



Global Terrestrial Observing System

Report of the Second Meeting
of the GTOS Steering Committee
15-19 June 1998, Santander, Spain

GTOS-19

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1. Opening of the Meeting

1.1. James Gosz, chairman of the GTOS Steering Committee (GTSC) meeting, welcomed the participants (see annex I) and invited them to briefly present themselves. On behalf of the members of the GTSC, he thanked the regional government of Cantabria for its generous offer to host the meeting, provide the excellent facilities and support the travel of members from developing countries. This was made possible through the efforts of Antonio Cendrero of the GTSC.

1.2. The agenda (see annex II) was discussed and adopted with a few changes in the schedule. Mr. Gosz stressed the importance of this meeting, in view of critical items it would be addressing. A number of actions were required from the steering committee, some of the important ones included finalizing the implementation plan; reviewing the draft data and information management plan; developing criteria for networks (size, types); reviewing and deciding on the establishment of a system of networks, a Network panel and a demonstration project; establishing other networks; identifying other programme components; and, deciding how to deal with terrestrial and space observations.

1.3. The Chairman indicated the meeting would be conducted in an open and informal atmosphere. The observers were invited to share their expertise and experience as they saw fit during the proceedings. Decisions would be taken by consensus among the steering committee members; if necessary formal procedures could be used to adopt motions from the floor.

2. Update on GTOS Activities

2.1. The GTOS Programme Director, Jeff Tschirley, provided an update on the main actions implemented by GTOS since the first GTSC meeting in December 1996:

2.2. Programme support: contributions from the Sponsors had been forthcoming and allowed the Secretariat to function at a basic level. However, additional resources had not yet been committed by other donors. Draft project proposals (support to the Secretariat; the TEMS meta-database; and development of user requirements) were revised and have been presented to some donors. The United States Agency for International Development (USAID) had expressed interest in supporting GTOS in areas relating to food security. This would be followed up with Texas A&M University.

2.3. Relations with GCOS and GOOS: the collaboration between the three Global Observing Systems has been further developed. GTOS representatives were nominated among the GTSC for participation in the following joint panels:

- Terrestrial Observation Panel for Climate (TOPC): David Norse;
- Joint Data and Information Management Panel (JDIMP): Gwynneth Martin and Peter Jones;
- Global Observing Systems Space Panel (GOSSP): André Bassolé and Anthony Janetos.

2.4. The meetings related to GCOS, GOOS and the joint panels were attended either by a Steering Committee member or by the Programme Director.

2.5. Relations with other organizations and agencies: the International Geosphere-Biosphere Programme (IGBP) was seen as a major potential collaborator for GTOS and links were established with LUCC (Land-Use and Land-Cover Change project of IGBP and HDP) and GCTE (Global Change and Terrestrial Ecosystems – Core project of IGBP). An IGBP representative was invited to the GTSC meeting to define specific ways and means of collaboration, but could not attend. The contacts established with the International Telecommunication Union (ITU) were not pursued, as recommended by the GTSC at its first meeting (December 1996). The collaboration with CEOS was expanded as regards the development of an Integrated Global Observation Strategy (IGOS) and of a project on Global Observation of Forest Cover (GOFC). Contacts were established with DIVERSITAS regarding biodiversity.

2.6. Communication and information: a GTOS brochure has been produced in English, French and Spanish and distributed widely. Overheads on the programme were prepared and sent to GTSC members and Sponsors representatives. They were also available on the GTOS ftp server. The GTOS web site was created in October 1996 and fully revised in December 1997; it is being regularly updated. GTOS publications were produced with a standard GTOS cover page and distributed widely. A list server was set up to facilitate the exchange of information among the GTSC, the Co-sponsors and the Secretariat. An annual report for 1997 was prepared and distributed widely during the first quarter of 1998.

ACTION: to put the updated version of the GTOS overheads on the ftp server for downloading when and as necessary.

2.7. The GTSC felt that a GTOS Newsletter should be developed in order to raise visibility of GTOS among developing countries and potential donors. ICSU accepted to assist in the development.

Recommendation 1: a GTOS Newsletter should be developed to keep donors, developing countries and participating organizations regularly informed on GTOS activities. It should be produced with the assistance of ICSU.

2.8. GTOS support to project proposals: GTOS endorsement of the EU funded NoLimits project was noted. The project is working toward the establishment of a European network of integrated environmental monitoring sites (see section 11.4). Antonio Cendrero summarized the objectives of a project on quantitative indicators and indices of environmental quality, which was supported by GTOS and successfully submitted to the European Union. It aims to build a Euro-Latin American Network for Environmental Assessment and Monitoring (ELANEM) based on previous cooperation links among partners. It will strengthen research and development capabilities of the different members and enhance their participation in international programmes.

2.9. Technical support to the Secretariat: it was reported that the Secretariat is still functioning at a level which prevented from pursuing many of the programme objectives; a staff of three full time professional was considered the minimum required for an effective programme. There was some discussion about the advertisement made by the GTOS Secretariat for two scientific officers to be recruited under the FAO Academic Exchange Programme. It was recommended to clearly spell out the conditions of this programme, i.e. that the candidate should be proposed by an academic or research institution of the member nations, which meets the salary costs while FAO provides a supplementary allowance plus travel expenses. It was suggested to advertise the

posts in the newsletters of the universities in UK. The group was informed of the possibility to recruit a young professional from Germany, with expertise in eco-toxicology and fresh water resources.

Recommendation 2: the post advertisement for two scientific officers at the GTOS Secretariat should spell out more clearly the requirements of the academic exchange programme.

ACTION: to advertise the two scientific officers' posts in the universities' newsletters (e.g. Oxford Global Change Institute).

3. Implementation Plan

3.1. Michael Gwynne introduced the implementation plan and observed that it should be a guide to reflect the constant evolution and development of GTOS. The philosophy behind it was to also develop a version with sufficient background for newcomers to GTOS.

3.2. Mr. Gwynne noted that the plan reflected the views of the participants at the GTOS Coordination and Implementation Meeting (Rome, Italy, May 1997), of the GTSC members as well as of members of the Steering Committees for GCOS and GOOS. He also had consultations with governments and politicians (in particular in Kenya, UK and USA) about global monitoring and assessment programmes. They all expressed interest but stressed the need for reliable environmental information on a short-term basis and that the information be understood by everybody - not only scientists.

3.3. The author pointed out that these considerations must not be ignored by GTOS in developing its programme. He presented the three phases of the implementation plan (preparatory, establishment and development), which are each one-year long, plus a phase which looks towards the 21st Century.

3.4. There was discussion of the three phases: it was suggested that the actions should be presented on an issue basis rather than following a time table. The group agreed that the related chapters (6 to 8) should be merged and restructured following a number of key issues for the development of GTOS, as proposed during the meeting. The schedule of the activities should be more flexible, so that it could be adapted according to the constraints and opportunities of the programme. It was also suggested to cost out each activity recommended in the plan.

3.5. The participants suggested that the implementation at local level be more detailed. A focus solely on global issues in the early stages could raise questions among policy makers and financing organizations regarding the practical utility of GTOS. The group emphasized the need for appropriate outputs applicable at regional levels, ensuring short term benefits with long term implications. Some participants highlighted the importance of building on existing initiatives at a national and institutional level, giving the possibility to reinforce those who don't have sufficient resources to develop their work. In order to obtain funding from donors, project proposals should focus on working at a local/regional level in order to set up infrastructure capabilities, rather than focusing solely on solving global environmental problems. It was noted that the demonstration projects are a good means for meeting the needs of diverse interest groups.

3.6. It was agreed that, in addition to the detailed implementation plan, a shorter document should be developed for larger distribution which captures the essence of the main implementation plan and is targeted to decision-makers and donors. It should focus on the main actions that will be implemented by GTOS, include practical examples of how data and information can be applied to policy issues, and be written in a more concise and journalistic style. An executive summary should be produced to be distributed widely. There was also agreement on the need to develop principles of involvement in GTOS, such as those developed by GOOS in their Strategic Plan and Principles.

3.7. There was discussion on data issues, in particular on data quality, analysis, access and scale. GTOS was seen to have a responsibility to ensure qualitative documentation on data, rather than in verifying it. In order to avoid GTOS becoming an “owner” of data, most of the data analysis should lie outside the system, but GTOS should be able to provide information on quality, context and access. Regarding data access, it is important to allow different levels of access to data, according to sites/networks constraints. It is not realistic to insist for unrestricted data access. The scale of data is an important issue but GTOS should not focus on small datasets, which are expensive: it does not mean that GTOS will exclude them, but that it should not be a priority. The importance of linking scientific data with policy planning issues was strongly emphasized, considering that funding agencies and governments are not interested in data itself.

3.8. It was suggested that the development of GTOS information systems be approached in two parts – the development of information infrastructure and the population of the infrastructure with data and information.

3.9. Some participants were concerned that socio-economic issues, which should be included in GTOS were not being sufficiently addressed. Decision makers need this kind of information, linked to bio-physical data. The development of a Joint Socio-economic Panel, as proposed in the implementation plan, should be a high priority for GTOS.

3.10. The group suggested a number of changes in the various chapters of the implementation plan, such as wording (e.g. GTOS "is becoming", or "will be", but not "is"), update of some paragraphs in view of the recent developments (e.g. GOSSP), add new elements (e.g. role of educators as data users). It was agreed that written comments on the plan should be sent to the Secretariat after the meeting and that a new version will be circulated to the GTSC and Co-sponsors by the end of July.

ACTIONS:

- Participants to send comments and inputs on the implementation plan to the Secretariat by the beginning of July 1998.
- Secretariat to produce a new version of the implementation plan, including the modifications and suggestions made during the meeting, and to distribute it to the Steering Committee and Co-sponsors by the end of July.
- To produce a second version of the plan (e.g. ca. 10 pages), targeted to donors and decision makers, focusing on the main actions to be implemented by GTOS.
- To produce an executive summary of the implementation plan (up to 3 pages) for wide distribution.
- To develop principles of involvement in GTOS, such as those developed by GOOS in their Strategic Plan and Principles.

4. Data and Information Management

4.1. Gwynneth Martin presented the results of the last Joint Data and Information Management Panel (J-DIMP) meeting (Honolulu, Hawaii, USA, 28 April - 1 May 1998). One of the main issues discussed at the J-DIMP meeting was the role of the panel and its terms of reference. It was agreed the panel should take the lead on specific issues - metadata (measurements and integration into a database), data and product distribution to users, archiving, and metadata products (e.g. inventories) - and support other issues such as collection/data assembly, quality control, mining and data archiving.

4.2. Among the questions addressed by the participants were the extent to which J-DIMP should address issues relating to archiving of data and custodianship. In view of the diversity of data sets and uses between the three observing systems, the GTSC expressed the view that many data and information management are unique to each observing system and need to be addressed accordingly. Due to this, the GTSC noted that J-DIMP may not need to meet frequently in the foreseeable future.

