21 May 2002

ENGLISH ONLY

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE
Sixteenth session
Bonn, 5–14 June 2002
Item 8 of the provisional agenda

COOPERATION WITH RELEVANT INTERNATIONAL ORGANIZATIONS

Interim report to the sixteenth session of the Subsidiary Body for Scientific and Technological Advice of the UNFCCC by the Global Climate Observing System

1. At its fifteenth session, the Subsidiary Body for Scientific and Technological Advice (SBSTA) endorsed the preparation by the Global Climate Observing System (GCOS) secretariat of a second report on the adequacy of the global climate observing systems. It noted the necessity for the report to address the needs of the Convention for climate-relevant observations, including those associated with the development of adaptation strategies (FCCC/SBSTA/2001/8 para. 41 (c)).

2. The SBSTA noted the need to complete the adequacy report in the shortest possible time in order to provide a framework for further work to improve global monitoring systems. It invited the GCOS secretariat to prepare, in time for consideration by the SBSTA at its sixteenth session, an interim report on the synthesis and analysis of national reports from Parties provided in accordance with decision 5/CP.5. It encouraged the GCOS secretariat to complete the final adequacy report by the eighteenth session of the SBSTA in order to enable substantive consideration of the report to take place at the ninth session of the Conference of the Parties (COP).

3. The SBSTA also noted the completion of two regional workshops to identify priority capacity-building needs of developing countries in relation to their participation in systematic observation. It invited the GCOS secretariat to make the follow-up regional action plans available to the sixteenth session of the SBSTA with a view to recommending a draft decision on this matter for consideration by the COP at its eighth session.

4. The GCOS secretariat submitted a report in response to the above requests. In accordance with the procedure for miscellaneous documents, this submission is attached and reproduced in the language in which it was received and without formal editing.[*]

[*] This submission has been electronically imported in order to make it available on electronic systems, including the World Wide Web. The secretariat has made every effort to ensure the correct reproduction of the text as submitted.

INTERIM REPORT TO THE SIXTEENTH SESSION OF THE SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE OF THE UNFCCC BY THE GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)

(Submission received on 6 May 2002)

CONTENTS

1. INTRODUCTION

This report is provided to the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UNFCCC in response to the invitations made at its fifteenth session to the GCOS Secretariat, working on behalf the global observing systems for climate, to provide:

- An interim report on the synthesis and analysis of National Reports[1] from Parties provided in accordance with decisions 4/CP.5 and 5/CP.5,
- Regional Action Plans developed as a result of the regional workshops on deficiencies in the global observing systems for climate held in the South Pacific and in eastern and southern Africa with a view to (the SBSTA) recommending a draft decision on this matter for consideration by the Conference of the Parties at its eighth session.

In addition to these two specific requests made by the SBSTA, this report also provides the Parties with information on progress in the preparation of the Second Report on the Adequacy of the Global Climate Observing Systems.

The GCOS Steering Committee, having reviewed the analysis of National Reports and the initial Regional Action Plans at its recent meeting, highlighted a number of issues and requested that the GCOS Secretariat bring them to the attention of the Parties at SBSTA 16.

2. SUMMARY OF ISSUES FROM THE GCOS STEERING COMMITTEE FOR CONSIDERATION BY THE SBSTA

The analysis of National Reports was based on submissions from 19 Annex I (50%) and 36 Non-Annex I (24%) Parties. A further 41 reports from Non-Annex I contained no information on systematic observation. These reports have provided valuable information on systematic observation of the climate system and several of the Parties have noted the value of their preparation in improving national coordination.

- The GCOS Steering Committee would hope that those Parties who have yet to submit reports on their activities in relation to systematic observation as requested in decisions 4/CP.5 and 5/CP.5 do so, as soon as practical, in order that their input might be considered in the preparation of the Second Adequacy Report.

Almost all of the Parties reported that there were many governmental bodies, agencies and research institutes involved with systematic observation as well as different levels of internal governance. Only a small number of Parties reported that they had instituted internal mechanisms to ensure coordination. A still smaller number of Parties reported that they had either prepared or were preparing National Plans for systematic observation of climate. A few Parties reported that they had allocated new financial resources to make some of the specific improvements to their observing systems recommended in their National Plans. The GCOS Steering Committee would bring to the attention of SBSTA the importance that:

- Those Parties that have not yet done so consider creating internal coordination mechanisms for all aspects of their climate observing system, with special emphasis on the terrestrial component, in light of the benefits accrued by some Parties as a result of developing National Plans for their national climate observing system activities.

---

[1] The term "National Reports" includes: the summary information provided by Annex I Parties on systematic observation in accordance with the UNFCCC guidelines, as a part of their National Communications; the detailed reports on systematic observation that were invited from all Parties; and the Initial Communications from Non-Annex I Parties.

Almost all Annex I Parties accepted the importance of the Climate Monitoring Principles adopted by the UNFCCC but acknowledged they had not been implemented, except in rare cases. They noted that the requirements for meta-data also had not been addressed universally. Many Parties reported that they were exchanging data in the case of well-established networks but that cost recovery remained an issue with many meteorological observations. However reports from the GCOS monitoring centres, and the conclusions of the regional workshops, show that there are major gaps in the availability of the data in both the GSN and GUAN. The GCOS Steering Committee would bring to the attention of SBSTA the importance that:

- Parties implement UNFCCC Climate Monitoring Principles for both satellite and *in situ* observing systems;
- Real time and historical data of the Parties reach the appropriate international data centres.

The reports show that the one of the main contributions to enhancing the climate observing system in recent years has resulted from the space agencies recognising and directly addressing climate requirements. The GCOS Steering Committee would note:

- The various space agencies are playing an increasing role in observation of the climate system. There are needs to ensure that data and products are available to all Parties and to continue to work toward the development of an integrated global climate observing system, in cooperation with the relevant international agencies.

The National Reports highlight the fact that many oceanographic and terrestrial networks, as well as several atmospheric ones, are supported out of research funds and that this potentially has significant implications for their long-term continuity. The Argo program is one example.

GCOS has now completed the pilot phase of its regional workshop programme and the Parties involved have prepared Regional Action Plans for both the Pacific Islands and Eastern and Southern Africa. These plans address both global and regional needs for climate observations.

As is clear from the analysis of National Reports, the initial Regional Action Plans from regions and the work of the GCOS Science Panels, there are serious deficiencies in the global observing systems for climate at both global and regional levels. Most Non-Annex I Parties have reported substantial difficulties in providing financial and other resources for the acquisition and operation of climate observing systems. Therefore the GCOS Steering Committee would bring to the attention of SBSTA the following issues:

- Funding of systematic observation in developing countries is one of the most important priorities identified by GCOS in addressing the reported deficiencies in the global observing systems for climate;
- Several ongoing partnerships between Annex I and Non-Annex I Parties are successful in operating specific GCOS stations. Other Annex I Parties may want to adopt similar cooperative arrangements; and,
- Success in GCOS Regional Workshop Programme will depend on the Parties and international funding agencies, including the GEF, giving special consideration to providing resources for implementing projects identified in the Regional Action Plans especially those addressing GCOS priorities for GSN, GUAN.

