



Global Terrestrial Observing System

GTOS and the Conventions

The Global Terrestrial Observing System
and the Data and Information Needs of Some of
the Environmental Convention Secretariats

M.D. Gwynne

October 1996 (Updated April 1997)

GTOS - 7

For bibliographic and reference purposes this publication should be referred to as:

GTOS-7 (1996). M.D. Gwynne. GTOS and The Conventions: The Global Terrestrial Observing System and the data and information needs of some of the Environmental Convention Secretariats
GTOS Secretariat
c/o FAO, SDRN
Viale delle Terme di Caracalla
Rome 00100, Italy

This report was prepared under Consultant Agreement No. 95-00299 made between the Division of Environmental Information and Assessment, United Nations Environment Programme and M.D. Gwynne. Its distribution in its present form does not imply endorsement by UNEP of the ideas expressed.

I. Summary Conclusions and Recommendations

International Conventions that are concerned with the conservation or utilisation of renewable natural resources do form a potential user group for GTOS. Seven of the eight Convention Secretariats visited are interested in working with GTOS. This suggests that other global and regional Conventions may also be interested in an association with GTOS.

The Conventions require habitat and other site-related data to show the responses of their sites to changing environmental, ecological and management pressures. This will allow the development of practical, soundly based management plans to ensure that sites are adequately conserved or are managed on a sustainable basis. Detailed data needs of the individual Conventions, as far as can be ascertained, are given in the description of each Convention.

GTOS observational activities should allow the effectiveness of management actions at Convention field sites to be assessed, particularly actions for preventing or mitigating the effects of seemingly adverse changes.

The Conventions need relevant data from the sites of interest as well as from a large zone surrounding the site (e.g. if the site is a marsh, data are also needed for the whole catchment area on which the marsh is dependent).

In putting work proposals before a Convention GTOS must follow the procedure of that Convention for the approval of its work programme. For each Convention this will normally entail working through the Secretariat to obtain for each major GTOS proposal the formal approval of, first, the Scientific and Technical Committee and, second, the Conference of the Parties. GTOS should thus work very closely with the Secretariats of The Conventions in drawing up relevant GTOS project proposals as this will ensure that appropriate procedures are followed.

To facilitate this procedure GTOS should seek observer status on the Scientific and Technical Committees of appropriate Conventions, particularly The Convention to Combat Desertification and The Convention on Biological Diversity which are still developing their work programmes.

Technical representatives of The Conventions, particularly those on Biological Diversity and to Combat Desertification, should be asked to participate in some GTOS programme planning sessions.

Services provided through GTOS (and co-operating agencies) should include advice to developing country Parties on how to utilise data from their observational systems for national resource management and policy making, including needed national infrastructure, staffing, and training. Services to be provided should also include advice on setting up and operating data management systems; assistance in analysis and interpretation of data, especially for communicating or reporting any national data required under The Conventions; and provision of spatially referenced largely satellite-based maps at appropriate scales, for land-cover categories, land-use information, weather data, and other specified variables.

GTOS should develop a common observational data management system for use by all The Convention Secretariats and which they could recommend to their Parties. This would be useful even if the system is not adopted by all GTOS users since it would enable The Conventions to exchange data and information readily, and co-operate more efficiently in joint activities.

The Conventions need reliable, believable data so GTOS should adopt adequate data quality assurance arrangements, quality control procedures, and harmonisation for its data gathering and data management activities. GTOS should gather data according to GTOS harmonised methods and protocols that result in data of agreed predetermined levels of accuracy and precision. This helps to ensure that the same types of data gathered for different Conventions are both comparable and compatible. GTOS should also be able to demonstrate to potential users the relevance of data from GTOS stations distant from Convention sites.

At an early stage GTOS should begin to develop an agreed data release policy for primary and secondary data gathered or developed under the auspices of GTOS. This is important when working with The Conventions where data gathered under them are often considered sensitive by the Parties.

GTOS should compile a catalogue of available data relevant to its programme so that GTOS users are aware of the information and data that already exist. An on-going GTOS meta-database should be developed that contains for all data sets and runs (both pre-existing and GTOS) full historical details including the purposes behind the original work, the methods used, quality assurance procedures, and resultant publications. Participants in GTOS should be encouraged to provide this information on new data routinely for inclusion in the GTOS meta-database.

GTOS should develop or adopt standard definitions for describing or classifying many variables such as soil types, vegetation classes and taxa. Relevant classifications already in use by The Conventions (e.g. wetlands) should be considered in relation to the terms and classes of GTOS categories.