4.3. The GTSC reviewed the J-DIMP terms of reference and suggested some modifications. The following recommendation was made:

Recommendation 3: the new terms of reference of the J-DIMP should refer to custodianship for data sets and to the role of the panel in overseeing the design and operation of the Global Observing Systems Information Center (GOSIC); it should monitor the use of the system and should report regularly to the GTSC. The chairman would convey this to the chairman of J-DIMP and the Directors of GCOS and GOOS.

4.4. The group discussed how countries that did not have comprehensive data sets or data and information management policies could benefit from GTOS protocols which might be developed on standards regarding data quality, access, custodianship, etc. The GTSC was of the view that data and information management should not focus only on “science drivers” but also on policy and above all social issues. The “knowledge information system” initiative of the World Bank was seen to be relevant of this issue.

4.5. The GTSC endorsed the development of a web-based Global Observing Systems Information Centre (GOSIC). It was seen as a useful initiative that could gradually evolve from pointing to relevant G3OS data sets toward development of data and information products. There was agreement on the initial screening of data sets identified by TOPC, which would be a good start for the terrestrial component.

4.6. Ms. Martin presented the draft GTOS Data and Information Management Plan, to be finalized and distributed by September 1998. The document defines the context and the overall principles which apply to GTOS data and information management. It proposes policies and presents a plan for implementation, including actions and processes required to move towards practical operations in the future. The main elements deal with user requirements, custodianship, access and release, metadata, data quality, data harmonization, and archiving. She emphasized the need to establish a GTOS panel or working group on data and information management as well as a GTOS panel on data and information release, and to develop data and analysis centres. She requested inputs from the Committee to be included in the plan, in particular with regard to the actions to be implemented by GTOS. At the last J-DIMP meeting, it was agreed that a Joint

Data and Information Management Plan will be developed by autumn 1998, reflecting the G3OS requirements and the role of the panel. In the meantime, each system will develop its own plan.

ACTIONS:

- *Chairman to send on behalf of the Steering Committee a letter to Tom Karl (J-DIMP chairman), indicating the changes suggested for the J-DIMP terms of reference and confirming the GTSC endorsement of GOSIC.*
- Steering Committee members to send inputs to Gwynneth Martin by the end of July 1998 to be included in the GTOS Data and Information Management Plan.
- Distribute the final draft of the GTOS Data and Information Management Plan by the end of September 1998 to the Steering Committee and Co-sponsors.

5. Terrestrial Ecosystems Monitoring Sites (TEMS) Meta-database

5.1. Josef Cihlar presented TEMS, a meta-database about sites and networks that are making long-term measurements relevant to GTOS and GCOS. He noted that current database contains some important gaps in geographical coverage and also in sites distribution by vegetation classes and biomes. Moreover, the sites data don't have equal level of details and there is seldom verification of the site data quality.

5.2. At its last meeting (Corvallis, Oregon, USA, 26-29 May 1998), the Terrestrial Observation Panel for Climate (TOPC) recommended that a second version of TEMS should be developed, initially with the networks and sites involved in the GT-Net and NPP demonstration project. Glacier and permafrost networks should be included once they are established and the individual sites agree to participate. The GTSC should decide on priorities for the GTOS issues in order to prioritize future expansion of TEMS. A structured approach should be used to determine geographical and thematic requirements for critical non-climate observations so that the second version of TEMS can be used to identify gaps in critical observations. The current version should remain as a meta-database of networks and site descriptor, guiding users to the holders of data.

5.3. TOPC recommendations for TEMS were endorsed by the GTSC. It was agreed that the TEMS meta-database should include a front page providing different options to users, e.g. choose the version they wish to consult and/or the network they are interested in (GT-Net, Glacier, Permafrost, ...). The database will be located at the LTER office (Albuquerque, New Mexico, USA). A template will be developed to be used by sites/networks to enter their data and update it when necessary.

5.4. The migration of TEMS from Oracle to Access software was seen to have pros and cons. Some members felt that Oracle was a more powerful tool, especially when used on web applications. Perhaps an Access version could be used for CD-ROM distribution. This issue should be resolved before further development.

6. Budget and Fundraising

6.1. The 1997 and 1998 budgets for GTOS were reviewed, and found to be inadequate even for the organization of regular meetings to develop the programme. There was a need to invest more

time and resources in order to develop relationships with key donors and interest groups who could support GTOS. It was suggested that UNEP send to the Secretariat a copy of its database of donors.

6.2. More effort was needed by each sponsor to include GTOS proposals in their annual programming meetings with donors and when proposals are requested. Similarly, the scientific members of the GTSC should be more active in seeking funds for GTOS that are compatible with their own research interests.

6.3. It was suggested to identify on-going activities in specific regions or countries, e.g. in Eastern Europe where there are a number of sites and networks which are no longer functioning because of insufficient funds. GTOS could participate in some of these initiatives and help in raising funds. GTOS should also present project proposals to existing programmes in the European Union, in particular the International Cooperation Programme (INCO) and ENRICH (European Network for Research in Global Change). The European Union may support activities for building capacity in developing countries, although the efforts need to be self-sustaining.

Recommendation 4: UNEP should send its database of donors to the GTOS Secretariat, in order to start the process of identifying potential donors for GTOS and preparing a package of proposals.

Recommendation 5: the Sponsors should include GTOS proposals in their annual programming meetings with donors and when proposals are requested.

Recommendation 6: the members of the GTSC should be more active in seeking funds for GTOS that are compatible with their own research interests.

ACTION: Each GTSC member should prepare a task profile of what he/she could contribute to GTOS programme development, and should send to the Secretariat examples of networks, funding sources.

7. G3OS Sponsors Group

7.1. Sophie Boyer King presented the results of the last G3OS Sponsors Group meeting (Paris, France, 5 June 1998). During the meeting, it was noted that both GCOS and GOOS have mechanisms for reporting to the Executive bodies of their host organizations (WMO and IOC respectively). A similar mechanism would be appropriate for GTOS. The Sponsors recommended the FAO representative to GTOS raise this matter at the highest appropriate level in FAO.

7.2. Louise Fresco underlined that FAO is supporting GTOS programmatically and financially. Mr. Fresco noted that for the next biennium, it could be possible to allocate additional resources for GTOS, but it should be linked to specific activities, possibly with on-going FAO initiatives (e.g. those related to the environmental conventions, in particular Biological Diversity and Desertification, and to the follow-up of Agenda 21). Stronger links need to be built with other FAO technical units.

7.3. Progress in establishing an Integrated Global Observation Strategy (IGOS) partnership was reported. This would bring together the representative of CEOS (Committee on Earth

Observation Satellites), G3OS, IGFA (International Group of Funding Agencies) and WCRP (World Climate Research Programme) to provide stronger links between the work of satellite agencies and in situ research organizations.

7.4. Ms. Boyer King mentioned the draft GCOS report to the UNFCCC SBSTA (Subsidiary Body on Scientific and Technical Advice for the United Nations Framework Convention on Climate Change) on the adequacy of the Global Observing Systems. Two main points emerged from the document: the data available is not perfect but can be improved with little expense, and effective sharing of data could bring governments closer to the Convention targets. The Sponsors agreed that this was an important development which showed that the G3OS were being accepted as advisors to the Convention. This could lead to an opportunity for funding through the GEF mechanism, as well as strengthening the dialogue between the G3OS and the Convention's secretariats.

7.5. There was some discussion on the role of the Sponsors in facilitating contacts between the G3OS and their own programmes and activities. UNESCO proposed to be a focal point to establish stronger links with DIVERSITAS.

Recommendation 7: ICSU, as a sponsor of GTOS, should facilitate the cooperation with IGBP to enhance GTOS activities. It was suggested to bring up this point to Will Steffen in July 1998, during his visit to ICSU in Paris.

8. Terrestrial Observations

8.1. Josef Cihlar presented the results of the last GCOS/GTOS TOPC meeting (Corvallis, Oregon). The panel reviewed the status of networks (GT-Net, Glacier, Permafrost, Hydrology) and agreed that it should assist in their establishment through TOPC members' activities and professional contacts. It could assist in the initial network implementation by identifying data sets and opportunities for continuing long-term observations from sunset experimental programmes, establishing linkages with scientific programmes (IGBP, GEWEX,...), collaborating with GOSSP and other panels. The panel also reviewed the demonstration projects and agreed to cooperate with GT-Net in implementing the NPP Project (Net Primary Production) and to continue to promote GTOS and GCOS interests in the GOFCC project (Global Observation of Forest Cover), as well as to oversee its development. The GTSC endorsed the goals for the TOPC activities and the workplan for 1998/99 as developed at the last TOPC meeting.

8.2. There was discussion among the participants about GTOS data sets and variables. Some participants pointed out that GTOS has not yet defined its recommended variables other than those for climate change. Until GTOS extends this process to its other themes, it should take advantage of the work done by the TOPC, because many of the variables that it has chosen can be equally important for other GTOS themes.

8.3. GTOS was asked by GCOS and the Sponsors to take the lead on the TOPC. The GTSC was concerned by the financial implications, which could constrain GTOS from developing other priority panels such as one on data and information management and one on socio-economic aspects. However, the GTSC felt it was important to continue the work of the TOPC and agreed that GTOS should become the primary sponsor of this joint panel. A key implication is the financing of panel meetings, which occur typically once a year and are an essential mechanism for the TOPC to continue the progress made to date.

ACTION: GTOS to take the lead for the Terrestrial Observation Panel for Climate (TOPC), including the organization of future TOPC meetings, the preparation and publication of meeting reports and an improved financial support.

9. Space Observations

9.1. The last Global Observing Systems Space Panel (GOSSP) meeting was held in Paris, France, in May 1997. It had put together a useful profile of what the G3OS bodies required in terms of space observations. Subsequently, there was the feeling that each system should continue its own way in informing space agencies of their requirements. In the meantime, the CEOS-SIT (the Strategic Implementation Team of Committee on Earth Observation Satellites) indicated that it wished to use GOSSP as a major avenue for information and discussion with G3OS. Consequently, the rationale for GOSSP has been recently re-evaluated by GCOS and GOOS, and it is now felt that this panel should be continued. GCOS would continue to be responsible for the panel.

9.2. The GTSC agreed that GOSSP should be continued and endorsed the new terms of reference with some modifications. The GTSC was concerned that a possible new chairman for the panel had been contacted without prior consultation with GTOS and GOOS. The members requested more information on the background and institutional support. The names of alternative candidates were suggested.

ACTIONS:

- Forward the CVs of alternative candidates to the Secretariat and the Chairman of the GTSC.
- Chairman of GTSC to send a letter to the Chairman of the GCOS Joint Scientific and Technical Committee (JSTC), John Towshend, indicating the modifications suggested by the GTSC in the new terms of reference of the Global Observing Systems Space Panel (GOSSP) and suggesting names of alternatives candidates for GOSSP chairmanship.

10. Networks

10.1. GT-Net (Global Terrestrial Observation Network)

10.1.1. The linking of terrestrial networks was seen to be a central activity in the future functioning of GTOS. GTOS could also play a role in encouraging networks that have similar objectives or geographic coverage to merge or to identify ways in which they could be more efficient in taking their observations.

