

**G** GLOBAL  
**C** CLIMATE  
**O** OBSERVING  
**S** SYSTEM



WORLD METEOROLOGICAL  
ORGANIZATION

INTERGOVERNMENTAL  
OCEANOGRAPHIC COMMISSION

# **REPORT OF THE GCOS WORKING GROUP ON SOCIO-ECONOMIC BENEFITS**

**First Session**

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## **REPORT OF THE GCOS**

### **WORKING GROUP ON SOCIO-ECONOMIC BENEFITS**

#### **1. OPENING OF THE SESSION**

1.1 Dr. Melbourne Briscoe, Chairman of the Global Climate Observing System (GCOS) Working Group on Socioeconomic Benefits opened the meeting at the Department of Commerce in Washington, D.C. on 1 August. He welcomed the participants (See Annex I) and provided introductory remarks concerning the purpose of the meeting. He reviewed the agenda for the meeting and it was accepted by the members of the Working Group (See Annex II).

1.2 Since the meeting was the **first** meeting of many of the participants, the Chairman invited them to make brief introductory remarks.

#### **2. INTRODUCTION AND BACKGROUND ON GCOS**

2.1 Dr. Spence, Director of the Joint Planning Office (JPO) for GCOS, provided an overview of the GCOS programme, the structure of the planning activities, and the progress made to date. He reviewed the objectives of the programme -- to meet the observational needs for climate system monitoring, for climate change detection and response monitoring, for data for national economic development, and for research toward understanding, modelling and prediction. GCOS will be a systematic programme of observations and data management, based, as far as possible, on existing systems.

2.2 Dr. Spence described the structure of GCOS which includes a Joint Scientific and Technical Committee (JSTC) with members from the pertinent disciplines and from agencies involved in climate or earth observations. He noted that the JSTC had developed the concept of an Initial Operational System (**IOS**) which will include current observational systems, necessary enhancements to these systems which may be recommended now, and a comprehensive data management system. At its Third Session, the JSTC established several discipline oriented and cross-cutting panels to provide input for the **IOS**. It also established the Working Group, and developed its terms of reference (See Annex III).

#### **3. OPENING STATEMENT OF THE PANEL CHAIRMAN**

3.1 The Chairman returned to the terms of reference for the Working Group, inviting the members to comment on its provisions. The members were satisfied that the terms provided adequate guidance for them to proceed, but suggested that a few phrases would usefully clarify the charge to the group. Specifically, it was recommended that the

first term include the word “assess”, thus “to review, summarize, and assess existing work. . .”.

3.2 Dr. Briscoe reminded the Working Group that one of the primary **purposes** of the meeting was to obtain information about existing studies of the value of climate forecasts to better justify the future expenditures on climate observations, models, and products. Thus, it was clear that the results of the Working Group could be effective in obtaining support for additional needed resources.

3.3 To focus the first session, it was determined that the Working Group should address particularly the socioeconomic benefits of climate forecasts. And further, it was resolved that most progress could be made by limiting the time scale to **seasonal-to-interannual** periods. It was conceded that the methodologies are better understood for the shorter periods, and that the credibility of assessments of socioeconomic benefits is better established. However, it was recognized that the overall benefits from the observing systems would be felt across nearly all time scales. The group agreed to consider longer times in future sessions.

#### **4. INVITED REPORTS**

##### 4.1 Overview of Literature and Bibliography

4.1.1 Professor Murphy provided an overview of his study, “Socio-economic Value of Climate Forecasts” which addressed the recent literature on the subject. He had compiled a large fraction of the extant literature, providing a detailed discussion of the various approaches taken by the community. He indicated those papers in which specific results had been obtained, but noted that the number of such studies is very limited.

4.1.2 Members of the Working Group appreciated the effort that had been invested in preparing the report, and felt it provided a good first step in assessing what has been done regarding the value of climate forecasts. It was felt that subsequent work should address: (1) what specific conclusions may be drawn from the completed studies; (2) how could the results be used to justify additional observations and forecasts; and (3) which sectors of the economy should receive priority attention in the future.

##### 4.2 Participant Presentations

4.2.1 Dr. **Solow** described the results of his work on the value of ENSO forecasts. The study focused principally on the agricultural sector in the Southeastern United States. The study points clearly to the difficulties in unambiguously relating forecasts to economic value. Dr. **Solow** noted the need for a study to determine the “value of information”. In this study, one would assess the financial or social importance of a current forecast or a future projection taking into account the decision making processes of the recipients of the information. He noted that most current studies assume that the recipients will make decisions to maximize profits, but other considerations may be involved as well. To Dr. **Solow**, the key question is the ability of the recipients to benefit. It will depend on the users

to provide the value assessment -- low if they will not use it (or are prevented from using it); high if they demand it.