Finally, the GCOS Steering Committee has noted the range of difficulties reported by the Parties with several aspects of the terrestrial component of the global observing systems for climate. As a result, GCOS will work with its partners and sponsoring agencies to give greater emphasis and prominence to the terrestrial component; to enhance its linkage with national activities; to investigate and address the reported difficulties with terrestrial data exchange; and to develop a clear statement of global terrestrial observing requirements for climate.

3. NATIONAL REPORTS ON SYSTEMATIC OBSERVATIONS

3.1 Basis of analysis

Decisions 4/CP.5 and 5/CP.5 required Annex I Parties to provide National Reports on their activities on systematic observation of the global climate observing system. These reports were requested to be submitted by November 30, 2001.

Table 4, in Appendix A, contains a listing of the reports from Annex I Parties that were available for analysis by April 26, 2002. Of the 39 Annex I Parties, 11 (28%) had submitted detailed reports following the guidelines for reporting on systematic observation of the global climate system. A further 8 (20%) had provided summary information on systematic observation in their official national communications. Thus a total of 19 (or almost 50%) of the Annex I Parties had provided information that could be analyzed. Those Parties providing information were responsible for nearly 60% of the land surface of all Annex I Parties, thus providing a sound basis for the interpretation of the state of atmospheric and terrestrial observation networks and systems in those areas. In addition, since almost all of the reporting Parties in Annex I have marine interests, it is likely that the state of oceanic observation systems is well represented. Finally it should be noted that these Annex I Parties were also involved in the provision of space-based observations; thus any conclusions in this area are likely valid.

As shown in Table 5, Appendix A, a total of 77 out of a possible 148 (52%) Non-Annex I Parties had submitted their Initial National Communications of which 36 (24%) provided some information on their activities in systematic observation of the climate system. Those submitting information on systematic observation represented just over 3% of the world's land surface making it difficult to draw many firm conclusions with respect to the state of systematic observation in Non-Annex I Parties. Furthermore, it is important to note that since Non-Annex I Parties are responsible for nearly 90% of the worlds' land surface it is essential that they participate fully in the collection and dissemination of surface-based observations of the climate system. Achieving a higher level of participation on the part of Non-Annex I Parties may well require changes in the manner in which they are expected to participate in international observing programmes.

Of the reports provided, the majority were from Europe (18), followed by Africa (13), North America and the Caribbean (10), the South Pacific (7). There was only very limited information available with respect to Asia (5), and Latin America (3). As has been previously reported to the UNFCCC, climate observations from the later two regions are limited in both number and quality and require urgent attention.

In reading the following material it is important to emphasize that this chapter was solely based on an analysis of the National Reports available at the time of writing. As indicated above, the land surface coverage of the Parties providing information represented only 8% of the total Earth's land surface. Thus detailed analysis on a global basis was not possible. However, because of the relatively large number of reports available, the general conclusions are likely sound. A detailed analysis of the adequacy of the global observing systems for climate will be available in the Second Adequacy Report that is now in preparation for submission to SBSTA 18.

3.2 General Comments

3.2.1 National Planning

Almost all of the Annex I Parties reported that there were many governmental bodies, agencies and research institutes involved in provision of systematic observation of the climate system within their countries. Furthermore, that responsibility was often distributed among the various levels of internal government. Only a small number of these Parties reported that they had instituted internal mechanisms to ensure coordination between the various organizations involved. The nature of these mechanisms varied substantially. A still smaller number of these Parties reported that they had either prepared or were in the process of developing national plans for global observations of the climate system; that that those plans identified not only the networks that were in existence at the time of preparation but also the changes and augmentations that were needed to address the various objectives established by GCOS, including those of the Convention. It was reported that none of the Parties had formally adopted their national plans for global observations of the climate system. However, it was reported that in a very few cases their development had led to the allocation of new financial resources by the Party to make specific improvements and/or augmentations to their climate observing systems. It was also noted by several Parties that their national plans for global observations of the climate system also addressed regional and national requirements for assessing the impacts of and adaptation to climate variability and climate change in addition to the documented global needs.

Only two Non-Annex I Parties reported on the establishment of coordination mechanisms for climate observing systems (although many of them noted that they did have coordination mechanisms for climate change issues at large). Furthermore only one reported any significant planning activities related to climate observing systems.

The vast majority of the Non-Annex I Parties reported on the important role that climate information played in the development of adaptation strategies to both climate change and variability but reported that they had insufficient financial and human resources available for these activities. Several of the Parties with economies in transition noted that they had long records of climate information at a number of locations but that these in many cases had been terminated in recent years due to the lack of resources.

3.2.2 The GCOS Monitoring Principles and Data Exchange

It was encouraging to note that almost all of the Annex I Parties providing reports accepted the importance of the Climate Monitoring Principles adopted by the UNFCCC. However, the same Parties acknowledged that only in rare cases had the principles been formally adopted and implemented. It was also noted by many Parties that the networks that now formed an essential part of GCOS had been established to meet requirements other than climate and that the incorporation of these new standards required significant changes to established practice and increased operating costs.

The majority of the Annex I Parties reported that they were exchanging data in the case of well-established networks but that cost recovery remained an issue of concern with meteorological observations. They also noted that there were difficulties in the exchange of many of the terrestrial observations required by GCOS. Finally it was reported that the GCOS requirements for meta-data had been systematically addressed in only a few networks.

Many of the Annex I Parties reported undertaking significant additional responsibilities on behalf of all Parties in the provision of data archiving, data monitoring and/or quality control through the establishment and operation of World or International Data Centres for most of the established GCOS Networks.

3.2.3 Support to Developing Country Parties

Only a small number of the Annex I Parties provided any information on the financial support being provided to developing countries in the field of systematic observation of the climate system. Those that

did so reported on existing practices and did not reflect the allocation of new financial resources, except one Party reported a willingness to provide new financial resources to support the provision of essential observations. At the same time, it was clear from the detailed reports of both Annex I and Non-Annex I Parties that many of the Annex I Parties had special relationships with one or more Non-Annex I Parties in the form of support for the provision of specific observations in all domains.

In addition, several of the Non-Annex I Parties reported on the important contributions that had been made by the development aid funds of developed countries and the resources provided by international agencies, including the GEF and UNDP, in the provision of equipment and training to support key observing components. This was particularly noticeable in the case of equipment to monitor sea level and other related parameters in both the Caribbean and Pacific Island States.