For reasons of cost and practicality GTOS should begin its operations modestly, starting simply, and building as much as possible on national, regional and global facilities and systems that are already in place. Great care should be exercised in the choice of variables to be observed so that the system does not become overloaded.

GTOS should carefully review the data needs of each Convention with a view to reducing the number of variables to be measured to the minimum necessary for obtaining a proper understanding of what is happening at each series of Convention sites. GTOS should also develop a core minimum set of sensitive variables to be measured at each field site. The same minimum set of variables would thus be measured at each field site of each Convention; this would facilitate comparison between sites and between times.

Several Conventions are moving away from more traditional conservation oriented approaches towards practical management issues, including the need to predict changes in ecosystems. Consequently, there is now an interest in environmental, ecological and management modelling. Thus fundamental bio-physical data for process modelling will be increasingly required from GTOS.

Socio-economic data are important to the work of The Conventions. It is important that **right from the start** GTOS give adequate attention to the acquisition of relevant categories of this type of data.

Some Convention Secretariats asked that GTOS consider recording crustal stress and tectonic earth movements and their consequences as these could have disastrous effects on many Convention sites. This is a serious problem in many areas and GTOS should give consideration as to how best to obtain the required data.

In view of the interest shown by some Convention Secretariats in carrying out inventories of the status of biological diversity in selected Convention sites and their surrounding zones, GTOS should look into the feasibility and practicality of carrying out such inventories under the auspices of the GTOS programme.

Several Conventions are extending their activities to coastal areas focusing on mangrove swamps, sea grass communities and coral reefs. GTOS should consider what part it can play in these activities. This is an area where the interests of GOOS, GCOS and GTOS overlap. A joint pilot activity in one or two areas between the three Global Observing Systems, in co-operation with the relevant Convention Secretariats, should be considered.

The Basel Convention has some data needs that are more specialised than those of the other Conventions that were consulted. Essentially there is a need to monitor the various toxic substances and chemicals that might find their way into the atmosphere, ground water, and food production systems from hazardous waste disposal sites. GTOS should consider the possibility of a special subprogramme specifically for the Basel Convention.

GTOS data would be of importance to the global assessments (e.g. wetlands, desertification, biological diversity of some taxa and habitats) to be carried out under the auspices of some Conventions. GTOS should explore the data needs of these assessments to ensure that the right data are collected, bearing in mind the need for adequate quality assurance, quality control, and data delivery mechanisms.

Several of The Convention Secretariats indicated an interest in developing a marine component of their Convention. Assessing the status, trends, and movements of marine animals, including Cetaceans and fish stocks, and the habitat and environmental factors that affect them, will be important aspects of this work. GTOS should consider whether it is feasible and practical to include these aspects in the future work programme of GTOS. These should be considered as possible fields in which the three Global Observing Systems could collaborate.

At the moment GTOS is not well known, has no physical entity, and lacks assured funding. The Convention Secretariats consequently find it difficult to believe in a potential partner that as yet has no material existence. The Sponsors should, therefore, as soon as possible establish and support an **Interim Secretariat** for GTOS. For the first two years this **Interim Secretariat** could be housed with one of the Sponsors while a more permanent home is sought.

To make GTOS better known, each of the sponsors should introduce GTOS to its Governing Body through a short information paper to be presented at the first possible session of that body. This might result in supportive decisions which could, for example, favourably influence the attitudes of Convention Parties towards GTOS.

At an early stage GTOS should develop a publication programme so that its actions and findings become well known. This must be done in such a way that full credit is always given to co-operating countries and partner organisations. This is particularly important for programmes with The Conventions several of which already have their own publication programmes. Joint series publications is one approach that should be explored.

Financing GTOS Convention-related activities remains a problem. Some funds may be available through the financial mechanisms of The Conventions. Most funds will have to be sought from additional sources such as bilateral and multilateral donors and aid programmes, or from foundations. Consequently, funds for familiarisation and contact visits to potential funding sources should be made available to the GTOS Interim Secretariat through the Sponsors.

Familiarisation and contact visits to the major donors must be an early priority on-going activity of GTOS and its Sponsors. These can, if necessary, be arranged through the GTOS Sponsors. Potential donors should include CIDA, DANIDA, EU, FINNIDA, GTZ, IBRD, IDRC, NORAD, SIDA, UK-ODA, UNDP, USAID, and to some of the larger foundations such as Carnegie, Leverhume, Mellon, Rockefeller and Sasakawa. Familiarisation visits to other possible supporting countries such as Australia, Belgium, France, Italy, New Zealand, Switzerland and Russia should also be considered at a later time.