4.2.2 Ms. Churie noted that in many regions of the world, the quality of the forecast is not the principal issue. Rather, issues such as distribution, access, availability, and credibility are the principal concerns. She noted that the receptivity of the government or of the various sectors will be a limiting factor. She felt that it would be insufficient to focus only on the economic benefits derived, but that the Working Group must also focus on the cultural setting of the recipients. In some countries, there will likely be a **scepticism** or rejection of the information, unless the country has an active role in the preparation and dissemination of the information. She urged the Working Group to consider whether the forecasts or advisories are credible scientifically, adaptable by the recipients, and applicable to significant problems in the various countries.

4.2.3 Dr. Johnson urged the Working Group to consider the processes at work in different countries. He noted that it is essential to know who are the users and the stakeholders. To appraise the value, one must know the structure in the country to gauge the response to the information. He raised additional issues concerning the meaning of "public" forecasts, noting that the packaging of information has a major effect on its value. Dr. Johnson suggested that "contingent evaluation" methods may be useful in complex situations to assess value. These methods provide a measure of value based on the willingness of people to pay or to be paid for the information.

4.2.4 Dr. Maunder reviewed the situation in New Zealand in which weather service functions have been assumed by private companies. In such situations, climate and climate forecast products will be provided only to those willing to pay for them.

4.2.5 Dr. Maunder also informed the Working Group about the Climate Prediction Services (CLIPS). The objectives of the project are: (1) to stimulate transfer of new research results and methodologies in operational climate prediction services; (2) to develop capacity in the meteorological services to make full use of the new information; and (3) to develop applications in various **socio-economic** sectors. A workshop in "Operational Climate Prediction", and other seminars are being planned. Additionally, new communication and product display technologies are being encouraged. The Group noted that these objectives are of relevance to its deliberation, and asked to be kept informed of the progress with CLIPS.

4.2.6 The Working Group discussed these issues at some length. They noted the difficulty in ascribing accurate value to the information concerning future weather and climate, but felt it was important to establish mechanisms that would provide such information. The Group also noted the strong dependence of value assessments on factors such as the decision making factors, dissemination mechanisms, and recipient attitudes toward the information.

4.2.7 To provide additional information on climate forecasts and services, Dr. Rodenhuis described the current activities and future plans of the Climate Analysis Center. He focused principally on the climate services of the future, and informed the Working Group about the plans for new long lead time forecasts that will be initiated soon. The

Group recognized that an opportunity exists to assess the value of these new products by doing baseline studies comparing conditions before and after the release of the new product. Dr. Rodenhuis was supportive of such a project.

4.2.8 Dr. Nierenberg provided a brief review of the activities of the “Economics and Human Dimensions of Climate Fluctuations” component of the NOAA Climate and Global Change Program. This objective of this research programme is to improve understanding of the complex interactions among the physical and social systems to produce information relevant to policy and decision-making processes. Two foci are relevant to the Working Group: decision making under uncertainty, and climate-human interactions. While such efforts would be useful in the context of the Working Group, she noted the limited budget for such studies.

4.2.9 Dr. Wilson briefly addressed the Working Group, and charged it to provide information which would be helpful in developing budgets and defending proposals. He noted the urgent need for defensible estimates of costs/benefits to provide as supporting data with budget submissions. He noted that the current emphasis is on sustainable development, thus the impact on the economy, including jobs, must be assessed with each proposal for funding. In the National Ocean Service, he poses three questions: (1) what are the climate signatures; (2) what are the impacts; and (3) what are the costs/benefits of the various proposed actions.

## **5. DISCUSSION**

5.1 Having heard a number of presentations and extensive remarks from the members and participants, the Chairman proposed a strategy to proceed. He invited the Working Group to consider the remarks of the speakers and provide their input in two ways:

- 1) complete a matrix which the ordinate represents the period of forecast (short, seasonal, decadal) and the abscissa, the sectors of society which potentially benefit. The entries in the matrix were to characterize the relative definition of the economic benefits, and the priority for attention;
- 2) provide a short list of those issues (already discussed or not) which should be given priority consideration by the Working Group.