3.3 Atmospheric Observations

3.3.1 General Comments

Sixteen Annex I and twenty-three Non-Annex I Parties provided information on the extent of their participation in the global atmospheric observing system components of GCOS. A number of common points can be made on the basis of these reports.

Almost all of the Parties reported an extensive involvement in the collection and exchange of many of the atmospheric observations required for climate purposes. These networks were well developed because the collection of data had been commenced for other purposes than climate, including weather prediction, economic and agricultural development and the analysis and correction of local and regional air quality problems. In almost all cases well-established national organizations were in existence for the management of these programmes. They also noted the long involvement of the World Meteorological Organization (WMO) in the international coordination of the effective exchange of this information. As a result, much of the basic information was readily available. However, almost all of the reporting Parties noted that they had yet to fully implement the GCOS best practices for those observations. Non-Annex I Parties reported significant difficulties in meeting the requirements for atmospheric climate observations.

In addition, most of the Parties reported that their networks addressed not only the global requirements stated by GCOS but also their national needs for the assessment of the impacts of climate change and variability and the development of adaptation actions to address those impacts.

3.3.2 GCOS Networks

A compilation of the contribution by Annex I Parties to the global atmospheric observing systems for climate purpose is contained in Table 1 below.

Table 1. Participation in the global atmospheric observing systems

	GSN	GUAN	GAW
How many stations are the responsibility of the Party?	330	65	90
How many of those are operating now?	330	65	89
How many of those are operating to GCOS standards now?	Unknown	<62	89
How many are expected to be operating in 2005?	<381	<67	<88
How many are providing data to international data centres now?	291	65	89
Total number of stations in the global network	989	150	22 (300 regional)

3.3.2.1 GCOS Surface Network (GSN)

Continued operation of the GCOS Surface Network (GSN) is clearly a strong commitment within all of the Parties providing reports as they represent over 30% of the global network. As with most atmospheric observing systems, the GSN is a subset of the national networks established for other purposes and as a result the Parties indicated that work is still required to ensure that the UNFCCC monitoring principles are fully implemented. The latter will be essential as the Parties move to automate many these stations to ensure their long-term survival. Automation, while desirable from many aspects, has the potential to disrupt the homogeneity of the data record for a decade or more. This could seriously damage several important time series that form the backbone of the climate change detection work of the IPCC, such as the long-term temperature series, unless the UNFCCC Climate Monitoring Principles for maintaining overlapping measurements in the transition are implemented.

It can be seen from Table 1 that data from the majority of the responding Parties' stations are now being exchanged on a regular basis. However several Parties noted that a small number of GSN stations were still not reporting in real time. It should also be noted that several of the Parties have yet to make sure that the historical data records from their GSN stations are available through the World Data Centres as had been requested by the WMO on behalf of GCOS.

Finally, it should be noted that while some stations were still being to be closed by some Parties, a few of the Parties are proposing an augmentation of their GSN contributions to address gaps in the current coverage of their networks. The augmentation is an extremely positive development that should be encouraged while the planned closures are clearly disappointing.

3.3.2.2 GCOS Upper Air Network (GUAN)

It was clear from the Annex I Party reports that the GCOS Upper Air Network (GUAN) was the most well established of the GCOS networks with the reporting Parties responsible for over 40% of the global network. It was encouraging to note that several of these Parties had recently introduced changes to their programmes in order that they achieve the atmospheric heights required in the GCOS specification. Almost all of the Parties reported that they were exchanging their observations with the international centres on an operational basis and that meta-data were readily available. Insufficient information was available to comment on the status of GUAN in Non-Annex I Parties. Information from Non-Annex I Parties was far less encouraging.

It should be noted, however, that the reports indicate that this network is perhaps the one at most risk over the long term because of its high operating costs and the potential for space-based technology and other technologies to provide the operational data required in weather forecasting.

3.3.2.3 Global Atmosphere Watch (GAW)

A number of the Parties reported on their involvement in the Global Atmosphere Watch (GAW), indicating that these were in general built upon national research activities into local and/or regional atmospheric pollution issues. Thus their reports included contributions to the regional as well as the global GAW networks. It was clear that some Parties had made significant investments into some of these research facilities to provide an understanding of global atmospheric processes and composition. It is essential for some of these to continue operation for the long term to provide the required baseline information, thus raising the issue of depending upon research funding to support what is increasingly an operational requirement. Observations were reported as being performed according to agreed research protocols and were being provided to the appropriate International or World Data Centre.

3.3.2.4 Other Atmospheric Networks

Many of the Annex I Parties reported that, in addition to the temperature and precipitation elements specified by GCOS, their GSN stations were involved in the observation of a wide range of climatological parameters that were of national interest. Many of these observations were being collected and retained in digital databanks as well as being provided to international data centres, although occasionally the observations, such as in the case of sunshine records, were still being retained in chart form. In addition, some of the Parties reported on their contribution to the Baseline Surface Radiation Network, a programme of the World Climate Research Programme that should be of interest to GCOS. Finally it should be noted that a number of Parties reported on a wide range of activities associated with the local composition and quality of the atmosphere.

3.4 Oceanographic Observations

3.4.1 General Comments

Ten Annex I Parties provided information on the extent of their participation in the Global Ocean Observing System (GOOS) component of GCOS. In addition, nine Non-Annex I Parties reported on oceanographic activities, only two of which were broadly based, the other seven reported primarily on sea level monitoring equipment that had been recently installed. Based on this information it was possible to make a small number of common points.

Firstly, ocean observations have in the past been collected by many different agencies and institutions both inside and outside government institutions in support of a range of requirements including fisheries management, ocean and coastal marine research, weather forecasting and warning services and more recently for climate monitoring and prediction.

Secondly, many requirements could only be met through the integration of observations from both in-situ and satellite observing platforms. As a result, several of the Parties noted that they have had to introduce new interagency coordinating mechanisms to ensure that all requirements were met in a cost effective manner.

Thirdly, it was noted that the continued reliance on research funding rather than operational funding to provide ocean observations meant that there was not a long-term commitment to many components of the system and therefore only a limited capacity to adhere to all of the GCOS monitoring principles.

Finally, it was encouraging to note that the Annex I Parties were generally endeavoring to maintain the key elements of the global ocean observing system, even though resources were clearly tight. It was even more encouraging to see that several of them were making major efforts to address the requirement for observation of the temperature and salinity profile within the oceans using profiling floats as part of the Argo programme. If this level of commitment is common to other Parties then there is a significant likelihood that Argo will meet the climate communities' expectations by the middle of the decade.

3.4.2 GCOS Networks

A compilation of the contribution by Annex I Parties to the global oceanographic observing systems for climate purposes is contained in Table 2 below.

