupled with the ability of nations to succeed in coordinating and representing oceanographic activities and interests nationally and internationally.

### 1. INTRODUCTION

#### 1.1 THE BACKGROUND

The Global Ocean Observing System (GOOS) is by far the largest and most complex of the scientific and technical programmes led by the Intergovernmental Oceanographic Commission (IOC). In order to ensure that projects of this magnitude are being appropriately managed and are moving in the right direction it is custom and practice to review them at regular intervals to assist them to maintain focus, efficiency and effectiveness in changing times. Bearing in mind that the mandate for GOOS was first set out formally in March 1991 by the IOC Assembly at its 16th session (Resolution XVI-8), that the Intergovernmental Committee for GOOS (I-GOOS) held its first session in February 1993, that the implementation of GOOS was considered to have begun with the inauguration of the GOOS Initial Observing System in 1998, and that the first review of GOOS had been made in 1996 and presented to the third session of I-GOOS in June 1997 (Document I-GOOS-III/20), it seemed timely to review the activity again. In response to a recommendation by the

GOOS Steering Committee (GSC) at its 4th session (Chile, March 2001), which was endorsed by the 5th session of I-GOOS (Paris, June 2001), the 21st session of the IOC Assembly decided (Resolution XXI-7) in July 2001 that a review of the organizational structure of GOOS should be carried out by an external independent Review Group during 2002, and repeated every 5 years.

## 1.2 TERMS OF REFERENCE OF THE REVIEW GROUP

The Terms of Reference of the Review Group set up in response to Resolution XXI-7 of IOC Assembly, are to:

- (i) review the development and implementation of GOOS, with particular attention to its structure, mandates and modus operandi, the activities of its advisory panels, the development of the GOOS Initial Observing System, including its pilot projects, the regional development of GOOS and the national development of GOOS;
- (ii) review the extent to which capacity-building activities in support of GOOS can benefit Member States;
- (iii) present the final review report to the Assembly at its 22nd session in 2003.

The Resolution also called upon the Review Group to “*address the issues identified as requiring attention by I-GOOS-V*”.

## 1.3 THE REVIEW PROCESS

The views of the wider community were sought through a questionnaire (Annex II) and through interviews. The questionnaire provided a description of the structure, mandates and modus operandi of GOOS as the background to a set of questions. 23 Member States responded to the questions, providing 25 written responses and 8 verbal ones. In addition, 5 organizations (JCOMM, SCOR, WMO, I-GOOS and the GPO) responded in writing. Formal interviews were carried out by the Review Group during its meeting in Paris on September 9 and 10, 2002 with the present and immediate past Chairs of I-GOOS, Chair of GSC, Representatives of the Sponsors (WMO and ICSU), two representatives of Industry, Executive Secretary of IOC, Director GPO, and the Technical Secretaries of OOPC, COOP, JCOMM, GOOS-AFRICA, and SCOR-IOC CO2 Panel. Annex III provides a brief summary of the questionnaire responses, which the Group found valuable in revealing concerns, and in ensuring that attention was drawn to all possible issues and to possible changes in structure. Also, it provides the Group’s views and observations in relation to the advice it received.

Annex IV addresses supplementary concerns, particularly those raised during the fifth session of I-GOOS (June 2001) and the 21st IOC Assembly (July 2001), and notes progress since the first review of GOOS was reported to I-GOOS-III in June 1997. Finally Annex V provides the Terms of Reference of the main GOOS bodies considered in this report. A list of acronyms appears in Annex VI.

## 1.4 SPAN OF REVIEW

The Group considered the involvement in this intergovernmental process of: the IOC, I-GOOS, JCOMM, IODE, the sponsoring bodies, the supporting advisory bodies, and the GOOS Regional Alliances, and the structure that links these together. The Group paid particular attention to the many concerns raised in the responses to the questionnaire over the current arrangements, in particular over the functions of I-GOOS and its relation to the GSC. Some of these concerns were linked to views, and possibly confusion, over the nature of GOOS itself, and the possible roles of “implementation bodies”. The Group further noted that the recent establishment of JCOMM had

both provided an essential and previously lacking component for implementation, and raised the need to ensure appropriate links between it and the various bodies formally involved in GOOS. It noted that although J-COMM and the IODE were outside the terms of reference of the Group, the Group is unable to sensibly offer advice that does not involve these bodies. The Group does however recognize that the ambit of these bodies includes some aspects outside GOOS and for which the Group offers no comment.

## 1.5 REPORT STRUCTURE

In order for the Group's report to be clear, it first notes some general issues, and then presents a description of the current structure and reporting arrangements in diagrammatic form. It proceeds to consider possible changes to the structure and then makes recommendations regarding the terms of reference and focus of each of the bodies together with necessary linkages between the bodies. The changes recommended should be seen in the context of the description of GOOS provided in Annex II.

## 2. GENERAL ISSUES

The Group noted that GOOS is a major programme of the IOC, and that success in its development and implementation is vital to both IOC and the wider international community.

### 2.1 IMPLEMENTATION MECHANISMS

As noted above, the Group felt that there was confusion over the appropriate mechanisms to achieve implementation of an ocean observing system, and indeed over the use of the term "implementation body". In common with other observing domains, implementation is taken in this report to be the responsibility of nations working singly or together. International bodies usually have responsibility for coordinating implementation, and are seldom funded to undertake implementation directly. The scope of the report concerns the structures and policies of the intergovernmental mechanisms available to ensure coordination of (i) the support for, and (ii) the design and implementation of this observing system, (iii) the exchange of data, and its quality control, (iv) the derivation and exchange of consequent products, and (v) the building of capacity to enable all to participate. The general term "implementation body" will be avoided in this report.

### 2.2 MANDATE

In agreement with the majority of respondents, the Group judged that the mandate for GOOS, which is cited in paragraphs 21 through 28 of the questionnaire attached in Annex II, was satisfactory and should not be changed. It did however feel that there was confusion over the identity of "GOOS". In this report GOOS is assumed to stand for the comprehensive, end-to-end Global Ocean Observing System, which includes all types of oceanographic data and marine meteorological data and products that need to be internationally available to support national, regional and global requirements. It is recommended that this definition or an agreed variation is made more visible and associated with the Mandate. National data only needed for national purposes, typically local high-resolution data, are taken to be outside the scope of GOOS, but very relevant to national issues.

### 2.3 MODUS OPERANDI

Most of the issues concerning the Modus Operandi are raised below in relation to individual bodies. Like the respondents, the Group judged the Modus Operandi to be stated appropriately but

not always executed with a clear remit or in a wholly satisfactory way. At this point note is made of the Group's views concerning motivation and the role played by research bodies.

### **2.3.1 Motivation**

For many countries, the motivation to participate in observations will come from the consequent return of products from specialized centres. The Group is concerned to ensure that the GOOS is explicitly developed to support the products and applications which it is intended to serve. The Group wishes to stress that whilst research has sustained the establishment and current operation of much of the current ocean observing system, operational support from the nations requires an explicit justification in terms of the benefits which derive either from the products which they can access or generate from the data, or from needs recognized in international conventions. The Group welcomes the IOC initiatives to engage industrial partners, who are valuable partners in GOOS. It is however concerned that these initiatives should not suggest that industry is likely to be a significant funder of GOOS observations. The Group recognizes that the main funding for GOOS will be from governments, and made in recognition of the benefits - primarily in terms of custody of the marine environment and resources, enabling climate change advice, and - perhaps lastly - direct industrial benefits to economies.

### **2.3.2 Research Community**

At this time a large part of the GOOS is supported from research budgets. This is in keeping with the current high priority that the research community places on its need to better identify and understand the global ocean system. This form of support for GOOS will remain, but operational funding should increase and ideally become dominant. As GOOS evolves in this way the research focus is likely to shift towards increased attention to understanding ocean processes; that shift may result in a move away from measurements that also serve global monitoring of the oceans. The Group feels that it is this strong input from the research bodies which confused some respondents, who were concerned that aspects of the governance of GOOS seem at times driven separately from I-GOOS. The research involvement is reflected in the co-sponsorship of the GSC, the OOPC and COOP by research organizations and should be openly and constructively recognized and encouraged by I-GOOS, and indeed, the IOC, as well as being explicitly depicted in the reports of those bodies.

## **2.4 IMPLEMENTATION, NETWORKING AND DATA COORDINATION**

The Group recognizes that JCOMM provides one of the primary mechanism for coordinating the implementation of actual measurements within GOOS, the establishment of the GOOS observing networks, and the exchange of products based on GOOS. JCOMM is set to focus on the mature capabilities and its initial focus is inevitably on physical measurement. The extent to which JCOMM covers biological measurements will depend on these both being mature and with an agreed need for global data exchange. Needs limited to regional data exchange seem most naturally considered within the GOOS Regional Alliances.

## **2.5 GOOS PLANNING**

The Group noted that inevitably the early focus of GOOS activities had been on a long-term vision, and that the balance of attention was now shifting to engagement. This requires realistic shorter-term expectations or there is a risk of disappointment and loss of focus on ensuring steady but significant progress. The Group also noted that whilst the long-term vision seemed well judged for the "blue water" major ocean domain, there was not yet such a clear vision of which coastal zone data would be relevant and necessary to be internationally exchanged. For the coastal zone the

Group welcomes the focus of the IOC on capacity building and the encouragement of regional linkages, but recommends realism over the expectations of the extent of coastal data that might be included within GOOS and therefore within the eventual remit of JCOMM.

## 2.6 COASTAL ACTIVITIES

As noted above, the Group recommends that GOOS plans are careful to recognize that although coastal activities are important to nations and regions, many elements may not be formally part of the proposed GOOS definition as there may be no requirement for international exchange of all of the data. This is not intended as a negative or exclusive remark and, to the contrary, the Group judges that coastal activities and capacity building in the coastal zone are clearly of IOC concern and best advanced seamlessly with GOOS. The remark is made as some of the views expressed to the Group seemed to seek international data exchange without any, as yet, established motive. The Group wishes to stress the need to develop the coastal activities and sees them as critical to water quality, ecosystem health and living resource issues that greatly interest many Member States. The Group sees the COOP as a key body in providing scientific advice and the GOOS Regional Alliances as essential for effective regional coordination and capacity building at the appropriate level. There remains of course a need for oversight and direction from the higher IOC bodies such as I-GOOS.

## 2.7 NATIONAL COORDINATION

The Group felt that the root of many of the concerns raised over the functioning of the current structures arose from the current absence of operational national oceanographic bodies or even of good coordination of oceanographic activities in many nations. This makes national engagement in GOOS difficult. Member States should be encouraged to develop national oceanographic bodies and national oceanographic coordination mechanisms, particularly those involving all organizations that may be expected to benefit from a GOOS.

## 2.8 THE GOOS INITIAL OBSERVING SYSTEM (IOS) AND PILOT PROJECTS

The Group judged that the GOOS has developed to a stage when the title “Initial Observing System” can be dropped. New global initiatives such as Argo, GODAE and satellite systems are still at an early stage, but are progressing well, together with new international coordination mechanisms such as JCOMM. The Group feels that persisting with the title “Initial” risks denial of the significant progress made in implementing GOOS.

The Group notes that some of the contributions to GOOS derive from Pilot Projects. The Group welcomes the fact that the GSC has endorsed the definition of a **GOOS pilot project as “...an organized, planned set of activities with focused objectives designed to provide an evaluation of technology, methods, or concepts within a defined schedule and having the overall goal of advancing the development of the sustained, integrated ocean observing system.”** The Group also welcomes the fact that this approach to pilot projects is now uniform across GOOS, JCOMM and IODE. This provides the consistent approach to Pilot Projects and the ordered methodology of moving from experimentation to implementation, which is a critical element for the integrated and staged development of the observing system.

The main pilot projects are GODAE, Argo and PIRATA. They are pre-operational experiments or research efforts designed to test fundamental GOOS concepts and technologies, and as such are essential parts of GOOS. The Group notes that these projects have been stimulated either by the GOOS community (through the OOPC for GODAE and Argo) or by the research community (for PIRATA), and welcomes the commitment to GOOS by the research community

engaged in these projects. These pilot projects should be part of the overall plans for GOOS that the GSC prepares for I-GOOS and they should be subject to I-GOOS advice and support. Particular attention should be given by I-GOOS to monitoring the outcomes and then ensuring as appropriate a transition to operations and eventual coordination by JCOMM.

### 3. CURRENT STRUCTURE

#### 3.1 THE DIAGRAM IN THE QUESTIONNAIRE

The Group noted that the depiction of the GOOS structure given in the questionnaire (see the Figure in Annex II) understandably led to some confusion. The confusion probably arose because some of the linkages depicted were those of a reporting nature while others reflected sponsoring or other arrangements. In addition that diagram ignored IOC bodies that make significant contributions to GOOS, especially JCOMM and the IODE. In order to be clear over the different types of linkages, and to make clear where change is sought, the present report illustrates the full extent of the current structure in terms of a set of diagrams covering different types of linkages.

#### 3.2 THE CURRENT STRUCTURE

Figure 1 shows the current formal reporting structure between the various bodies, including the IODE and JCOMM. Figure 2 shows the main sponsoring links within the GOOS structure. Figure 3 shows the structure of the regional GOOS bodies in relation to the IOC Regional Committees and Sub-commissions. Regarding the representation in some schematic form for policy makers of the linkages between the main GOOS bodies, the main GOOS programme activities (Figure 4) and the main bodies contributing to GOOS (Figure 5), the Review Group recommends that these be shown in the form of lists. Policy makers ought to be satisfied that it is the role of I-GOOS and indeed of all the GOOS bodies shown in Figure 1, to manage a broad array of linkages to the many other parts of the community in which activities pertaining to GOOS are taking place. To try to put all of these into a structural diagram, or even a set of structural diagrams, is to invite confusion.

In relation to this current structure the Group notes in particular that:

- (i) **I-GOOS**, the intergovernmental body, has the main aim of both approving a strategy for GOOS and of achieving national support for the execution of this strategy. It is not seen as very effective in either of these roles and this concern is discussed in the report, below.
- (ii) **JCOMM** has been established as a Joint WMO/IOC Technical Commission, dealing with global coordination and sharing of marine and ocean data and products (analogous to the role the CBS plays in meteorology). JCOMM is the primary mechanism for coordinating the implementation of physical measurements in GOOS, following the advice of I-GOOS and the GSC. JCOMM derives from the WMO Commission for Marine Meteorology (CMM) and the joint IOC/WMO Integrated Global Ocean Services System (IGOSS). Noting its newness and the intention to meet only every four years, the Group felt that JCOMM may have a major challenge to live up to the aspirations placed upon it and will need full support to succeed.
- (iii) **IODE** has the role of encouraging the development of national ocean data centres to common standards and, in contrast to the real-time data activities of J-COMM, deals with data not usually available in real-time. It also encourages the development of archives for national purposes, and some of these data may lie outside the remit of

GOOS. The IODE's network of National Ocean Data Centres is a key element in the implementation of GOOS.

- (iv) **The GOOS Regional Alliances** are not constituted as regional intergovernmental bodies. This is both a limit in relation to possible formal establishment of them as IOC bodies and an advantage in ensuring involvement of the full oceanographic communities. It may be possible to revise the constitution of the regional bodies, but at this time the Group wishes to encourage current arrangements whilst ensuring that good links are maintained between both the GRA's as a group and the IOC bodies. The Group notes that, together with JCOMM, the GRAs also provide a mechanism for coordinating the implementation of GOOS, particularly with respect to regional needs.

## 4. RECOMMENDED STRUCTURE

### 4.1 CHANGING THE STRUCTURE

Although some responses to the questionnaire suggested changes to the current structure, almost all were in favour of retaining the current structure, judging that any difficulties were not inherently related to the structure itself. The Group specifically considered various structural options including those raised by a few respondents, and judged that to a large extent these options created as many difficulties as they resolved.

### 4.2 STREAMLINING THE STRUCTURE

The Group noted that some confusion had arisen in the minds of several of the respondents about the structure of GOOS, because of the inadequate way in which the structure had been depicted in the Questionnaire (Figure 1 of Annex II). That structure showed no linkage between I-GOOS and the GSC, nor between the GPO and either the GSC or I-GOOS, and in addition depicted all three of those bodies as reporting in some way to a GOOS Executive that sat above them. It became clear to the Group that the actual structure was that depicted as the current structure in Figure 1 of this report. The former sponsors' forum depicted at the top right of Figure 1 of Annex II had recently ceased to exist, and the GOOS Executive had recently evolved, following the 5th session of I-GOOS, into the newly created I-GOOS Board. The GSC clearly did provide scientific and technical reports to I-GOOS, and the GPO clearly did report to both it and I-GOOS. At the same time, the Group felt that it was important to recognize that JCOMM too had recently arrived, and should be shown as part of the structure because it assists in implementing GOOS. For these various reasons, the structure depicted in Figure 1 of the present report constituted a streamlining and a clarification in comparison with previous depictions of the structure. This formed the Group's starting position for a consideration of further improvements.

With regard to any possible further streamlining of the overall structure, the Group noted that I-GOOS was in effect a specialized meeting of the IOC Assembly for the purposes of inter-governmental governance of GOOS. This makes I-GOOS different from both IODE and JCOMM, which involve designated specialists. It would be simpler if the governance of GOOS could be conducted by the IOC governing bodies directly. The Group does however recognize that I-GOOS was created due to both the need for a focus on GOOS and in recognition of the fact that some of the IOC delegations may not have members knowledgeable in this specialized area. Equally, those attending I-GOOS need both specialist abilities and also an ability to represent national interests. The Group judges that this reason for creating I-GOOS remains sound especially at this early stage when GOOS needs extra attention. It does however note that in practice I-GOOS itself remains dependant for its success on both attendance by sufficient number of nations, and appropriate composition of their delegations. The Group's recommendations, of less frequent I-GOOS sessions

with a focus of approving strategy and an inter-sessional work-plan, are intended to encourage improvement in this regard, but it is concerned that there remains the underlying difficulty that arises from the limited extent of oceanographic support and coordination within nations. It judges that patience and step-wise progress is key in allowing such national support and coordination to come into place, and is concerned that expectations should be realistic. The Group believes that IOC should maintain encouragement for the national, regional, and global development of GOOS, and work to build confidence by encouraging expectations and goals to be realistic. Consistent with the less frequent I-GOOS sessions the Group see it as vital for an active I-GOOS Board to report to and take inter-sessional actions and recommendations for decision to IOC.

#### 4.3 THE NUMBER OF MEETINGS

The Group noted the view of some respondents, and the IOC Review by Zillman et al (2000), that there seemed to be too many meetings concerning GOOS. It noted that since the IOC review streamlining has occurred through: (i) the merging of the former Products and Services Module into the OOPC; (ii) the combination of the former LMR, HOTO and Coastal GOOS Modules into COOP, (iii) bringing the previously separate observing sub-systems together under JCOMM, and (iv) the steps being taken by JCOMM to merge some of the specialist panels (e.g. of the Ship of Opportunity Programme and the Voluntary Observing Ship programme). There did not seem to be any duplication between the GOOS and JCOMM bodies, except perhaps in the area of capacity building. The Group noted that COOP met twice per year, while the OOPC and the GSC met once/year and I-GOOS every two years; this number and frequency did not seem excessive. The Group noted that beneath the main GOOS bodies mentioned above there were a number of entities dealing with specific projects (like GODAE, or Argo, or PIRATA), or with specific regions. The Group did not find any reason to doubt the need for these entities. The Group recommends that the GSC and its advisory panels are vigilant to ensure that meetings do not proliferate and seek to ensure the most efficient structures. This should be a regular GSC agenda item.

#### 4.4 STRUCTURE RECOMMENDATION

The Group recommends formally retaining all current bodies but seeks to distinctly change and improve their terms of reference and reporting relationships in order to: (i) recognize recent changes, (ii) give less overlap, and (iii) provide a stronger clarity of focus to each body as GOOS evolves towards implementation. Overall it also suggests a stronger link to products and services.

Figure 6 sets out the new structure as seen by the Group in terms of the tasking relationships between the different bodies. As shown in this revised structure, the Group also recommends (for reasons explained in the following text) the addition to I-GOOS of responsibilities for both capacity building and GRAs.

#### 4.5 DOCUMENTATION OF REVIEW OUTCOME

The Group recommends that subsequent to IOC's decision on the response to this review, the document describing the "Structure, Mandates and Modus Operandi of GOOS" (I-GOOS-V/6) should be updated in line with the then agreed position. It also notes that the comprehensive description of GOOS in *The GOOS 1998* will be 5 years old by the time of the 22nd IOC Assembly in 2003, and in need of update by the GPO in conjunction with the I-GOOS board. The revision to *The GOOS 1998* should describe the whole end-to-end system, including to the observing elements, data and information management, data assimilation and exchange, communications, quality control, modelling and product development and delivery.