10.1.2. James Gosz presented GT-Net and the demonstration project to be developed by the participating networks. The objective of GT-Net is to better understand global and regional change by linking existing terrestrial observation networks. The key activities will be to define a clear policy on data and information access; to share and exchange environmental data; to develop a set of standards for metadata as well as local/regional/global in situ data sets; and to undertake demonstration projects, the initial one being to estimate primary terrestrial

productivity. Initially, GT-Net will focus on those networks that regularly make in situ terrestrial and freshwater measurements. Over the longer term, it will strive to meet the needs of the other Global Observing Systems on terrestrial issues relating to climate and oceans.

10.1.3. GT-Net will undertake projects which demonstrate the effectiveness of linking existing networks by generating data sets which are useful in studying global change. This will serve as a test bed for collaboration among networks and sites, including data sharing and exchange, and obtaining the experience needed for further development of the global terrestrial network. The first project will concentrate on improving current estimates of global terrestrial primary productivity. It will adopt a hierarchical approach and use models which combine both satellite data and in situ observations. A set of output products, which have Net Primary Production (NPP) as their common foundation, will be produced. The NPP project has two primary goals: to distribute a global standard NPP product to regional networks for evaluation; and to translate this standard product to regionally specific crop, range and forest yield maps for land management applications.

10.1.4. The U.S. Long-Term Ecological Research (LTER) Network Office (NET) will provide scientific and technical support toward the development and implementation of GT-Net. These activities will be under the direction of the NET Associate Directors for Information Management, and Technological Advancement (James Brunt and John Vande Castle). The terms of reference were endorsed by the GTSC.

10.1.5. The GTSC endorsed the development of GT-Net and of demonstration projects, including the first one on Net Primary Production. The following recommendations were made:

Recommendation 8: GT-Net should not be limited to those networks that attended the meeting in Guernica (Experts meeting on Ecological Networks, 17-20 June 1997, Guernica, Spain). Additional other networks should be encouraged to participate in order to have a wider representation of terrestrial issues (e.g. forests). The networks should be invited according to specific criteria defined by GTOS.

Recommendation 9: a brochure should be developed explaining the demonstration project on NPP as well as the valued added it will bring to the sites/networks participating in GT-Net.

10.1.6. The Committee recognized that, with the establishment of other GTOS Networks, the term "GT-Net" was in danger of being misunderstood. It was agreed that GT-Net would refer to a system of networks, each representing a specific thematic orientation for a region of the globe or a regional effort among the nations of that region (see diagram below). Each regional network represents an organized effort, either for a particular theme or habitat type (e.g., glaciers, forests, permafrost) or among adjacent countries (e.g., Poland, Hungary). These organized efforts are extremely important to the functioning of GTOS because they represent collaboration and integration efforts that are maintained outside of the GTOS activity and its limited resources. The networks supply not only site-specific information of value to GTOS but also syntheses of information at regional levels.

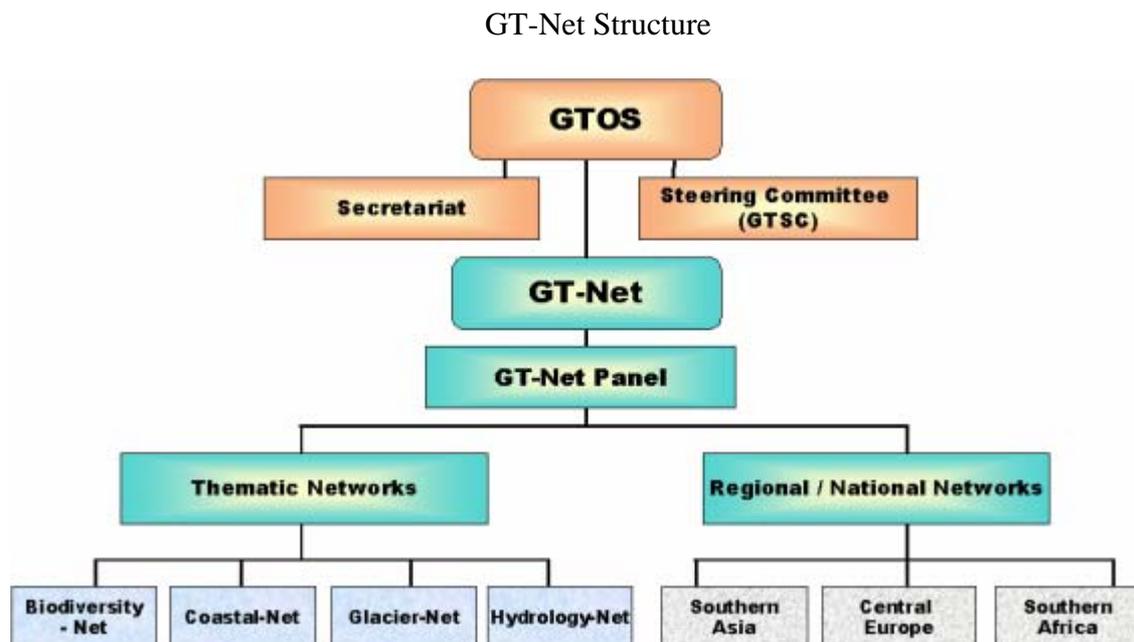
10.1.7. It is important to recognize the distinction between the two types of regional activities. The thematic networks can provide specific types of information, often a result of standard measurements unique to the theme (e.g., permafrost). The national networks are comprised of sites representing many different types of habitats (e.g., forests, lakes, coastal areas) and may have core topics (e.g., biodiversity, productivity) that can provide a different type of synthesis.

There may, and perhaps, should be interactions between the two regional network types as a particular site can be represented in a certain thematic effort as well as an integrated national effort.

10.1.8. Each of the regional networks represented (see diagram) in GT-Net will have a person designated by that network who will serve on a GTOS Network Panel (GT-Net Panel). In this way, each type of network will have a voice in determining how GTOS will operate and the directions in which it will move. The various thematic and regional national networks will host their own meetings and determine their own governance rules.

10.1.9. The GT-Net Panel will provide the GTSC with scientific and technical guidance on all matters relating to the implementation and operation of GTOS observation programmes, including practical advice on means to facilitate on-going operations. The GT-Net Panel will be composed mainly (about 75%) of scientists designated by the regional networks participating in GTOS, and members of the GTSC (about 20%), plus a few (5%) independent scientists of distinction who may have no direct role in GTOS and its network.

ACTION: Chairman of the GTSC to send a letter to the networks that attended the meeting in Guernica informing them of the changes in the structure of GT-Net.



10.2. Network of Glacier Sites (NGS)

10.2.1. This proposed network would be based on the existing World Glacier Monitoring Service (WGMS) network, which coordinates the annual monitoring of 60 glaciers globally representing tiers 2 and 3 of the GHOST concept. The gaps identified so far concern tier 4 and 5, as well as the lack of sites in New Zealand. Among the actions undertaken for the establishment of a Glacier Network, the TOPC - the lead panel in the establishment of this network - developed a strategy document, guidelines for sites participation and a letter to national contacts. WGMS has agreed to work together with GCOS to form a climate change network.

10.2.2. It was noted that the network's relevance lies not only in its contribution to understanding climate change, but also in the information it can provide at national and sub-regional levels on factors influencing water availability and hence production in semi-arid to arid mountain areas and down stream hydrology in arid ecosystems. This is an important additional reason for accepting networks as part of GTOS, and in particular the Glacier Network.

10.2.3. The GTSC endorsed the action taken so far and the progress achieved, adopted the Glacier Network as a GTOS Network and approved proceeding with its establishment. It was suggested that the Glacier Network should have elements indicating the support to science and benefits to developing countries.

10.3. Permafrost Network

10.3.1. Contacts had been made with Jerry Brown of the International Permafrost Association (IPA) to determine interest in working together on the establishment of a Permafrost Network. The Circumpolar Active Layer Monitoring (CALM) network - currently consisting of 59 sites in the Northern Hemisphere - could form the basis of this network. The next steps are to develop foundation documents (strategy paper, guidelines for participation, letter of invitation to sites/networks), to identify gaps in coverage and to develop a strategy to fill these (in collaboration with IPA). IPA has agreed in principle to work together to form a climate change network, but a letter should be sent to its Director to formally establish it.

10.3.2. The GTSC endorsed the action taken so far and approved in principle the formation a Permafrost Network. The participants considered it important that the Arctic Monitoring and Assessment Programme (AMAP) be contacted regarding participation in the proposed Permafrost Network.

Recommendation 10: closer collaboration between the Arctic Monitoring and Assessment Programme (AMAP) and International Permafrost Association (IPA) should be considered and encouraged.

10.3.3. The participants underlined the need to find ways of bringing similar networks to work more closely together under the GTOS umbrella.

10.4. Hydrology Network

10.4.1. At its last meeting, the TOPC made the following recommendations for action that should be taken prior to the establishment of a Hydrology Network:

- assess the availability of historic international stream discharge records to the TOPC user community;
- in collaboration with the Global Runoff Data Centre (GRDC), investigate the feasibility of routinely providing, on behalf of GTOS, certain specific discharge observations at global or continental scales in the future;
- assess the availability of Flow Regimes from International Experiments and Network Data (FRIEND) data sets to the G3OS community;

- assess linkages of GCOS and GTOS to the World Hydrological Cycle Observing System (WHYCOS) Network and the availability of WHYCOS data for climate purposes;
- develop or encourage the development of a hydrological network of pristine discharge stations for climate purposes.

10.4.2. The GTSC recognized that a hydrological network is critical for many of the GTOS issues. It endorsed the proposed course of action and agreed that efforts should continue in assessing feasibility of establishing this network.

11. GTOS Programme Development

11.1. Regional component

11.1.1. Jeff Tschirley presented initiatives that would take place in Eastern Europe and in the Southern African region and would contribute to the development of regional components for GTOS. The purpose is to develop national and regional data and information that can be useful in developing policies and programmes relating to international conventions such as Biological Diversity, Climate Change and Desertification. Efforts would be made to strengthen national technical capacities for environmental monitoring, participation in international conventions, and providing better coordination of efforts at a regional level.

11.1.2. There was some concern among the participants about the focus on data and information management and lack of user-orientation. It was also noted that the broad objectives may make it difficult to achieve with the time and resources available. The group underlined the need to focus on short-term products that can be of interest to politicians and their senior advisors and bring benefit to countries and to GTOS. The Global Observing Systems have a role to play in developing countries, helping them in capacity building and getting them involved in the G3OS. Training initiatives for these countries should also be considered.

11.1.3. There was discussion on the question of whether GTOS should have regional centres and national committees. The GTSC stressed the need to build interactions with national governments. National GTOS committees could provide a link between national institutions (both governments and NGOs) and the regional level. To obtain active national support - including funding - of regional and global activities, governments should get ownership of national contributions to GTOS in the context of perceived national and regional socio-economic and science priorities related to GTOS. The members of such national committees should be on the level of political decision-makers with access to technical and/or financial resources.