5.2 A compilation of the results from the matrices unanimously indicated that the agriculture sector should receive highest priority, since it is the most affected sector. Other sectors of importance and which should receive emphasis were energy, water, and transportation (see Annex IV). There was little distinction among the various periods of forecast, but a tendency to emphasize the importance of the shorter and seasonal periods.

5.3 From the list of issues, several were noted by a few of the members. A few are noted here:

- o economic value studies should be based on the “macro-view”, but incorporate “micro-decision making” elements;

- o some classes of benefits to be considered include:  
economic advantage,  
food supply and costs,  
floods/droughts,  
medical benefits,  
loss of life;
- o needs of the users (e.g., delivery, information exchange, access) must be carefully considered;
- o climate information should be used more extensively in long-term planning, and its value there, more widely recognized;
- o studies should observe non-climate data and fluctuations to obtain independent information to evaluate the value of climate information;
- o factors which limit the value of forecasts and climate information should be understood and reduced;
- o emphasis should be placed on the use of existing methods, rather than the development of new methods, to obtain needed results more promptly;
- o a protocol (standardization of methodology) should be considered to provide intercomparability among various studies and sectors.

## **6. PANEL REPORT AND RECOMMENDATIONS**

6.1 The Working Group agreed that it should produce a comprehensive report of its deliberations and findings. An outline and a timetable for the completion was also agreed. The Report should consist of the following:

1. Prologue
2. Introduction
3. Overview of the Literature
4. Findings and Recommendations
5. Conclusions
6. Appendices

The Working Group agreed to revise draft material in the fall, providing a final version by the end of 1994.

6.2 The principal chapter of the report will be the "Findings and Recommendations". The Chairman reviewed a provisional compilation of recommendations:

- o Analyses of the economic value of forecasts should be performed. These should focus on seasonal-to-interannual periods; involve sectors including agriculture, energy, water, and transportation; consider diverse regions (e.g.,

the United States, Australia, southern Africa, Asia, and equatorial South America). Where possible corroborative studies with alternate methodologies should be done to enhance the robustness of the conclusions;

- o Analyses should be made of the methodology for estimating the value of a climate observing system with emphasis on: (1) multiyear climate variability and change, and (2) societal impacts not easily quantified;
- o Consensus should be sought for a protocol for making estimates of the economic value of climate information. Such a protocol must be widely considered and debated to have community support and credibility;
- o The U.S. Climate Analysis Center should consider the response and reaction by users to its new long-range forecast products, and to their dissemination, packaging, accuracy, applicability, etc. The result should be a “lesson learned” document, as well as an empirical basis for refining the decision or response models used in assessment studies.

6.3 A description of the analyses required as noted in the first bullet above has been prepared (see Annex IV) for widespread distribution.

6.4 The Working Group agreed that the document submitted by Dr. Murphy would provide an excellent appendix to the report. With a few additions and updates, they recommended that it be incorporated *in toto*. In response, Dr. Murphy agreed to summarize the results of studies which provided specific evaluations of the benefits of forecasts and climate information. This would take the form of a table of values/benefits. He also **agreed** to incorporate a section on “contingency methods” to be provided by Dr. Johnson.

6.5 As a **final** recommendation, the Working Group **proposed** that it continue its work under the aegis of the Joint Scientific and Technical Committee of GCOS. The Group proposed that a small core group be identified and continued, supplemented on an *ad hoc* basis by experts selected to address particular agenda items.

6.6 The Chairman invited Dr. Maunder to present the results of the Working Group meeting to the Conference on the Economic Benefits of Meteorological and Hydrological Services in Geneva in September.

6.7 The Chairman noted that he would present the report of the first meeting to the fourth session of the JSTC in Hamburg in September.

## 7. CLOSURE OF TEE MEETING

7.1 The Chairman thanked the participants and concluded the meeting at 1500 hours on 3 August.

## Annex I

### Lii of Participants

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## **Annex II**

### **Agenda**

1. Opening of the Session
2. Introduction and Background on GCOS
3. Opening Statement of the Panel Chairman
4. Invited Reports
  - 4.1 Overview of Literature and Bibliography
  - 4.2 Participant Presentations
5. Discussion
6. Panel Report and Recommendations
7. Closure of the Meeting

## Annex III

### Terms of Reference for the GCOS Working Group on Socio-economic Benefits

All the nations of the world should derive socioeconomic benefits from the climate system observations proposed as part of the Global Climate Observing System (GCOS). Specific assessments of these socioeconomic benefits are essential to obtain a commitment by governments to the resources needed for the development and operation of a GCOS. The Joint Scientific and Technical Committee (JSTC) of GCOS hereby establishes a Working Group on **Socio-economic** Benefits\* with the following terms of reference.