Table 2: Participation in the global oceanographic observing systems

	Voluntary Observing Ships VOS	Ships of Opportunity SOOP	Tide Gauges	Surface Drifters	Sub-Surface Floats	Moored Buoys	Automated Shipboard Aerological Program
For how many platforms is the Party responsible?	2810	123	384	617	217	219	<4
How many are providing data to international data centres?	Unknown	123	328	603	214	210	<3
How many are expected to be operating in 2005?	<2721	121	380	851	1310-1360	200	<5

It appears that each of theses well-defined programmes within the GOOS climate component is proceeding under the effective direction of the Joint IOC/WMO Technical Commission for Oceanography and Marine Meteorology (JCOMM) recent set up for this purpose.

3.4.2.1 Voluntary Observing Ships (VOS)

It was clear that the number of ships participating in the VOS programme was continuing to decline. As result of the introduction of real-time reporting for ships at sea and personnel reductions, several Parties noted that they were no longer able to perform their traditional quality control activities and that meta-data collection and dissemination for VOS observations was no longer in place. It is hoped that the international centres receiving these observations will have assumed some of this responsibility to the extent possible. At the same time, it was also clear that several Parties were making efforts to ensure, through automation and a careful selection of shipping, that a high quality core of observations could be maintained for climate purposes and to provide effective calibration and validation to satellite observations over the open oceans.

3.4.2.2 Surface Drifting Buoys

Several of the Parties reported on their drifting buoy programmes, noting that they had been put in place for a variety of reasons including climate and that their level of deployment was essentially constant at this time, although the long term availability of funding was reported as an issue. It was noted that the real time exchange of data was proceeding and that international programme coordination was in place. As indicated in Table 2 some modest programme expansion appears to be possible over the next few years. From a climate perspective a more uniform deployment in all oceans would be desirable.

3.4.2.3 Moored Buoys

Several Annex I Parties reported on their moored buoy programmes noting that most of them had been put in place for weather forecasting purposes, the exception being the Tao/Triton and Pirata arrays of buoys in the Pacific and Atlantic Oceans that were there for climate prediction purposes. (It should be noted that the former is one of the few examples of a research network becoming operational, with operational funding support as opposed to continuing to rely on research funds.) It was noted that there was significant regional and international cooperation in these activities and that data exchange was occurring in real time. The Parties expressed concern however over the significant increases in operating costs that they were experiencing as a result of buoy vandalism and that a continuation of current trends would lead to a reduction in the size of the programmes.

3.4.2.4 Automated Shipboard Aerological Programme

This programme, put in place as one of the observational systems to replace the weather ships programme that had existed from the 1940s to the 1990s, has had only a limited uptake within the reporting Parties.

3.4.2.5 Sea level

This activity, which requires observations from both in-situ and satellite observations to determine the long-term changes, appears to be well supported by all of the Parties with marine boundaries. In addition, this was one network where Non-Annex I Parties reported receiving substantial assistance from Annex I Parties and the GEF.

3.4.2.6 Ship-of-Opportunity Programme (SOOP)

As recommended by the recent (2000) International Workshop to Review the Global Upper Ocean Thermal Network, several Parties reported their intention to continue their activities in obtaining temperature profiles of the ocean through the continued use of ships of opportunity,

3.4.2.7 Subsurface Profiling Floats

As noted earlier (viz. the Argo programme), several of the Parties have reported on their intention to make significant new investments (Australia, Canada, France, New Zealand, UK, USA) to purchase and deploy subsurface profilings floats to measure the profile of salinity and temperature to depths of 2000m. This is an extremely encouring development in a programme of great significance to the climate community. At the same time, it must be noted that the long term sustainability of the activity remains a concern as most of the investments are from research funding.

3.4.3 Other Oceanographic Networks

Several of the Parties reported that they were undertaking other ocean observing activities of interest to the climate community. These included : a continuation and repetition of some of the traditional deep ocean sections made during hydrographic surveys ; biogeochemical surveys in near coastal waters ; the availability of long term lighthouse observations; and the availability of some limited in-situ sea ice observations.

3.5 Terrestrial Observations

3.5.1 General Comments

Almost all of the Annex I Parties reported that they were conducting terrestrial observational programmes, the nature and extent of which varied substantially from Party to Party. However, in only a very few cases were such programmes established and operated with long-term climate monitoring as an objective. The terrestrial observation networks that did exist had been developed primarily to address

specific local and/or regional problems or to assist in the management of national resources. As such their use for climate purposes has been opportunistic rather than planned. Thus while such networks often provide interesting insights into aspects of the climate system, most observational networks in this sector are incompletely developed to address GCOS requirements and this must remain an area of emphasis over the coming years.

With the exception of their long-term involvement in hydrology measurements and more recently participation in the use of satellites to measure forest and other land cover parameters, none of the Non-Annex I Parties reported any significant activities in the terrestrial domain.

Several of the Parties commented that the nature of their constitutions limited the jurisdiction and role of the national government in many terrestrial areas. This is quite unlike the situation in the atmospheric and oceanographic domains and makes it much more difficult to implement both national and international observing programmes. Indeed, it was noted that there were only a few situations of programmes that were attempting to set up terrestrial monitoring networks based on international protocols for site selection, layout, sampling, recording and archiving in the terrestrial domain and that this could be a major issue as GCOS proceeds. Only one of the Parties reported that they had a mechanism in place for the national coordination of their terrestrial observing programmes and their participation in the global observing systems for climate.

It was also clear that the vast majority of the observing programmes currently in place were solely of a research nature, with only short term funding available for them. A number of the Parties reported that many of the observational programmes of use to the climate community either had been or were in the process of substantial reduction as a result of changes in priority and budget reductions. At the same time it was noted that attempts were now being made to incorporate the stated climate observational requirements into account during these network rationalization activities.

Finally while the Parties commented on the national–to-international programme linkages in the atmospheric and oceanographic domains (with the WMO and WMO/IOC JCOMM), similar linkages were reported only rarely in the terrestrial domain. This is perhaps an area where the international programmes need greater attention.

3.5.2 GCOS Networks

A compilation of the contribution by Annex I Parties to the global terrestrial observing systems is contained in Table 3 below.

Table 3. Participation in the global terrestrial observing systems

	GTN-P	GTN-G (mass)	GTN-G(length)	FLUXNET
How many sites are the responsibility of the Party?	483	45	277	66
How many of those are operating now?	403	43	277	59
How many are providing data to international data centres now?	131	43	277	26
How many are expected to be operating in 2005?	201	42	277	67

It appeared that those Parties with potential contributions in the field of Glaciers (GTN-G) and Permafrost (GTN-P) were actively involved in those programme including the exchange of data with the appropriate international data centres.

It was clear that these Parties were actively involved in reviewing their permafrost networks to ensure that the long-term requirements of GCOS were addressed. However the reports showed some apparent uncertainty on the part of the Parties as to what should or should not be included in the glacier networks in order to address the global requirement. Perhaps this is an area where the international programme could provide a greater degree of specificity in their requirements. Both these networks were reported to be highly dependent upon the continuation of research funding for operation.