Recommendation 11: GTOS should further develop the concept of regional centres built on existing regional infrastructure. The regional offices of e.g. FAO, UNEP, UNESCO, WMO and collaborating centres of regional importance such as CERN could serve as hosts. GTOS requires a regional representation to raise the profile and visibility of anticipated deliverables and benefits. It was suggested that efforts be made to establish a regional GTOS for Southern Asia.

ACTION: The GTOS Secretariat to send the GTSC and Co-sponsors revised versions of the Eastern Europe and Southern Africa projects, and to keep them informed on the further developments of these initiatives.

11.2. Southern Africa Initiative

11.2.1. The Southern Africa Initiative will serve to develop an integrated approach to agriculture and rural development, with respect to data management on terrestrial ecosystems interactions. The major purpose is to integrate a global dimension within the national and regional context. The Southern Africa Initiative will conduct preparation studies in four countries (presumably South Africa, Zimbabwe, Kenya and Uganda) to assess the availability, quality and institutional capacities to collect and use data and information on terrestrial and freshwater ecosystems. The initiative will establish linkages with existing regional programs and institutions, such as the Southern African Development Community (SADC), and national agencies. A proposal has been submitted to the government of Finland to support the initiative.

11.2.2. The participants pointed out that it is important to analyse information management capacity, existing networks, issue analysis, gaps in data and information before organizing a regional workshop. The ILTER is working in South Africa to develop a programme, and UNEP has been promoting an environmental information network in the region: both of these and other relevant initiatives could be linked to the project. There is also need to inventory sites, identify measurements currently being taken, compare against TOPC variables, check against awareness of global issues among countries.

11.2.3. The Committee noted that GTOS should consider how coherent is the policy process in the region, in particular the extent to which information filters through to policy and the environment in which the scientific community works. The inter-country scientific linkages and the capacity of networking should also be observed. GTOS should address the political implications of environmental issues and should assist in regionalizing or globalizing the perspective of African scientists.

11.3. Eastern Europe Initiative

11.3.1. This component will be developed in collaboration with the NoLimits project (presented in the next paragraph) with the support of the FAO sub-regional office in Budapest, where some funds are available. The Eastern Europe Initiative will develop a user needs assessment and recommendations for information collection and dissemination, and organize a workshop gathering technical and policy partners of the region involved in terrestrial ecosystems.

11.4. NoLimits Project

11.4.1. Terry Parr informed the participants on a project on Networking of Long-term Integrated Monitoring in Terrestrial Systems (NoLimits), developed in January 1997 which was endorsed by GTOS and accepted by the European Union in July 1997. The first board meeting of this project was held in Cumbria, UK, 4-5 March 1998. The mission of NoLimits is to create a European network of sites for long-term integrated monitoring which addresses local, national, European and global scale requirements for policy relevant data and information, and provides a focus on environmental change and its consequences. The two main objectives are to hold a series of workshops and working group meetings in relation to the networking of long-term

integrated monitoring sites; and to establish a self-sustaining Information Exchange Network on the Internet to provide a forum for the exchange of information between sites and users of data and information in real-time.

11.4.2. The user communities are represented by GTOS, the European Environment Agency (EEA) and the Centre for Earth Observation (CEO). The data and information from such a network could be used for instance to inform and enhance the interpretation of environmental information and indicators collated by EEA and presented in its routine state of the Environment Reports (e.g. the Dobris and Dobris II reports). It could also provide a European focus for collaboration with GTOS and other global monitoring programmes.

11.4.3. The Dobris reports are examples of how European monitoring information is used in influencing policy. Dobris II is especially emphasizing performance indicators. UNEP pointed out a similar potential relationship between GTOS and its GEO report which operates at regional and global level to identify issues and suggest priorities for action.

11.4.4. European Environment Agency (EEA) recently sponsored a meeting called Bridging the gap, to address the issues of monitoring, not always measuring the right variables, lack of relevant information. There was a need for more coherence in environmental monitoring. This confirms earlier suggestion by GTSC to promote collaboration of networks with similar objectives. How to have a core set of measures plus a “system” set of variables to look at interactions, dynamics. The EU fifth framework (1999) makes specific reference to global observing systems but will require demonstrating benefits and value to human beings.

11.4.5. Mr. Parr noted that the participation of the GTSC in the project task force would be beneficial, in particular to assist in defining user needs and requirements and linking monitoring to off-site effects and outputs. The collaboration with GTOS could take place initially in developing a project in Eastern Europe, although it is important to focus also on Western Europe and to learn from its experience, e.g. how to integrate research into a political, social and economic context.

11.4.6. It was agreed that there is a need to clarify the link between GTOS and the NoLimits project. A small workshop should be organized between GTOS, Nolimits and other partners such as the Man and Biosphere Programme (MAB).

Recommendation 12: a workshop should be organized between GTOS, NoLimits and other partners (e.g. Man and Biosphere Programme) to clarify the links and the ways and means for collaboration in Eastern and Western Europe.

12. Functioning of GTOS

12.1. Introduction

12.1.1. Jeff Tschirley presented some issues to be discussed with the Committee in order to improve the functioning of GTOS, in particular regarding the Steering Committee's meetings and composition, the use of the Roster of Experts and the exchange of information among GTOS members.

12.2. Steering Committee

12.2.1. It was agreed that on certain matters, and when necessary due to budgetary and time constraints, the Chair shall convene an Executive Session of the Steering Committee composed of a subset of SC members to act on behalf of the full Steering Committee. The full SC will be provided with recommendations and minutes from the Executive SC discussion sessions. E-mail or telephone conferences should also be considered for specific issues. It was agreed that the full SC will continue to meet on a time-to-time basis, at least annually, depending on the status of the program and available funds. The Committee agreed that a rotational plan should be implemented to ensure continuity and allow the introduction of members with new ideas. The present membership of the GTSC would be reviewed by the Chairman prior to the next meeting.

ACTION: Chairman to review the present membership of the GTSC and to implement a rotational plan.

12.3. Roster of Experts

12.3.1. The Committee observed that the Roster of Experts is a valuable resource that should be used more. Members of the joint panels with GCOS and GOOS should be included in it. It is important to keep the Roster regularly informed on GTOS activities.

ACTION: Include members of the joint GCOS and GOOS panels in the GTOS Roster of Experts and keep the Roster regularly informed on GTOS activities.

12.4. Information and Communication

12.4.1. The Secretariat expressed concern over the limited feedback from GTSC members on information and documents sent through the list server. It was suggested to target the information and to direct it to specific members. Suggestions on the kinds of comments expected from the members might encourage them to respond more frequently.

12.4.2. The Chair persons of the joint panels should be included in the mailing list to ensure they receive regularly information and documents on GTOS.

12.4.3. The agenda for future GTSC meetings should be more descriptive on the issues that will be discussed. It could also have a "high-level" section so that key people could attend a part of the meeting (e.g. donors).

13. Collaboration with Other Organizations

13.1. Global Ocean Observing System (GOOS)

13.1.1. Colin Summerhayes made a presentation on the Global Ocean Observing System and in particular on the GOOS Coastal Module. The GOOS mission is to use long term, multi-disciplinary operational ocean monitoring to assess present and forecast future states of seas and oceans in support of their sustainable use; to contribute to the prediction of climate change and variability; and to meet the needs of a wide range of users. He underlined that GOOS is products and services oriented. It has developed four design modules for monitoring, assessment and prediction: climate, coastal, living marine resources, and health of the ocean.

13.1.2. The Coastal Module of GOOS (C-GOOS) aims to promote the design and implementation of end-to-end systems that are responsive to user needs in the Coastal Zone. It concentrates on the effects of human activities and global climate change on ecosystem services and human health in coastal areas, where over 50% of the human population are expected to live by the turn of the century, where living resources are most concentrated, and where inputs from terrestrial, atmospheric and oceanic sources converge. The next meeting of C-GOOS will be held late October 1998 in Brazil. A letter of invitation will be sent to GTOS. It was noted that the establishment of a Joint GTOS/GOOS Panel on Coastal Zone would be useful in developing the terrestrial issues related to coastal areas and to help in defining the social benefits.

13.1.3. Mr. Summerhayes mentioned the support provided by the Intergovernmental Oceanographic Commission (IOC) to the GOOS Project Office, both in terms of human (four full-time persons) and financial (ca US\$ 300.000) resources. GOOS reports directly to the IOC assembly, which then reports to UNESCO council. This intergovernmental mechanism is very useful because it serves to interact with governments and to put pressure on them.

13.1.4. GOOS encourages the formation of national GOOS committees (where representatives of governments are present) and of regional initiatives such as NEAR-GOOS and Euro-GOOS.

13.1.5. The participants were informed that at the National Ocean Conference held in Monterey, California on 11 -12 June 1998, it was announced that an additional US\$12 million would be invested through 2002 to place monitoring buoys in the North Atlantic and North Pacific to measure critical ocean data. GOOS was specifically mentioned.

13.2. Global Climate Observing System (GCOS)

13.2.1. Josef Cihlar made a brief presentation on behalf of the Global Climate Observing System, which was not represented at the meeting. GCOS works to ensure that the required observations from atmosphere, ocean, and land surface that relate to the Climate Agenda are addressed through partnerships with research and observing programmes. The final goal should be the delivery of products to the various user communities. The GCOS plans have been published and a number of networks have been established. These include atmospheric components obtained through partnerships with the World Weather Watch and the Global Atmospheric Watch, oceanic components through partnerships with a number of implementation groups and GOOS, and terrestrial components, similarly with a number of collaborators including GTOS.

13.2.2. The currently implemented GCOS Upper-Air Network and the established GCOS Surface Network have received the endorsement of many WMO Members, on the progress of GCOS. The GCOS panels are continuing to develop a strategy on how to encourage additional observations and how to establish new networks, e.g., supporting observations of atmospheric constituents or precipitation measurements.

13.2.3. Mr. Cihlar underlined that the GCOS/GTOS Terrestrial Observation Panel for Climate (TOPC) has identified the set of terrestrial observations required to detect, predict and assess impacts of climate change. Two types of initiatives are planned to acquire data for the required variables-establishment or consolidation of terrestrial networks, and identification and access to existing data sets. With regard to the latter, Panel members have identified over 150 possibilities and are assembling comments on each, describing such things as existing metadata, quality assessments, uses, etc. The Panel has met in May (TOPC IV) to review the data sets and plan next steps, and seeks guidance from JDIMP, specifically with regard to format, standards and

metadata requirements. A further question concerns the process or procedures to be followed once a data set has been identified as one, which meets the requirements of the observing systems. At the TOPC IV meeting, the Panel made significant progress on various issues and developed numerous recommendations which are described in other parts of this report.

13.2.4. The Thirds Conference of the Parties of the UN Framework Convention on Climate Change (UN/FCCC) addressed the need for systematic observations as stated in the appropriate articles of the Climate Convention. In particular, the UN/FCCC requested a report on the status of observing networks to support the needs of the Convention. GCOS has agreed to take a lead role in preparing a document for the Subsidiary Body for Scientific and Technological Advice (SBSTA) to address this issue. This document will be submitted to COP-4 in Buenos-Aires in November 1998.