Terms of Reference:

- o To review and summarize existing work already done, in academia and by nations and international bodies, that is relevant to the problem of assessing the socio-economic benefits of the GCOS;
- o To advise the sponsoring bodies (**WMO, IOC, UNEP, ICSU**) and participating groups (GOOS, GTOS) on those studies that should be undertaken to further the understanding of the socio-economic benefits of the GCOS and the means by which the studies can be accomplished;
- o To develop and maintain liaison with IPCC Working Group II, the OECD Environment Directorate, international and intergovernmental agencies such as WMO, UNEP, and FAO, and other such professional/expert groups with interest in socioeconomic matters as may be appropriate;
- o To act on behalf of the JSTC for GCOS as a point of oversight, communications and information in matters relating to the socioeconomic benefits of a GCOS whenever designated;
- o **To** report progress and recommendations to the JSTC.

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\* Definition: Socioeconomic benefits are interpreted as including societal and economic benefits beyond fiscal matters, such as preservation of life and property, improved quality of living standards, and health matters. Where possible, non-fiscal benefits will be translated into fiscal equivalents using standard methods.

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### Tentative Work Plan:

One principal stimulus for the schedule of activities is the need to present the findings of the Working Group to the April 1994 meeting of the IOC Committee for GOOS, the body charged with implementing the ocean aspects of GCOS.

Therefore, the activities of the Working Group are proposed as follows:

- o Identify extant published and informal/unpublished literature related to the value of climate forecasts for seasonal and longer outlooks and for climate related natural disasters (e.g., floods and droughts). Cull the literature for the significant items, and summarize these in a document. The literature search should be summarized by mid-March
- o Establish contact with the OECD Environment Directorate;
- o Based on the above activities, prepare recommendations for required additional studies;
- o Draft report of activities for report to J-GOOS meeting;
- o Present report to the IOC Committee for GOOS (April 1994), and updated version to the Second WMO conference on the Economics and Social Benefits of Meteorological and Hydrological Services (September 1994);
- o Finalize and print report for presentation to JSTC-IV (September 1994).

All activities of the Working Group will be carried on by electronic mail, facsimile, and post to the extent possible. One meeting will be planned for review and consideration of the draft report.

Chairman: Dr. Melbourne Briscoe, USA

## Annex IV

### THE SOCIO-ECONOMIC BENEFITS OF CLIMATE FORECASTS

#### Information Summary

Substantial interest has been shown in identifying the **socio-economic** benefits of climate forecasts. An interdisciplinary group of experts met 1-3 August 1994 to review existing work and to recommend studies to be undertaken to further the understanding of the socioeconomic benefits of a Global Climate Observing System<sup>1</sup>. This System is now under development by governments in order to acquire data **necessary** for climate monitoring and apply the information to national economic development. Priorities are:

- . Prediction of seasonal climate variability
- . Detection of climate change
- Reduction of uncertainties in climate prediction

Early progress has been made in the U.S. in estimating the benefits of improved seasonal forecasts to the agricultural sectors. It has been determined that these benefits total **US\$200M** per year in the U.S. Southeast alone. National, regional, and global studies are needed in those economic sectors that:

- Significantly contribute to national GNP's
- Show sensitivity to climate fluctuations
- Appear to be sensitive to climate *inform&on*, such as a forecast of future variability
- . Are amenable to estimating economic benefits

Preliminary recommendations, of interest to academic as well as user communities:

- . Interdisciplinary studies should be performed of the value of **seasonal-interannual** forecasts, using appropriate methodologies. Sectors recommended for study are:

AGRICULTURE (first priority)  
Energy

Water  
Transportation

Areas recommended are the U.S., Australia, southern Africa, Asia (e.g., India) and equatorial South America (e.g., Peru).

- . Studies should be performed on the methodology of estimating the value of a climate observing system, with emphasis on multi-year climate variability and societal impacts not easily quantified.
- . A set of guiding principles should be developed for making estimates, that receives broad review and agreement by the climate, economics, and user communities.
- The U.S. should evaluate systematically the response of users to its **12-month** advance forecasts of **3-month** climate conditions, which it will begin in 1995.

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