The GTOS Sponsors should at the earliest opportunity try to interest leading newly industrialised developing countries in supporting GTOS. Visits should be made to some to discuss their potential role in GTOS (e.g. Brazil, China, Indonesia, South Africa, and South Korea), with a view to soliciting their practical support.

GTOS project documents to go to donors, especially those to go through The Conventions, should have all costs properly and fully shown. Information, data and other practical benefits to national partners in the project should be clearly spelled out.

GTOS should plan its operations under The Conventions as a series of programme packages Each of which can be put separately to relevant donors. Each package before submission to a donor must have the prior agreement of The Convention Secretariat, the Scientific and Technical Committee of The Convention, the Conference of the Parties of The Convention, and the Governments of the countries where the work will take place.

II. Background

Rationale

Current emphasis in environmental thinking is that renewable natural resources must be managed in a sustainable manner. In other words, such resources can, and should, be used by people but in ways that enable the resources to be perpetuated and not become exhausted or extinct. This view was the prevailing one at the United Nations Conference on Environment and Development (UNCED; Rio de Janeiro, 1991) and is that which runs through Agenda 21 which is now the accepted guide for national and international environment and development action in the post UNCED world.

To manage renewable natural resources properly, however, it is necessary to know the extent, state and present rate of change of each. How much is there? In what condition is it? Is it

holding its own, or declining, or improving? Answers to these questions are vital for all those concerned with renewable natural resources whether it is at local, national or international levels. Such answers can only be provided by actual observations and measurements. These measurements provide the minimum set of information necessary for proper management of renewable natural resources.

These observed and measured changes are, however, mainly due to other factors that are affecting the state and well-being of the natural resources being managed. The forest is being depleted by settlers starting agricultural small holdings. Valuable farmland is being built upon. Soil is being eroded and redistributed because large numbers of livestock and wildlife are using the rangelands. Less (or more) rain has fallen in recent years, and temperatures are higher (or lower) than they used to be so that the vegetation is not growing like it did formerly. New plant species are appearing and old plant species are vanishing so that the vegetation resource to be managed now is not the same as the vegetation resource that was there a few decades ago. To understand these factors and their consequences requires additional sets of measurements and observations carried out over lengthy periods of time. Information on and appreciation of these factors, and there are many of them, will help managers of natural resources to better understand the changes that they see in the resources with which they are dealing. With this additional information they will become better, more efficient managers and the resources will benefit accordingly.

The renewable natural resources themselves are, however, largely composed of living organisms. Each of these organisms has its own way of responding to the changing environment in which it finds itself. Some species are genetically more variable than others and so can better and more rapidly adapt to changing conditions; thus they may flourish in new conditions. Others are more conservative in their structure and function and so do not adapt so easily; these may be under stress in new conditions and so may well disappear from a newly developed environment. To understand why this is so requires a new set of detailed measurements and observations at biological grouping, organism and cellular levels involving both biophysical and biochemical investigations along with careful measurements of local environmental conditions and their fluctuations over time. These studies enable a better understanding of the actual biophysical processes that govern the lives of organisms within each of the major renewable natural resource types. This in turn helps to better understand the responses of organisms to changes in environmental conditions, no matter what the causes of those changes. It also helps in understanding, for example, why some natural resources in some localities are changing faster than others, why some crops (and livestock types) are flourishing and others not, and why some people in some rural areas can attain a better life style than people in other similar looking rural areas. Renewable natural resource managers do not have to know the details of these scientific investigations, or of how the biophysical processes work, but they must be aware of the findings and their implications for the renewable natural resources which they manage. Application of the findings enables resource managers to refine their management procedures and thus still further improve the condition of their renewable natural resources to the betterment of the lives of the people in and around these resource areas.

The basic measurement and observation set must be made at each specific area of concern. Any additional more detailed studies, however, will mostly have to be carried out at special, relevant long term study sites and the findings applied to the managed sites by extrapolation. In many cases such extrapolation is most effectively accomplished using space-based large-area remote sensing techniques to record land-cover and land-use at relevant scales.

Terrestrial Observing System

This realistic approach to renewable natural resource management requires the co-operation of managers, development specialists, policy makers, economists and a wide variety of scientists and technicians. It also implies the existence of a widespread international terrestrial observing system to facilitate gathering of data at various measurement levels, carrying out of necessary analyses and interpretation, and provision of useful, reliable information for the utilisation and development of renewable natural resources in efficient and sustainable ways. Such a system would also contribute materially to scientific understanding of terrestrial ecosystems, and this, in turn, would help to generate better, more reliable and more useful information for the users of the system.