## 5. REVIEW GROUP RECOMMENDATION FOR IMPROVING THE EFFECTIVENESS OF EACH BODY IN RELATION TO GOOS

The report now offers its view of how to improve or sustain the functioning of the various bodies.

### 5.1 I-GOOS

Some of the respondents indicated concern regarding who governs what and whom within GOOS. At the level of I-GOOS this confusion arises because when the Committee was initially formed, it was described at its first meeting in February 1993, as the IOC Committee for GOOS. Subsequently IOC Assembly Resolution VII-5 in March 1993 invited WMO and UNEP to co-sponsor, jointly with IOC, the IOC Committee for GOOS and in turn IOC Executive Council Resolution IOC-XXVII.6 in July 1994 noted with satisfaction that WMO and UNEP had decided to co-sponsor the activities of I-GOOS. This development reflects the interest across the UN system in developing GOOS through a partnership approach, and the co-sponsorship has a formal status. In effect the IOC is operating as the lead agency for GOOS. Nevertheless, the Group notes that I-GOOS reports formally only to the IOC, whose delegations take the responsibility for the management of GOOS, and, further, that the IOC provides all of the staff and most of the programme money for GOOS developments, with WMO and UNEP contributions contributing solely towards the activities of the GSC and its subsidiary bodies. Thus, regardless of its co-sponsorship, I-GOOS is in effect operating simply as a specialized subsidiary body of the IOC and could be simply be an IOC body. The WMO co-sponsorship of JCOMM both provides a more direct channel for WMO interests in GOOS as well making it clear that GOOS involves a real partnership between international organizations.

The Group recommends that IOC considers returning to the role of the I-GOOS very specifically dealing with IOC interests in GOOS and to being sponsored solely by IOC whilst recognizing other sponsor interests through reports from JCOMM and the GSC. The Group recognizes that change of sponsorship may prove a sensitive issue and if the present arrangements persist the Group recommends that the I-GOOS nevertheless seeks to acts only for IOC and accepts the joint sponsorship as simple recognition of the partnership that characterizes the whole GOOS. According to the IOC decision on sponsorship the I-GOOS should be clearly designated either the IOC Committee for GOOS or the Intergovernmental Committee for GOOS. As noted below, the Group fully endorses the joint sponsorship of the GSC and encourages to GSC to report on agreed plans to all its sponsors.

The Review Group sees considerable merit in maintaining the current delegations of responsibility to JCOMM and IODE, as these delegated activities are of a technical and specialist nature and so best dealt with by technical bodies. The role of I-GOOS has been noted, above, to be an extension of the IOC governance function for the purposes of focusing on the overall management and fostering of GOOS.

The current Terms of Reference of I-GOOS pre-date the creation of JCOMM and therefore even quite separate from this review there is a need for them to be adjusted to avoid duplication. The current Terms of Reference are also rather general and all encompassing, and give the Group concerns that I-GOOS does not have a sufficiently clear focus.

The Group recommends that the revised Terms of Reference should focus on the following key elements:

- (i) **Identify and articulate the data and product needs of international conventions and national development;** *for example following the pattern of IOC's involvement*

*though the OOPC in GCOS's efforts to produce Adequacy Reports for the UN Framework Convention on Climate Change, and by perhaps seeking input from a Working Group on national development needs. Use should be made of a visibility/communications group to aid national recognition of needs and opportunities. The group should have cross membership with JCOMM, IODE and the GSC.*

- (ii) **Maintain plans for the continued development of both the observing systems and the composite data products that utilize the integrated observing system, to meet the needs articulated in (i) above;** *for example combined satellite and in-situ products for the ocean surface, and analysis products from GODAE, such as sea surface currents and subsurface temperature fields. This wide-ranging and substantial activity should be undertaken through modification and endorsement of proposals from the GSC. I-GOOS should be responsible for assessment and development of the plans, documenting agreed actions and agreeing on the responsibilities for oversight of the effects of these actions. I-GOOS would follow a scientific and technical "best practice" approach; implement rolling reviews of performance; provide appropriate documentation; and communicate plans, benefits and outcomes to relevant audiences.*
- (iii) **Seek national support for the implementation of the plans identified in (ii) above;** *this requires planning to proceed in line with reasonable expectations of national support and for I-GOOS to use both its own structure and that of its partners (e.g. IODE and JCOMM) to solicit such support. It will also require I-GOOS to encourage nations to place all appropriate data and products within the scope of international data exchange mechanisms and the governance of JCOMM and IODE.*
- (iv) **Assist in developing the capacity for all nations to contribute to and benefit from GOOS;** *this will involve in particular: (a) ensuring use of GOOS data and products (noting that JCOMM capacity development focuses on technical capability, I-GOOS should focus on aiding countries to acquire the capability to create and utilize information products and services to support national development); and (b) encouraging and fostering regional cooperation including the development of GRA's (noting the benefits of specialized data sharing and common development of products and observing subsystems). A Capacity Building Panel should be used to set plans and ensure inter-sessional activity. The group recommends that a combined GSC/I-GOOS/JCOMM capacity building panel should be formed so as to incorporate the current GSC and JCOMM capacity building panels into a single focal panel.*
- (v) **Take responsibility for the management of the GOOS Project Office.**

The Group recommends that the IOC review the Terms of Reference of I-GOOS in line with this advice, bearing in mind in addition the comments below.

The Group is concerned to recommend that I-GOOS should visibly adopt a new business-like stance in its intents and agenda, and that Member States should recognize their responsibilities to ensure that it is an effective and useful body for inter-governmental coordination. As noted above, a prerequisite for this will be for Member States to ensure that the delegate or delegates attending are able directly or through consultation to represent both the full national responsibility for implementation of GOOS and for the use of GOOS products.

Consistent with the proposed refocusing of I-GOOS, the GSC should be required to maintain both a long term strategic plan and a realistic suggested work plan for the continued development of the observing system during the inter-sessional period between I-GOOS meetings, noting implied resource needs, for I-GOOS to consider, and if necessary amend, prior to formal approval by the

IOC. These plans should recognize fully and seek to engage the roles played by JCOMM and IODE. The Group notes that adequate linkages already exist for such coordination between the GSC and these related bodies.

Recognizing that the value from the GOOS and support for the GOOS depends on the real use of products and services which the GOOS enables to be put in place through JCOMM and the Member States activities, it is important that the I-GOOS plans help to ensure the continued development and availability of new or improved products, in particular those that seek to use the full integrated observing system. Here the Group recognizes that best use of the observing system will increasingly derive from analyses that combine various types of in situ and satellite data, and hence suggest that I-GOOS plans must explicitly consider the generation of such analyses. It is therefore important that the I-GOOS receives status reports from the JCOMM products and services area as well as advice from the GSC on new developments, opportunities and benefits in forecasting and analysis products, so that the overall plans enable new products and services to be put into effect and exchanged through arrangements in JCOMM.

I-GOOS should take responsibility for the development of the infrastructure required for services, the standards of services, identification of the needs for services, identifying those services that are not optimum for present needs, etc. This task will have to be carried out in concert with the JCOMM services area, recognizing that JCOMM will not supply all services based on GOOS.

This (new) primary role for I-GOOS places a significant burden on the GSC beyond simply advising on progress with GOOS for information and comment, as has been close to the practice in the past. This new role will also place an additional significant burden on the GPO in the preparation of appropriate documentation.

The Group strongly supports the creation of the I-GOOS Board and recommends that it not only simply reports to IOC but that takes requests for action and recommendations for decision to IOC, including any necessary changes in strategy or work-plan. The Group recommends that the I-GOOS Board sees I-GOOS as a specialized meeting of IOC for the purpose of approving GOOS strategy and work-plan whilst using IOC as its main work-plan decision body. In practice this may be essential as I-GOOS lacks the full formal authority of IOC that will be needed for many decisions. Close mutual coordination of the GSC and the I-GOOS Board is essential. The membership and terms of reference and focus of the I-GOOS Board and the GSC are however so distinct that a merger of the two groups is not recommended.

The nature of this new role is such that the meeting frequency for I-GOOS should in the future be lengthened to 4 years, with annual inter-sessional activity being delegated to appropriate Working Groups, under the direction of the I-GOOS Board. Otherwise the work plan will not show sufficient development between I-GOOS meetings for the meetings to be of sufficient substance. This less frequent meeting structure will help to alleviate the implied burdens on the GSC and the GPO, and may provide the opportunity to move to multi-language support for the meetings in accordance with normal UN intergovernmental practice. The less frequent meeting frequency makes it vital for the I-GOOS board to be active and effective. The board should report to IOC during the inter-sessional period on progress and exceptional issues.

## 5.2 JCOMM

The Group judged that J-COMM has been wisely established as a true joint partnership with full joint reporting, and shared governance between IOC and WMO. This has the advantage of ensuring that marine and ocean observing is developed with the benefits from the synergies in terms of management, data protocols, data handling and exchange, etc.

The Group commends JCOMM for the detail and clarity of intent within its Terms of Reference, which are cited below in full both to report on its role and because of their significance as a model for the development of new Terms of Reference for other bodies. It should be stressed that the Group has not sought to check or endorse every detail within the Terms of Reference, but takes the level of detail as being exemplary in establishing clear methods and intents for achieving the overarching aspiration of the Terms of Reference. The Group seeks no change in these Terms of Reference, but sees a need for other bodies involved in GOOS to adapt to recognize the role of JCOMM as expressed in these Terms of Reference, and further encourages them to establish a similar level of detail in their own Terms of Reference – especially at this stage in the development of GOOS, to avoid overlaps.

JCOMM shall be responsible for matters relating to:

*Further development of the observing networks*

Under the guidance of the relevant scientific and operational programmes of IOC and WMO, development, maintenance, coordination and guidance of the operation of the global marine meteorological and oceanographic observing systems and supporting communications facilities of these organizations to meet the needs of the IOC and WMO Programmes and in particular of the Global Ocean Observing System (GOOS), the Global Climate Observing System (GCOS) and the World Weather Watch (WWW). Evaluation on a continuing basis of the efficiency of the overall observing system and suggesting and coordinating changes designed to improve it.

*Implementation of data management systems*

Development and implementation, in cooperation with the Commission for Basic Systems (CBS), the Committee for International Data and Information Exchange (IODE), the International Council of Science (ICSU), and other appropriate data management bodies, end-to-end data management systems to meet the real-time operational needs of the present operational systems and the global observing systems; cooperation with these bodies in seeking commitments for operation of the necessary national compilation, quality control, and analysis centres to implement data flows necessary for users at time scales appropriate to their needs.

*Delivery of products and services*

Provision of guidance, assistance and encouragement for the national and international analysis centres, in cooperation with other appropriate bodies, to prepare and deliver the data products and services needed by the international science and operational programmes, Members of WMO, and Member States of IOC. Monitoring of the use of observations and derived products and suggesting changes to improve their quality. Coordination of the safety-related marine meteorological and associated oceanographic services as an integral part of the Global Maritime Distress and Safety System of the International Convention for the Safety of Life at Sea (SOLAS).

*Provision of capacity building to Member States*

Review and analysis of the needs of Member States of IOC and Members of WMO for education and training, and for technology transfer and implementation support in the areas of responsibility of the technical commission. Provision of the necessary technical publications, guidance material, and expert lecturers/trainers and operation of workshops as required to meet the needs. Development of projects to enhance Member States capacity to participate in and benefit from marine meteorological and oceanographic programmes of WMO and IOC.

*Assistance in the documentation and management of the data in international systems*

Development of cooperative arrangements with the data management bodies of IOC, ICSU, and WMO, such as IODE, the Commission for Climatology (CCI), and the ICSU World Data Centres to provide for comprehensive data sets (comprising both real-time and delayed mode data) with a high level of quality control, long term documentation and archival of the data, as required to meet the needs of secondary users of the data for future long term studies.

These responsibilities exclude those aspects specifically handled by other WMO constituent bodies or equivalent bodies of IOC.

The Group notes that JCOMM has the benefit of embracing the marine atmospheric data as well as the physical ocean components. The Group recognizes the key technical implementation role that the GOOS community requires JCOMM to undertake in order for GOOS data to be exchanged, quality controlled and available for use by Member States. It also recognizes the important role that JCOMM is structured to play in the exchange of products between nations, and in facilitating the development of services within nations.

The Group commends the cross membership and the linkages that have been established between JCOMM, GSC, I-GOOS and the IODE through attendance of senior representatives of GOOS and IODE at meetings of the JCOMM Management Committee. The Group also commends the current practice of inviting the chairs of supporting panels such as the OOPC and COOP to attend meetings of the JCOMM Management Committee, and further recommends that these bodies also report to the meetings of the Commission. It will be important for these linkages to work well to enable all four bodies to be effective. In particular, for technical purposes, both JCOMM and IODE should be represented at the GSC meetings. The Group welcomed the decision of the IOC Assembly to develop a common strategic plan for data management across the IOC involving these various bodies.

The Group noted the close involvement of IODE in the data management group of JCOMM, and recognized that data management of the developing components of GOOS would be critical, and trusts that the relationship between the real-time data exchange necessary for data assimilation and the climatological holdings (archives) will be dealt with effectively.

JCOMM is structured to develop good links with the satellite agencies and needs to give the development of these links a high priority. Together with I-GOOS it needs to seek to transition the currently fragile support for oceanography through R&D missions into operational activities. This will be a difficult task that is likely to require the mobilization of significant national funding.

Research and Navy data form a significant part of the current GOOS and there is a need for JCOMM, I-GOOS and IOC work together to encourage the submission of this data in real time. The research community should benefit from the real time products available to support their programmes whilst the Navies should with their governments be encouraged to recognize the consequent public good. As occurs with atmospheric observations, military priorities and perspectives can be expected to prevail in times of tension.

The Group feels that it is essential for the success of GOOS that the IOC and the bodies involved in GOOS are 'continually' aware of the performance of the GOOS network and the extent to which GOOS data and products are available internationally. The Group therefore recommends that JCOMM explicitly provide regular reports to IOC and appropriate GOOS bodies concerning the performance of the GOOS network and the extent to which GOOS data and products are available internationally.

In relation to the need for products to be available to all the Member States, often as a return for their contribution to observations, the Group supports the intention of JCOMM to take responsibility for designating regional global centres with special responsibilities for producing and disseminating particular types of GOOS data and information.

The nature of the functions of JCOMM requires frequent engagement of national responsibilities, and the Group therefore recommends that consideration be given to increasing the frequency with which JCOMM meets. Most importantly the JCOMM Management Committee needs to be active and to ensure regular reporting on progress to IOC and WMO.

The Group believes that the provision of adequate resources to JCOMM is critical to the success of GOOS, and judges that current resources need enhancement. It is recommended that the JCOMM post recently established in the GOOS Project Office is funded on a permanent basis by IOC.

### 5.3 IODE

The Group recognized that significant parts of the current ocean data are obtained from diverse non real-time sources and are outside the intended remit of JCOMM. Whilst IODE is not formally part of GOOS, and therefore not within the ambit of this review, the Group recognizes the very important role which IODE plays in fostering data management in ocean data archives, and in building capacity through the development of such archives and by providing training in data and information management. The Group welcomes the already established linkages between IODE and JCOMM and the GSC and recommends that these linkages be well-maintained in accordance with the need for there to be a seamless flow of the real-time data considered by JCOMM, into long-term data archives, and for the community to have access as appropriate to both sources of data.

The Group recommends that the IODE works to ensure that global data centres receive as far as possible all data falling within the scope of GOOS. This requires liaison between IODE and JCOMM to ensure that the real-time data managed within JCOMM migrates to such centres, along with the appropriate parts of the delayed mode and research data that fall within the direct ambit of IODE. The Group further recommends that IODE provides IOC with an annual report concerning the statistics on the availability of GOOS data within the global data centres, so that IOC Member States can both appreciate progress and be aware of any difficulties.

The Group wishes to stress the importance of data access, archiving and quality control if GOOS is to succeed in terms of end products. It will be important for IODE to work with I-GOOS in drawing national attention to these needs.

### 5.4 GSC

Formally the GSC is sponsored by IOC, WMO, UNEP and ICSU as the steering group for GOOS. This is in accordance with the requirements of IOC Assembly Resolution XVII-5 (March 1993), which led to the signing of a Memorandum of Understanding between IOC, WMO and ICSU regarding the co-sponsorship of J-GOOS in August 1993, followed by the signing of a Memorandum of Understanding between IOC, WMO and ICSU regarding the co-sponsorship of J-GOOS's successor, the GSC, in December 1997. The GSC has the status of an International Programme, and has a status like that of the WCRP Joint Steering Committee (JSC) in relation to the WCRP. At the same time, unlike the WCRP, GOOS has formal intergovernmental governance by the IOC acting through I-GOOS. As discussed above, this dual arrangement with an I-GOOS and a GSC is at the heart of some of the concerns over who governs what and whom within GOOS. As noted, realistically the I-GOOS, operating largely on behalf of the IOC, has the formal

responsibility for the intergovernmental governance of the heart of GOOS. In as much as other intergovernmental bodies, such as WMO, FAO and UNEP, and other international bodies, like ICSU and IGBP, have other degrees of responsibility within the GOOS domain, the GSC acts to advise I-GOOS not only as a subsidiary reporting body but also with the personality of the wider international scientific community. Its membership is subject to the governance of all sponsors and its functions should recognize that its status is wider than that of a simple subsidiary body. The Group sees advantages from the current multi-sponsored arrangements, which ensure a wider involvement in GOOS and avoid otherwise uncoordinated activities within the other agencies and programmes. The Group therefore seeks to ensure that the GSC aims are in fact wholly consistent with this dual role.

Notwithstanding the concerns addressed above, the Group noted wide agreement that the GSC is essential as a scientific and technical advisory body, and that it has proved highly effective during the design and the initial and continuing implementation phases.

The current GSC Terms of Reference appear to make the GSC directly responsible for overall design and management of GOOS, and do not properly reflect its advisory role to both I-GOOS and its other sponsors. The Group recommends amendment of the current Terms of Reference to reflect its overarching role, which is:

- (i) **Primarily to maintain for the I-GOOS and other sponsors a long-term strategic plan and accompanying short- to medium- term action plans for GOOS**, which should identify and encourage “best practice”, be formally updated prior to each session of I-GOOS and be presented in conjunction with targets for implementation during the inter-sessional period. The plans should cover
  - (a) evaluation and review of the current status of and weaknesses in all real-time and delayed-time ocean and marine observing systems in relation to key ocean events and agreed objectives;
  - (b) evaluation and review of the overall status of and weaknesses and opportunities in data and information management within GOOS;
  - (c) evaluation and review of the status of and weaknesses and opportunities in ocean analysis and forecasting systems, noting the need to work in conjunction with JCOMM to encourage ocean analysis and forecasting centres to produce and exchange performance metrics to common standards so as to identify opportunities for progress;
  - (d) identification of research needs for new ocean measurement systems and forecasting systems for GOOS;
  - (e) the development of plans and suggested processes for the migration of research measurements into operations within JCOMM;
  - (f) the development and review of requirements in response to changing user needs, and the interpretation of those needs in terms of the observations and products required.
- (ii) **To undertake, in coordination with the I-GOOS Board, activities to assist in gaining community wide understanding of and support for the agreed programme; e.g. by supporting subsidiary programmes, conferences and publications.**
- (iii) **To undertake, in coordination with JCOMM and I-GOOS, capacity-building activities aimed at improved scientific capability.**

The Group noted that some respondents to the questionnaire were concerned that the membership of the GSC was overly scientific, and wishes to report that in fact the current membership is well balanced between the science community and operational or industrial members. The Group recommends that this constitution of the GSC should be retained as it helps to ensure that the advice is both scientifically sound and includes an informed judgment in relation to national implementation capacity. The Group noted some concerns over the method used to select members of the GSC. The details of the method are noted in Annex IV. The method is entirely in accord with the expected governance of a Group of Experts having multiple sponsors. The Group is content that the process used is satisfactory and encourages the GSC to routinely report on the balance of the membership in order that the I-GOOS remains well informed.

As the scientific advisory body to I-GOOS, the GSC should maintain contact with the I-GOOS Board and report formally to meetings of I-GOOS. The Group notes that the GSC chair is a member of the I-GOOS Board, and similarly that the I-GOOS Chair is a member of the GSC Executive Committee.

## 5.5 GSC ADVISORY PANELS

### 5.5.1 COOP and OOPC

The Review Group regards the advisory panels (OOPC and COOP) as having been very effective, whilst noting that the COOP has special challenges as it deals with a much less mature part of the observing system. The Group seeks no substantive change in the existing advisory panels other than noting the need for good coordination between COOP and OOPC to ensure a mutual understanding of their respective roles with respect to physical and biogeochemical observations, and to ensure an understanding of the inter-relationship between the coastal and open ocean. The Group encourages the COOP and OOPC to cooperate in identifying those coastal domain observations that should be taken as part of the global observing system and, when sufficiently mature, placed under the responsibility of JCOMM.