13.3. Biodiversity Conservation Information System (BCIS)

13.3.1. John Busby presented the Biodiversity Conservation Information System, which brings together twelve international organizations and networks concerned with the conservation of biodiversity. Its goal is to support environmentally sound decision-making and actions affecting the status of biodiversity and landscapes at local, national, regional and global levels through cooperative provision of data, information, advice and related services.

13.3.2. BCIS is an open partnership that builds on existing resources and expertise. It recognizes the concerns of those who contribute data and information and protects their rights and interests through a "data custodian" model. BCIS complements other biodiversity information initiatives and supports biodiversity-related conventions such as CITES, RAMSAR and World Heritage Convention. It will assist development of environmental assessments by UNEP and the World Resources Institute.

13.3.3. It was mentioned that WCMC (World Conservation Monitoring Centre) has undertaken a feasibility study with the secretariats of five conventions (Biological Diversity, RAMSAR, World Heritage, CITES, Migratory Species) to harmonize their information and data management needs both from the point of view of the conventions and the countries, and to identify commonalities. Ian Crain (Orbis Institute) acted as lead consultant on this and a draft report is now complete.

ACTION: Gwynneth Martin/John Busby to request WCMC to make the draft report on the information needs of the conventions available to the GTOS Secretariat.

13.3.4. John Busby will visit UNESCO (Diversitas and MAB) to assess how BCIS can start a biodiversity module with GTOS. Being more product and user oriented, a collaboration with BCIS would be beneficial for GTOS.

13.4. International Long Term Ecological Research Programme (ILTER)

13.4.1. James Gosz presented the ILTER programme. Its objectives are to: promote and enhance the understanding of long-term ecological phenomena across national and regional boundaries; promote comparative analysis and synthesis across sites; facilitate interaction among participating scientists across disciplines and sites; promote comparability of observations and experiments, integration of research and monitoring, and encourage data exchange; enhance training and education in comparative long-term ecological research and its relevant

technologies; contribute to the scientific basis for ecosystem management; facilitate international collaboration among comprehensive, site-based, long-term, ecological research programmes; and facilitate the development of such programs in regions where they currently do not exist.

13.4.2. ILTER aims to involve within-country scientists in the development of LTER and site selection. Fifteen countries are now members of the programme.

13.4.3. The GTSC agreed that national ILTERs should be invited to become members of GT-Net. It was observed that although GTOS and ILTER are both interested in long term research and monitoring, GTOS focuses more on generating global/regional data sets and analysis. GTOS is also more than "ecological monitoring" because it includes also social dimensions.

Recommendation 13: the differences and similarities between GTOS and ILTER should be clearly defined. It is important to clarify the interactions also between GTOS and the other participating networks, explaining what are their respective responsibilities and how they complement each other.

13.5. International Lake Environment Committee (ILEC)

13.5.1. Christopher Magadza presented ILEC, which has a large inventory of data describing the conditions of lakes throughout the world. It aims to promote environmentally sound management of natural and man-made lakes and their environments consistent with sustainable development policies, by promoting international research and by facilitating the exchange of findings and knowledge among the experts around the world. ILEC organizes training seminars on regional developing and lake environment conservation in developing countries and prepare guidelines for lake environment management. It also supports the UNEP International Environmental Technology Centre.

ACTION: GTOS Secretariat to invite ILEC to link its database to TEMS.

13.6. Texas A&M Impact Assessment Group

13.6.1. Neville Clarke, Coordinator of the Texas A&M University Impact Assessment Group (IAG), presented the objectives of the IAG. It was established in 1996 to bring together a group of related research and development activities that assess the impact of policy options and new technology for agriculture and natural resources. A team of experienced senior faculty are developing interactive linkages between economic, environmental, and demographic models to provide an integrated analysis capability. The method includes extensive georeferenced analysis of related basic and foundation data and a spatial characterization tool that provides the capability to link both models and spatially referenced data for integrated analysis at multiple levels of scale.

13.6.2. Texas A&M is extending and expanding these methods for the United States Agency for International Development (USAID) to provide the ability to conduct impact assessment of new technology and policy options in developing countries. Current research in Kenya and Mali will demonstrate the utility of these methods at local and national levels and contribute to USAID's ability to meet its institutional requirements for impact assessment. This research will be extended to the development of regional and global levels of scale and to other continents.

13.6.3. The GTSC recognized the potential mutual interests of GTOS, USAID and Texas A&M, in a collaboration wherein the modelling and impact assessment methods of the IAG could

support the use of data collected by GTOS at both national and global levels. At the same time this would offer Texas A&M the opportunity to create linkages with policy makers in developing countries to use impact assessment methods in evaluating policy options related to agriculture and natural resources. The GTOS demonstration project on Net Primary Productivity may offer significant opportunity for mutual benefit between GTOS and USAID by providing new extensive data on land use and degradation and the possibility of using Texas A&M models in decision-support.

13.6.4. Mr. Clarke mentioned that Texas A&M could consider seconding staff to the GTOS Secretariat under the FAO Academic Exchange Programme. The GTSC agreed that the SC Chairman and the Secretariat should continue discussions with Texas A&M representatives to further explore mutual interests and to come to specific recommendations.

13.7. Global Runoff Data Centre (GRDC)

13.7.1. Wolfgang Grabs presented the Global Runoff Data Centre (GRDC), which operates under the auspices of WMO and is core funded by the government of Germany in the Federal Institute of Hydrology, Koblenz, Germany. The Centre's principal objectives are to collect and archive discharge data from rivers on a global scale and to make them available to the global scientific community. Dissemination of data is regulated by an explicit data policy based on a free and open access to data for identified users. Principal users of the database are climate modellers, hydrologists and water-related programmes of UN agencies such as UNESCO and UNEP.

13.7.2. Though GRDC by itself is not a network, it routinely collects data from now over 3,600 gauging stations worldwide (mean daily and monthly discharge data). Close linkages exist inter alia with regional components of UNESCO's project Flow Regimes of International and Experimental Network Data (FRIEND), the Global Environment Monitoring System - Water (GEMS/Water) of UNEP and WHO, World Hydrological Cycle Observing System (WMO), the Global Precipitation Climatology Centre (GPCC) of WMO, GCOS, WCRP. In this respect it is noteworthy that GRDC is listed as GEWEX project. GRDC is actively involved in regional and global levels.

13.7.3. Mr. Grabs observed that local hydrological observations, which are the hydrological response from most of the largest drainage basins, and concurrent global coverage offer cross-cutting opportunities for GTOS through tier levels 2-4. An obvious opportunity is the global observing network of GRDC consisting of 174 stations from gauging stations close to the mouth of rivers discharging into the world oceans. Issues such as land-based sources of pollution, coastal pollution, influence of freshwater fluxes on the oceanic thermo-haline circulation are in need for surface water information.

The GTSC made the following recommendation:

Recommendation 14: a GTOS Freshwater Panel should be established in order to explore the potential of hydrological information for GTOS, including the role of GRDC, and to define feasible objectives and deliverables. Such a panel could meet on an ad-hoc basis.

13.8. International Boreal Forest Research Association (IBFRA)

13.8.1. Anatoly Shvidenko briefly presented IBFRA, which consists of six boreal zone countries: Canada, Finland, Norway, Russia, Sweden and the United States. IBFRA was formed in 1991 to "promote and coordinate research to increase the understanding of the role of the circumpolar

boreal forest in the global environment and the influence of resource management and environmental change on that role". The three major areas of interest within IBFRA are the effects of global climate change, monitoring and classification of boreal forests, and biodiversity and forest management.

13.8.2. Mr. Shvidenko underlined that IBFRA could be considered by GTOS for two main reasons: 1) it is an international Association collected comprehensive data on boreal terrestrial biota; and 2) IBFRA is starting to develop a new Integrated Information System which could be extremely valuable for future GTOS activities.

13.8.3. The GTSC noted with interest the work done by IBFRA but concluded that it should not be included in the GT-Net at the present time, because it focuses on data collection rather than on already established data sets.

13.9. Global Observation of Forest Cover (GOFC)

13.9.1. As a contribution to the implementation of an ongoing forest monitoring system, GOFC will produce high quality, multi-resolution, multi-temporal global data sets and derived products of forest cover and attributes, with particular attention to areas of rapid change and fragmentation. The project aims to satisfy multiple user communities in producing a variety of products at different scales, covering the range of forest issues.

13.9.2. The GTSC approved the progress achieved so far and endorsed GOFC as a GTOS/CEOS project. The GTSC agreed that GOFC should be linked to the NPP project and that the TOPC should be responsible for GOFC oversight on behalf of GTOS.

14. Working Groups Sessions

14.1. Introduction

14.1.1. The afternoon of Thursday 18 June was dedicated to four working groups sessions: (1) non-climatic variables; (2) funding strategy; (3) GTOS governance; (4) data and information management. The results of the working group sessions are summarized below (see full report of each group in Annex III).

14.2. Working Group on Non-climatic Variables

14.2.1. Considering the current GTOS financial situation, the group proposed to establish virtual panels operating via fax and email to make an initial assessment of user needs and of existing sites or on-going activities that could contribute to meeting these needs. It recommended that priority should be given to the establishment of panels for land quality, loss of biodiversity, and key socio-economic issues. The first tasks would be to prepare draft terms of reference and lists of potential members.

14.2.2. The group made the following recommendations:

Recommendation 15: to establish a joint GOOS/GTOS coastal panel

Recommendation 16: to reassess the needs for a virtual panel on water resources before the next Steering Committee meeting and to review the major international initiatives dealing with water resources.

14.3. Working Group on GTOS Funding Strategy

14.3.1. The break-out group considered the strategy and implementation plans for funding of GTOS. It suggests a close relationship must be achieved between program, implementation, and funding plans. The group first considered the operational aspects of GTOS and then placed funding needs of the secretariat in the context of the total function of the system.

14.3.2. The immediate actions recommended by the group are the following:

- Incorporate the elements of this paper into the revised Operational Plan for GTOS, as part of the results of this meeting of the GTOS Steering Committee.
- Carefully ensure that the programme, implementation, and funding plans are fully harmonized.
- Engage co-sponsors at an early time to secure start up funds, seeking their support in acquiring funds from donors.
- Develop a list of potential donors and their interests and mandates and a plan of engagement for donors of highest priority — relate outcomes to areas of donor interest — an action plan for donor engagement.
- Develop invitations to donors and users for participating in the next meeting of the GTOS Steering Committee or its Executive Committee.
- Develop a clear, precise, brief prospectus on GTOS that can be used for initial contacts with potential donors and users – identifying fundable modules in the context of the total strategy.
- Develop a plan for engagement of foundations, understanding their mandates and interests and tailoring meetings to gain their interest and support. Specifically develop foundation approaches to seek one-time (start-up) support for GTOS.

14.4. Working Group on GTOS Governance

14.4.1. The group reviewed the GTOS structure and recommended to reduce the Steering Committee in size to 12-15 members after the initial 3 years (i.e. 1999), and to implement a rotational plan whereby 3-4 members will be replaced each year thereafter. New members will be identified by both the current Steering Committee and Co-sponsors and following Co-sponsors approval, they will be invited by the Chairman of the Steering Committee on behalf of the Co-sponsors. It was agreed to disband the working groups established at the first Steering Committee meeting in December 1996. New working groups can be created to consider, develop or evaluate specific topics and issues thought relevant to the GTOS programme and its operations.