Such a world wide terrestrial observing system is not yet operational though similar observing systems are currently being developed for oceans and for global climate with the co-operation of interested governments and the sponsorship of UNESCO, UNEP, WMO and ICSU. There are several reasons why an international terrestrial observing system has not yet been developed even though the need for it has long been obvious to most people directly connected with managing renewable natural resources and with understanding the natural processes that govern the functions of terrestrial ecosystems. These include:

- renewable natural resources are located within national boundaries and so are the properties of the nation states concerned;
- utilisation of its renewable natural resources by a country usually has economic significance to that country. Countries, therefore, are often reluctant to have information on their natural resources released since its availability could adversely effect national marketing and resource utilisation strategies to the possible detriment of economic returns.
- large areas of the tropics and subtropics have relatively few facilities for the study of managed ecosystems and even fewer for the study of natural ecosystems.
- many people within countries with abundant renewable natural resources are not convinced that additional measurements and observations are needed for proper resource management and exploitation. They see additional observations as a costly and unnecessary way of gratifying scientists at the expense of ordinary people.
- it is difficult to organise and not easy to carry out.

By 1992 the need for a world wide terrestrial observing system had become generally recognised. Consequently, a meeting of interested parties was held in Fontainebleau, attended by representatives of international agencies and organisations including FAO, UNESCO, UNEP, WMO and ICSU. At this meeting it was agreed that such a system should be developed and that it should be called the Global Terrestrial Observing System (GTOS). It was also agreed that it was essential that the system be concerned with both managed and natural ecosystems, and that it must have practical value to the management and development of renewable natural resources, particularly those of developing countries. In other words, GTOS should contribute materially to the wellbeing of people, especially those in developing countries, by leading to an improvement in the utilisation and development of both managed (arable agricultural lands, rangelands and other pastoral areas, forests and woodlands, fresh waters, etc.) and natural

ecosystems. It should also contribute materially to better scientific understanding of the biophysical processes involved in the form, function and change of ecosystems over time since this would further help in ensuring sustainable, efficient utilisation of renewable natural resources worldwide.

Subsequently, FAO, UNESCO, UNEP, WMO and ICSU agreed formally to sponsor GTOS. Several international expert meetings were held to lay the foundations of GTOS and to formulate its general philosophy and principles. An international ad hoc Scientific and Technical Planning Group was established to further develop these ideas and to make proposals for future implementation of GTOS. The report of this group is expected at the end of 1995.

Users

It is clear that there are many hundreds, if not thousands, of variables that could be measured by a worldwide terrestrial observing system. It is equally clear that if such a system is to have any practical usefulness the number of variables will have to be reduced to the relatively few that are of real use and significance to the users. The only practical route to achieve this is to determine first who are the likely users of the system, establish their information and data needs, and design the system accordingly. Thus the observing system would be user driven.

Ultimately, there are two major users: countries with large or economically important renewable natural resources, and the international scientific community. These two groups are too large in scope and too diverse in interests to allow, at least initially, the needed focus on practical orientation of the observing system. For GTOS to function efficiently at its start smaller user groups with more readily defined and narrower information and data requirements need to be identified. One likely user group in this category was quite quickly recognised: the Secretariats and Parties of some of the environment related international conventions.

Accordingly, UNEP selected eight relevant international conventions and arranged for a consultant to visit the Secretariats of each to discuss with staff what they considered to be their information needs and those of the Parties to their Conventions. This Report is a record of these visits. The Conventions chosen by UNEP (listed in order of Convention adoption) are:

- **Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar) (1971)**
- **Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)**
- **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973)**
- **Convention on the Conservation of Migratory Species of Wild Animals (CMS) (1979)**
- **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (SBC) (1989)**
- **United Nations Framework Convention on Climate Change (1992)**

- **Convention on Biological Diversity (1992)**
- **United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (1994)**

Visits to the Secretariats of these Conventions were made between 18 September and 12 October 1995.

In addition it was considered expedient to discuss GTOS with relevant staff in each of the international organisations that sponsor GTOS to obtain their current views on its future development. Accordingly, visits were made to the Food and Agriculture Organization of the United Nations (FAO), United Nations Educational, Cultural and Scientific Organization (UNESCO), United Nations Environment Programme (UNEP), World Meteorological Organization (WMO), and the International Council of Scientific Unions (ICSU). Meetings were also held with the Chairman of the GTOS ad hoc Scientific and Technical Planning Group, staff of the Global Ocean Observing System (GOOS) Support Office at the Intergovernmental Oceanographic Commission, and the Joint Planning Office of the Global Climate Observing System (GCOS) at the World Meteorological Organisation. These discussions were held within the same time frame as the visits to The Convention secretariats.