### 5.5.2 Applications and Modelling

The Group considered that the GSC is not well structured to provide best scientific advice on the full use of an integrated observing system involving analysis of data within forecasting models and with the now increasingly diverse development of products and applications. It recommends that the GSC works to strengthen its links with these activities, including for example by maintaining links with GODAE and with the services and products group of JCOMM.

### 5.5.3 Capacity Building Panel

The Review Group recognizes that the GSC, within its Terms of Reference, should seek to encourage capacity building in the fields of scientific and technical understanding necessary for GOOS. The Group welcomes the recommendation by the GSC and JCOMM that the GSC Capacity Building Panel be merged with the JCOMM Education, Training and Capacity Building Coordination Group. However the Group recommends that I-GOOS should also take an active part in capacity building to assist it in wider areas of capacity development than would naturally be appropriate to the GSC and its advisory bodies or to JCOMM (see I-GOOS section, above). The Group recommends a shared approach through a joint GSC/I-GOOS/JCOMM capacity building panel that capitalizes initially on appropriate members of the current GSC capacity building panel and JCOMM Education, Training and Capacity Building Coordination Group. To emphasize the difference from the former structure (Figure 1), and with note of I-GOOS's overarching role, this

new group is shown as reporting to I-GOOS (Figure 6); however it is expected that being a tripartite entity it will in practice link also to the GSC and JCOMM.

It is recommended that the CB Panel be appointed as a group of experts by the I-GOOS Board with cross linkages to JCOMM, the GSC, COOP and OOPC.

The Group concurs that Partnerships are essential for building the capacity for GOOS, as emphasized in the various publications on GOOS Capacity Building.

## 5.6 GPO

The Group noted a number of commendations from the respondents to the questionnaire and from interviewees for the effective work of the GPO.

The Group noted that the GPO is serviced by a full Section of the IOC Secretariat, the Operational Observation Section. The Head of this Section serves as Director of the GPO and is managed directly by the Executive Secretary of the IOC. Some of the Section's staff work on GOOS, others on JCOMM. The IOC has set up regional offices to deal with GOOS developments in Perth, Australia, and Rio de Janeiro, Brazil, and the staff of those offices report to the Executive Secretary of the IOC through the Director of the GPO. In addition some of the efforts of the IOC Secretariat staff in Bangkok, Thailand, and Cartagena, Colombia, are concerned with regional GOOS developments, and those staff report on those developments to the Executive Secretary through the Director of the GPO.

The Group notes that the current Terms of Reference for the GPO go beyond a supporting capacity for I-GOOS, the GSC, and JCOMM, and suggest an actual responsibility for GOOS planning. Whilst noting that the GPO will clearly cooperate in such matters, it recommends that the Terms of Reference for the GPO make clear its role in:

- (i) supporting the I-GOOS, the GSC and JCOMM, and their subsidiary bodies;
- (ii) managing regional GOOS offices;
- (iii) liaising with IODE;
- (iv) developing work programmes and budgets in consultation with the bodies involved;
- (v) raising funds for GOOS coordination;
- (vi) coordinating with sponsors and other appropriate groups;
- (vii) GOOS outreach through publications and web site.

It is self-evident that aside from the Director of the GPO reporting to his line manager (the Executive Secretary IOC), he must continue also to report formally on progress in GOOS developments under his responsibility to both I-GOOS and the GSC.

The Group recognizes that, in common with many Secretariat functions, the GPO is under-resourced and therefore increasingly under-staffed in relation to the growing workload imposed by the creation of JCOMM, the expansion of regional GOOS activities, increasing involvement with space agencies, etc. The development of strategic plans and more comprehensive work programmes required of the GSC will create further work for the GPO. The Group trusts that IOC will recognize the key role that the GPO provides in enabling the GOOS to continue to develop and indeed exist, and therefore will ensure that it is appropriately resourced.

A number of respondents wished that the GPO could undertake a greater role in marketing, outreach and the maintenance of the web site. There was in addition a call for the production of documents sufficiently ahead of meetings to allow for translation into the four working languages of IOC. These requirements relate to the question of human resources, noted above.

The Group judges the establishment of regional offices in Perth and Rio as sound initiatives consistent with the need to build regional capacity.

#### 5.7 GOOS REGIONAL ALLIANCES (GRAs)

The Group welcomes the growth in GOOS Regional Alliances, recognizing their importance in rationalizing regional observing networks, in providing mutual support in capacity building, and in regional provision of regional networks and products. The Group notes that to a large degree GOOS Regional Alliances are and need to be a matter of regional initiative, and are therefore not formally within any control of the IOC structures. As already noted, the I-GOOS has been recommended to encourage and foster the development of GRAs in view of the benefits. The Group suggests that chairs of GRAs be given observer status at I-GOOS meetings, and for I-GOOS to receive within its agenda short reports on regional activities. The Group notes that the IOC regional structures have been established for separate purposes than the promotion of GOOS, however there is clearly some merit, where regional parties are willing, to see some commonality between the GRAs and the IOC regional bodies. The Group recommends that the IOC Regional Committees and Sub-commissions ensure the provision of regular reports from those GRAs involved within their regions. The Group notes and welcomes the initiative taken to have the GRAs meet to share experiences every two years in association with particular regional events. Finally, the Group notes that several respondents to the questionnaire called for the establishment of a GRA for the southeastern Pacific, and recommends that I-GOOS work with the region concerned to identify the most appropriate mechanism for developing GOOS there.

#### 5.8 IOC

Noting that GOOS is a key programme of IOC, the delegate or delegations who attend meetings of the IOC governing bodies, should, as noted under I-GOOS, ensure that they are able to represent their National GOOS interests and activities.

Recognizing that GOOS is evolving, the Group recommends that the IOC governing bodies regularly review, at intervals of about 4 years, the Terms of Reference of the various bodies involved in GOOS with a view to ensuring both clarity of intent, lack of overlap, and appropriate attention to all issues within the scope of GOOS.

The Group notes that full ownership of GOOS requires not only familiarity with the performance metrics of the observing system, but also an appreciation of the significant indicators of ocean change. These indicators might be for instance variations of mean temperature in major ocean basins, phenomena such as El Nino, and major events in biological systems (e.g. incidences of algal blooms; collapses or shifts in fish stocks, and damage to coral reefs), etc, as either directly enabled by GOOS, or concerning other events within the oceans for which GOOS data are relevant. The Group therefore recommends that the IOC seeks and publishes annual information on such events, and ensures that the most appropriate bodies within GOOS and the IOC domain are tasked with the responsibility of drawing the underlying information to IOC's attention.

As mentioned under 2.7, above, encouragement of national oceanographic bodies and national oceanographic coordination mechanisms, particularly those involving all organizations that may be expected to benefit from GOOS, is a key issue for IOC.

## 6. CONCLUDING REMARKS

GOOS and the associated generation and exchange of products are still at a very early stage but showing real evidence of progress. The Group believes that the recent creation of J-COMM will now greatly aid the continued development of GOOS. It hopes that this report with its recommendations for improvement in the assigned responsibilities of bodies within and linked to the GOOS will further aid progress.

## 7. LIST OF RECOMMENDATIONS

**2.2: Mandate** - The mandate for GOOS appears satisfactory and should not be changed other than to clearly define GOOS as the comprehensive, end-to-end Global Ocean Observing System, which includes all types of oceanographic data and marine meteorological data and products that need to be internationally available to support national, regional and global requirements.

**2.3.2: Research Community** - Whilst seeking to encourage a transition of GOOS into operational support I-GOOS, and the IOC, should recognize and encourage the substantial contribution made to GOOS by the research community. Active long-term involvement of the research community in GOOS is expected to remain, including the co-sponsorship of the GSC, the OOPC and COOP by research organisations.

**2.5: GOOS Planning** - To avoid the risk of disappointment and loss of focus on ensuring steady but significant progress, I-GOOS and the IOC should develop and advance realistic incremental planning of GOOS, including realism over the expectations of the extent of coastal data that might be included within GOOS and therefore within the eventual remit of JCOMM.

**2.7: National Coordination** - The IOC should encourage the development of national oceanographic bodies and national oceanographic coordination mechanisms, particularly those involving all organizations that may be expected to benefit from GOOS.

### **2.8: The GOOS Initial Observing System (IOS) and Pilot Projects -**

- (a) The title “Initial Observing System” should be dropped, whilst noting that the biological data still has “initial” status.
- (b) Pilot Projects managed by the wider scientific community through independent steering committees, should be part of the overall plans for GOOS that the GSC prepares for I-GOOS and they should be subject to I-GOOS advice and support. Particular attention should be given by I-GOOS to monitoring the outcomes and then ensuring as appropriate a transition to operations and eventual coordination by JCOMM.

**3.2: The Current Structure** - To avoid confusion, the linkages between the main GOOS bodies, the main GOOS programme activities (Figure 4) and the main bodies contributing to GOOS (Figure 5) should be shown in the form of lists.

**4.3: The Number of Meetings** - The GSC and its panels should be vigilant to ensure that meetings do not proliferate, and should seek to ensure the most efficient structures. This should be a regular GSC agenda item.

### **4.4: Structure Recommendation –**

- (a) In terms of the tasking relationships between the different bodies, the Group recommends the structure given in Figure 6.

- (b) The terms of reference and reporting relationships of I-GOOS, the GSC and the GPO should be changed and improved in order to (i) recognize recent changes, (ii) give less overlap, and (iii) provide a stronger clarity of focus to each body as GOOS evolves towards implementation.

#### **4.5 Documentation of Review Outcome -**

- (a) Subsequent to IOC's decision on the response to this review, the document describing the "Structure, Mandates and Modus Operandi of GOOS" (I-GOOS-V/6) should be updated in line with the then agreed position.
- (b) *The GOOS 1998* should also be updated; the revision should describe the whole end-to-end system, including to the observing elements, data and information management, data assimilation and exchange, communications, quality control, modelling and product development and delivery.

#### **5.1 I-GOOS -**

- (a) IOC should consider returning to the role of the I-GOOS very specifically dealing with IOC interests in GOOS and to being sponsored solely by IOC, whilst recognizing other sponsor interests through reports from JCOMM and the GSC. If the present co-sponsoring arrangements persist, I-GOOS should nevertheless seek to act only for IOC and accept the joint sponsorship as simple recognition of the partnership that characterizes the whole GOOS. According to the IOC decision on sponsorship, the I-GOOS should be clearly designated either the IOC Committee for GOOS or the Intergovernmental Committee for GOOS
- (b) The current Terms of Reference of I-GOOS should be adjusted to avoid duplication with JCOMM and to give I-GOOS a sufficiently clear focus. The IOC should review the Terms of Reference of I-GOOS in line with the specific suggestions provided in the text of the report.
- (c) I-GOOS should visibly adopt a realistic and business-like stance in its intents and agenda.
- (d) Member States should recognize their responsibilities to ensure that I-GOOS is an effective and useful body for inter-governmental coordination, by ensuring that the delegate or delegates attending are able directly or through consultation to represent both the full national responsibility for implementation of GOOS and for the use of GOOS products. Such an advocacy is clearly also appropriate for delegations to meetings of IOC governing bodies
- (e) To assist the proposed refocusing of I-GOOS, the GSC should be required to maintain both a long term strategic plan and a realistic suggested work plan for the continued development of the observing system during the inter-sessional period between I-GOOS meetings, noting implied resource needs, for I-GOOS to consider, and if necessary amend, prior to formal approval by the IOC.
- (f) The I-GOOS Board should work with I-GOOS as a specialized meeting of IOC for the purpose of approving the GOOS strategy and work-plan, whilst using the IOC governing bodies for authorizing work-plan recommendation and decisions.
- (g) I-GOOS plans must help to ensure the continued development and availability of new or improved products, in particular those that seek to use the full integrated observing system. The plans should explicitly consider the generation of analyses that combine various types of *in situ* and satellite data. This demands that I-GOOS receives status

reports from the JCOMM products and services area, as well as advice from the GSC on new developments, opportunities and benefits in forecasting and analysis products, so that the overall plans enable new products and services to be put into effect and exchanged through arrangements in JCOMM.

- (h) In order for the work plan to show sufficient development between I-GOOS meetings for the meetings to be of sufficient substance, the meeting frequency for I-GOOS should in the future be lengthened to 4 years, with annual inter-sessional activity being delegated to appropriate Working Groups under the direction of the I-GOOS Board.

## **5.2: JCOMM -**

- (a) To avoid overlaps, the Terms of Reference of I-GOOS, the GSC and the GPO should be adapted to recognize the role of JCOMM, and established with a similar level of detail to the JCOMM Terms of Reference.
- (b) To ensure good linkages between GOOS bodies and IODE and JCOMM, the OOPC and COOP should report to the meetings of the JCOMM, and JCOMM and IODE should be represented on the GSC.
- (c) JCOMM needs to establish the links needed to enable it to give the development of satellite data a high priority and will need together with I-GOOS to seek to transition the currently fragile support for oceanography through R&D satellite missions into operational activities.
- (d) JCOMM should provide regular reports to IOC and appropriate GOOS bodies concerning the performance of the GOOS network and products, and the extent to which these are available internationally.
- (e) Recognising that the nature of the functions of JCOMM requires frequent engagement of national responsibilities, attention should be given to increasing the frequency with which JCOMM meets as a Commission.
- (f) In terms of priority within GOOS the highest priority should be placed on resources for JCOMM, to meet the substantial challenges of enabling the implementation of GOOS. The IOC should consider formally establishing a JCOMM post in the GOOS Project Office under the Director GPO.

## **5.3: IODE -**

- (a) The linkages between IODE and JCOMM and the GSC should be well maintained to facilitate a seamless flow of the real-time data considered by JCOMM, into long-term data archives, and for the community to have access as appropriate to both sources of data.
- (b) IODE should work to ensure that global data centres receive as far as possible all data falling within the scope of GOOS.
- (c) IODE should provide IOC with an annual report concerning the statistics on the availability of GOOS data within the global data centres, so that IOC Member States can both appreciate progress and be aware of any difficulties.

## **5.4: GSC -**

- (a) To ensure wide involvement in GOOS and to ensure coordination with other agencies and programmes, the membership of the GSC should be subject to the governance of all sponsors and its functions should recognize that its status is wider than that of a simple subsidiary body.

- (b) The GSC Terms of Reference should be amended to reflect its overarching role, which is primarily to maintain for the I-GOOS and other sponsors a long-term strategic plan for GOOS, which should be formally updated prior to each session of I-GOOS and presented in conjunction with action plans and targets for implementation during the inter-sessional period.
- (c) The present constitution of the GSC, which is well balanced between the science community and operational or industrial members, should be retained as it helps to ensure that the advice is both scientifically sound and includes an informed judgment in relation to national implementation capacity.
- (d) Noting that the process used to select and appoint new members is satisfactory, the Group recommends that the GSC should routinely report to I-GOOS on the balance of the membership in order that the I-GOOS remains well informed.
- (e) The GSC should maintain regular contact with the I-GOOS Board and report formally to meetings of I-GOOS.

**5.5.2: Applications and Modelling** - The GSC should review and improve its links to modelling and application activities.

**5.5.3: Capacity Building Panel** - A shared approach to capacity building is recommended, through a joint GSC/I-GOOS/JCOMM capacity building panel that capitalizes initially on appropriate members of the current GSC capacity building panel and JCOMM Education, Training and Capacity Building Coordination Group. To emphasize the difference from the former structure, and with note of I-GOOS's overarching role, this new group is shown as reporting to I-GOOS (Figure 6); however it is expected that being a tripartite entity it will in practice link also to the GSC and JCOMM.

**5.6: GPO -**

- (a) The Terms of Reference for the GPO should be modified to reflect its multi-faceted supporting roles for I-GOOS, the GSC, and JCOMM, and indicate that it should report formally to I-GOOS and the GSC (as it in fact does).
- (b) IOC should recognize the key role that the GPO provides in enabling the GOOS to continue to develop and indeed exist, and should therefore ensure that it better and appropriately resourced.

**5.7: GOOS Regional Alliances (GRAs) -**

- (a) Chairs of GRAs should be given observer status at I-GOOS meetings, and provide short reports on regional activities to I-GOOS.
- (b) Where this does not already happen, IOC Regional Committees and Sub-commissions should ensure the provision of regular reports from those GRAs involved within their regions.
- (c) I-GOOS should work with the southeastern Pacific region to identify the most appropriate mechanism for developing GOOS there.
- (d) It is recommended that IOGOOS reports to IOCINDIO and IOCINCWIO, and GOOS-  
AFRICA to IOCINCWIO and IOCEA. The aim of the reporting should be note of key actions, issues and progress with a view to receiving advice and support.

**5.8: IOC -**

- (a) Noting that GOOS is a key programme of IOC, the delegate or delegations to meetings of IOC governing bodies should, as noted under I-GOOS, ensure that they are able to represent their National GOOS interests and activities.
- (b) IOC governing bodies should regularly review, at intervals of about 4 years, the Terms of Reference of the various bodies involved in GOOS with a view to ensuring both clarity of intent, lack of overlap, and appropriate attention to all issues within the scope of GOOS.
- (c) IOC should seek and publish annual information on major marine environmental events, and ensure that the most appropriate bodies within GOOS and the IOC domain are tasked with the responsibility of drawing the underlying information to IOC's attention.

FIGURE 1

**THE PRESENT GOOS-RELATED REPORTING STRUCTURE WITHIN IOC**

**Green boxes** (dark) are the main bodies contributing to GOOS. Their main reporting chain is from the GSC subsidiary bodies (COOP, OOPC, Capacity Building) through GSC and I-GOOS to the IOC governing bodies. There are linkages (not shown) between IODE, I-GOOS, JCOMM and the GSC. Note the lack of any formal reporting relationship for the GOOS Regional Alliances (GRAs). The diagram does not show the specialized subsidiary bodies (like GLOSS, DBCP, SOOP, etc.) reporting to JCOMM, nor does it show the specialized subsidiary bodies (like the GODAE Steering Team, the Argo Science Team, and so on) that report through the OOPC to the GSC; these are depicted in Figure 4. **Grey boxes** (light) depict the GOOS Secretariat, comprising the GPO and the Rio and Perth regional GOOS offices. The Secretariat services the requirements of I-GOOS, the GSC, and JCOMM, as well as those of the GSC subsidiary bodies (COOP, OOPC, Capacity Building) and some of the GRAs. The connections between the grey and green boxes depict the management connections between the GPO and the I-GOOS Board (I-B), the GSC Executive Committee (EC), and the JCOMM Management Committee (MC).

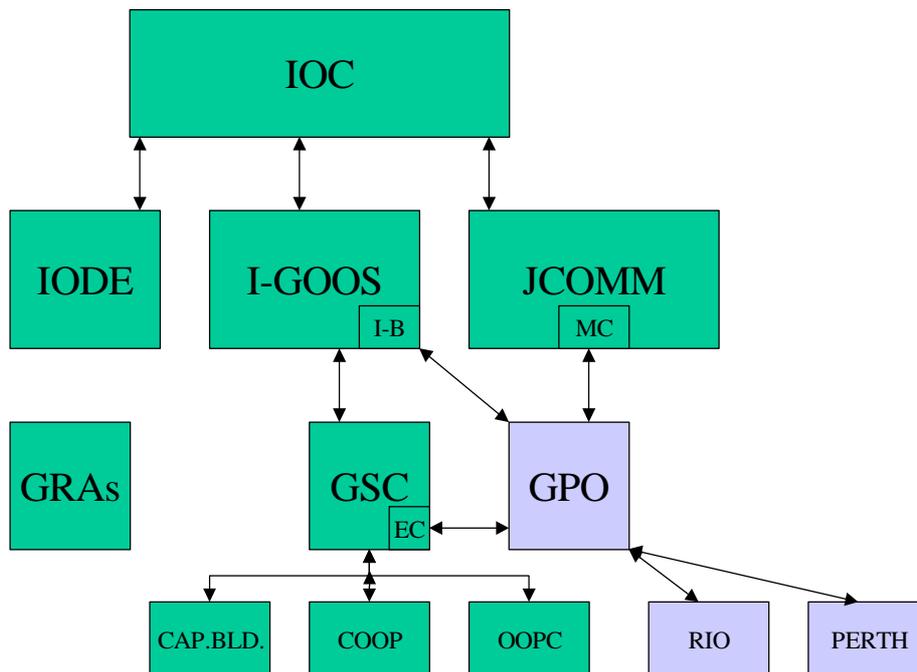


FIGURE 2

**MAIN SPONSORING LINKS WITHIN CURRENT GOOS STRUCTURE**

As explained in the text, the co-sponsorships of I-GOOS and the GSC reflect formal requirements by the IOC as expressed through Resolutions. The GOOS sponsorship of the GSC's subsidiary bodies embraces all GOOS sponsors - IOC, WMO, UNEP and ICSU. The co-sponsorship of the OOPC by GOOS and GCOS reflects the fact that the climate module of GOOS is the ocean module of GCOS, as endorsed in the Annex to IOC Assembly Resolution XVII-5. Co-sponsorship of OOPC by the WCRP reflects the fact that the OOPC is the direct descendant of the Ocean Observing System Development Panel co-sponsored by the IOC/SCOR Committee on Climate Change and the Ocean, and the WCRP. FAO co-sponsorship of COOP reflects the response of FAO to IOC's invitation to it to co-sponsor GOOS. IGBP co-sponsorship of COOP was requested by the IOC at the request of the GSC to ensure close links to the IGBP's research programmes.