Many of the Parties reported on their activities in measuring the fluxes of carbon dioxide, water vapour and energy. They noted that these activities are increasingly being coordinated as part of the FLUXNET, which may be the first component of a GCOS Terrestrial Network for Carbon (GTN-C) currently in the process of being specified by the international community. It was reported that the majority of the FLUXNET sites are relatively new undertakings and without secure funding. In addition, as most of the observations were from active research projects, there were some limitations on the availability of the data. Finally, several of the Parties from Europe reported that the European Community was taking a very active role in the establishment of a carbon flux research network across Europe. It would be hoped that the appropriate elements of this project could evolve into an operational system.

3.5.3 Other Terrestrial Networks

3.5.3.1 Hydrology

Almost all Parties identified that they had substantial network in place to measure stream-flow and water levels. A smaller number of the Parties indicated the existence of groundwater and/or water quality networks. It was reported, however, that the quality of data varied substantially because the stations are operated and maintained to varying standards according to the primary use of each station. (This was one field in which internal constitutional issues were raised as a difficulty to be overcome). While the standards adopted by each of the agencies involved are considered to be good, the suitability of the data for use in climate analyses is questionable. At the same time, several of the Parties reported that they were in the process of reviewing these networks with a view to having them participate in a GCOS Terrestrial Network – Hydrology (GTN-H). Once again this was an area in which the European Community was taking an active role in establishing an appropriate network for the whole of Europe. Finally, it was noted by a few of the Parties that they were making some of the data available to international data centres, although this was by no means universal.

3.5.3.2 Snow and Ice

A small number of the Parties reported on their activities with respect to snow cover, snow depth and the freeze-up and thawing of lakes and rivers. The use and exchange of these appeared to be limited to addressing national and/or regional requirements at this time. Perhaps this is an area where the global requirements need greater definition.

3.5.3.3 Ecological

The variety of ecological observation networks[2] described by the Parties was considerable, reflecting as they do the range of the natural habitats and agricultural practices involved and the specific interests of research institutes. Several of the Parties reported that their networks were described in an Internet database established by GTOS called The Terrestrial Ecosystem Monitoring Sites (**TEMS**). As with hydrology, the programmes involved were primarily local in nature and functioned with only limited coordination at the national level with the exception of one Party that had established a national coordination mechanism. It is clear that other Parties will need to be encouraged to develop similar mechanisms. Even more important, however, is the need for the climate community to establish a clear statement of its requirements in this area. Given the nature of the networks involved, there was little activity reported in the area of data exchange.

---

[2] Land cover, soil properties, forest plots, fire statistics, indicator species, alpine tree line, paleoclimatic information are some of the examples

3.6 Space-based Observations

All of the Parties providing detailed reports on their climate monitoring activities reported that they were involved with space-based observations. In general, the Parties' activities were not as operators of environmental satellites, but as active users and major contributors to research, development and applications in relation to space-based observing systems used to derive climate-related information. They contributed to international space-based programmes in a variety of ways, including: membership of international coordinating bodies such as the Committee for Earth Observation Satellites (CEOS), development and construction of satellite hardware, provision of ground stations for the reception of satellite data and satellite orbit determination, quality control and the archiving of raw and processed data, and active involvement in the multitude of calibration/validation programmes associated with the various platforms and derived parameters.

Several of the Parties noted that space-based observations were the only cost-effective means of obtaining climate date over vast geographic areas, over the oceans and for many of the terrestrial data sets; including types and extent of land cover, forest fires, snow and ice extent and biological productivity. It was underscored, however, that satellite observations could not measure all parameters of the Earth system on their own. Not only are surface-based, and in-situ observing systems essential for the calibration and validation of satellite-derived geophysical, chemical, and biospheric parameters, they are also needed to provide subsurface observations such as soil moisture and the salinity/temperature profiles of the oceans.

Several Parties emphasized that the future evolution of global climate observing system is one that requires an integrated approach involving both space-based systems and in-situ observing networks. Furthermore, several Parties mentioned that the establishment of an Integrated Global Observing Strategy (IGOS) as a strategic planning process was an important mechanism to influence the decisions and resource allocations of individual funding agencies. This mechanism unites the major satellite and in-situ programme managers responsible for global environmental observations of the atmosphere, oceans, and land into a coordinated planning process; this could be of significant benefit in the development of an integrated observing system for climate. One of the Parties noted that the IGOS process has begun (at least among the space agencies) to result in commitments for addressing the gaps in the ocean observing system.

Some Parties cautioned that while most of the UNFCCC Climate Monitoring Principles were now addressed with space-based platforms, there remained a concern with the overlap of observing systems that were required in an operational system. It was reported many of the major space-based components are now operating with long-term commitment from the space agencies. However, overlap is sometimes very limited or non-existent from one satellite to its replacement because of the expense involved and the normal practice of limited satellite control ground command stations. The potential adverse impact of this for long-time-series data sets has been offset to a degree by both; a worldwide trend toward systematic calibration/validation processes with reference to ground targets whose radiometric properties are accurately known; and the re-processing of older data using substantially improved retrieval algorithms. In addition, on-board calibration systems for satellite sensors are becoming more and more sophisticated, thereby allowing scientists to monitor more accurately sensor response over long time intervals. This is allowing scientists a better chance to separate true effects of geophysical processes such as climate change from any spurious satellite sensor, or related changes with time, such as instrument noise or systematic errors.

Finally, at least one Party noted that there is an increasing convergence between research and operational requirements for climate observations, despite an apparent divergence in the past. As the "prediction" time-window is broadened beyond weather time scales (days to a week) to include (quasi-operationally) seasonal-to-interannual (e.g., El-Nino), and decadal (e.g., climate change and impacts) time scales, a substantially larger number of components and processes of the Earth system need to be observed and modeled over much longer time frames than in the past. Such a need may be construed as a driving

requirement for the improvement of operational observing systems, and also for the transition of research to operational platforms.

3.7 Conclusions of the GCOS Steering Committee

The GCOS Steering Committee reviewed the preceding material at its Tenth Session in Farnham, England from April 15-19, 2002 and adopted the following recommendations. That:

- GCOS invite its sponsoring agencies to give greater emphasis and prominence to the terrestrial component of the global observing systems for climate and enhance its linkage with national activities;
- GCOS invite the FAO and WMO, as the organizations with prime responsibility for the terrestrial component of the global observing systems for climate, to investigate and address the reported difficulties with data exchange;
- Its Terrestrial Observations Panel for Climate (TOPC) develop a clear statement of global requirements, since there were substantial uncertainties on the part of almost all Parties on which parts of their activities in the terrestrial domain should be a part of the global observing system for climate;
- Its Atmospheric Observations Panel for Climate (AOPC) work closely with the WMO Commission on Basic Systems and WMO Members to address the expressed concerns of some of the Parties over the future viability of the GUAN; and
- The GCOS secretariat investigate the desirability of including information on the successful receipt, and the subsequent availability, of their observations by the International Data Centres in the UNFCCC reporting guidelines for the next cycle of National Reports.