14.4.2. The group recommended to establish a GTOS Network Panel (GT-Net Panel), in order to allow each type of network to have a voice in determining how GTOS will operate and directions in which it will move. This panel will be in effect the GTOS Scientific and Technical Committee proposed at the Fontainebleau meeting in 1992 and by the ad hoc Scientific and Technical Planning Group for GTOS. A Network Panel is very important if GTOS is to succeed because it is vital that active terrestrial/aquatic scientists at the forefront of their fields should keep GTOS abreast of current scientific findings and applications. The reports of the GT-Net Panel will come

before the GTOS Steering Committee which will consider them in light of current political, economic, social and development needs thus giving GTOS the requisite geopolitical and scientific balance.

Recommendation 17: to establish a GTOS Network Panel (GT-Net Panel) composed mainly of scientists designated by the networks participating in GTOS, as well as selected members of the Steering Committee, plus a few independent scientists of distinction.

14.5. Working Group on Data and Information Management

14.5.1. The Working Group was directed to consider two specific issues - development and management of GTOS products, and the role and development of GTOS Data and Analysis Centres.

14.5.2. GTOS Products: derived datasets and any further products developed from them may certainly be GTOS products. The question of whether or not any primary datasets would be termed "GTOS products" gave rise to considerable discussion. GTOS is envisaged as a facilitator, not a collector or owner of data. A mechanism is needed to ensure that a GTOS designation is made (where appropriate) without usurping ownership in any way.

14.5.3. GTOS Data Centres: several different types of Data Centres will be needed: local, national and regional centres to manage datasets; centres with particular analysis expertise and capabilities; archive facilities; and a central coordination point. Since analysis is only one of the functions required, the term GTOS Data and Analysis Centres was dropped in favour of simply GTOS Data Centres. These Centres would be primarily existing institutions with which formal agreements had been made to undertake one or more of the above functions on behalf of GTOS.

14.5.4. A number of actions were recommended by this group, such as: develop criteria for datasets to be designated as GTOS products; develop criteria for management of GTOS products; establish GTOS Data Centres; develop archive procedures; establish GTOS archive.

15. Date and Venue of Next Meeting

15.1. The Committee was informed that the next meeting will probably be financially supported by ORSTOM and would be held in Montpellier, France, in March 1999.

ACTION: The Secretariat to inform the GTSC and Co-sponsors on the precise venue and dates of the Third GTOS Steering Committee meeting and to organize the meeting.

16. Closure of the Meeting

16.1. The Chairman thanked Antonio Cendrero for his dedication to GTOS and for his successful efforts in obtaining support from the Government of Cantabria for the meeting. He hoped that Mr. Cendrero's need to reduce, for personal reasons, his involvement in GTOS would be temporary.

16.2. The Chairman thanked all the participants for their participation in the meeting and for the inputs and suggestions provided and wished them a safe journey home.

16.3. The meeting was closed on Friday 19 June 1998 at 12:00.

Annex I: List of Participants

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Annex II: Annotated Agenda

Time	Agenda Item	Lead Discussant
MONDAY, 15 JUNE		
09.30-10.00	Opening of the meeting <ul style="list-style-type: none"> • Welcome and introduction • Adoption of the Agenda 	Gosz
10.00 - 10.30	Statement from the Chairman	Gosz
10.30 - 10.45	Coffee break	
10.45 - 11.45	Update on GTOS activities <ul style="list-style-type: none"> • Programme support, proposals, activities 	Tschirley
12.30 -13.00	GTOS Implementation plan <ul style="list-style-type: none"> • Presentation of the plan 	Gwynne
13.00 - 14.30	Lunch	
14.30 - 15.30	GTOS Implementation Plan <ul style="list-style-type: none"> • Discussion (chapters 1 - 4) 	
15.30 - 15.45	Coffee break	
15.45 - 17.30	GTOS Implementation plan <ul style="list-style-type: none"> • Discussion (chapters 5 - 9) 	
TUESDAY, 16 JUNE		
09:00 – 9:30	Budget and fund raising	
09.30 - 10.30	Data and information management <ul style="list-style-type: none"> • Results of J-DIMP meeting • GTOS data and information management plan • G3OS Data and Information Center 	Martin
10.30 - 10.45	Coffee break	
10.45 - 12.00	Data and information management (cont.) <ul style="list-style-type: none"> • TEMS followup, including presentation, demonstration 	
12.00 - 13.00	G3OS sponsors group	Boyer-King

	<ul style="list-style-type: none"> • Results of recent meeting 	
13.00 - 14.30	Lunch	
14:30 – 15:30	Terrestrial observations <ul style="list-style-type: none"> • Results of TOPC meeting • Non-climate variables (land, freshwater, biodiversity) 	Cihlar
15.30 - 15.45	Coffee break	
15.45 - 17.00	Networks <ul style="list-style-type: none"> • GT-Net: network panel, meta data, pilot project • TOR for LTER Network Office 	Gosz
WEDNESDAY, 17 JUNE		
9:00 – 10:30	Networks (cont.) <ul style="list-style-type: none"> • Joint networks - hydrology, glaciers • NoLimits project • Circumpolar Active Layer Monitoring Network 	Cihlar Parr
10.30 - 10.45	Coffee break	
10.45 - 13.00	Further GTOS programme development <ul style="list-style-type: none"> • Regional GTOS focus (e.g. Africa, Europe) • Role of sponsors, GTSC members 	Tschirley
13.00 - 14.30	Lunch	
14.30 - 15.30	Collaboration with other organizations and programmes <ul style="list-style-type: none"> • Global Ocean Observing System, Coastal zones • Global Climate Observing System 	Summerhayes Cihlar
15.30 - 15.45	Coffee break	
15.45 - 17.00	Collaboration with other organizations (cont.) <ul style="list-style-type: none"> • IGBP (GCTE, LUCC, LOICZ) • ILTER • IPA (International Permafrost Association) • ILEC (International Lake Environment Committee) • IBFRA • Biodiversity Conservation Information System • Texas A & M / USAID 	Gosz Magadza Svhiddenko Busby Clarke

THURSDAY, 18 JUNE		
09.00 - 10.30	Space observations <ul style="list-style-type: none"> • Results of GOSSP meeting • New GOSSP terms of reference, Chairman • Collaboration with CEOS 	Cilhar
10.30 - 10.45	Coffee break	
10.45 - 11.15	Preparation of working groups sessions (in the afternoon)	Gosz
11.15 - 13.00	Functioning of GTOS <ul style="list-style-type: none"> • Structure, meetings • Information and communication • Web-site • Publications (guidelines) 	Gosz
13.00 - 14.30	Lunch	
14.30 - 17.00	Working Group sessions	
FRIDAY, 19 JUNE		
09.00 - 10.30	Working Groups <ul style="list-style-type: none"> • Results of sessions • Terms of reference, role, future development 	Gosz
10.30 - 10.45	Coffee break	
10.45 - 11.30	Other Issues	Gosz
11.30 - 11.45	Date and venue of the next meeting	Gosz
11.45 - 12.00	Closure of the meeting	Gosz

1) Working Group on Non-climatic Variables

Approaches and priorities

Non-climatic variables were considered as thematic groups with allowance made for the fact that the same basic observations can be required by several groups. The groups are: changes in land quality; availability of freshwater; loss of biodiversity; pollution and toxicity; socio-economic drivers for terrestrial ecosystem change; land - coastal zone interactions. For each thematic group preliminary attempts were made to identify the major issues and the key variables required to address them. Selection criteria included: global importance (in scale or in scope); good probability of early GTOS product delivery ; the ability to build on existing activities and structures; the entry capability of developing countries.

Two operational models were considered. First, the TOPC model of a dozen or so permanent members plus co-opted experts that meet annually to reach consensus on variables and operational procedures. It has been an effective but relatively expensive model (c.US\$50k/yr). The sub-group considered it essential for GTOS to start work on the other global change themes in its mandate, but accepted that in the current financial situation it was not feasible to follow only the TOPC model. It therefore proposed a second model based at least initially on virtual panels operating via fax and email to establish terms of reference, and make an initial assessment of user needs and of existing sites or on-going activities that could contribute to meeting these needs.

The virtual panels would have many activities to build on. A land panel may be able to focus on quality aspects per se in that the TOPC and the GOS space panel should be considering most land cover and land use aspects as well as a number of in situ variables. Pollution and toxicity poses a major challenge because of the very wide range of issues involved. Initially the theme could be taken as part of other themes e.g. with acid precipitation, pesticide accumulation in the environment being covered under land quality or biodiversity.

Recommendations

1. In the light of the on-going GOOS action re the coastal zone and the major role that water and air borne terrestrial inputs of sediments, nutrients, pesticides and other chemicals play in the health and productivity of the coastal zone, a joint TOPC type coastal zone panel should be established by GOOS and GTOS.
2. Virtual panels should be established for land quality; loss of biodiversity; and socio-economic-drivers. The first tasks would be to prepare draft terms of reference and lists of potential members. The land panel should focus on land quality and geoindicators. The biodiversity panel should focus on habitat loss (including wetlands) and its implications for threatened species. The socio-economic panel could start with a review of the lessons to be learnt from on-going LUCC, CIAT, and stakeholder analysis projects that require or generate geo-referenced data on socio-economic variables.

3. There are a number of major international initiatives dealing with water resources. These should be reviewed before the next SC meeting and the needs for a virtual panel reassessed.

2) Working Group on GTOS Funding Strategy

Introduction

The break-out session on funding at the meeting of the GTOS Steering Committee considered the strategy and implementation plans for funding of GTOS. It suggests a close relationship must be achieved between program, implementation, and funding plans. Some elements of these deliberations might be included in chapter VI-B – Funding Strategy of the GTOS Implementation Plan. The break out group first considered the operational aspects of GTOS and then placed funding needs of the secretariat in the context of the total function of the system.

Funding Strategy

- The funding strategy should be outcome oriented and linked to the major elements of the programmatic strategy and implementation plan of GTOS. To conceptualize this, the five major areas of emphasis could be one dimension of a matrix, where the other dimension portrays the perceived donor “hot buttons”.
- The funding strategy should provide a broad framework that links modular elements defined by donor interests into an overall plan that deals with all critical elements of GTOS. Flexibility and adaptability should be characteristics of the strategy and its use.
- Major new emphasis should be placed on ascertaining user needs and developing user/donor ownership to the GTOS strategy through participation in its development.
- Definition of how GTOS products will be used by developing and developed countries to improve information quality and decision making must receive further serious consideration. GTOS should be prepared to modify, where necessary, its current strategy to more effectively meet user and donor needs (without compromising the scientific intent).
- GTOS’ funding strategy makes the general assumption that participating networks will be self funded; it is not part of the GTOS funding strategy to develop funds for participating networks, although there may be some exceptions, especially in start up of programs in developing countries. Considerable uncertainty remains on responsibilities of GTOS versus its participating networks in securing funds for areas of endeavor at the interface; these should be sorted out and definite plans made as part of the funding strategy.
- The principle functions of GTOS for which a funding strategy must be developed and used include:
 - developing and maintaining a strategy and operational plan for GTOS;
 - facilitating the communication between various elements of the “network of networks” to ensure overall function and utility of GTOS;
 - facilitating the linkage of data and analysis from individual networks;

- providing a forum for identification of user and donor needs for terrestrial information and data systems;
- developing methods for relating and using data across the several spatial tiers by policy and decision makers in developing and developed countries;
- ensuring that methods are available and used for effectively and efficiently using data and information in the GTOS “network of networks” by policy and decision makers.