Figure 2 deliberately shows the GSC as linked laterally to I-GOOS, to express in diagrammatic form the partnership between the intergovernmental community, as represented by I-GOOS (on the left), and the scientific community, as represented by the GSC and its advisory bodies (on the right).

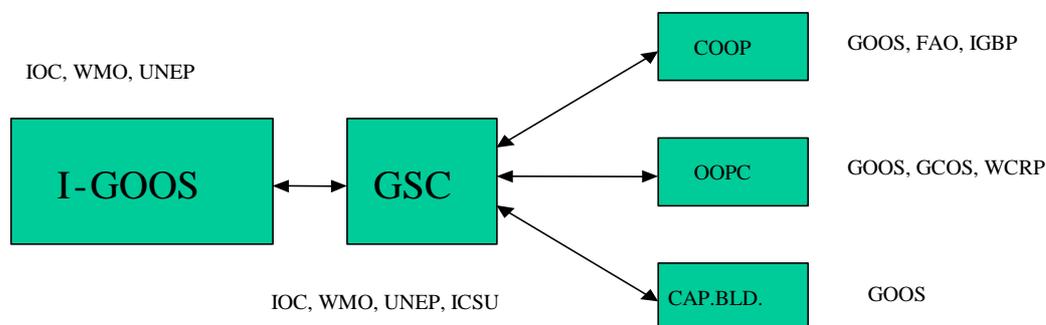


FIGURE 3

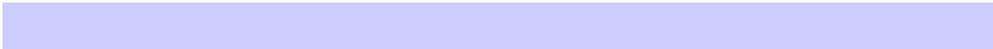
**MAIN BODIES INVOLVED IN GOOS**



<b>IOC</b>	UN owner/governance/policy (esp.data)
<b>Nat. Govts.</b>	Real owners/implementers/users/resources
<b>I-GOOS</b>	Intergovernmental programme management
<b>GSC</b>	Scientific advice
<b>JCOMM</b>	Technical implementation/standards/mechanisms
<b>IODE</b>	Data & information management/infrastructure
<b>GRA's</b>	Regional cooperation/coordination
<b>GCOS</b>	Share OOPC; reports for GOOS to UNFCCC
<b>GXOS</b>	Coordination with sponsors and other obs systems
<b>IGOS-P</b>	Coordination with space agencies and others
<b>WCRP/IGBP</b>	Coordination with climate and environmental science
<b>POGO</b>	Coordination with research agencies

FIGURE 4

**MAIN GOOS PROGRAMME ACTIVITIES**



<b>VOS</b>	Voluntary Observing Ships [ <b>JCOMM</b> ]
<b>SOOP</b>	Ship of Opportunity Programme [ <b>JCOMM</b> ]
<b>DBCP</b>	Data Buoys (fixed/driftng) [ <b>JCOMM</b> ]
<b>TAO/TRITON</b>	Equatorial Pacific Buoy Array [ <b>JCOMM</b> ]
<b>PIRATA</b>	Equatorial Atlantic Buoy Array [ <b>JCOMM</b> ]
<b>GLOSS</b>	Global Tide Gauge Network [ <b>JCOMM</b> ]
<b>CPR</b>	Continuous Plankton Recorder [ <b>SAHFOS</b> ]
<b>GODAE</b>	Global Ocean Data Assim. Exp. [ <b>GODAE Bur.</b> ]
<b>Argo</b>	Argo [ <b>Argo Science Team (Buoy Operators)</b> ]
<b>GOSIC</b>	Information Centre [ <b>GOOS/GCOS/GTOS</b> ]
<b>GCRMN</b>	Global Coral Reef Monitoring Network [ <b>IOC</b> ]
<b>Satellites</b>	Ocean Observing Satellites [ <b>IGOS-P; Sp. Agcs.</b> ]

FIGURE 5

**RELATIONSHIP: IOC AND REGIONAL GOOS BODIES**

It is recommended that IOGOOS report to IOCINDIO and IOCINCWIO, and GOOS-AFRICA to IOCINCWIO and IOCEA. The aim of the reporting should be note of key actions, issues and progress with a view to receiving advice and support.

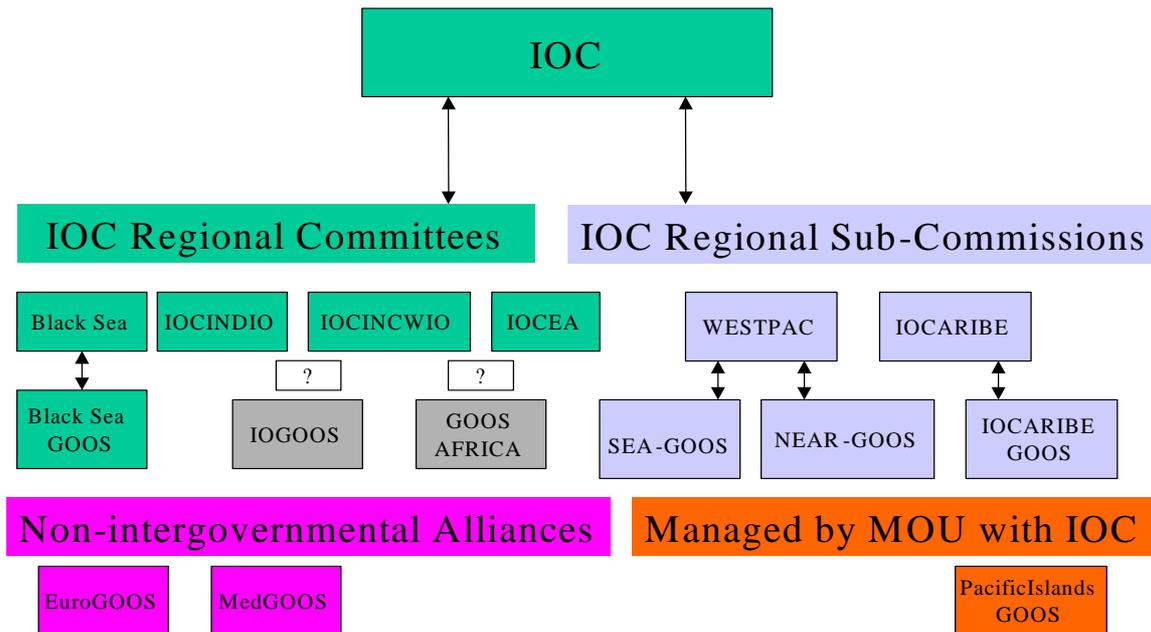
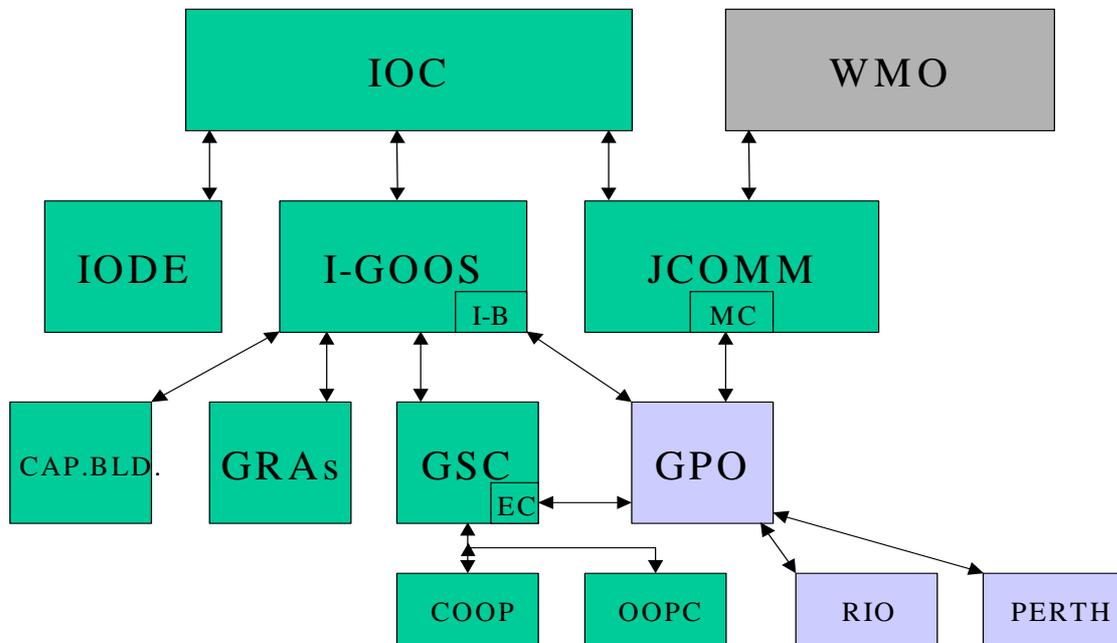


FIGURE 6

**RECOMMENDED TASKING STRUCTURE FOR GOOS-RELATED BODIES**

The Group recommends that the structure be maintained more or less as shown in Figure 1 (current structure) but with certain specific changes: (i) the capacity building panel is shown as reporting to I-GOOS; (ii) the GOOS Regional Alliances (GRAs) are shown as reporting to I-GOOS. Note that as depicted in Figure 2 the relationship between I-GOOS and the GSC is not strictly hierarchical but that of a partnership between the intergovernmental community and the international research community. In a single diagram of this complexity it is not feasible to show precise hierarchical relationships; in that context the Secretariat functions (GPO), which serve I-GOOS, GSC and JCOMM and also their subsidiary bodies, are shown as a different colour.



## ANNEX I

### BACKGROUND TO THE REVIEW

#### I.1 The History

The Global Ocean Observing System (GOOS) is by far the largest and most complex of the scientific and technical programmes led by the Intergovernmental Oceanographic Commission (IOC). In order to ensure that projects of this magnitude are being appropriately managed and are moving in the right direction it is custom and practice to review them at regular intervals to assist them to maintain focus, efficiency and effectiveness in changing times. Bearing in mind that the mandate for GOOS was first set out formally in March 1991 by the IOC Assembly at its 16th session (Resolution XVI-8), that the Intergovernmental Committee for GOOS (I-GOOS) held its first session in February 1993, that the implementation of GOOS was considered to have begun with the inauguration of the GOOS Initial Observing System in 1998, and that the first review of GOOS had been made in 1996 and presented to the third session of I-GOOS in June 1997 (Document I-GOOS-III/20), it seemed timely to review the activity again. In response to a recommendation by the GOOS Steering Committee (GSC) at its 4th session (Chile, March 2001), which was endorsed by the 5th session of I-GOOS (Paris, June 2001), the 21st session of the IOC Assembly decided (Resolution XXI-7) that a review of the organizational structure of GOOS should be carried out by an external independent Review Group during 2002, and repeated every 5 years. The Assembly instructed the Executive Secretary IOC to initiate the review process according to the Terms of Reference set out below.

#### I.2 Terms Of Reference Of The Review Group

The Terms of Reference of the Review Group (Resolution XXI-7) are to:

- (i) review the development and implementation of GOOS, with particular attention to its structure, mandates and modus operandi, the activities of its advisory panels, the development of the GOOS Initial Observing System, including its pilot projects, the regional development of GOOS and the national development of GOOS;
- (ii) review the extent to which capacity-building activities in support of GOOS can benefit Member States;
- (iii) present the final review report to the Assembly at its 22nd session in 2003.

The Resolution also called upon the Review Group to “address the issues identified as requiring attention by I-GOOS-V”.

#### I.3 The Review Process

Resolution XXI-7 decreed: (i) that the Review Group should comprise 4 experts drawn from nominations submitted preferably from operational agencies of Member States, and from different user communities; and (ii) that proposals for nominations on the Review Group should be submitted to the IOC Executive Secretary by IOC Member States and GOOS sponsors (WMO, UNEP, ICSU) and should be chosen by the Chairman of IOC in consultation with the Co-Presidents of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), the Director of the GOOS Project Office (GPO), and the Chairpersons of I-GOOS and the GSC. IOC Circular Letter 2000 (21 August 2001) called for Member States to nominate potential candidates for the Review Group.

Fifteen nominations were received from 13 Member States. Following the required consultation, and recognizing the need to obtain a Group with a broad coverage of both geography and discipline, the Chairman IOC appointed Dr. G. Love (Australia; Operational Meteorology) to Chair the Group, along with Dr. I. Asanuma (Japan; Remote Sensing), Prof. J. Field (S. Africa; Biology) and Dr. K. Radhakrishnan (Physics; India). Following the appointment of the Group on February 6, 2002, Dr. Love had to withdraw for personal reasons and was replaced on April 3, 2002, by Dr. P. Mason (UK; Meteorology).

The Review Group was asked to obtain information through questionnaires and verbal discussions or interviews, and to correspond by e-mail (Resolution XXI-7). Under Dr. Love's leadership the Review Group designed a questionnaire setting out the background to the review, and enumerating seven sets of questions on different aspects of GOOS. The questionnaire (Annex III) was approved by Dr. Mason and distributed on April 9, 2002.

In accord with the requirement of the Resolution, the questionnaire was sent to the following groups:

1. GOOS Project Office Staff
2. Present and immediate past Chairs of I-GOOS and the GSC
3. Member States, primarily by e-mail, via Circular Letter 2028 (10/7/2002)
4. Chairs of GOOS Advisory Panels
5. National GOOS and JCOMM Contact Points
6. Head of Global Information Systems Information Centre (GOSIC)
7. Chairs of GOOS Regional Alliances
8. Directors and Chairs of Global Climate and Terrestrial Observing Systems (GCOS) and (GTOS)
9. Chairs of International ocean Data and Information Exchange (IODE) programme and JCOMM
10. Chairs or Secretaries of Argo Science Team, Scientific Committee on Oceanic Research (SCOR) and Partnership for Observations of the Global Ocean (POGO)
11. Chairs of Committee on Earth observing Satellites (CEOS) and the Partners for an Integrated Global Observing Strategy (IGOS)
12. GOOS sponsors contact points (IOC, WMO, UNEP, ICSU).

In addition, a Member of the Review Group carried out informal interviews as opportunities arose with representatives of Member States during the 35th IOC Executive Council (Paris, June 2002). As shown in Annex IV.1, 23 Member States responded to the questions, providing 25 written responses and 8 verbal ones. In addition, 5 organisations (JCOMM, SCOR, WMO, I-GOOS and the GPO) responded in writing. The grand total of responses was 38.

The responses, compiled by question, are available on request from the Executive Secretary of the IOC.

Formal interviews were carried out by the Review Group during its meeting in Paris on September 9 and 10, with:

1. Director GPO (Colin Summerhayes)
2. Technical Secretary of Coastal Ocean Observations Panel (COOP) (Thorkild Aarup)

3. Technical Secretary of JCOMM (YvesTreglos)
4. Technical Secretary of GOOS-AFRICA (Justin Ahanhanzo)
5. Technical Secretary of SCOR-IOC CO<sub>2</sub> Panel and Technical Secretary designate of Ocean Observations Panel for Climate (OOPC) (Maria Hood)
6. Chair of I-GOOS (Silvana Vallerga)
7. Industry (User) Representative (Ralph Rayner of FUGRO-GEOS)
8. Industry (User) Representative (Mary Altalo of SAIC)
9. Sponsors representative (Peter Dexter of WMO)
10. Sponsors representative (Leah Goldfarb of ICSU)
11. Past Chair I-GOOS (Angus McEwan – by telephone)
12. Chair of GSC (Jim Baker – by telephone)
13. Executive Secretary of IOC (Patricio Bernal – by telephone)

These interviews are recorded in the notes of the meeting, available on request from the Executive Secretary of the IOC.

Members of the Review Group were also able to gauge the responses of GOOS groups to the seven sets of questions by talking to the attendees at particular GOOS meetings. The Chairman, Dr. Mason, attended the 5th session of the GSC in Paris (May 1-3, 2002). With Dr. Radhakrishnan he attended the Indian Ocean GOOS Meeting in Mauritius (November 4-9, 2002). And with Dr. Asanuma he attended the 1st Regional GOOS Forum, Athens, (December 2-6, 2002).

As requested, the Review Group carried out the bulk of its business by e-mail, meeting in full session only once, at UNESCO headquarters in Paris on September 9-11, 2002.

As required by the Resolution, an interim progress report was submitted to the 35th session of the Executive Council (Paris, June 2002). Dr. Mason presented the Draft Report of the Group, for comment, to the 6th session of the GSC (Cape Town, February 26-28, 2003) and to the 6th session of I-GOOS (Paris, March 10-14, 2003). Taking comments from those meetings on board, he prepared the Final Report for presentation to the IOC Assembly at its 22nd session (June/July 2003).

Among a number of background documents, the Review Group was provided with a copy of the previous review of GOOS, which had been presented to the third session of I-GOOS in June 1997 (Document I-GOOS-III/20: *GOOS Progress Assessment; A Report on Progress to end 1996*). Its findings were based on a questionnaire sent to 50 external experts, to which there had been a 50% response, about the same number of respondents as in the present survey.

## ANNEX II

### THE QUESTIONNAIRE

**Not included here are the two Annexes to the Questionnaire, namely (1) the Terms of Reference of I-GOOS, the GSC, and the GPO, and (2) the Principles for a Global Ocean Observing System (GOOS)**

#### THE GLOBAL OCEAN OBSERVING SYSTEM: A REVIEW

##### Introduction

1. The twentieth session of the IOC Assembly in July 2001 decided that a comprehensive review of the Global Ocean Observing System (GOOS) should be undertaken. This paper is intended to provide background information for those in the GOOS stakeholder community who may wish to provide information to the review team, and to lead to an initial flow of information to the review team.

2. The Terms of Reference of the review of GOOS are to:

(i) review the development and implementation of GOOS, with particular attention to its:

- structure;
- mandates and modus operandi;
- the activities of its advisory panels;
- the development of the GOOS Initial Observing System, including its pilot projects;
- the regional development of GOOS; and,
- the national development of GOOS.

(ii) review the extent to which capacity-building activities in support of GOOS can benefit Member States.

(iii) present the final review report to the Assembly at its 22nd session in 2003.

3. The review team is:

Dr. Paul Mason (Chair), The Meteorological Office, London Road, Bracknell, Berkshire RG12 2SZ, UK, e-mail: paul.mason@metoffice.com

Dr. Ichio Asanuma, Earth Observation Research Centre, NASDA, Triton Square X-23, 1-8-10, Harumi, Chuo-ku, Tokyo, 104-6023, JAPAN, e-mail: asanuma@eorc.nasda.go.jp

Prof John G. Field, Zoology Department, University of Cape Town, 7701 Rondebosch, SOUTH AFRICA, e-mail: jgfield@pop.uct.ac.za

Dr. K. Radhakrishnan, Indian National Centre for Ocean Information Services, Plot No. 3, Nandagiri Hills Layout, Jubilee Hills, Hyderabad - 500 033, INDIA, e-mail: radhakr\_incois@vsnl.in

4. The review team is particularly interested in receiving the views of any GOOS stakeholders on matters covered by the review's Terms of Reference and will, over the course of 2002, arrange meetings with key stakeholders. In order to minimise the overall cost of the review these meetings are likely to be held in conjunction with other IOC and GOOS meetings, and may not necessarily involve all members of the review team on each occasion.

5. Each section of this paper that refers to a particular term of reference is followed by a number of questions. It would be appreciated if answers to these questions could be e-mailed or mailed to the chair and/or other review team members.

6. Much of the information for this paper was derived from a report to the 5th Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (GOOS) (Paris, 28-30 June 2001) prepared by the then Chairman of I-GOOS, Dr. Angus McEwan (see: [http://ioc.unesco.org/goos/IG5/IG5\\_6\\_Structure.doc](http://ioc.unesco.org/goos/IG5/IG5_6_Structure.doc)). While the review team has used this report as a starting point in its work it should not be considered to be endorsing it. The review team is concerned to ascertain whether the report is comprehensive in its descriptions, and, as necessary, to elaborate on, and resolve, any significant underlying issues.