A full list of all those consulted is given in Annex 1.

III. The Conventions

1. Convention on Wetlands of International Importance Especially as Waterfowl Habitaat (RAMSAR) (1971)

The Convention

This international Convention was adopted in Ramsar, Iran, on 2 February 1971 and entered into force on 21 December 1975. As of October 1995, 80 states were Parties to The Convention.¹

The Convention on Wetlands is administered by the Ramsar Convention Bureau headed by a Secretary General and located at the IUCN headquarters in Gland. The Bureau comprises two units: an Administrative Unit and the Conservation Unit. The latter, headed by the Assistant Secretary General, comprises four Technical Officers each responsible for a particular geographical region and for one of the current four main obligations of The Convention.

The policy making body of The Convention on Wetlands is the Conference of Contracting Parties (COP) which meets every three years; it last met in Kushiro, Japan, in June 1993, and will next meet in Brisbane in March 1996. A Standing Committee, consisting of representatives from each of the seven Ramsar geographic regions (Africa, Asia, Eastern Europe, the

¹ By 31/3/97, 101 states had ratified The Convention

neotropical region, North America, Oceania and Western Europe), the host country of the most recent meeting of the Conference of the Contracting Parties, and the host country of the next COP session, provides policy and administrative guidance between regular meetings of the Parties. A Scientific and Technical Review Panel consisting of seven experts appointed on an individual basis by the Conference of the Parties gives advice on scientific matters. This committee is now approaching the end of its first three year period and is thought to have been a success. A new Panel will be appointed in March 1996. The current Chairman is from the United States so that the new chairman will most likely be from the South. IUCN and the International Waterfowl and Wetlands Research Bureau have observer status on the Panel. National Ramsar Committees and Working Groups have been established in a number of countries to promote the work of The Convention within their territories.

The primary aim of The Convention on Wetlands is the conservation and wise use of wetland biomes. Wetlands are defined by The Convention as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which does not exceed six metres at low tide. It can include riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water lying within the wetlands. Five major wetland types are recognised:

- Marine (coastal wetlands including rocky shores and coral reefs).
- Estuarine (deltas, tide marshes and mangrove swamps).
- Lacustrine (wetlands associated with lakes).
- Riverine (wetlands along rivers and streams)
- Palustrine (marshes, swamps and bogs).

In addition there are human-made wetlands such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans, reservoirs, gravel pits, sewage farms and canals.

As a result of these provisions the coverage of The Convention extends to a wide variety of habitat types including rivers, shallow coastal waters and coral reefs.

Contracting Parties have four main obligations:

- designation of at least one wetland for inclusion in the '*List of Wetlands of International Importance*' with selection based on international significance in terms of ecology, botany, zoology, limnology or hydrology. Wetlands of international importance to waterfowl at any season should be included.
- inclusion of wetland conservation in national land-use planning to ensure the wise use of wetlands in their territories.
- designation of nature reserves for wetlands in their territories to be managed for the benefit of waterfowl and for training in wetlands research, management and conservation.
- consultation with other Contracting Parties on the implementation of The Convention, particularly with regard to transfrontier wetlands, shared water systems, shared species, and development aid for wetlands projects.

The Bureau of The Convention on Wetlands is required to maintain a '*List of Wetlands of International Importance.*' This is done through the Ramsar Database which is held at the offices of the International Waterfowl and Wetlands Bureau (to be renamed Wetlands International) currently at Slimbridge in the United Kingdom but shortly to move to Germany or Holland. The database holds full administrative, locational, socio-economic and ecological data on each of the wetlands sites covered by The Convention. The ecological data are for each listed wetland and for the whole catchment in which that wetland occurs. These data are organised such that changes in the ecology of a wetland revealed by subsequent surveys become readily apparent. This enables The Convention Bureau to respond rapidly to reports of changes in ecological character at listed sites. In addition the Ramsar Database allows periodic publication of the updated '*Directory of Wetlands of International Importance*' which provides a comprehensive overview of the latest information about every wetland site on the List. The Directory was last published in 1993 in four volumes covering: I Africa; II Asia and Oceania; III Europe; IV the Neotropics and North America.

An additional part of the Ramsar Database is the '*Montreux Record*' begun in 1990. This is a register of wetland sites on the '*List of Wetlands of International Importance*' where changes in ecological character have occurred, are occurring, or are expected to occur as a result of technological developments, contamination, or other human interference. Sites are included on the Record by Contracting Parties after consultation with the Bureau.