In addition, the GCOS Steering Committee would hope that those Parties who have yet to submit reports on their activities in relation to systematic observations as requested in decisions 4/CP.5 and 5/CP.5 do so, as soon as practical, in order that their input might be considered in the preparation of the Second Adequacy Report;

Furthermore the GCOS Steering Committee requested that the GCOS secretariat bring to the attention of the UNFCCC/SBSTA the following issues:

- It is important that those Parties that have not yet done so consider creating internal coordination mechanisms for all aspects of the climate observing system, with special emphasis on the terrestrial component, in light of the benefits accrued by some Parties as a result of developing National Plans for their national climate observing system activities;
- It is important that the Parties implement UNFCCC Climate Monitoring Principles for both satellite and *in situ* observing systems;
- It is essential that the real time and historical data of the Parties reach the appropriate international data centres;
- The various space agencies are playing an increasing role in observation of the climate system. There are needs to ensure that data and products are available to all Parties and to continue to work toward the development of an integrated global climate observing system, in cooperation with the relevant international agencies.
- Funding of systematic observation in developing countries is one of the most important priorities identified by GCOS in addressing the identified deficiencies in the global observing systems for climate;
- Several ongoing partnerships between Annex I and Non- Annex I Parties are successful in operating specific GCOS stations. Other Annex I Parties may want to adopt similar cooperative arrangements.

4. REGIONAL ACTION PLANS

4.1 Introduction

The Conference of the Parties (COP) to the UN Framework Convention on Climate Change invited GCOS to organize a regional workshop programme in its decision 5/CP.5 of November 1999. The overall objective of the programme is to stimulate much-needed improvements in global observing systems for climate at the regional level. To facilitate this objective, workshop participants, having come together to reach a common understanding of the goals of GCOS and agree on regional deficiencies, are encouraged to develop Regional Action Plans. The purpose of these Regional Action Plans is to identify the highest priority regional climate observing system needs and to propose projects to address those needs. The Action Plans are a necessary precursor to securing the required resources to implement improvements.

GCOS has now completed three workshops in its ten-workshop programme, and Regional Action Plans developed following the first two workshops (Pacific Islands and Eastern and Southern Africa) have recently been completed. SBSTA invited the GCOS Secretariat to make those plans available for consideration at its sixteenth session in June 2002, with a view to recommending a draft decision on these plans for consideration by the COP at its eighth session in October 2002. The full Regional Action Plans have been submitted to SBSTA as separate documents.

Although GCOS has facilitated the development of these plans, the regions themselves drafted them based on their own perceptions of needs. Some of the projects contained in the plans directly address the global concerns of GCOS, while others are of more regional importance. The following summarizes the Regional Action Plans and draws special attention to the priorities in each observing system domain--atmospheric, terrestrial, and oceanographic--from the global perspective. Action Plan projects not highlighted here have nonetheless been identified as being of special importance to the region and thus also worthy of consideration for funding.

4.2 Pacific Islands

The Pacific Islands **(**PI) Action Plan introduces a comprehensive set of projects and activities designed to address the priority climate observing system needs of the region. The overall goal of the Action Plan is to establish robust and sustainable climate observing systems for the Pacific Island region that meet long-term regional *and* global climate needs. The authors of the Pacific Islands Action Plan stress that it is a living document and note that further input from all Pacific Island Regional GCOS partners is required to further enhance the Action Plan. The Pacific Island Regional GCOS Implementation Team has the responsibility, at least through August 2002, to continue its development and to specify how the projects and activities introduced in the Action Plan could be implemented. Clearly, support for implementation will be required from Parties within the region as well as from donor nations and funding agencies, such as the Global Environment Facility (GEF), with interests in creating a robust and sustainable PI-GCOS.

A first group of actions is focused on advocating the importance of climate observing systems to policy makers and other users. The Action Plan, among other things, calls for the implementation of a project entitled, “Expanding and Enhancing the Prudent Use of Climate Predictions” that would enhance the ability of national meteorological and hydrological services (NMHSs) to produce, interpret, disseminate, and explain short and long term climate prediction information; raise awareness of the availability and potential usefulness of this information; and enhance the ability of potential users to incorporate predictions into their decision-making. In addition, near-term activities include a call to the South Pacific Regional Environment Programme (SPREP) and the WMO Sub regional Office to encourage countries in the region to establish national plans for both GCOS and national climate networks, and a request that all Pacific GCOS partners establish GCOS coordinators. Such coordinators would link climate-data generators and users across government agencies, as well as provide an interface with GCOS.

The second group of actions is focused on fully supporting and operating all of the required GCOS stations in the region by 2005, and according to best practices by 2008. Recent monitoring of both the

GCOS Surface and Upper Air Network performance indicate substantial performance deficiencies in these networks, including many stations that underreport or are completely silent. The reasons for these deficiencies include lack of reliable, ongoing funding; poor data exchange nationally and internationally; inadequate training; and inadequate quality checking and maintenance. The situation is similar for oceanographic and terrestrial networks. The Action Plan calls for a number of projects and actions: an assessment of the relative performance of manual and automated observing sites for meeting GSN purposes in the region; the homogenization of climate records for GSN stations; demonstrating the benefits of parallel observation periods by the New Zealand National Institute of Water and Atmospheric Research (NIWA) and the Australian Bureau of Meteorology (BoM); restoring and upgrading human-operated surface observing networks in the region; improving the transmission of meteorological data and enabling such data to be collected and distributed in a timely, reliable, and accurate manner; restoring and upgrading the regional upper air networks; providing high frequency radio transceivers to improve communication and collection of weather reports from remote stations; and upgrading hydrological observing systems in the region. Finally it is proposed to correct the metadata inconsistencies that exist for GCOS stations that are listed in WMO Volume A, the network monitoring centers, and internal databases.

The third group of actions is focused on rescuing all un-archived climate data by 2005 and of fully archiving quality-controlled climate data in digital form by 2008. Proposed activities include; development of a regional climate database with centralized quality control; the recruitment of roving experts to audit existing data holdings and provide recommendations for data rescue and computerization; and the training of relevant personnel in all aspects of climate data management. A near-term activity calls for the BoM and NIWA to promote the use of homogeneity software to ensure the continuity of historical data sets.

Finally, there is a need to promote institutional strengthening and capacity building. This would be accomplished by implementing several projects including one designed to strengthen basic meteorological observer training and one to provide the expert external specialist and back-up services required to maintain weather and climate monitoring to WMO-specified calibration standards. A further proposed project would implement an integrated observing system to increase efficiency and effectiveness through the sharing of resources, skills, and knowledge, and by avoiding unnecessary duplication of effort.