## **Background to GOOS**

7. GOOS grew out of the vision that understanding and forecasting climate change would require the existence of an ocean observing system akin to the WMO's World Weather Watch system underpinning weather forecasting. Since then the vision of GOOS has grown to encompass all aspects of ocean management as well as climate change.

8. GOOS is now conceived of as an internationally organised system for the gathering, coordination, quality control and distribution of many types of marine and oceanographic data and derived products of common worldwide importance and utility, as defined by the requirements of the broadest possible spectrum of user groups.

## **GOOS Structure**

9. GOOS is administered by three executive bodies with inter-relationships as schematically shown in Figure 1:

- (i) The IOC WMO UNEP Committee for GOOS (I-GOOS), a committee of IOC with participants delegated by the Member States of the intergovernmental sponsors who intend to support and participate in GOOS. It takes broad responsibility for representing the interests of the participating countries and potential beneficiaries of ocean observing systems and the users of marine observing information and products. It also is a vehicle for recruiting national support and participation. It reports to the IOC and recommends actions to be taken by the Sponsors.
- (ii) The GOOS Steering Committee (GSC), a scientific and technical committee, which is composed of nominated experts in the relevant disciplines of marine science and global observation. It carries broad responsibility for all the technical aspects of the design, review and implementation of the system and for the development and oversight of appropriate plans and organizational structures. The GSC is advisory to I-GOOS and to the Sponsors, the Member States and participating observing agencies, via the intergovernmental process and also informally.
- (iii) The GOOS Project Office (GPO), the executive office for the GOOS organisation and part of the secretariat of IOC, which provides the Director and core staff, supplemented by seconded staff from participating countries. The GPO is responsible for the implementation of actions arising through the business of I-GOOS and GSC. It also supplies secretariat support for the various panels and sub-bodies. It is responsible for the arrangement and sponsorship of a wide diversity of meetings associated with GOOS and for the communication of information.

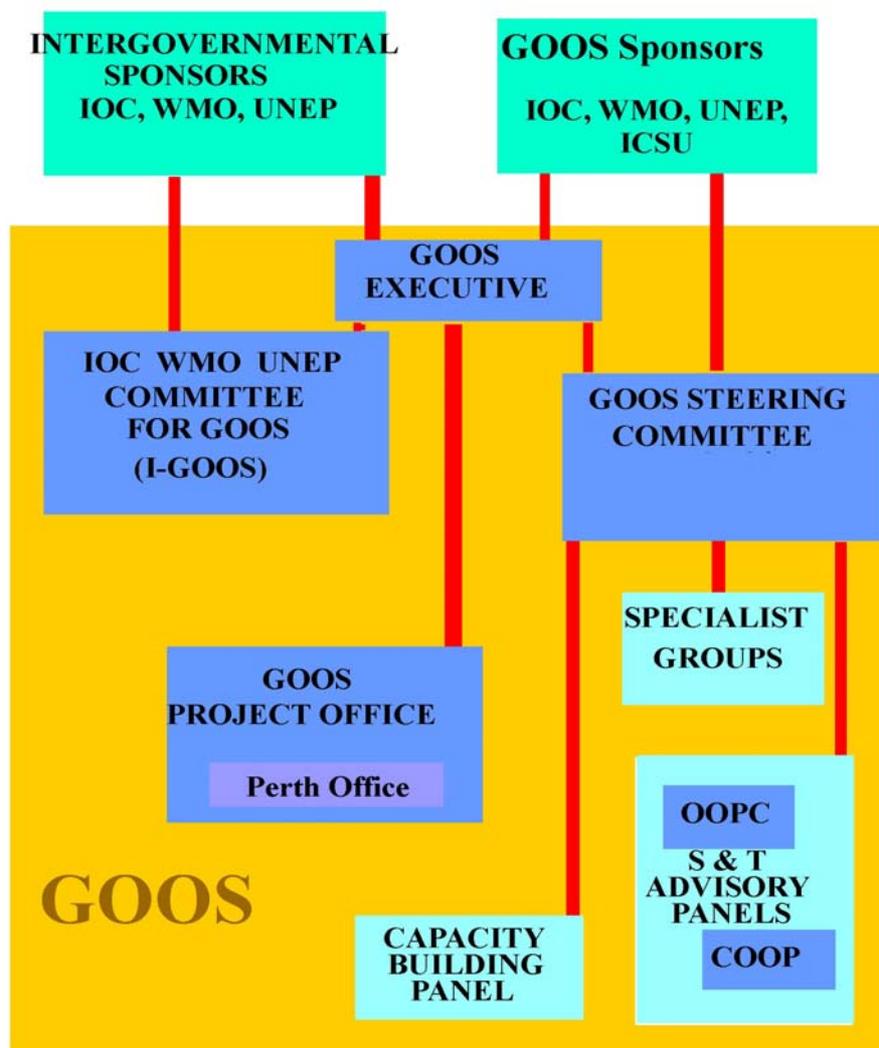


Figure 1: The Structure of GOOS

### QUESTION BOX I

Does the preceding section provide a reasonable description of the working structure of GOOS?

If not, how would you describe the GOOS working structure?

Do you believe that the present GOOS working structure is an appropriate one?

If not, how should it be changed?

## The Panels

10. The GSC conducts its broad range of work largely through the use of advisory specialist panels and groups which, where appropriate, are jointly supported with other systems and programmes external to GOOS but which share similar interests and disciplines in global observation. These panels are:

- (i) Science and Technology Panels for the design, planning and implementation advice for the two GOOS programmatic themes:
  - Ocean Observing Panel for Climate (OOPC), (embracing the former Climate and Service Modules) and
  - Coastal Ocean Observations Panel (COOP), (embracing the former Coastal, Health of the Ocean and Living Marine Resources Modules).
- (ii) A Capacity Building Panel for the development of plans for strengthening national capabilities to participate in GOOS, and
- (iii) Ad hoc Specialist Panels, as needs arise.

11. These panels are generally commissioned by the GSC and report through it (as well as to other parent bodies). The Panels have a defined mandate and an ongoing role. I-GOOS at present it has little input to steering the activities of these panels.

12. The GSC meets annually and the I-GOOS meets bi-annually. To ensure administrative continuity and effective inter-sessional communication and decision-making there is an informal GOOS Executive group comprising the Chairs of I-GOOS and the GSC and the GPO Director, supported by members of an executive sub-committee of the GSC.

### *Ocean Observations for Climate Panel (OOPC)*

13. The Ocean Observations Panel for Climate was formed in 1996 as a "follow-up" to the Oceans Observing System Development Panel (OOSDP). It is sponsored jointly by the World Climate Research Programme (WCRP), the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS).

14. Recognizing the need for scientific and technical advice and guidance for the common module of the Global Climate Observing System and the Global Ocean Observing System, and the need for liaison and co-ordination between these operational observing systems (e.g. systematic, long-term, global climate observations) and those of climate research (e.g. limited-life, hypothesis-validating observations), the (then) J-GOOS (now GOOS SC), JSTC for GCOS (now the GCOS SC) and the JSC for the WCRP established OOPC with the following terms of reference:

- (i) To evaluate, modify and update, as necessary, the design of the observing system for the common module of GOOS and GCOS whose goals are:
  - (a) to monitor, describe, and understand the physical and biogeochemical processes that determine ocean circulation and effects on the carbon cycle and climate variability;
  - (b) to provide the information needed for ocean and climate prediction, including marine forecasting.
- (ii) To provide a procedural plan and prioritisation for an integrated set of requirements consistent with the observing system design criteria and in a form that enables timely

and effective implementation. This will entail drawing from findings of WOCE, TOGA, JGOFS and CLIVAR, and particularly close interaction with the CLIVAR Upper Ocean Panel (UOP).

- (iii) To liaise and provide advice, assessment and feedback to other panels in task groups of GCOS, GOOS and WCRP as requested, concerning ocean observing for climate in order to ensure that the designs and implementation schedules are consistent and mutually supportive.
- (iv) To establish the necessary links with scientific and technical groups to ensure that they are cognizant of, and can take advantage of the recommended system, and that, in turn, the Panel can benefit from research and technical advances.
- (v) To carry out agreed assignments from, and to report regularly to, the JSTC, J-GOOS and the JSC for the WCRP.

#### *Coastal Oceans Observation Panel (COOP)*

15. The COOP plans and facilitates the implementation of an end-to-end observing system to provide systematic data sets and products to users. Goals are to monitor, assess, and predict effects of natural variations and human activities on the marine environment and ecosystems of the coastal ocean. Principal foci are on issues of ecosystem (including human) health, living marine resources, natural hazards, and safe and efficient marine operations. It is not intended that "coastal" be limited by specific geographic boundaries. Although the emphasis is on coastal ecosystems (e.g., estuaries, bays, sounds, fjords, open waters of the continental shelf), boundaries should be determined by the problems being addressed and the products that are to be produced. Thus, the broad area of concern extends from semi-enclosed systems in the coastal zone to the continental shelf and the deep ocean as required to provide products relevant to the issues under consideration.

16. The focus is on design and implementation of a sustained, integrated system. It is being designed and implemented as an end-to-end system, from measurements to the timely distribution of products. Taking into account user requirements, scientific and technical feasibility, and utility. This requires oversight and adjustments to the design and operation as needs and feasibility change.

17. The COOP was established in October 2000 with the following terms of reference:

- (i) Integrate and refine the design plans drafted by the Health Of The Oceans (HOTO), the Living Marine Resources (LMR), and the Coastal GOOS (CGOOS) panels to develop a unified plan that is consistent with the GOOS Design Principles and addresses issues related to the following themes
  - coastal marine services (e.g., safe and efficient marine operations, coastal hazards),
  - the health of marine and estuarine ecosystems and its relation to human health, and
  - living marine resources.
- (ii) Develop mechanisms for more effective and sustained involvement of user groups in the design and implementation of the coastal module of GOOS.
- (iii) Develop mechanisms that enable effective synergy between research and the development of a sustained observing system for coastal marine and estuarine ecosystems.
- (iv) Formulate an implementation plan that is coordinated with the OOPC plan for climate services, research and marine services with due emphasis on

- integrated observations;
  - data and information management;
  - data assimilation and modelling for the purposes of prediction and product development;
  - capacity building; and,
  - national, regional, and global promotion of objectives and benefits of the system.
- (v) Establish criteria and procedures for selecting observing system elements on global and regional scales, and recommend the elements that will constitute the initial observing system.
- (vi) Define procedures for ongoing evaluation of system components, reliability of data streams, access to data, and applications.

## **QUESTION BOX II**

**Are the Terms of Reference for the OOPC adequate, and if not, how should they be modified?**

**Do you feel that the OOPC is adequately carrying out its terms of reference, if not where is it falling down and what remedial action would you recommend?**

**Are the Terms of Reference for the COOP adequate, and if not, how should they be modified?**

**Do you feel that the COOP is adequately carrying out its terms of reference, if not where is it falling down and what remedial action would you recommend?**

**Are the OOPC and COOP, plus specialist panel, an adequate panel (advisory) structure for GOOS?**

**If not, which additional panels are required/which panels should be abolished, and why?**

**Is a new mechanism needed to coordinate scientific guidance on observing systems currently being provided somewhat independently by a number of bodies and panels (eg CLIVAR, JCOMM, OOPC, the WMO's CBS, etc.)?**

## **The GOOS Initial Observing System**

18. The GOOS Initial Observing System (GOOS-IOS) is the nucleus on which GOOS will grow. It unites the main global observing sub-systems supported by the IOC, WMO and (in the case of coral reefs) the IUCN, and includes measurements from ships, buoys, coastal stations and satellites (see below). In addition to these international elements, as of July 1999 many nations are now contributing substantial parts of their national observing systems to GOOS, as indicated in GOOS Report 80 (Initial Global Ocean Observing System (GOOS) Commitments Meeting) which lists commitments made at the Initial GOOS Commitments Meeting in Paris, July 5-6, 1999. The status of the GOOS-IOS as at November 2000 may be found at: <http://ioc.unesco.org/goos/goos-ios.htm>. This web site gives detailed information of the component observing systems and comments on their capability.

19. The practical implementation of GOOS began in 1998 with the creation of the GOOS-IOS from a number of pre-existing observing systems. Some of these are exclusively contributions to GOOS; others evolved for different purposes, but also address, are compatible with, and satisfy GOOS requirements. In principle, they can provide contributions to GOOS as well as to the original group of clients for whom they were initiated.

20. Although the implementation of GOOS through the GOOS-IOS has begun by exploiting existing systems, it is expected that the existing systems will be adapted to meet the design requirements. New components will be added as appropriate and in accordance with GOOS designs.

### **QUESTION BOX III**

**Do you feel that the GOOS-IOS is evolving appropriately, including its use of pilot projects?**

**What areas of observations are poorly catered for by the GOOS-IOS, and what strategies would you propose for addressing these deficiencies?**

### **Mandate for GOOS**

21. The mandate for GOOS was first set out formally at the 16th IOC Assembly in March 1991 in Resolution XVI-8, which decided to:

- (i) undertake development of a Global Ocean Observing System (GOOS)
- (ii) charge the Technical Committee for Ocean Processes and Climate (C/OPC) with overseeing the coordination of the initial planning and development of GOOS; and
- (iii) establish a GOOS Support Office.

22. In May 1991, WMO's eleventh Congress accepted the invitation of IOC to cooperate in the development, implementation and maintenance of a global ocean observing system.

23. The basis for the management bodies for GOOS development was laid down in March 1992, when the 25th IOC Executive Council decided to create the IOC Committee for GOOS (I-GOOS), to serve as the intergovernmental forum for promoting the Global Ocean Observing System. I-GOOS held its first meeting in February 1993. Subsequently, sponsorship of this body became shared by IOC, WMO and UNEP, with IOC as the lead agency, and its name was changed to the Intergovernmental Committee for GOOS.

24. The 25th Executive Council also decided to create, jointly with ICSU, a GOOS Scientific and Technical Advisory Panel (J-GOOS) to advise I-GOOS on all scientific and technical aspects of GOOS. J-GOOS, a Group of Experts, was created by a Memorandum of Understanding between IOC, WMO, and ICSU in 1993, and first met in May 1994.

25. In June 1992, GOOS featured prominently in Agenda 21, the recommendations of the United Nations Conference on Environment and Development (UNCED). Section 17.103 of Agenda 21 recommended that:....."States should consider: .....(b) Supporting the role of the IOC in cooperation with WMO, UNEP and other international organisations in the collection, analysis and distribution of data and information from the oceans and all seas, including as appropriate, through the Global Ocean Observing System ...". Furthermore, section 17.110 recommended that:

"Developed countries should provide the financing for the further development and implementation of the Global Ocean Observing System."

26. In June 1997, the third session of I-GOOS agreed (Resolution I-GOOS-III.4) with the recommendation of the GOOS sponsors (IOC, WMO, UNEP and ICSU) that J-GOOS and the Strategy Subcommittee of I-GOOS should be merged to form a GOOS Steering Committee (GSC), to provide a mechanism for the inter-sessional planning, implementing and monitoring of GOOS. The session also approved the terms of reference for the GSC (Annex to Resolution I-GOOS-III.4). Resolution I-GOOS-III.4 was endorsed by the 19th session of the IOC Assembly in Resolution XIX-6.

27. This decision led to a revision of the Memorandum of Understanding (MOU) on GOOS between IOC, WMO, UNEP and ICSU. The revised version, creating the GOOS Steering Committee (GSC), was signed in December 1997. In the MOU (which includes the terms of reference of the GSC, which are repeated in Annex I, below, along with the terms of reference of the GOOS Project Office) the sponsors agreed that the GSC should be the primary international body responsible for: (a) the scientifically based design and testing of GOOS; and (b) coordination of the GOOS planning and implementation process. The GSC first met on April 20-23, 1998.

28. In July 1999, the 20th session of the IOC Assembly (Resolution XX-7) reiterated and reinforced its decision to establish, develop and maintain an internationally coordinated Global Ocean Observing System, and (Resolution XX-8) endorsed the revised terms of reference for I-GOOS (see Annex V, below).

#### **QUESTION BOX IV**

**Do you feel that GOOS is being implemented and governed in a way consistent with its mandate?**

**If not, please give examples or instances where this is occurring?**

**Should the GOOS mandate be changed, and if so, how?**

#### **Modus Operandi**

29. GOOS is conceived as a 'user driven' system in which its structure and tasks are defined with the objective of delivering a global resource of ocean data and 'products' (syntheses and models) in the most efficient way to those who can use or apply them for any purpose of public benefit. With this overall objective in mind, a set of GOOS Principles (IOC, 1998, Strategic Plan and Principles for the Global Ocean Observing System (GOOS), Version 1.0. GOOS Report No. 41, IOC/INF-1091, IOC, UNESCO, Paris, 17pp) has been formulated to guide the decisions and actions of its internal organizations and its external participants.

30. A key application of GOOS is serving the needs for global climate prediction. In addition there are the requirements of a diverse set of existing and potential end users, which are often defined on a regional rather than global basis. Real time marine data products are already used in a wide range of industries including fisheries, aquaculture, shipping, coastal defences, and offshore oil and gas.

31. It was intended from the outset that GOOS should be 'expandable' to any purpose for which internationally coordinated marine observations are a prerequisite. There are a number of stages in the process:

- (i) The spectrum of conceivable end-use must be matched with types of observation that are technically achievable;
- (ii) The observational systems that would be required to deliver useful data and products for known or definable end purpose can then be designed in general terms;
- (iii) Observations common to different purposes or with special purposes can be grouped and evaluated according to feasibility and cost;
- (iv) Priorities for implementation can be set in terms of feasibility, cost, deliverable outcome and potential benefit; and,
- (v) Questions of practical implementation are addressed in the context of national and international programmes and enhancements.

32. In the development of GOOS these processes are merged in scientific designs generated by the specialist groups and advisory panels under the review and direction of the GSC, and in the strategic and implementation plans that derive from these designs or which are developed at the regional level by regional GOOS entities like EuroGOOS or the US IOOS. Plans with a varying degree of detail have been prepared for four of the 'Modules' originally defined by end use (Climate, Health of the Ocean, Living Marine Resources, Coastal) and plans have also been developed in conjunction with external groups for Data and Information Management and Satellite Observations. To ensure conformity and complementarity with other global observing initiatives there is a high level of cross-representation between the membership of the GOOS panels and their counterparts.

33. Although the Internet allows the 'off-line' preparation of documents and a high level of communication between the experts serving on the GSC or appointed to these groups and panels, face-to-face meetings are essential for efficient discussion. These meetings are commonly held in different regions so as to raise regional and national awareness of GOOS and the recruitment of 'grass-roots' supporters. The meetings of the Coastal GOOS and Living Marine Resources Panels were usually preceded by a one-day stakeholders' meeting to ascertain the needs of local user communities. This practice is being continued by the Coastal Ocean Observations Panel (COOP). In addition a GOOS Users' Forum has been established to be held once a year in conjunction with COOP meetings. The GSC also meets every other year in a different region, with local observers present to broaden the community engaged in developing GOOS. The external sponsorship that can be gained for these meetings usually justifies the logistic cost of GPO secretariat travel and participation.

#### **QUESTION BOX V**

**Is this an accurate description of the modus operandi of GOOS, if not, please give instances or examples of where a different modus operandi is being followed?**

**Is the modus operandi of GOOS as described here appropriate, and, if not, how would you recommend that it be modified?**

## **Regional and National Development of GOOS and Capacity Building**

34. It is recognised that one of the most important means of implementation of GOOS is through the development of GOOS regional alliances (GRAs) which are able to focus on observations of common national or regional interest and accordingly to gain national support. The GOOS Project Office has worked with the GOOS Capacity Building Panel and with Member States to aid the development of regional GOOS bodies in areas where many states share common sea-related problems, as in the Caribbean (IOCARIBE-GOOS), Mediterranean (MedGOOS), Pacific islands (PacificGOOS), north-east Asian seas (NEAR-GOOS), and the Black Sea (Black Sea GOOS). GOOS developments in European Seas are the province of the EuroGOOS Association, and focus on the development of the Baltic Operational Oceanographic System (BOOS), and the Northwest Shelf Operational Oceanographic System (NOOS), with Mediterranean interests being handled jointly with MedGOOS. Work continues on the possibilities for the development of GOOS in southeast Asia (SEA-GOOS), in the Indian Ocean (IO-GOOS), and around Africa (GOOS-AFRICA).

35. Another element in the development of GOOS is encouragement by I-GOOS and the GSC, supported by the actions of the GPO, of the formation of national GOOS coordinating committees that ideally should bring together at the national level all of the potential stakeholders in such an enterprise. These committees may complement and even be part of the national oceanographic committees promoted by the IOC, to which they add a new dimension by involving all potential stakeholders (e.g., industry and local government as well as academia and central government).