In 1988 the Standing Committee established a **Monitoring Procedure** to record changes in ecological character of listed wetlands. This was formally adopted by the Conference of Contracting Parties in 1990. The kinds of problems which may prompt a Contracting Party to consult the Bureau over the application of the **Monitoring Procedure** may include:

- impacts on water supply (on its source, course, quantity, quality and seasonality).
- impacts on the ecological character of the wetland site by actions that affect its:
 - physical characteristics (e.g. draining or infilling).
 - chemical characteristics (e.g. industrial or agricultural contaminants).
 - biological characteristics (e.g. inappropriate management of natural resources, habitats, or species).

It is recognised throughout the activities of The Convention on Wetlands that in order to keep a wetland ecologically functional it is necessary to use an integrated interdisciplinary catchment area approach to management. This will ensure that the wetland is not seen in isolation from the surrounding parts that support it. Also recognised are special problem areas for management which include shared wetland systems, shared species, and global climate change.

The entry point to The Convention has hitherto been nature conservation which has little appeal to many countries. With the move of The Convention in recent years towards the utilisation and management of wetlands enthusiasm for it has grown considerably. A number of countries are now actively considering acceding to The Convention, the most recent being Namibia; if they all accede the number of Contracting Parties will rise to 90. There are, however, still major gaps in global coverage, notably in Africa and the Caribbean. In Latin America Columbia is still not included in spite of its extensive and important wetlands.

What is needed and which the Bureau hopes to see The Convention achieve is a technically sound reliable assessment of the wetland resource of the planet. This assessment should

describe the various types of wetlands and indicate their value and ecological function, and show how wetlands are satisfying human needs. Hopefully, this would encourage the establishment of national wetlands policies (so far only Canada, Costa Rica and Uganda have wetlands policies). The Convention Bureau hopes that The Convention will lead to a better appreciation of the globality of wetlands which will help to foster increased appreciation of the interdependence of countries. This in turn should, hopefully, decrease the strong feelings of national sovereignty that sometimes prevents the sharing between countries of relevant data, information and experience.

Funds Available

The budget for The Convention on Wetlands is supported by contributions from Contracting Parties determined according to the United Nations scale of contributions which is based on Gross National Product. Contributions are fixed for a three year period and paid in three annual instalments. States not Party to The Convention can also contribute should they so wish, as can other organisations. Contracting Parties will contribute for the triennium 1994-1996 a total of Swiss francs 6,675,000 (\$6,068,000).

The Wetland Conservation Fund, established in 1990, is intended for the provision of technical assistance for wetland conservation and for wise use initiatives in developing countries. The Fund is financed in part from The Convention's core budget but relies mostly on voluntary contributions from developed country Contracting Parties and on donations from NGOs. The Fund is aimed at small-scale projects in five categories: preparatory assistance for accession to The Convention; emergency assistance; training; technical assistance which includes the preparation of inventories, monitoring, and development of management plans. Allocations for Category 1 activities do not exceed Swiss francs 25,000 (\$23,000) and those for activities in the other four categories do not normally exceed Swiss francs 40,000 (\$36,000).

Links with Other Conventions

The interests of The Convention on Wetlands touches upon the concerns of several other global and regional Conventions. The Convention Bureau keeps in touch with these by periodic consultations with their Secretariats. This helps to minimise possible overlap of activities and enhances co-operation with them. UNEP convened a meeting to this effect in Geneva (March 1994) to which global and regional Convention Secretariats were invited in order to facilitate future co-operation; it may have helped. The Convention Bureau is in the process of developing a Memorandum of Understanding with the Secretariat of The Convention on Migratory Species (*quod vide*). There are possible major overlaps with the work of The Convention on Biological Diversity so that the two Secretariats will have to consult frequently if this overlap is to be minimised. There are also consultative links with the Secretariat of CITES.

The important organisational partners of The Convention are The World Conservation Union (IUCN), the International Waterfowl and Wetlands Research Bureau, the World Wide Fund for Nature (WWF), and BirdLife International (formerly the International Council for Bird Preservation). Other co-operating organisations include the Asian Wetland Bureau and Wetlands for the Americas.

Needs from GTOS

The Convention on Wetlands is now moving away from the simple listing of approved wetlands towards the conservation and management of wetlands as a whole. Emphasis in the future will be on the wise use approach and its relation to national development of Contracting Parties. Accordingly, Ramsar is now starting to consider fish and fisheries and to pay more attention to coral reefs, mangrove swamps, seabed grasses and coastal areas in general. The United States is pushing a new International Coral Reef Initiative and intends to work on it through Ramsar rather than the Law of the Sea Convention. Also, attention will now be given to all the wetland sites in a country and not just to those that are listed. Many of these unlisted wetlands would never become listed because of the uses to which they are now put.