4.3 Eastern and Southern Africa

The Eastern and Southern Africa (ESA) Action Plan contains thirteen project proposals covering all three domains.

4.3.1 Atmospheric

As in the Pacific region, projects related to improving the GCOS Surface and Upper Air Networks are high priorities. The operation of the GSN and GUAN networks in the region continues to be unsatisfactory, with 25 percent of GSN and 20 percent of GUAN stations silent. According to recent monitoring, 90 percent of the 84 surface stations and 50 percent of the 10 upper air stations failed to provide more than 10 percent of expected reports. Three related proposals in the Action Plan address problems associated with these key baseline networks.

The first project, “Improving the GCOS Surface and Upper Air Networks in Eastern and Southern Africa,” calls for rehabilitation of the existing stations through a reassessment of the stations included in the networks; a combination of upgrading and automation; negotiation for the bulk purchase of consumables and equipment; establishment of national GCOS focal points; and capacity building devoted to the operation, maintenance, and repair of stations.

Secondly, poor telecommunication facilities account for the inadequate performance of some of the GSN and GUAN stations in the region. Hence, a project, “Improving Telecommunications Facilities for Climate Data Collection and Exchange in Eastern and Southern Africa,” has been proposed. The

principal needs are for resources to operate, rehabilitate, repair, or replace obsolete telecommunication equipment and to train staff for equipment maintenance and operation.

Thirdly, improvement and then maintenance of high quality databases, designed for the long-term sustainability of data, is an equally important component of an integrated climate observing systems. Therefore a project, "Capacity Building for Climate Data Management Systems in Eastern and Southern Africa," has been proposed to improve data management not only for GSN and GUAN networks but for data generated by other GCOS networks as well. Its principal actions are to conduct a comprehensive training programme in data management for all NMHSs in the region and to survey the data rescue needs of each country.

A separate priority in the atmospheric domain is to make improvements in the Global Atmosphere Watch (GAW). There are two "global" and three "regional" GAW stations in the ESA region. These stations do not report as much as desirable because funds are insufficient for needed equipment and for day-to-day operations. The GAW project proposes upgrading and/or automation of the existing stations and capacity building related to operation, maintenance, and repair.

4.3.2 Terrestrial

The ESA has proposed three distinct projects in the terrestrial domain that are of high priority for GCOS.

The first is to improve hydrological observations in the region, so that Parties in the region can respond appropriately to such hydro-climatic disasters as floods and droughts. The project calls for the installation of 100 new data collection platforms (DCPs); the rehabilitation of existing hydro-meteorological stations; the provision of hardware and software for establishing and/or improving national hydrological databases; and building capacity in data collection, transmission, dissemination, and database management.

The second proposes to provide the minimum set of carbon cycle observations needed in the ESA region to reduce uncertainty in the prediction of carbon fluxes in Africa south of the equator to the global average for continental areas within five years. Increased observations will greatly help to reduce the uncertainty of sources and sinks of CO_2 in the region. The principal activities proposed are: establishment of two additional atmospheric CO_2 sampling stations within the ESA; networking the existing carbon flux measurement sites; establishment of new sites in under-sampled biomes; observing carbon-cycle-relevant parameters at 50 GSN stations; creating a database of land-surface characteristics for carbon-cycle modeling at 500 locations in the region; and capturing carbon cycle indicators for the region from operational satellite products.

The third terrestrial priority is the mountain glaciers project that proposes to establish a reliable, consistent, and sustainable glacier observing system for the tropical glaciers of Mts. Kenya, Kilimanjaro, and Ruwenzori. These glaciers are important indicators of climate change in the region, and, as they recede, will have impacts on water resources. A principal activity is to set up automated observing stations on the three mountains. Additional activities include sampling and analysis of ice cores; setting up a regional database; regular monitoring by remote sensing; and the training of several scientists and technicians.

4.3.3 Oceanographic

Priorities for improving oceanographic observations in the Indian Ocean were considered in some detail prior to development of the ESA Action Plan. The Action Plan thus recommends that an existing project developed to address the need for improved oceanographic observations, the Western Indian Ocean Marine Applications Project, be supported. In addition, the following related activities have been recommended for inclusion; the establishment and/or upgrading of twelve multi-parameter sea level stations; the procurement and deployment of fifteen Argo profiling floats and two arrays of moored buoys; the recruitment and equipping of twenty voluntary observing ships; and the enhancement of the

capacity of meteorological and oceanographic institutions in the region to collect, analyze, interpret, and archive ocean data.

4.4 Central America and the Caribbean

The GCOS workshop for the countries in this region was held in late March 2002. Hence, the region has not had adequate time to complete its Regional Action Plan or to have it approved. Nevertheless, a drafting meeting has been held, and a preliminary document has been produced. The draft document indicates that this third Regional Action Plan has much in common with the Pacific Islands and Eastern and Southern Africa plans, specifically concerning the types of projects proposed to address observing system deficiencies and the key GCOS networks addressed.

4.5 Summary

At the conclusion of the pilot phase of the GCOS Regional Workshop programme, two regions have successfully drafted Action Plans that, when implemented, will significantly improve the status of observing systems for climate in those regions. In addition, work has already been launched on an Regional Action Plan for a third region. In each case a substantial amount of work was accomplished in a relatively short time. The first two Regional Action Plans have been widely circulated within their respective regions and approved by regional decision making bodies.

These Regional Action Plans meet the needs both of GCOS for identifying priority projects to address global concerns and of the regions for addressing issues that are more regional in nature, including observational needs related to vulnerability and adaptation to climate change. There are some common themes between the two Regional Action Plans that are also found in the analysis of the National Reports contained in section 2 of this report. Specifically these relate to the nomination of national GCOS coordinators and associated regional and/or national GCOS planning as well as the need to address clearly identified deficiencies in both the GSN and GUAN networks and the priority of the implementation of Argo. The two regions have articulated specific projects that would address these deficiencies and in most cases have identified the likely costs. Resources are now required for the implementation of projects within the Regional Action Plans. Therefore, the GCOS Steering Committee would hope that the UNFCCC/SBSTA consider undertaking the following action:

- Success in the GCOS Regional Workshop Programme will depend on the Parties and international funding agencies, including the GEF, giving special consideration to providing resources for implementing projects identified in the Regional Action Plans, especially those addressing GCOS priorities for GSN and GUAN.