### **QUESTION BOX VI**

**Do you feel that the regional GOOS arrangements are well integrated into the GOOS framework, and, indeed, do they need to be?**

**Do you feel that IOC member states are able to make effective national contributions to GOOS (regionally or globally)?**

**Do there need to be additional/fewer mechanisms for integrating national/regional GOOS activities into the GOOS arrangements?**

### **QUESTION BOX VII**

**Do you feel that GOOS is effective as a capacity building mechanism?**

**If not, how would you propose changing it to make it more effective?**

## **Concluding Remarks**

36. The GOOS Review Team would appreciate answers to the questions posed in the six question boxes contained in this paper as well as comment on any matter relating to GOOS that falls within the Terms of Reference as provided in Paragraph 2 of this paper.

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*(GOOS Review Team)*

ANNEX III

RESPONSES TO THE QUESTIONNAIRE AND IN INTERVIEWS

III.1 LIST OF RESPONDENTS TO QUESTIONNAIRE

**Table 1. National Responses**

The responses were written unless indicated by an (\*), in which case they were verbal responses from individuals interviewed by Group Member Dr. K. Radhakrishnan during the 35<sup>th</sup> IOC Executive Council (Paris, June 2002).

Australia	(i) national submission (ii) * A. McEwan, Australian delegation [ <i>NOTE that McEwan also submitted a written report under 2, below, in his role as past-Chair I-GOOS</i> ]
Azerbaijan	
Belgium	
Canada	(i) national submission (ii) * G. Holland, Canadian delegation
China	* H. Li, Chinese delegation
Colombia	
Croatia	
Cuba	
Ecuador	
Finland	
France	(i) national submission (ii) * F. Gerard, French delegation
Germany	(i) national submission (ii) * D. Kohnke, German delegation
India	
Japan	(i) national submission (ii) * Y. Michida, Japanese delegation
Mauritius	
Netherlands	(i) KNMI (ii) RIKZ
Norway	
Portugal	* M. Ruivo, Portugese delegation
Spain	
Turkey	(i) DHNO (ii) IMS
UK	(i) IACMST (ii) UK Met. Office (iii) SOC
Ukraine	
USA	(i) national submission (ii) * Ned Cyr, US delegation

## **Table 2. Responses from Individuals in Organisations**

1. JCOMM (Savi Narayanan, Co-President)
2. SCOR (Silvana Vallergera, Chair of I-GOOS)
3. WMO (Peter Dexter, Head of Marine Programme)
4. GPO (Maria Hood, IOC Secretariat CO2 programme)
5. I-GOOS (Angus McEwan: past Chair I-GOOS, present Member I-GOOS Board)

### **III.2 SUMMARY OF RESPONSES TO QUESTIONS**

The full text of the responses and written reports on the interviews are available on request from the Executive Secretary IOC. The points drawn out in the following summary were made by combining responses that were more or less identical. Where responses from one question seemed to belong to another question they were moved to the appropriate place. *Explanatory notes are given in italics.*

#### **III.2.1 QUESTION BOX 1 - GOOS STRUCTURE**

Question Box 1 contained 4 related questions:

- (i) Does the preceding section provide a reasonable description of the working structure of GOOS? *There were 28 questionnaire responses, 19 of which said Yes, and 9 of which said No.*
- (ii) If not, how would you describe the GOOS working structure? *There were 7 questionnaire responses.*
- (iii) Do you believe that the present GOOS working structure is an appropriate one? *There were 21 questionnaire responses, 7 of which said Yes, and 12 of which said No.*
- (iv) If not, how should it be changed? *There were 24 questionnaire responses.*

Many found the GOOS structure diagram provided in the questionnaire document inadequate and/or confusing (see Figure 1, Annex III, above). Many complained that the accompanying text was confusing to outsiders and needed to be more crisply worded.

Most respondents felt that the organs that constitute the current GOOS working structure were appropriate, but many respondents commented that there were limits to these bodies being able to fully meet their respective roles and that there seemed to be a lack of clarity in definition of the roles and the reporting relationships. A few respondents expressed concern that there were too many bodies.

There was a strong sense that the Terms of Reference of the different bodies needed to be simplified; that the complementary roles of the different bodies should be made clear; and that the organizational structure should be shown in such a way as to display the real reporting lines (e.g. including regional GOOS bodies) and key linkages (e.g. with JCOMM, IODE, GCOS and POGO). Several respondents in response to these and later questions noted that part of the confusion of roles between I-GOOS and the GSC stemmed from the fact that both appeared to be in some way shown as responsible for implementation of GOOS.

Many responses were concerned that I-GOOS was ineffective.

Most respondents wished IGOOS to continue and be strengthened and gave strong arguments in support of continuing the current organs of GOOS. A few respondents sought structural change as varied as (a) abolishing I-GOOS (two respondents), (b) abolishing GSC (one respondent), and (c) merging both these bodies (one respondent).

With regard to the relationship between GOOS and other sponsoring organizations, some confusion had been generated by the depiction of the sponsors in the diagram in the questionnaire (Figure 1 of Annex III). One respondent suggested that I-GOOS should report to the governing bodies of the sponsors, meaning to WMO and UNEP as well as to IOC. Another suggested inviting FAO to join the co-sponsors of I-GOOS. A third suggested that I-GOOS should be an IOC Committee and not a joint IOC-WMO-UNEP Committee.

### **III.2.2 QUESTION BOX 2 - THE PANELS**

Question Box 2 contained 7 related questions:

- (i) Are the Terms of Reference for the OOPC adequate, and if not, how should they be modified? ***There were 24 questionnaire responses, 13 of which said Yes, and 11 of which said No.***
- (ii) Do you feel that the OOPC is adequately carrying out its terms of reference, if not where is it falling down and what remedial action would you recommend? ***There were 22 questionnaire responses, 16 of which said Yes, and 1 of which said No.***
- (iii) Are the Terms of Reference for the COOP adequate, and if not, how should they be modified? ***There were 28 questionnaire responses, 17 of which said Yes, and 7 of which said No.***
- (iv) Do you feel that the COOP is adequately carrying out its terms of reference, if not where is it falling down and what remedial action would you recommend? ***There were 28 questionnaire responses, 21 of which said Yes, and 1 of which said No.***
- (v) Are the OOPC and COOP, plus specialist panel, an adequate panel (advisory) structure for GOOS? ***There were 24 questionnaire responses, 21 of which said Yes, and 3 of which said No.***
- (vi) If not, which additional panels are required/which panels should be abolished, and why? ***There were 9 questionnaire responses.***
- (vii) Is a new mechanism needed to coordinate scientific guidance on observing systems currently being provided somewhat independently by a number of bodies and panels (eg CLIVAR, JCOMM, OOPC, the WMO's CBS, etc)? ***There were 27 questionnaire responses, 11 of which said Yes, and 10 of which said No.***

Nearly all respondents viewed the Panels as successful and effective. The Ocean Observations Panel for Climate (OOPC), as a more mature body, raised few issues other than questions concerning its evolution to take on board biogeochemical parameters, and its overlaps and connections with the Coastal Ocean Observations Panel (COOP).

The COOP was seen to have a challenging task, and will need to work with and through both the international and regional GOOS structures. The COOP, which is in the early stages of its evolution, has a challenging task, essentially because it has to address the coastal environment and

management issues, biology including living resources, as well as environmental and human health. The activities are carried out in the coastal ocean where some of the data may be of a strategic nature. Hence the implementation will have to be essentially by coastal states, and capacity building becomes crucial element.

There were some concerns that the TOR's of the panels should be reviewed and updated. In the case of the OOPC some respondents felt that the ToR's should (i) not include forecasting, the responsibility for which now ought to lie with JCOMM; (ii) acknowledge the need for a link to the SCOR-IOC CO2 Panel; (iii) not include implementation. In the case of COOP some respondents felt that the ToRs should (i) not include implementation; and (ii) mention the contribution of COOP to integrated coastal zone management. Several respondents called for the ToRs of both panels to cross-refer to each other, to be more compatible, and to show links to JCOMM and IODE.

As far as the requirement for new advisory panels is concerned (question vi, above), one respondent noted "...a pressing need for a panel addressing economic issues..." which "...is likely to be an increasingly important topic for government committees as they consider cost-benefit analyses..." "...there is much value in having a panel to consider appropriate methodologies and to compile useful statistics". An interviewee noted that "There is a well-founded economic case based on public good benefits; it has not been put across to policy makers....The profile must be raised."

Great interest was shown amongst the respondents in the outputs of GOOS, which begs the question of increasing the GSC's involvement in the science leading to ocean products and services.

One respondent suggested that "GOOS, GCOS, WCRP, CBS should discuss the concept of an overall coordinating mechanism for scientific guidance, which might be useful for implementing bodies such as JCOMM, which otherwise struggle a little with balancing these requirements".

### **III.2.3 QUESTION BOX 3 - THE GOOS INITIAL OBSERVING SYSTEM**

Question Box 3 contained 2 related questions:

- (i) Do you feel that the GOOS-IOS is evolving appropriately, including its use of pilot projects? ***There were 33 questionnaire responses, 15 of which said Yes, and 14 of which said No.***
- (ii) What areas of observations are poorly catered for by the GOOS-IOS, and what strategies would you propose for addressing these deficiencies? ***There were 28 questionnaire responses.***

Many respondents had difficulty with the concept of the Initial Observing System (IOS). Many respondents recognized the various initiatives to develop GOOS such as the Tropical Atmosphere Ocean (TAO) array, the Ship of Opportunity Programme (SOOP), the Voluntary Observing Ship (VOS) programme, the Argo profiling float programme, the Data Buoy Cooperation Panel (DBCP), the Global Sea-Level Observing System (GLOSS) and so on. Many respondents further recognized the difficulties in coping with the coastal seas.

While some respondents were evidently very pleased with the progress that has been made in implementing GOOS in recent years, several respondents asked that greater priority be given to awareness-raising about GOOS and to making information about GOOS more available, for example on the Internet. On the same theme, but in response to question box 4 (below) one respondent noted that: "the profile of GOOS is not as high in Member States as it ought to be. A lot of effort must be undertaken to improve this situation." Another respondent suggested that the GPO should be provided "...with staff to develop and maintain a professional Web site as well as other

outreach documents to demonstrate what the programme is about and what it is producing". Two interviewees noted that GOOS marketing is very weak, so visibility is low, which means that credibility is low. In future marketing must have a higher focus to attract the interest of managers and industry. One interviewee noted that IOC claimed no credit for the role of GOOS in El Nino or other forecasts.

Many respondents made many useful suggestions about what areas of observations need to be covered that are not covered by GOOS at present. Many of their concerns are currently being addressed in the development by COOP of the Strategic Design Plan. Specific mention was made of the need for improvements in the following areas:

- chemical and biological parameters, including primary production, plankton, and
- marine pollution;
- salinity at the sea surface;
- CO<sub>2</sub> transport across the sea surface;
- shelf and coastal oceanography;
- monitoring on key ocean sections;
- precipitation measurements;
- rates of chemical biological and physical processes;
- continuity of satellite missions;
- transitioning systems from research to operations;
- capacity building for developing countries;
- observations in the southeast Pacific;
- observations in the Indian Ocean;
- non-physical parameters in NEAR-GOOS;
- standardization and method development for biogeochemical measurements.

#### **III.2.4 QUESTION BOX 4 - THE MANDATE FOR GOOS**

Question Box 4 contained 3 related questions:

- (i) Do you feel that GOOS is being implemented and governed in a way consistent with its mandate? ***There were 25 questionnaire responses, 20 of which said Yes, and 3 of which said No.***
- (ii) If not, please give examples or instances where this is occurring? ***There were 7 questionnaire responses***
- (iii) Should the GOOS mandate be changed, and if so, how? ***There were 15 questionnaire responses, 3 of which said Yes, and 6 of which said No.***

There was a clear overall judgment that the mandate was satisfactory and should not be changed.

The biggest concern raised by respondents over the discharge of the mandate were concerned with the past ineffective functioning of I-GOOS.

Regarding implementation of the mandate, one respondent noted that: "...it is still totally unclear where we are standing with respect to the observing system, the data management, exchange and assimilation, or analysis centres." The same respondent noted in response to question box 3 that: "Nobody yet knows what the observing system looks like."

Two respondents recommended that GOOS must focus on the preparation of user-oriented products branded with its logo.

One respondent called for an appropriate level of resources to enable the GPO to get the job done.

### III.2.5 QUESTION BOX 5 - THE GOOS MODUS OPERANDI

Question Box 5 contained 2 related questions:

- (i) Is this an accurate description of the *modus operandi* of GOOS, if not, please give instances or examples of where a different *modus operandi* is being followed? ***There were 19 questionnaire responses, 12 of which said Yes, and 6 of which said No.***
- (ii) Is the *modus operandi* of GOOS as described here appropriate, and, if not, how would you recommend that it be modified? ***There were 20 questionnaire responses, 8 of which said Yes, and 9 of which said No.***

Many respondents found the description of the current *modus operandi* acceptable, but only half of them found the current *modus operandi* appropriate.

Criticism of the present *modus operandi* tended to focus on the apparent confusion between the roles of I-GOOS, the GSC and the GPO, as was brought out in previous sections (above).

Some of the respondents found the concept of GOOS as being user-driven hard to reconcile with the GOOS working practices.

With regard to connections to the user community, several interviewees noted that serious thought needs to be given to involving industry in the design and implementation of GOOS from an early stage. This not least because industry should be an advocate to government for the large investments needed in observing systems.

Some respondents considered that it was highly desirable to separate the meetings of I-GOOS and the IOC Assembly to give Member States time to digest I-GOOS recommendations before the Assembly.

*This is already happening in the case of the 6<sup>th</sup> session of I-GOOS.*

A few respondents suggested that more frequent governance was required than was possible with I-GOOS meetings every two.

*These respondents may not have known about the recent addition of an I-GOOS Board that would carry out I-GOOS business inter-sessionally.*

### **III.2.6 QUESTION BOX 6 - REGIONAL AND NATIONAL DEVELOPMENT OF GOOS**

Question Box 6 contained 4 related questions:

- (i) Do you feel that the regional GOOS arrangements are well integrated into the GOOS framework, and, indeed, do they need to be? *There were 31 questionnaire responses, 4 of which said Yes to the first part, and 22 of which said No. Eleven said Yes to the second part and only 3 said No.*
- (ii) Do you feel that IOC member states are able to make effective national contributions to GOOS (regionally or globally)? *There were 26 questionnaire responses, 8 of which said Yes, and 2 of which said No (11 said 'It depends on the country').*
- (iii) Do there need to be additional/fewer mechanisms for integrating national/ regional GOOS activities into the GOOS arrangements? *There were 18 questionnaire responses.*
- (iv) What would you propose in this regard? *There were 16 questionnaire responses.*

#### **III.2.6.1 Regional Development**

There was a wide variety of responses concerning the regional development of GOOS. Many saw great value in regional alliances and coordination and in data sharing for mutual benefit. Some were content with current arrangements. Some suggested that GOOS Regional Alliances (GRAs) do not need to be integrated into the GOOS structure. Others felt that the GRAs do need to be integrated with the overall global GOOS structure.

A specific plea was made for the development of a GOOS Regional Association for the southeastern Pacific.

#### **III.2.6.2 National Development**

As far as national developments are concerned, the respondents recognized the varying ability of countries to respond to global and regional initiatives. For many countries the challenge is to make GOOS relevant; for others it is to build their capacity to contribute to, participate in, and benefit from GOOS. The need to ensure communication of the relevance and benefits of GOOS at the national level was seen as critical. Other responses ranged from suggesting that I-GOOS should determine the requirements of Member States with respect to GOOS, to suggesting that I-GOOS should work towards overall system plans that specified in some detail the expected contributions of Member States (as in the WMO plans for the World Weather Watch), at least for specific system components and applications.

The respondents were concerned to use existing mechanisms to ensure that there was good integration of global, regional and national activities.

One respondent noted that its national GOOS group seemed rather divorced from the international GOOS activities.

One respondent noted that in part the lack of national commitments reflected "...the fact that GOOS requirements are not clear to all and have never been discussed at intergovernmental level. This both prevents already participating Member States from increasing their commitment, and others from joining."

Confusion about the operation of GOOS at the national level was also manifest in one comment in question box 2, which called for clarification "...of the relative roles of and connections between separate bodies like OOPC, JCOMM and CLIVAR that have to work together at the national level."

### **III.2.7 QUESTION BOX 7 - GOOS CAPACITY BUILDING**

Question Box 7 contained 2 related questions:

- (i) Do you feel that GOOS is effective as a capacity building mechanism?

*There were 25 questionnaire responses, 9 of which said Yes, and 12 of which said No.*

- (ii) If not, how would you propose changing it to make it more effective?

*There were 18 questionnaire responses.*

Many respondents recognized that while a very considerable effort was needed to build the capacity of developing countries to participate in GOOS, and while the principles of how to build this capacity had been defined, there was no readily identifiable source of funds to enable the activity to take place in other than a piecemeal and *ad hoc* fashion. In terms of training, little had been achieved to date outside the annual course offered by GLOSS on sea-level measurements, and by NEAR-GOOS on data and information management. Some respondents noted that the development of the GOOS Regional Alliances was itself an effective vehicle for capacity building, and that the GRAs individually were starting to bring in funds to develop their own capacity further (e.g. in MedGOOs and Black Sea GOOS). Some respondents pointed to GOOS pilot projects as offering the potential for both demonstrating benefit and building capacity.

One interviewee noted that much more attention should be paid to developing the ability of developing countries to engage in numerical modelling.

## ANNEX IV

### ADDITIONAL ISSUES

#### IV.1 RESPONSES TO THE CONCERNS RAISED BY THE 5<sup>TH</sup> SESSION OF I-GOOS

Resolution XXI-7 also called on the Review Group to address the issues identified as requiring attention by I-GOOS-V, which are as follows (extracted from the report of the 5<sup>th</sup> session of I-GOOS):

- (i) "Some amendments were necessary to update the existing Terms of Reference of I-GOOS, the GSC and the GPO, including those concerning relationships with the new JCOMM."

*This has been dealt with in section 5 of the report (above)*

- (ii) "the following issues, *inter alia*, should be addressed as part of a review process:
- The future structure should be the simplest possible to provide effective development and operation.
  - Changes appeared necessary to make I-GOOS more effective, and to take work forward between the biennial meetings.
  - The boundaries between the responsibilities of the I-GOOS and the GSC, concerning scientific advice, resource planning, policy and implementation were ambiguous.
  - The tasks assigned to the GOOS Project Office in its Terms of Reference (ToRs) did not appear to provide the same support to I-GOOS as they did to the GSC. According to the ToRs, the GPO only 'maintains liaison' with the I-GOOS and its officers.
  - The role of the GOOS Sponsors Forum and the way it contributes to GOOS should be clear, apparent, and accountable.

*The GOOS Sponsors' Forum no longer exists. It was an ad hoc mechanism that came into being at 1997 at a time when the sponsors felt that the GOOS structure of the time (I-GOOS on the one hand and the Joint GOOS Scientific and Technical Committee, or J-GOOS on the other hand) was not working effectively; the result was the merging of the I-GOOS Strategy Sub-Committee with J-GOOS to form the GOOS Steering Committee).*

- The role of the informal GOOS 'Executive Group' should be reviewed as an effective coordinating mechanism.
- The development of regional components of GOOS should ultimately be the responsibility of I-GOOS. Arrangements are needed so that regional alliances can be based on existing IOC, WMO and UNEP structures. Mechanisms should be established so that the different regional experiences can be shared."

*These points have been dealt with in section 5 of the report (above).*

- (iii) "what is needed is the finalization and wide dissemination (especially to operational agencies of governments) of GOOS requirements so that a rolling process of review could be initiated as the basis for comparing achievements with requirements. As the requirements for Climate are known, most of the effort is required on the Coastal requirements. A part of this task is to define and establish the working relations with J-COMM or any other similar body to be established."

"It was agreed that it was not up to I-GOOS to define the requirements, but to endorse those emerging from the scientific and technical advisory bodies (OOPC and COOP). Nevertheless, I-GOOS could play a useful role in disseminating the requirements at national and regional level."

*These points have been dealt with in section 5.3 of the report (above)*

- (iv) "called for the creation within Member states of "GOOS Focal Points" able to represent the full spectrum of national oceanographic activity."

*This is a matter for I-GOOS to deal with.*

- (v) "that the IOC should encourage Member States with interests in GOOS (a) to form National GOOS Coordinating Committees representing all key stake-holders, and (b) to ensure that the national representatives selected to attend I-GOOS represent the interests of a broad range of operational agencies and users of GOOS products."