All these new areas of activity will require more basic survey and inventory data, and more information about changes in the health of wetlands and their causes. An effective association with a measurement and observation system such as GTOS would be a great help in acquiring these data. If, however, the GTOS association is to develop it is essential that its activities are channelled through the governments of the Contracting Parties; these are the heart of The Convention so they should not be sidelined but encouraged to take up their responsibilities under The Convention. Any co-operation with GTOS cannot simply be sanctioned by The Convention Bureau but must be put before the Contracting Parties for their consideration and approval. This can best be done by first discussing GTOS and its work with the recently established Scientific and Technical Review Panel and getting its approval for the proposals; the Panel will next meet in mid-1996 and it would be useful to have GTOS on the meeting agenda. As a stage in the approval process it may be possible to run pilot studies with a few co-operative Convention Parties to demonstrate to the other Parties the practical benefits of GTOS involvement. The approved GTOS programme proposals can then be put before the Contracting Parties for consideration at their next Conference.

Land-cover and land-use data for the whole catchment area of each wetland would be of immediate value to The Convention Contracting Parties. Spatially referenced maps at a scale of 1:250,000 (or 1:200,000) and based on satellite information backed by ground measurements and observations from within the catchment would be the best means of supplying these data. Such maps would be easily understood and could be used by staff in the field as practical aids to management. A sequential time series of similar maps would aid in detecting any ecological changes that might have occurred. The wetlands themselves could be similarly treated but at scales such as 1:100,000 but this would depend on the particular site and the maps available for it.

Water availability and water quality are the keys to the satisfactory ecological functioning of wetlands. Information and data on water attributes and water supply would, therefore, be of great value to the Contracting Parties. This would include rainfall amount, extent and seasonality with similar information, where applicable, on snow fall. Data on the extent, type and seasonality of surface water within the catchment area and in the wetland are essential. Evapotranspiration, runoff and streamflow data, including water quality, turbidity and bedload, are also important. An area of special interest to The Convention is the state and quality of ground water; any information that GTOS could supply on ground water through direct measurements or by indirect inference (terrain and geology) would be of very great practical importance. So also would water chemistry measurements relevant to pH, turbidity, levels and types of pesticide, herbicide, and fertilizer derived contaminants, biological oxygen demand, major cations, and organic carbon. The exact variables to be observed would depend on the site,

its types of use, and the human activities within its catchment. Similarly, information on events likely to interrupt water supply to wetlands, such as volcanic eruptions, earthquakes, land slides and mudslides, would be useful as would crustal stress data indicating the likelihood of some of these events occurring.

At the moment there are no modelling initiatives under way through The Convention on Wetlands. Thus there has been no call for relevant biophysical and biochemical data. However, with the shift by The Convention towards more practical wetlands management issues, including the need to predict changes in wetland ecosystems, there may be a move towards environmental, ecological and management modelling in the future. Consequently, the need for biophysical and biochemical data is likely to grow.

For each wetland there is always a need for basic habitat data particularly terrain type, near-surface geology and structure. Vegetation cover, physiognomy, species composition and growth form data are important. Animal species population status and dynamics data are essential both for resident species and seasonally occurring ones, including migrants. Biological diversity information for both plants and animals, including information on rare and endangered species, is important.

Socio-economic data from each wetland and from the areas around it are becoming increasingly more important. These should include settlement patterns, agricultural type, pastoral activity, water requiring activities (e.g. industry, irrigation, fishing, aquaculture), tourism (e.g. bird watching, angling, water sports, accommodation and catering).

Basic weather data are needed for the whole of each catchment area. More detailed weather data would be needed for key parts of each wetland. Basic weather information should include precipitation (rainfall, snow fall and its water equivalent, dew where appropriate), air temperature, atmospheric humidity, and low level wind (direction and velocity). Where feasible basic weather data and their annual and seasonal variability should be shown on appropriately scaled maps.

2. Convention Governing the Protection of the World Cultural and Natural Heritage (1972)

The Convention

This international Convention was adopted in Paris at the General Conference of UNESCO on 23 November 1972 and entered into force on 17 December 1975. By 1 January 1995 140 states had become Parties to The Convention.²

The World Heritage Convention is administered by the World Heritage Centre in UNESCO, Paris. The Centre is headed by a Director and has a total staff of 27 of which 16 are professionals. UNESCO also partly supports the running of the Centre.