Funding Plan

- In addition to developing an overall strategic framework for GTOS funding, there is need for a shorter term plan for developing funding. The plan should identify:
 - critical elements of GTOS that must be supported;
 - definition of user-donor-outcome oriented modules for funding;
 - potential donors and their specific mandates and interests.
- The short term funding plan, covering about three years, should be developed and implemented by the GTOS Steering Committee and Secretariat.
- With respect to the principle functions of GTOS (see above) – donors might be categorized in terms of their interest in:
 - ownership by co-sponsors and their institutional interests;
 - funding network development and utilization at the global level;
 - maintaining and archiving data, information, and methodologies;
 - utilization of GTOS products by developing countries in decision making.
- Systematic and ongoing approaches for donor and user engagement should be developed:
 - one-on-one contacts with key donors;
 - donors participation in GTOS or GTOS Executive Committee meetings;
 - one-on-one contacts with key users;
 - user “advisory committee” to GTOS;
 - broad engagement of donors in workshops to identify needs and showcase opportunities for GTOS.

Start-Up Funding

Given the early status of GTOS, there is need for increased but interim funding to support the development of several demonstration projects and to market the overall strategy with donors with the view towards sustaining funding through specific modular projects as described above. This should be regarded as a responsibility of the co-sponsors who should either provide funds or intervene with donors on behalf of GTOS for start up funding. There is need for sufficient funding to ensure limited flexibility to exploit targets of opportunity in program development over the early years of GTOS.

The GTOS Secretariat

- The general philosophy is that the secretariat should be kept relatively small and that the operational aspects of GTOS will be vested in the networks. However, certain elements of the total system, as described above, will require sustaining leadership, management, and administration.
- As noted above, the principle functions of the secretariat will be to:
 - facilitate the engagement of networks and other participants in GTOS;
 - ensure the effective utilization of GTOS products by users in developing and developed countries;
 - market the GTOS agenda with donors and users;
 - ensure appropriate planning, reporting, and communication;
 - support the Steering Committee and other elements of GTOS;
 - coordinate with other observing systems;
 - maintain effective engagement with co-sponsors;
 - develop and maintain methods to ensure effective communication with and among collaborators, donors, users, and others (website, inter alia).
- Funding for the Secretariat:
 - The start up funding would be used mainly by the secretariat to develop and implement a marketing plan for GTOS and to support initial demonstration efforts.
 - With modules of the GTOS strategy funded by multiple donors, the secretariat would budget for and receive funds from individual projects to support administrative and management costs.
 - Ongoing core support from the co-sponsors for the secretariat will be required to stabilize ongoing activities and staffing and to bridge gaps in project funding which will occur from time to time.
 - The short term objective for the secretariat should be to acquire funding to support at least three professional staff.

Immediate Actions:

- Incorporate the elements of this paper into the revised Operational Plan for GTOS, as part of the results of this meeting of the GTOS Steering Committee.
- Carefully ensure that the programme, implementation, and funding plans are fully harmonized.
- Engage co-sponsors at an early time to secure start up funds, seeking their support in acquiring funds from donors.
- Develop a list of potential donors and their interests and mandates and a plan of engagement for donors of highest priority — relate outcomes to areas of donor interest – an action plan for donor engagement.

- Develop invitations to donors and users for participating in the next meeting of the GTOS Steering Committee or its Executive Committee.
- Develop a clear, precise, brief prospectus on GTOS that can be used for initial contacts with potential donors and users – identifying fundable modules in the context of the total strategy.
- Develop a plan of engagement for foundations, understanding their mandates and interests and tailoring meetings to gain their interest and support. Specifically develop foundation approaches to seek one-time (start-up) support for GTOS.

3) Working Group on GTOS Governance

The GTOS structure was revised by the breakout group on GTOS Governance as follows. The changes will be incorporated in the chapter IV of the implementation plan.

GTOS Elements

The GTOS system consists of three elements:

- **GTOS Networks:** The networks of national stations, sites, and areas are where observations are made and data and information are collected. Included in GTOS Networks are all the centres, designated and un-designated where GTOS data are stored, managed or analyzed, and where assessments and other forms of evaluation are made. A number of different types of networks are involved based on environment types (e.g., Coastal, Glacier) and organizational efforts (e.g., national networks). A GTOS Network Panel (GT-Net Panel) will provide an organizational link between the various networks and the other elements of GTOS.
- **GTOS Programme:** The work programme of GTOS, the reason for gathering and analyzing the data and information.
- **GTOS Management:** GTOS Management provides the means for bringing together the various independent national networks, habitat networks that comprise GTOS and in making their liaison and co-operating easier, more cost effective, and more productive.

Steering Committee

The Steering committee (SC) comprises the Main Steering Committee and its subsidiary bodies (such as working groups and panels).

- **Main GTOS Steering Committee**
 - **Role:** The Co-sponsors provide the GTOS Steering Committee with Terms of Reference governing its composition, general responsibilities, and powers, by which it provides scientific, technical and general directional guidance to GTOS. The Chair of the GTOS

Steering Committee reports directly to the Co-sponsors. The Steering Committee meets on a time-to-time basis, at least annually, depending on the status of the program and available funds. The GTOS Steering Committee can create limited-life GTOS subsidiary bodies, such as Working Groups and Panels, for specific purposes as required and funds permitting.

- **Membership:** The initial Steering Committee is a group of 15-20 experts invited by the Co-sponsors to participate in their personal capacities and on a voluntary basis, augmented by one representative of each of the Co-sponsoring organizations. Co-sponsor representatives serve as members for an indefinite number of years and each Co-sponsor can change its representative at its own discretion. Each term of membership for an independent member is three years and members may not serve for more than two consecutive membership terms. A rotational plan will be implemented after the initial 3 years whereby 4-5 members will be replaced each year thereafter. The Steering Committee will be reduced in size to 12 - 15 independent members after the initial 3 years. New members are identified by both the current Steering Committee and Co-sponsors and following Co-sponsor approval, will be invited by the Chairman of the Steering Committee on behalf of the Co-sponsors. Identification of new Steering Committee members will be based on expertise needed to provide a balance across GTOS programs, geographical representation, underrepresented groups, and user needs. The Steering Committee can co-opt additional persons from time to time to attend particular Steering Committee meetings when the Chair considers that discussion on a specific agenda topic needs expert opinion beyond that within the expertise of the Steering Committee.
- **Executive Steering Committee:** On certain matters - and when necessary for budgetary and time constraints - the Chair shall convene an Executive Session of the SC composed of a subset of SC members to act on behalf of the full Steering Committee. The full SC will be provided with recommendations and minutes from the Executive SC discussion sessions.

GTOS Network Panel (GT-Net Panel)

➤ Background

The heart of GTOS is a world-wide network of representative sites and observational facilities at which terrestrial observations are made. These sites are mainly those already within existing national and international networks; however, new national networks and international networking activities are expected that would become involved in GTOS, eventually reaching over 100. GTOS will continuously attempt to involve these current and future activities, especially as gaps in coverage are revealed. To ensure that GTOS develops along sound scientific lines and in ways that do not contradict the already operational aims and goals of each participating network, it is essential that each participating network is represented within GTOS. The many national sites and networks are organized into different international networks (e.g., National, Glacier, Permafrost). Each of these international networks will have a person designated by that network that will serve on a GTOS Network Panel (GT-Net Panel). Each individual site or national network (e.g., Environmental Change Network of the U.K., Hungarian LTER Network) will have a say in the international network to which it belongs and be able to pass information and directives using the designated person for that network. In this way, each type of network will have a voice in determining how GTOS will operate and the directions in which it will move. This two-level hierarchy of sites/national networks and international

networks will provide the guidance GTOS needs, provide a voice for all sites and networks and be economical. The various international networks will host their own meetings and determine their own governance rules.

The GT-Net Panel will be, therefore, in effect the GTOS Scientific and Technical Committee that was proposed, along with a GTOS Steering Committee, at the Fontainebleau meeting in 1992. Such a body is very important if GTOS is to succeed because it is vital that active terrestrial/aquatic scientists at the forefront of their fields should keep GTOS abreast of current scientific findings and applications. The reports of the GT-Net Panel will come before the GTOS Steering Committee which will consider them in light of current political, economic, social and development needs thus giving GTOS the requisite geopolitical and scientific balance.

- **Role:** The GT-Net Panel has no operational mandate and exists to provide the GTOS Steering Committee with sound scientific and technical guidance on all matters relating to the implementation and operation of GTOS terrestrial observation programmes including practical advice on means to facilitate their on-going operation. This guidance includes advising on the future expansion of GTOS networks, observational and analytical aspects of GTOS, identification of important gaps in geographical, ecosystem and observation coverage with suggestions on how the gaps might be closed, necessary metadata, harmonization approaches including quality assurance and quality control procedures, evaluation of methods for use within GTOS, and national scientific and technical capacity building and training. Individual Panel members and their respective organizations may be asked to assist from time-to-time in some operational tasks such as transforming scientific data into other forms for use by national policy makers.
- **Membership:** The GT-Net Panel would be composed mainly (about 75%) of scientists designated by the international networks participating in GTOS and members of the GTOS Steering Committee (about 20%) plus a few (about 5%) independent scientists of distinction who may have no direct role in GTOS and its networks. Each of the international networks (e.g., National, Glacier, Permafrost) would develop its own membership rules and procedures for designating the representative to the GT-Net Panel. The Chair of the GT-Net Panel would be elected from the Panel members and will report to the Chair of the Steering Committee. The GTOS Secretariat would serve as the focal point for the Panel and act as its Secretariat.

GTOS Working Groups

- **Role:** Working Groups are informal subsidiary bodies of the GTOS Steering Committee and are created by its Chair on the recommendation of Steering Committee members. Each Working Group is led by a designated member of the Steering Committee. Working Groups are created to consider, develop or evaluate specific topics and issues thought relevant to the GTOS programme and its operations. Working Groups have no fixed length of life but are generally short-term. Each is disbanded on completion of its work. Working Groups normally do not meet but communicate and interact by electronic and other means. Very occasionally, however, a topic may be of such complexity or importance that electronic communication is not sufficient and an actual meeting is required. If the Chair of the Steering Committee approves, and available funds permit, the GTOS Secretariat will support such a meeting.