*Item (a) has been dealt with in sections 2.7 and 5.8 of the report (above); item (b) has been dealt with in section 5.2.*

#### **IV.2 RESPONSES TO THE CONCERNS RAISED BY THE 21st IOC Assembly (June 2001)**

- (i) "The Assembly noted that with the creation of national networks of buoys and tide gauges along the western coast of South America, there was a very real prospect of creating a regional GOOS for the South East Pacific, and urged that the IOC and the Member States work towards such a goal through the offices of the CPPS. Similar opportunities should be pursued for the western South Atlantic and the Arctic."

*This has been dealt with in section 5.6 of the report (above).*

- (ii) "The Assembly agreed that the intergovernmental process is indispensable to the implementation of such a global and highly networked undertaking as GOOS, for it provides the mandates, agreements and endorsements that justify national cooperation. It also provides the means for working towards national commitments leading to obligations. To achieve these ends, I-GOOS must have higher intergovernmental visibility and be seen as the leading body. The Assembly noted that an increasing challenge for the future would be how to obtain the resources to organize and implement GOOS as a Flagship of the IOC, and to build the capacity of developing nations to engage in GOOS."

*Figure 6 makes clear the leadership of IOC and the body that it has designated to manage GOOS (I-GOOS). It is evident that obtaining resources and building capacity are two significant challenges to achieving the desired result.*

- (iii) (iii) "The Assembly also urged Member States to consider making staff available even in their home offices and on a part time basis to work as extensions of the GOOS Project Office, so as to expand the effort needed to meet the growing demands for coordination of implementation."

*As noted in section 5.5 of the report (above) there is still a serious shortfall of resources for the activities of the GOOS Project Office.*

- (iv) "The Assembly encouraged Member States to use all possible means to stimulate national coordination of and involvement in GOOS activities, recognizing that while this could be done through National Oceanographic Committees it might also require the formation of National GOOS Coordinating Committees that bring together all stakeholders, as a means of engaging the wider community at the national level, including policy makers. It would be up to individual Member States to choose their own mechanism."

*This has been dealt with in sections 2.7 and 5.8 of the report (above).*

### **IV.3 PROGRESS SINCE THE FIRST GOOS REVIEW REPORTED TO I-GOOS-III**

The Review Group noted that good progress had been made against most of the 22 of the recommendations of the previous review of GOOS (Table IV.3.1 below).

The Review Group noted lack of action on Recommendations 7 (creation of a GOOS Resource Search Group), and 17 (create GOOS Promotion and Marketing Group).

*The need for I-GOOS to form advisory groups on Resources and on Promotion and Marketing emerged independently in the present review, and must be addressed, as indicated in the revised ToRs for I-GOOS (section 5.2 of the report, above).*

#### **Table IV.3.1 Progress Against Recommendations Of The First GOOS Review (1996)**

Extracted from section 7, "Summary And Recommendations For Action", from GOOS Progress Assessment; A Report on Progress to end 1996, published as I-GOOS-III/20, June 1997.

*Recommendation 1: Improve and strengthen GOOS management by reorganisation suggested by sponsors. **Result: creation of the GSC in 1998.***

*Recommendation 2: Strengthen the GPO (already partly accomplished by creation of permanent post). **Result: an increase in staffing and financing, but still not sufficient to meet the increased demand.***

*Recommendation 3: Use the upcoming IOC Assembly as a forum to persuade Member States to invest in GOOS through secondments and earmarked GOOS Trust Fund allocations. **Result: (i) at IOC headquarters: one secondment (J. Trotte, from Brazil, for 3 years); plus a 30% increase in extrabudgetary funding; (ii) development of 2 IOC Regional (GOOS) Programme Offices (Perth and Rio); (iii) development of several regional GOOS secretariats to serve the needs of GOOS Regional Alliances.***

*Recommendation 4: Plan and hold Commitments Meeting in Year of the Ocean, mid-1998. **Result: meeting duly held in July 1999. Details on commitments offered at that meeting now being catalogues by contractor (Bert Thompson).***

*Recommendation 5: Publish GOOS Principles, GOOS Strategic Plan and Realization of GOOS in time for Commitments Meeting mid 1998. **Result: all published***

***Recommendation 6:*** I-GOOS Chair and Vice Chairs and GPO Director to act as Executive Approvals Group to act inter-sessionally to ensure speedy publication of I-GOOS planning documents. **Result:** ***Informal GOOS Executive Group created; now superseded by creation of the I-GOOS Board.***

***Recommendation 7:*** Create GOOS Resource Search Group to work with GPO to act inter-sessionally to develop concrete proposals to solicit external funds to enable GOOS activities to proceed. **Result:** ***Not Created (action still needed, and addressed by the present Review Group).***

***Recommendation 8:*** New GOOS Steering Committee to reconsider the approach to planning, especially bearing in mind the need to involve operational agencies. **Result:** ***GSC increasingly considering operational requirements in planning; clarification of roles required with subsequent creation of JCOMM.***

***Recommendation 9:*** Focus Panel activities on tasks leading to deliverables. **Result:** ***Panels have been requested to focus on providing advice related to implementation and the provision of products and services.***

***Recommendation 10:*** Create and Fund Coastal Module Panel to develop Coastal Plan. **Result:** ***Coastal Panel created and initial plan published; now replaced by COOP, with integrated design plan about to be published.***

***Recommendation 11:*** Create and Fund LMR Panel to create LMR Plan. **Result:** ***LMR Panel created and initial plan published; now replaced by COOP, with integrated design plan about to be published.***

***Recommendation 12:*** Develop Plan for Services and Products: charge the service module with developing and distributing products with the GOOS label, and create a network of ocean service producers. **Result:** ***Services Module absorbed into both COOP and OOPC, with JCOMM subsequently becoming a focus for development of products and services.***

***Recommendation 13:*** Create Pilot Projects (GODAE, HOTO, S.E. Asia, Indian Ocean, etc). **Results:** ***GODAE and Argo now well underway; SEAGOOS development begun; Indian Ocean GOOS created; RAMP developed by HOTO and beginning to be applied (more needed)***

***Recommendation 14:*** Develop coherent approach to Capacity Building, focusing on practical assistance. **Result:** ***Development and publication of Capacity Building Principles and Implementation Plan; 1<sup>st</sup> meeting of GOOS CB Panel and agreement on an Action Plan.***

***Recommendation 15:*** Develop Data and Information Management Plan: **Result:** ***Developed and published, but remains to be put into effect.***

***Recommendation 16:*** Work with IGOSS, IODE etc to develop GOOS infrastructure. **Result:** ***JCOMM has created a substantial infrastructure for achieving many GOOS goals in association with IODE; IODE is working through the ODIN programme to develop the infrastructure for GOOS in Africa and now the Caribbean and South America.***

***Recommendation 17:*** Create GOOS Promotion and Marketing Group to strengthen and broaden promotional activities, starting with plans for Year of the Ocean. **Result:** ***This activity remains a responsibility of the GPO, which does not have the resources for it. A GOOS display was arranged for EXPO 98 in Lisbon. Some additional publicity is coming about through the brochures and newsletters of the IGOS Partners. A Communication and Marketing Group is still needed.***

***Recommendation 18:*** IOC to reorganize its activities to provide a more comprehensive and integrated approach to ocean data collection and management. **Result:** Creation of JCOMM has greatly assisted this development; IOC is now considering development of an integrated approach to data and information management across all of its programmes. IOC is also developing an ocean data policy.

***Recommendation 19:*** Develop formal links between IOC GPO and national and regional GOOS offices, and create networks of national contacts and promoters. **Result:** Several new regional and national GOOS groups have been developed. Reports of activities are published on the GOOS Web site. A network of national and regional contacts has been created. GOOS newsflashes are being used to disseminate information rapidly. The 1<sup>st</sup> GOOS Regional Forum will bring regional GOOS groups together.

***Recommendation 20:*** Encourage bi-lateral arrangements, which lead gradually to multi-lateral developments. **Result:** such developments are being encouraged through the development of new GOOS Regional Alliances.

***Recommendation 21:*** Harness the basic research community in support of GOOS. **Result:** The creation of POGO reflects the interests of the managers of research establishments in GOOS. Many researchers are actively and enthusiastically engaged in the implementation of GODAE and Argo, and are keen to develop an ocean time series station network.

***Recommendation 22:*** Expand postgraduate and postdoctoral programmes to offer training in support of the development of GOOS. **Result:** Little progress aside from the formation of a POGO Fellowship programme for short-term training.

#### **IV.4 THE SELECTION PROCESS FOR THE GSC AND ITS SUBSIDIARY ADVISORY PANELS**

##### **IV.4.1 The GSC**

Only 12 of the members of the GSC are experts selected from the community; the others are all in some *ex officio* position.

The procedure for selection of 4 new experts for the 4 empty slots on the 12-person core group of the GSC in 2002 (for attendance at GSC-VI in February 2003), was as follows.

Circular Letter 2026 was sent to Member States on July 4, 2002, requesting nominations and curriculum vitae by August 30 against descriptions of 4 vacancies (operational meteorological/ocean forecasting, coastal operational physical oceanography, biologist to deal with harmful algal blooms or chemist/biologist to deal with pollution, and carbon cycle chemistry). Sponsoring organizations (IOC including the GPO, WMO, UNEP, ICSU including SCOR) and the chairs of GOOS related bodies (I-GOOS, GSC, OOPC, COOP, JCOMM) were also asked to suggest possible candidates.

A selection team was appointed with the approval of the Chairman IOC, comprising the Members of the I-GOOS Board, the Members of the Executive Committee of the GSC, and the Director of the GOOS Project Office. It was required to consider scientific/ technical ability; management experience; geographic balance; and gender balance.

Fifty-nine candidates were suggested, of whom 30 were suggested by Member States. Two withdrew their names, leaving 9 candidates for the operational forecasting position, 19 for the

coastal physics position, 20 for the biology/chemistry position, and 9 for the carbon position. Ten of the 57 candidates were women.

In terms of geographic balance the previous 12-person core committee was as follows:

GSC	April 2002			May 2002	Post GSC-V
Europe	2	UK; Germany		1	UK
N. America	3	2 USA; 1 Canada		3	2 USA; 1 Canada
S. America	1	Brazil		1	Brazil
Africa	1	S. Africa		0	
E. Asia	3	China; Japan; Philippines		2	China ; Philippines
S. Asia	1	India		1	India
Australasia	1	NZ		0	
<b>Total</b>	<b>12</b>			<b>8</b>	

Recognising the strong US position, the selection process for the short list excluded all 9 US candidates. *[NOTE that one of the two US people currently on the committee will be dropped after the next meeting and there will be no replacement from the USA].*

That left us with 48 candidates. CVs were lacking for 9 of these who for the most part had been proposed by individuals rather than Member States, and whose candidacy therefore carried slightly less weight. In the time available it did not prove feasible to obtain CVs for these individuals.

A ranked short list of 13 candidates was made up from the recommendations of the selection committee. It contained 3 women and representatives from Asia, Europe, Australasia, South America, and Africa. The short list was evaluated by the GOOS sponsors (IOC, WMO, UNEP, and ICSU) for them to approve. The final selection was then approved by the Chairman of IOC. The final 4 candidates were selected from Europe (Germany), Australasia (Australia), East Asia (Japan) and South America (Argentina), replacing previous incumbents from Germany, New Zealand, Japan and South Africa. Three had been nominated by Member States, and the fourth was endorsed by the candidate's Member State. One is female. The end result means that for the time being nobody on the GSC is from Africa. This reflects in part the dearth of submissions from African countries, plus the fact that only one African candidate made it onto the short list. There will be a further rotation of candidates following GSC-VI (March 2003), which provides another change for African candidates to be considered.

Core committee members are appointed for 3 years with a possibility of remaining for a further 2 years.

#### IV.4.2 OOPC Members

Members are chosen by the three sponsors: GSC, GCOS-SC, and WCRP. When replacements are required, the OOPC chair, working with the Panel members develops a short list of well-qualified replacement candidates and presents it to the sponsors with CVs. Any sponsor may add other candidates to the list for consideration. The final decision is a joint one by the sponsors.

Of foremost importance in the replacement process, is the maintenance of the balance of technical expertise, which includes data management, modelling, *in situ* observations, satellite remote sensing, biogeochemical ocean processes, and broad experience in climate-related research and operational oceanography. Geographical balance and gender representation are taken into consideration and will tip the selection decision when candidates are otherwise equally qualified as to needed expertise on the Panel. Panel members are expected to be widely recognized in their fields and capable of leading and/or interacting with international *ad hoc* groups of experts established by the OOPC to address specific problems.

The table below indicates membership in January 2002. Since then the German and Australian members have stepped down and replacements are being sought.

OOPC	Jan. 2002	
Europe	3	France; Germany; Norway; UK
N.America	5	4 USA; 1 Canada
S.America	1	Brazil
Africa	0	
E.Asia	1	Japan
S.Asia	0	
Australasia	1	Australia
<b>Total</b>	<b>11</b>	

#### IV.4.3 COOP members

The criteria for selecting members of the COOP were described in the report on GOOS to the thirty-third IOC Executive Council by the Director of the GOOS Project Office (GPO). COOP was formed by merging the former Living Marine Resources (LMR), Health of the Ocean (HOTO) and Coastal Seas (C-GOOS) Panels of GOOS at the end of 2000. The mechanism reflects the fact that the panel is advisory to the GSC, which is itself co-sponsored under a Memorandum of Understanding by 4 partners (IOC, WMO, UNEP and ICSU).

The first step was for the GSC to appoint two co-chairs of COOP. To ensure continuity, these are respectively the ex-chairs of the Coastal GOOS and HOTO Panels. The two co-chairs, in consultations with the GSC and the GPO, then identified the topic areas to be covered by the Panel. A list of candidates for each topic area was then generated, with help from Brazil, China, India, Japan, the Russian Federation, WMO and the GPO. To maintain continuity, the first level of selection was made from the membership each of the three pre-existing panels. New experts were then selected against the topic areas that had not been covered by the previous panels. Candidates

were selected with due attention to (i) skills and experience to address the topical areas required; (ii) an appropriate mix of academic and operational people; (iii) appropriate geographical balance, and (iv) gender. The list of potential panel members was then circulated to the COOP sponsors (IOC, WMO, UNEP and ICSU) for their approval. FAO and IGBP have subsequently become co-sponsors. COOP panel members are expected to serve two year-terms with the possibility of renewal.

In order to strengthen expertise areas foreseen as important for development of the COOP implementation plan (remote sensing, ecosystem modelling, real-time *in situ* sensing of non-physical variables, and data management), four panel members were rotated off COOP in September 2002. The sponsors of COOP were invited to nominate candidates for these 4 topic areas, and 4 candidates were selected by the Co-Chairs in consultation with GSC, the GPO and the COOP sponsors, taking into account gender and geographic balance.

COOP	May 2002		Sept. 2002	
Europe	8	Germany, Israel, Italy, Norway, Poland, Russia, UK (2)	8	Azerbaijan, France, Germany, Israel, Italy, Norway, UK (2)
N. America	7	Canada (3); Mexico; USA (3);	7	Canada (2); Mexico; USA (4);
S. America	2	Brazil; Chile	2	Brazil; Chile
Africa	2	Ghana; S. Africa	1	S. Africa
E. Asia	2	China; Japan	3	China; Japan; Philippines
S. Asia	1	India	1	India
Australasia	1	NZ	1	NZ
<b>Total</b>	<b>23</b>		<b>23</b>	

#### IV.4.4 CB Panel

The Membership of the Capacity Building Panel was proposed to the GSC by the Consultant (Geoff Holland) who prepared the Capacity Building Principles (GOOS Report 69), agreed by GSC-IV, and subsequently approved by I-GOOS-V. Membership initially comprised representatives of the (*then*) GOOS advisory bodies OOPC, Coastal GOOS Panel, LMR Panel, HOTO Panel, the GSC, the GPO, the IOC's TEMA programme, the GOOS sponsoring agencies, potential donor agencies, and some recipient countries in need of support.

## ANNEX V

### THE TERMS OF REFERENCE OF THE DIFFERENT BODIES INVOLVED IN GOOS

#### V.1 The Intergovernmental Committee for GOOS (I-GOOS)

I-GOOS is the intergovernmental body taking overall responsibility for promotion, coordination, implementation and management of the Global Ocean Observing System (GOOS), according to the agreed principles and strategy. As amended by the fourth session of I-GOOS, and approved by the 20th Assembly of the IOC (Resolution XX-8), the terms of reference of I-GOOS are as follows: I-GOOS will:

- (i) regularly assess user requirements;
- (ii) approve overall plans for the initiation and implementation stages of GOOS elements;
- (iii) facilitate the development of such plans on the advice of the GOOS Steering Committee, its Scientific and Technical Advisory Panels and other scientific and technical groups as appropriate;
- (iv) identify the resources needed for GOOS and the means of obtaining them;
- (v) monitor the progress of GOOS and propose changes as required;
- (vi) provide guidance to the Director of the GOOS Project Office on priority needs for GOOS development and implementation;
- (vii) be responsible for the representation of GOOS at intergovernmental meetings.

For implementing these activities, the Committee is invited to:

- (i) develop and maintain a strategy for providing training and technical assistance within the TEMA framework;
- (ii) develop and maintain working relations with relevant bodies of other UN organisations, with other intergovernmental and regional bodies such as ICES and non-governmental bodies, notably ICSU and its SCOR;
- (iii) build upon bodies responsible for the various existing programmes and activities such as IGOSS, DBCP, GLOSS and GIPME/MARPOLMON;
- (iv) support and promote regional development of GOOS.

**Membership:** Chair; two Vice-Chairs; representatives of Member States; Chair or other designated representative of the GSC; Director GPO (as Technical Secretary); representatives of the sponsoring organisations (IOC, WMO, UNEP, ICSU).

#### V.2 The I-GOOS Board

The I-GOOS Board should have the following Terms of Reference (to be recommended to I-GOOS-VI by the I-GOOS Board):

- (i) review the planning of the work programmes of I-GOOS and the GSC and advise the I-GOOS and the GSC Executive Committee on their implementation;
- (ii) assess the resources required for the implementation of the work programmes, and suggest action to identify and mobilise resources;

- (iii) encourage the Member States through I-GOOS to address the constraints on the timely collection and exchange of marine data within the EEZ;
- (iv) facilitate the regular assessment of user requirements, integrating the work of existing bodies taking into consideration the analysis of benefits and costs;
- (v) provide inter-sessional guidance to GPO in the implementation of GOOS and the building of national capacity;
- (vi) coordinate and integrate the work of I-GOOS, as implemented through its various working groups;
- (vii) keep under review the internal structure and working methods of I-GOOS including its relationship to other bodies, and the terms of reference of I-GOOS and the GSC;
- (viii) contribute inter-sessionally to the planning processes for GOOS of IOC, WMO and UNEP as required.

**Membership:** the Chairperson and the past Chairperson; the two Vice-Chairpersons; the Chairperson or other designated representative of the GSC; a representative of the regional GOOS bodies, rotating between the bodies at a two year interval; the Director GPO (Technical Secretary).

For the purposes of benchmarking between regional bodies and to organize biennial regional GOOS meetings in a different region each time, the Board will from time to time be temporarily enlarged to include the Chairpersons of: EuroGOOS, NEAR-GOOS, MedGOOS, IOCARIBE-GOOS, PacificGOOS, GOOS-AFRICA, Black Sea GOOS, and the Head of the Perth Office (representing the development of GOOS in the Indian Ocean), plus representatives of other geographic areas as appropriate.

Other senior representatives of the sponsoring organizations and related bodies may be invited as appropriate.

### **V.3 The GOOS Steering Committee (GSC)**

The Terms of Reference of the GOOS Steering Committee, as agreed by the GOOS sponsors and endorsed by I-GOOS-III (Annex to Resolution I-GOOS-III.4), and by the 19th session of the IOC Assembly (Resolution XIX-6 Annex I), are as follows:

1. The GOOS Steering Committee shall:
  - (i) be responsible for all the scientific and technical aspects of GOOS design, and undertake appropriate activities to support the design process;
  - (ii) 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;
  - (iii) provide guidance to the Director of the GOOS Secretariat (Project Office) in the duties to be performed by the GOOS Secretariat staff;
  - (iv) Submit reports to the sponsoring organisations and to I-GOOS at appropriate times.
2. Specifically, the GOOS Steering Committee will:
  - (i) establish subordinate bodies, as appropriate, with as far as possible the chairs being selected from among the membership of the GOOS Steering Committee;

- (ii) identify observational requirements (user needs) and products in cooperation with I-GOOS; define design objectives; and recommend coordinated actions by the sponsoring organisations and other relevant organisations and agencies;
- (iii) 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;
- (iv) collaborate with the steering committees of the other global observing systems (GCOS and GTOS) and with other appropriate bodies;
- (v) review and assess the progressive development and implementation of the components of GOOS;
- (vi) identify and encourage research efforts, in close cooperation with the ongoing research programmes (such as IGBP and WCRP) in order to promote studies of importance for the development of GOOS;
- (vii) encourage the development of new technologies needed for GOOS.