5. PROGRESS IN THE PREPARATION OF THE SECOND REPORT ON THE ADEQUACY OF THE GLOBAL CLIMATE OBSERVING SYSTEM

At its Fifteenth session, the SBSTA “endorsed the preparation by the GCOS secretariat of a second report on the adequacy of Global Climate Observing Systems”. This Second Adequacy Report will be a succinct scientific report on the state of the global observing systems for climate. Its goals are to:

- Determine what progress has been made in defining and implementing climate observing networks and systems since the first Adequacy Report prepared for COP-4;
- Determine the degree to which current networks and systems meet with scientific requirements and conform with associated observing principles; and
- Assess how well these current systems, together with planned improvements, meet the needs of the Convention.

It will:

- Be based on the National Reports prepared by the Parties and submitted to the UNFCCC Conference of Parties;
- Utilize data and information on operational and research observing systems from all available sources including national, regional and international organizations;
- Draw upon a balanced range of scientific experts to develop the specific analyses;
- Take into account relevant COP decisions on capacity building, technology transfer and adaptation; and
- Incorporate an integrated approach to global climate observing systems, including the exploitation of new and emerging methods.

The Second Adequacy Report is being prepared under the overall direction of the GCOS Steering Committee (GCOS-SC), acting through its Chairman and the chairmen of its Science Panels. Working with the GCOS secretariat they are responsible for assembling the necessary resources, intellectual, human and financial, and for its preparation. The first steps are already underway to refine the specific objectives and define the metrics of analysis in light of the needs of the Convention and involves experts previously engaged in the work of the IPCC. Subsequent steps will involve the establishment of a number of teams of scientific experts to undertake specific analyses and prepare first drafts for components of the report. It is planned that these drafts will be available on the GCOS website for an open review in order to develop a consensus on the conclusions and will also the subject of presentation at international scientific conferences. Following this open review period of some 3 to 4 months, a final draft of the Second Adequacy Report will be submitted to the GCOS-SC for approval. At its recent meeting, the GCOS-SC adopted the following key milestones:

- July 1-3 2002 - GCOS Science Panel chairs to finalize the information base and define critical questions for meeting with IPCC experts.

- August 12-14 2002 - Meeting with IPCC experts on needs of Convention for observing systems as in TAR and to develop appropriate metrics for Adequacy analyses.

- October 2002 - Meeting of authors to review, organize, and assemble initial Adequacy analyses.

- Dec 2002 - Open comment period begins on the draft Adequacy Report to develop a consensus on the conclusions.

- April 2003 - Review of draft Report by GCOS SC.

- June 2003 - Report available to SBSTA 18.

Appendix A

Table 4: Annex 1 Party Submissions

Party	Detailed National GCOS Report	National Communications	Area in Sq. Km	Region
Australia	Yes		7,692,030	Pacific
Austria	Yes		83,858	Europe
Belarus			207,600	
Belgium			30,527	
Bulgaria			110,994	
Canada	Yes (Draft only)		9,984,670	North America
Croatia			56,542	
Czech Republic		Yes	78,866	Europe
Denmark			43,095	
Estonia		Yes	45,227	Europe
European Community	Yes			Europe
Finland		Yes	338,145	Europe
France	Yes		640,355	Europe
Germany			357,020	
Greece			131,957	
Hungary			93,030	
Iceland			103,000	
Ireland			70,273	
Italy			301,230	
Japan			377,835	
Latvia		Yes	64,589	Europe
Liechtenstein			160	
Lithuania			65,200	
Luxembourg			2,586	
Monaco		Yes		Europe
Netherlands	Yes		41,532	Europe
New Zealand	Yes		268,680	Pacific
Norway			324,220	
Poland		Yes	312,685	Europe
Portugal			92,391	
Romania			237,500	
Russian Federation			17,075,200	
Slovak Republic		Yes	48,845	Europe
Spain		Yes	504,782	Europe
Sweden	Yes		449,964	Europe
Switzerland	Yes		41,290	Europe
Ukraine			603,700	
United Kingdom	Yes		244,820	Europe
United States Of America	Yes		9,372,587	North America
Total	**11**	**8**	**50,496,985**	

Table 5: Non-Annex 1 Party Submissions

Party	GCOS Comments	Area in sq km	Region
Algeria	Yes	2,381,740	Africa
Antigua And Barbuda	Yes	442	North America
Argentina		2,766,890	
Armenia	Yes	29,800	Europe
Azerbaijan	Yes	86,600	Europe
Bahamas	Yes	13,940	North America
Barbados		430	
Bhutan		47,000	
Bolivia	Yes	1,098,580	Latin America
Botswana	Yes	600,370	Africa
Burundi		27,830	
Cape Verde	Yes	4,033	Africa
Chad	Yes	1,284,000	Africa
Chile		756,950	
Colombia		1,138,910	
Congo		342,000	
Cook Islands	Yes	240	Pacific
Costa Rica	Yes	51,100	North America
Cote d'Ivoire	Yes	322,460	Africa
Cuba	Yes	110,860	North America
Dominica		754	
Ecuador		283,560	
Egypt	Yes	1,001,450	Africa
El Salvador		21,040	
Ethiopia	Yes	1,127,127	Africa
Georgia	Yes	69,700	Europe
Ghana	Yes	238,540	Africa
Grenada		340	
Guatemala		108,890	
Haiti		27,750	
Honduras		112,090	
Indonesia		1,919,440	
Israel		20,770	
Jamaica	Yes	10,990	North America
Jordan		89,213	
Kazakhstan		2,717,300	
Korea	Yes	98,480	Asia
Kiribati		717	
Lao		236,800	
Lebanon		10,480	
Lesotho	Yes	30,355	Africa
Malaysia	Yes	329,750	Pacific

Mali		1,240,000	
Marshall Islands		181	
Mauritius	Yes	1,860	Africa
Mexico		1,972,550	
Micronesia		702	
Moldova		33,843	
Mongolia	Yes	1,565,000	Asia
Morocco	Yes	712,550	Africa
Nauru		21	
Nicaragua		129,494	
Niger		1,267,000	
Niue		260	
Panama	Yes	78,200	North America
Papua New Guinea	Yes	462,840	Pacific
Peru	Yes	1,285,220	Latin America
Philippines		300,000	
Saint Kitts and Nevis		261	
Saint Lucia	Yes	620	North America
Saint Vincent And Grenadines		389	
Samoa		199	
Senegal		196,190	
Seychelles		455	
Singapore		647	
Sri Lanka		65,610	
Thailand		514,000	
Togo	Yes	56,785	Pacific
Tunisia	Yes	163,610	Africa
Turkmenistan	Yes	488,100	Asia
Tuvalu	Yes	26	Pacific
Trinidad and Tobago		5,128	
Uruguay	Yes	176,220	Latin America
Uzbekistan	Yes	447,400	Asia
Vanuatu		14,760	
Yemen	Yes	527970	Asia
Zimbabwe	Yes	390,580	Africa
Total	**36**	**31,618,382**	
Total on all Non-Annex 1 Parties	**148**	**459,575,015**	

- - - - -