- Membership: Each Working Group is comprised of those Steering Committee members who volunteer to join because they are interested and knowledgeable in the discussion subject. Working Groups may seek advice (or co-opt) where necessary) from those on the GTOS Roster of Experts and from others not members of the Steering Committee or Roster.

4) Working Group on Data and Information Management

Introduction

The Working Group was directed to consider two specific issues - development and management of GTOS products, and the role and development of GTOS data and Analysis Centres (DACs). Both terms are introduced in the GTOS Implementation Plan and are expanded upon in the draft Data and Information Plan (GTOS DIMP).

The draft GTOS DIMP includes discussion of the distinction between data and information. In the same way, a distinction may be made between data and products. At the base (see figure 1) are primary datasets which may be used in a variety of ways - analysed, summarised, integrated, compared - to produce a product. The product may itself be a dataset which can be used in turn to generate higher level products. In general, a primary dataset itself may be considered a product.

GTOS Products

As shown in figure 1, derived datasets and any further products developed from them may certainly be GTOS products. The question of whether or not any primary datasets would be termed “GTOS products” gave rise to considerable discussion. GTOS is envisaged as a facilitator, not a collector or owner of data. A mechanism is needed to ensure that a GTOS designation is made (where appropriate) without usurping ownership in any way. The following scenarios are foreseen.

1. Existing datasets, primary or derived, will be used to develop GTOS products where they are identified as required to meet a priority need (datasets currently identified by TOPC are examples of this). A formal approach should be made to the dataset owners asking that the dataset be made accessible to GTOS, and the description included in a GTOS metadatabase. The suggestion was made that the datasets be flagged as “a contribution to GTOS”.
2. Any derived data product resulting from activities facilitated by GTOS will be a GTOS product (such as the estimates of Net Primary Productivity from the GT-Net demonstration project). A basic tenet of any GTOS Network should be that any such outputs are designated as GTOS products but ownership will remain with the Network members and will be acknowledged.
3. New primary datasets to be compiled through GTOS Network activities (such as those to be generated in the GT-Net demonstration project) are to be GTOS products. This should work in the same way as in the preceding case i.e. “ownership” will remain with the dataset generators and will be acknowledged. (Note that, as mentioned above, the designation of primary datasets as GTOS products was questioned. Using the designation “contribution to GTOS” rather than GTOS product may be preferable. This point should be clarified during the course of the planned demonstration projects.)

Data Centres

The development of GTOS products as described above will require a variety of functions which differ with the level of the product (see figure 1). At the lower (dataset) level, these will include verification, quality control, first level processing, local archiving and provision of metadata. As the products become more derivative then functions also include integration of datasets, long-term archiving of datasets and other products, provision of metadata, coordination of various aspects of data management and establishment of policies for product development. Thus several different types of Centre will be needed:

- local, national and regional centres to manage datasets
- centres with particular analysis expertise and capabilities
- archive facilities
- a central coordination point.

(Since analysis is only one of the functions required, the term GTOS Data and Analysis Centres was dropped in favour of simply GTOS Data Centres.)

These Centres would be primarily existing institutions with which formal agreements had been made to undertake one or more of the above functions on behalf of GTOS. This would be done either from their existing resources, or with additional resources supplied through GTOS. There may be cases when a requirement cannot be met by any existing organisation and GTOS would then need to clearly identify the need and plan to establish a suitable facility.

The existing Data Centres in the prototype networks are candidates to become the initial GTOS Data Centres to provide at least dataset management and analysis facilities but not necessarily long-term archiving. The Secretariat, with the GOS Information Centre, should undertake the coordination role.

Towards Implementation

A number of actions were recommended.

Action	Who/how
Develop criteria for datasets to be designated as GTOS products	Metadata requirements to be included in GTOS DIMP
Develop criteria for management of GTOS products	Requirements for metadata, archiving, access, distribution, ... to be included in the GTOS DIMP
Establish GTOS Data Centres	Use funded case studies as prototypes
Develop archive procedures	GTOS DIMP and case studies
Establish GTOS Archive	Identify candidates, negotiation

The activities currently underway and planned by TOPC and GT-Net participants should provide excellent opportunities to refine any recommended criteria and procedures through practical application.

Figure 1



Annex IV : List of Recommendations

UPDATE ON GTOS ACTIVITIES

Recommendation 1: a GTOS Newsletter should be developed to keep donors, developing countries and participating organizations regularly informed on GTOS activities. It should be produced with the assistance of ICSU.

Recommendation 2: the post advertisement for two scientific officers at the GTOS Secretariat should spell out more clearly the requirements of the academic exchange programme.

DATA AND INFORMATION MANAGEMENT

Recommendation 3: the new terms of reference of the J-DIMP should refer to custodianship for data sets and to the role of the panel in overseeing the design and operation of the Global Observing Systems Information Center (GOSIC); it should monitor the use of the system and should report regularly to the GTSC. The chairman would convey this to the chairman of J-DIMP and the Directors of GCOS and GOOS.

BUDGET AND FUND RAISING

Recommendation 4: UNEP should send its database of donors to the GTOS Secretariat, in order to start the process of identifying potential donors for GTOS and preparing a package of proposals.

Recommendation 5: the Sponsors should include GTOS proposals in their annual programming meetings with donors and when proposals are requested.

Recommendation 6: the members of the GTSC should be more active in seeking funds for GTOS that are compatible with their own research interests.

G3OS SPONSORS GROUP

Recommendation 7: ICSU, as a sponsor of GTOS, should facilitate the cooperation with IGBP to enhance GTOS activities. It was suggested to bring up this point to Will Steffen in July 1998, during his visit to ICSU in Paris.

NETWORKS

Recommendation 8: GT-Net should not be limited to those networks that attended the meeting in Guernica (Experts meeting on Ecological Networks, 17-20 June 1997, Guernica, Spain). Additional other networks should be encouraged to participate in order to have a wider representation of terrestrial issues (e.g. forests). The networks should be invited according to specific criteria defined by GTOS.

Recommendation 9: a brochure should be developed explaining the demonstration project on NPP as well as the value added it will bring to the sites/networks participating in GT-Net.

Recommendation 10: closer collaboration between the Arctic Monitoring and Assessment Programme (AMAP) and International Permafrost Association (IPA) should be considered and encouraged.

GTOS PROGRAMME DEVELOPMENT

Recommendation 11: GTOS should further develop the concept of regional centres built on existing regional infrastructure. The regional offices of e.g. FAO, UNEP, UNESCO, WMO and collaborating centres of regional importance such as CERN could serve as hosts. GTOS requires a regional representation to raise the profile and visibility of anticipated deliverables and benefits. It was suggested that efforts be made to establish a regional GTOS for Southern Asia.

Recommendation 12: a workshop should be organized between GTOS, NoLimits and other partners (e.g. Man and Biosphere Programme) to clarify the links and the ways and means for collaboration in Eastern and Western Europe.

COLLABORATION WITH OTHER ORGANIZATIONS

Recommendation 13: the differences and similarities between GTOS and ILTER should be clearly defined. It is important to clarify the interactions also between GTOS and the other participating networks, explaining what are their respective responsibilities and how they complement each other.

Recommendation 14: a GTOS Freshwater Panel should be established in order to explore the potential of hydrological information for GTOS, including the role of GRDC, and to define feasible objectives and deliverables. Such a panel could meet on an ad-hoc basis.

WORKING GROUP ON NON CLIMATIC VARIABLES PANELS

Recommendation 15: to establish a joint GOOS/GTOS coastal panel

Recommendation 16: to reassess the needs for a virtual panel on water resources before the next Steering Committee meeting and to review the major international initiatives dealing with water resources.

WORKING GROUP ON GTOS GOVERNANCE

Recommendation 17: to establish a GTOS Network Panel (GT-Net Panel) composed mainly of scientists designated by the networks participating in GTOS, as well as selected members of the Steering Committee, plus a few independent scientists of distinction.

Annex V: List of Acronyms

AMAP	Arctic Monitoring and Assessment Programme
BCIS	Biodiversity Conservation Information System
CALM	Circumpolar Active Layer Monitoring network
CEO	Centre for Earth Observation
CEOS	Committee on Earth Observation Satellites
CERN	Chinese Ecosystem Research Network
CGIAR	Consultative Group for International Agricultural Research
CIAT	International Centre for Tropical Agriculture
CIESIN	Consortium for International Earth Science Information Network
CITES	Convention on International Trade in Endangered Species
COP	Conference of the Parties
DIVERSITAS	DIVERSITAS Programme
EEA	European Environment Agency
ELANEM	Euro-Latin American Network for Environmental Assessment and Monitoring
EMAP	Environmental Monitoring and Assessment Programme
ENRICH	European Network for Research in Global Change
EU	European Union
FAO	Food and Agricultural Organization
FCCC	Framework Convention on Climate Change
FRIEND	Flow Regimes from International Experiments and Network Data
G3OS	Three Global Observing Systems
GCOS	Global Climate Observing System
GCTE	Global Change and Terrestrial Ecosystems (Core project of IGBP)
GEMS	Global Environment Monitoring System
GEWEX	Global Energy and Water Cycle Experiment
GHOST	Global Hierarchical Observing Strategy
GOFC	Global Observation of Forest Cover
GOOS	Global Ocean Observing System
GOSIC	Global Observing Systems Information Center
GOSSP	GCOS/GOOS/GTOS Global Observing Systems Space Panel
GPCC	Global Precipitation Climatology Centre
GRDC	Global Run-off Data Centre
GT-Net	GTOS System of Networks
GTOS	Global Terrestrial Observing System
GTSC	GTOS Steering Committee
HDP	Human Dimensions of Global Environmental Change Programme
IBFRA	International Boreal Forest Research Association
ICSU	International Council for Science
IGBP	International Geosphere-Biosphere Programme
IGFA	International Group of Funding Agencies
IGOS	Integrated Global Observing Strategy
ILEC	International Lake Environment Committee
ILTER	International Long-Term Ecological Research
INCO	International Cooperation Programme
IOC	Intergovernmental Oceanographic Commission
IPA	International Permafrost Association

ITU	International Telecommunication Union
JDIMP	GCOS/GOOS/GTOS Joint Data and Information Management Panel
JSTC	Joint Scientific and Technical Committee for GCOS
LTER	Long Term Ecological Research
LUCC	Land-Use and Land-Cover Change project of IGBP and HDP
MAB	Man and the Biosphere Programme
NGO	Non Governmental Organization
NoLimits	Networking of Long-term Integrated Monitoring in Terrestrial Systems
NPP	Net Primary Productivity
RAMSAR	Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR Convention)
SADC	Southern African Development Community
SBSTA	Subsidiary Body on Scientific and Technical Advice
SC	Steering Committee
TEMS	Terrestrial Ecosystem Monitoring Sites meta-database
TOPC	GCOS/GTOS Terrestrial Observation Panel for Climate
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
USAID	United States Agency for International Development
WCMC	World Conservation Monitoring Centre
WCRP	World Climate Research Programme
WGMS	World Glacier Monitoring Service
WHO	World Health Organization
WHYCOS	World Hydrological Cycle Observing System
WMO	World Meteorological Organization