**Membership:** (a) up to 12 scientific and technical experts, selected with the assistance of the sponsoring bodies, on the basis of their personal expertise, so as to provide a balanced representation of the major scientific and technical disciplines and of the major operational and research programmes, including governmental, contributing to GOOS; a chair and vice-chair will be chosen by the sponsors from among the members; (b) one representative of each of the sponsoring organizations; (c) the Chairperson of I-GOOS; (d) representatives of the other global observing systems; (e) individual experts as needed: note these include the chairs of GSC advisory panels; (f) Technical Secretary (Director GPO).

#### **V.4 The GOOS Project Office (GPO)**

The GOOS Project Office was created as the GOOS Support Office in response to the Annex to Resolution XVI-8, in March 1991. That Annex described the functions of the Office as to:

- (i) review and analyse scientific and observational requirements for the GOOS and prepare draft recommendations on how the Global Ocean Observing System should be implemented to meet these needs;
- (ii) review and analyse existing and new ocean observation and data management systems and capabilities and prepare draft recommendations on their modification, expansion and/or improvement in support of the GOOS;
- (iii) identify requirements for technical assistance and training related to the GOOS and prepare draft recommendations for their implementation;
- (iv) assist the [then] Committee on Ocean Processes and Climate and the Secretary IOC to interact with the GCOS Planning Office and other international organisations, as appropriate, on GOOS-related issues;
- (v) make initial estimates of the costs and benefits of GOOS in terms of existing activities, new activities, utilisation of satellites and other value-added services, and propose a procedure for periodic review and revision of the predicted costs and benefits, including the costs of technical assistance and training.

The Office was renamed the GOOS Project Office (GPO) by I-GOOS-III in June 1997. With creation of the Memorandum of Understanding between IOC, WMO, UNEP and ICSU on the

formation of the GOOS Steering Committee (1998), the Terms of Reference for the GPO (referred to in the MOU as the GOOS Secretariat), were agreed to be to assist the GOOS Committees in:

- (i) the promotion, coordination, implementation and management of GOOS;
- (ii) identifying the resources needed for GOOS and the means for obtaining them;
- (iii) developing and updating plans for initiating implementation stages and monitoring the progress of GOOS;
- (iv) liaising with related research projects and other observing system bodies as appropriate;
- (v) conducting public and information activities to promote GOOS.

Bearing this in mind, the GOOS Project Office staff, under the responsibility of the Director, was charged with:

- (i) assisting the GOOS Steering Committee in preparing scientifically and technically-based plans for the development of GOOS,
- (ii) providing staff support to the GOOS Steering Committee and its Officers and to the subsidiary bodies established by the Committee,
- (iii) maintaining liaison with the sponsoring organizations and other relevant bodies,
- (iv) maintaining liaison with the I-GOOS and its officers,
- (v) making arrangements for scientifically and technically-based planning and related co-ordination activities,
- (vi) the preparation of annual budgets for the GOOS Steering Committee activities for approval by the Officers of the GOOS Steering Committee and the sponsoring organizations and for regular reporting on the use of funds made available to the GOOS Steering Committee.

Under the terms of the 1998 MOU, the GOOS Project Office (Secretariat) shall be located at the IOC Secretariat, and shall assist in the promotion, planning, coordination and implementation of GOOS, provide staff support to GOOS Committees and Officers, consistent with resources, and facilitate co-ordination between the GSC and the I-GOOS and with the Secretariats of GCOS and GTOS. A Director of the GOOS Project Office (Secretariat) shall be appointed in consultation with the sponsoring organizations. The Director and staff of the Office shall not be assigned duties outside the objectives of GOOS without the specific approval of the sponsoring organizations. The Director will be responsible to the Officers of the GOOS Steering Committee and I-GOOS, acting on behalf of the sponsoring organizations. The continuity of these arrangements and of the necessary financial support for the GOOS Project Office (Secretariat) staff and planning activities shall be reviewed periodically by the sponsoring organizations and the Officers of the GOOS Steering Committee.

The most recent Terms of Reference of the GPO have not yet formally approved by I-GOOS.

#### **V.5 Ocean Observations Panel for Climate (OOPC)**

What follows is the revision adopted by the GOOS SC, the GCOS SC and the JSC for the WCRP, as of May 2001:

Recognizing the need for scientific and technical advice and guidance for the common module of the Global Climate Observing System and the Global Ocean Observing System, and the need for liaison and co-ordination between these operational observing systems (e.g. systematic, long-term,

global climate observations) and those of climate research (e.g. limited-life, hypothesis-validating observations), J-GOOS, JSTC for GCOS and the JSC for the WCRP hereby establish an Ocean Observations Panel for Climate (OOPC) with the following terms of reference:

- (i) To evaluate, modify and update, as necessary, the design of the observing system for the common module of GOOS and GCOS whose goals are:
  - To monitor, describe, and understand the physical and biogeochemical processes that determine ocean circulation and effects on the carbon cycle and climate variability;
  - To provide the information needed for ocean and climate prediction, including marine forecasting
- (ii) To provide a procedural plan and prioritization for an integrated set of requirements consistent with the observing system design criteria and in a form that enables timely and effective implementation. This will entail drawing from findings of WOCE, TOGA, JGOFS and CLIVAR, and particularly close interaction with the CLIVAR Upper Ocean Panel (UOP).
- (iii) To liaise and provide advice, assessment and feedback to other panels in task groups of GCOS, GOOS and WCRP as requested, concerning ocean observing for climate in order to ensure that the designs and implementation schedules are consistent and mutually supportive.
- (iv) To establish the necessary links with scientific and technical groups to ensure that they are cognizant of, and can take advantage of the recommended system, and that, in turn, the Panel can benefit from research and technical advances.
- (v) To carry out agreed assignments from and to report regularly to the JSTC, J-GOOS and the JSC for the WCRP.

## **V.6 Coastal Ocean Observations Panel (COOP)**

As approved by GSC-IV and I-GOOS-V, the COOP Terms of Reference are to:

- (i) integrate and refine the design plans drafted by the Health Of The Oceans (HOTO), the Living Marine Resources (LMR), and the Coastal GOOS (CGOOS) panels to develop a unified plan that is consistent with the GOOS Design Principles (Annex 2) and addresses issues related to the following themes:
  - coastal marine services (e.g., safe and efficient marine operations, coastal hazards);
  - the health of marine and estuarine ecosystems and its relation to human health; and
  - living marine resources;
- (ii) develop mechanisms for more effective and sustained involvement of user groups in the design and implementation of the coastal module of GOOS;
- (iii) develop mechanisms that enable effective synergy between research and the development of a sustained observing system for coastal marine and estuarine ecosystems;
- (iv) formulate an implementation plan that is co-ordinated with the OOPC plan for climate services, research and marine services with due emphasis on:
  - integrated observations;

- data and information management;
  - data assimilation and modelling for the purposes of prediction and product development;
  - capacity building; and
  - national, regional, and global promotion of objectives and benefits of the observing system;
- (v) establish criteria and procedures for selecting observing system elements on global and regional scales, and recommend the elements that will constitute the initial observing system;
- (vi) define procedures for ongoing evaluation of system components, reliability of data streams, access to data, and applications.

### **V.7 GOOS Capacity Building Panel**

The terms of reference for the GOOS Capacity Building Panel, as agreed by I-GOOS-V and published in the GOOS Capacity Building Principles document are:

- (i) to initiate, plan, and oversee the implementation on GOOS capacity building through the development of key demonstration projects carried out within the GOOS implementation process. For this purpose, the Panel welcomes suggestions from interested nations or donor agencies for potential demonstration projects;
- (ii) to develop a plan to be submitted to ODA organizations to obtain funding for GOOS-related capacity building activities;
- (iii) to create awareness of GOOS capacity building;
- (iv) to develop guiding principles to be applied in GOOS capacity building activities;
- (v) to develop key indicators for measuring the success of capacity building efforts;
- (vi) to initiate and assist in the development of multi-year regional plans for GOOS capacity building, including partnerships with developed regional activities;
- (vii) to consult and collaborate with the GOOS module advisory panels in the planning and implementation of capacity building and in the selection of demonstration and pilot projects on which capacity building efforts are to be focused.

### **V.8 Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM)**

The Technical Commission shall be responsible for matters relating to:

#### *Further development of the observing networks*

Under the guidance of the relevant scientific and operational programmes of IOC and WMO, development, maintenance, coordination and guidance of the operation of the global marine meteorological and oceanographic observing systems and supporting communications facilities of these organizations to meet the needs of the IOC and WMO Programmes and in particular of the Global Ocean Observing System (GOOS), the Global Climate Observing System (GCOS) and the World Weather Watch (WWW). Evaluation on a continuing basis of the efficiency of the overall observing system and suggesting and coordinating changes designed to improve it.

### Implementation of data management systems

Development and implementation, in cooperation with the Commission for Basic Systems (CBS), the Committee for International Data and Information Exchange (IODE), the International Council of Scientific Unions (ICSU), and other appropriate data management bodies, end-to-end data management systems to meet the real-time operational needs of the present operational systems and the global observing systems; cooperation with these bodies in seeking commitments for operation of the necessary national compilation, quality control, and analysis centres to implement data flows necessary for users at time scales appropriate to their needs.

### Delivery of products and services

Provision of guidance, assistance and encouragement for the national and international analysis centres, in cooperation with other appropriate bodies, to prepare and deliver the data products and services needed by the international science and operational programmes, Members of WMO, and Member States of IOC. Monitoring of the use of observations and derived products and suggesting changes to improve their quality. Coordination of the safety-related marine meteorological and associated oceanographic services as an integral part of the Global Maritime Distress and Safety System of the International Convention for the Safety of Life at Sea (SOLAS).

### Provision of capacity building to Member States

Review and analysis of the needs of Member States of IOC and Members of WMO for education and training, and for technology transfer and implementation support in the areas of responsibility of the technical commission. Provision of the necessary technical publications, guidance material, and expert lecturers/trainers and operation of workshops as required to meet the needs. Development of projects to enhance Member States capacity to participate in and benefit from marine meteorological and oceanographic programmes of WMO and IOC.

### Assistance in the documentation and management of the data in international systems

Development of cooperative arrangements with the data management bodies of IOC, ICSU, and WMO, such as IODE, the Commission for Climatology (CCI), and the ICSU World Data Centres to provide for comprehensive data sets (comprising both real-time and delayed mode data) with a high level of quality control, long term documentation and archival of the data, as required to meet the needs of secondary users of the data for future long term studies.

These responsibilities exclude those aspects specifically handled by other WMO constituent bodies or equivalent bodies of IOC.

## **V.9 JCOMM Management Committee and Programme Areas**

### **V.9.1 MANAGEMENT COMMITTEE**

- (i) Review the short and long-term planning of the work programme of JCOMM and advise on its implementation;
- (ii) Assess the resources required for the implementation of the work programme, as well as approaches to identifying and mobilizing these resources;
- (iii) Coordinate and integrate the work of JCOMM, as implemented through the various working groups, teams and rapporteurs;

- (iv) Review the internal structure and working methods of the Commission, including its relationship to other bodies, both internal and external to WMO and IOC, and develop proposals for modifications as appropriate;
- (v) Assess the implementation of activities and projects referred to JCOMM for action by WWW, WCP, GOOS, GCOS and other programmes, including in particular the GOOS/GCOS Implementation Action Plan;
- (vi) Contribute as required to the planning processes of WMO and IOC.

## **V.9.2 SERVICES PROGRAMME AREA**

### **Services Coordination Group**

The Services Coordination Group, in close collaboration with CBS, GOOS and GCOS subsidiary bodies and related experts, shall:

- (i) Keep under review and advise on the effectiveness, coordination and operation of the Services work programme, including performance with respect to timeliness, standards, quality and relevance to established user requirements;
- (ii) Through the assembly of requirements identified by specialist service groups, and other PAs of JCOMM, provide advice on JCOMM services that need to be implemented or discontinued;
- (iii) Develop interfaces to representative user groups in order to monitor the strength and weaknesses of existing services;
- (iv) With the concurrence of the co-presidents of JCOMM, establish and create Expert Teams, Task Teams, Pilot Projects and appoint Rapporteurs, as appropriate, to undertake the work of the Services Programme Area;
- (v) Ensure effective coordination and cooperation with groups and bodies in the area of service provision, including other Programme Areas of the Commission;
- (vi) Liaise with external bodies, in particular those representing user communities.

## **V.9.3 OBSERVATIONS PROGRAMME AREA**

### **Observations Coordination Group**

The Observations Coordination Group shall:

- (i) Keep under review and advise on the effectiveness, coordination and operation of the observations work programme, including performance measured against scientific requirements, delivery of raw data, measurement standards, logistics and resources;
- (ii) Provide advice to JCOMM and to Observation Teams on possible solutions for newly identified requirements, consulting as appropriate with relevant scientific groups and CBS;
- (iii) Review *in situ* data requirements and recommend changes as appropriate, taking into account the continuing development of satellite observations and their capabilities;
- (iv) Coordinate the development of standardized, high quality observing practices and instrumentation and prepare recommendations for JCOMM;

- (v) With the concurrence of the co-presidents of JCOMM, establish and create Expert Teams, Task Teams, Pilot Projects and appoint Rapporteurs, as appropriate, to undertake the work of the Services Programme Area;
- (vi) Examine trade-offs and use of new and improved techniques/developments against requirements and available resources;
- (vii) Liaise with and input to CBS activities regarding the consolidated requirements database and operational satellites.

#### **V.9.4 DATA MANAGEMENT PROGRAMME AREA**

##### **Data Management Coordination Group**

The Data Management Coordination Group, in close collaboration with IODE and CBS subsidiary bodies and related experts, shall:

- (i) Develop the strategy, initiate and oversee the implementation of the Data Management Programme Area;
- (ii) Identify, review, assess and recommend priorities and actions for the Data Management Programme Area;
- (iii) In concurrence with the co-presidents of JCOMM, establish and create Expert Teams, Task Teams, Pilot Projects and appoint Rapporteurs, as appropriate, to undertake the work of the Data Management Programme Area;
- (iv) Ensure collaboration, appropriate coordination and liaison with data management bodies and other bodies;
- (v) Ensure full integration and effective cooperation of data management activities within the Commission;
- (vi) Keep under review, assess and coordinate the adoption of appropriate new information technology;
- (vii) Establish and maintain cooperation with science programmes and assist with their data management activities, as appropriate;
- (viii) Provide advice and feedback to users of the Data Management Programme Area functions, both through the appropriate JCOMM Programme Area and directly;
- (ix) Promote the adoption of good Data Management practices within the Commission and with external partners.

#### **V.9.5 CAPACITY BUILDING PROGRAMME AREA**

##### **Education, Training and Capacity Building (ETCB) Coordination Group**

- (i) The ETCB Coordination Group, in close cooperation with WMO ET/TCO, IOC-TEMA, GOOS, GCOS, IGOS and other relevant organizations and bodies involved in Capacity Building, shall:
- (ii) Plan, initiate and implement the ETCB work programme, including in particular the JCOMM Capacity Building Strategy;
- (iii) Keep under review existing training and guidance material (paper and electronic) and advise on procedures for updating, as well as for the development of new material;

- (iv) Review and assess regional requirements for capacity building and develop regional projects as appropriate;
- (v) Develop and implement integrated training and support activities, in collaboration with other programme areas and external bodies and programmes (e.g.);
- (vi) Review and assess the resources needed for capacity building activities of JCOMM in light of the resource plan of the Task Team on resources;
- (vii) Endeavour to mobilize the resources required for JCOMM capacity building, including those needed for the implementation of the work programme of the Programme Area for Services.

ANNEX VI

**LIST OF ACRONYMS**

BOOS	Baltic Operational Oceanographic System
CB	Capacity Building
CBS	WMO Commission on Basic Systems
CCI	WMO Commission for Climatology
CEOS	Committee on Earth Observation Satellites
CGOOS	Coastal GOOS Panel
CLIVAR	Programme on the Variability of the Coupled Ocean-Atmosphere System and Climate Prediction (WCRP)
CMM	WMO Commission for Marine Meteorology
COOP	Coastal Ocean Observations Panel
C/OPC	Committee for Ocean Processes and Climate
CPPS	Permanent Commission for the South Pacific
CPR	Continuous Plankton Recorder
CV	Curriculum Vitae
DBCP	Data Buoy Co-operation Panel
DHNO	Department of Navigation, Hydrography and Oceanography (Turkey)
EC	Executive Committee (of the GSC)
EEZ	Exclusive Economic Zone
ETCB	Education, Training and Capacity Building (JCOMM)
ET/TCO	Education and Training and Technical Cooperation Programmes of WMO
EuroGOOS	European Association for the Global Ocean Observing System
FAO	Food and Agricultural Organization of the United Nations
GAW	Global Atmosphere Watch
GCOS	Global Climate Observing System
GCRMN	Global Coral Reef Monitoring Network
GIPME	Global Investigation of Pollution in the Marine Environment.
GLOSS	Global Sea-Level Observing System
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GOOS-AFRICA	Coordinating Committee for GOOS in Africa
GOSIC	Global Observing Systems Information Centre
GPO	GOOS Project Office
GRA	GOOS Regional Alliance
GSC	GOOS Steering Committee
GTOS	Global Terrestrial Observing System
GXOS	The global observing systems (GCOS/GOOS/GTOS/GAW)
HOTO	Health of the Oceans
IACMST	Interagency Committee for Marine Science and Technology (UK)

I-B	I-GOOS Board
ICSU	International Council for Science
IGBP	International Geosphere-Biosphere Programme
IGOS	Integrated Global Observing Strategy
IGOS-P	Integrated Global Observing Strategy Partnership
IGOSS	Joint IOC/WMO Integrated Global Ocean Services System
IMS	Institute of Marine Science (Turkey)
I-GOOS	Intergovernmental Committee for the Global Ocean Observing System
IOC	Intergovernmental Oceanographic Commission
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IOCARIBE-GOOS	GOOS Regional Alliance for IOCARIBE
IOCEA	IOC Regional Committee for the Central Eastern Atlantic
IOCINCWIO	IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean
IOCINDIO	IOC Regional Committee for the Central Indian Ocean
IODE	International Oceanographic Data and Information Exchange
IOGOOS	Indian Ocean GOOS Regional Alliance
IOOS	Integrated Ocean Observing System (of the USA)
IOS	GOOS Initial Observing System
IUCN	World Conservation Union (formerly International Union for the Conservation of Nature)
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JGOFS	Joint Global Ocean Flux Study (of IGBP)
J-GOOS	Joint Scientific and Technical Committee for GOOS
JSC	Joint Steering Committee (for the WCRP)
JSTC	Joint Scientific and Technical Committee (for GCOS)
KNMI	Royal Netherlands Meteorological Institute (Holland)
LMR	Living Marine Resources
MARPOLMON	Marine Pollution Monitoring
MedGOOS	Mediterranean GOOS Regional Alliance
MC	Management Committee (of JCOMM)
MOU	Memorandum of Understanding
NEARGOOS	North-East Asian Regional GOOS
NOOS	Northwest Shelf Operational Oceanographic System
ODA	Overseas Development Agency
ODIN	Ocean Data and Information Network (of IODE)
OOPC	Ocean Observation Panel for Climate
OOSDP	Ocean Observing System Development Panel
PA	Programme Area (of JCOMM)
PacificGOOS	(now Pacific Islands GOOS)
PIRATA	Pilot Research Moored Array in the Tropical Atlantic
POGO	Partnership for Observations of the Global Ocean

R&D	Research and Development
RAMP	Rapid Assessment of Marine Pollution
RIKZ	Rijksinstituut voor Kust en Zee (Holland)
S & T	Science and Technology
SAIC	Science Applications International Corporation
SAHFOS	Sir Alister Hardy Foundation for Ocean Science
SC	Steering Committee
SCOR	Scientific Committee on Ocean Research
SEA-GOOS	Southeast Asian GOOS Regional Alliance
SOC	Southampton Oceanography Centre
SOLAS	International Convention for the Safety of Life at Sea
SOOP	Ship-of-Opportunity Programme
TAO	Tropical Atmosphere Ocean Array
TEMA	Training, Education and Mutual Assistance in Marine Science
TOGA	Tropical Ocean Global Atmosphere Programme
ToRs	Terms of Reference
TRITON	Triangle Trans-Ocean Buoy Network (Japan)
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UOP	Upper Ocean Panel (of CLIVAR)
VOS	Voluntary Observing Ship
WCP	World Climate Programme
WCRP	World Climate Research Programme
WESTPAC	IOC Sub-Commission for the Western Pacific
WMO	World Meteorological Organization of the United Nations
WOCE	World Ocean Circulation Experiment
WWW	World Weather Watch