The primary mission of The Convention is to define the worldwide natural and cultural heritage and to identify and draw up a list of sites and monuments considered to be of such exceptional value that their protection should be the responsibility of all humankind and not just the state in which they occur. The aim of The Convention is, therefore, to promote co-operation among all nations and peoples in order to contribute effectively to this protection. The Convention is unusual in that it combines both the natural world and human culture recognising that both are complementary. Thus the places selected as World Cultural Sites range from monuments and items of outstanding architectural beauty to natural sites where human activity is not obtrusive. These natural sites include physical and geological formations, wildlife habitats and natural landscapes. The natural world is important to many cultural sites because the cultural identity of peoples is usually forged in the environment in which they live. This is frequently reflected in art and material culture where the most beautiful of human works often owe part of their beauty to their natural surroundings.

These monuments, architectural works and natural sites are recorded in the '*World Cultural and Natural Heritage List*' which shows that 440 sites have been designated as of 1 January 1995. The List is still growing.

On signing The Convention each state agrees to conserve any sites and monuments within its borders that are recognised to be of outstanding cultural value. The Convention has established a mechanism to help states to achieve this through international co-operation. This mechanism operates through the World Heritage Committee which is composed of relevant specialists from 21 countries that have signed The Convention. This committee meets annually to select new sites from proposals made by countries for inclusion (assisted by IUCN and the International Council on Monuments and Sites). The selection procedure is rigorous in order to limit the number of sites to those that are really worthy of inclusion. The World Heritage Committee also determines the technical and financial aid to be allocated from the World Heritage Fund to countries which have requested it. When a site is specifically endangered it may be put on the '*List of World Heritage in Danger*' which provides for emergency measures.

² By 18/2/97 there were 148 States Parties to the World Heritage Convention

World Heritage Fund

The World Heritage Fund is used for expert studies to determine or correct the causes of deterioration, to plan conservation measures, to train local specialists in relevant techniques, and to supply any needed equipment for conservation or restoration. The World Heritage Fund gets its income from obligatory contributions from states that are Parties to The Convention. For each country this is fixed at one percent of its contribution to the budget of UNESCO. Voluntary contributions also come from countries, from institutions and from private individuals. Thus the general public can contribute directly to the work of The Convention. At the moment (1995) the World Heritage Fund has an annual income of about \$3,500,000 and the World Heritage Centre can muster an additional \$10,000,000 to \$15,000,000 from other sources if they are needed.

The World Heritage Programme is founded on the paramountcy of nation state sovereignty so that there is little interference with government actions unless it proves absolutely necessary. However, the World Heritage Fund is also used to respond to emergency situations that threaten or have affected sites, for example fires (as in the Galapagos Islands), volcanic eruptions, floods (as in Venice), and earthquakes.

Site Description and Monitoring

The World Heritage Convention was drawn up in the 1960s before the term 'monitoring' came into general use. Consequently, The Convention itself does not make any mention of monitoring and has no provision for carrying it out. Responsibility for the monitoring of World Heritage Sites has thus been assigned by the World Heritage Centre primarily to the states that are Parties to The Convention. There is thus no legal obligation for these states to undertake monitoring.

Monitoring is seen as a continuous, permanent process between national and local institutions, technical personnel, and the World Heritage Centre. Its purpose is to try and ensure that each site is well conserved and kept in the best condition possible and that potential threats to its security are recognised in advance and steps taken to remove them or to mitigate their consequences. At the moment routine monitoring under The Convention is carried out on a five year cycle. However, Retroactive Monitoring (see paragraph 12) can occur at any time that a recognised responsible person in the World Heritage Programme visits a site and is able to make informal comments on its state.

The need for extensive background knowledge on each site so that its initial condition and subsequent trends are known has long been recognised in the World Heritage Programme. Thus what subsequently became known as site monitoring has been built into the site designation process. A statement on site status is now a required part of the nomination procedure for all potential new sites.

India and several other developing countries see any form of monitoring as a violation of national sovereignty and so are not in favour of it. Here the World Heritage Centre can only press for the state to undertake the necessary site studies and reporting procedures. Other developing countries, such as Columbia, recognise the value of monitoring but say that they are unable to afford it. In the latter cases the World Heritage Centre offers to undertake the initial inventory and establish a monitoring service on behalf of the Government, using support from the World Heritage Fund. Wherever possible, in this respect, UNESCO works closely with the

NGO community in order to obtain an independent view of what is happening at the site. Monitoring is, however, always at the macro-level and seldom goes in to detail; it is concerned with the overall conservation health of the site.

Monitoring is treated as a continuous process and not a purely sporadic activity. Under the World Heritage Programme (but not The Convention) three types of site monitoring are recognised.

- **Systematic Monitoring:** The continuous process of monitoring the condition of World Heritage Sites with periodic reporting on their state of conservation.
- **Administrative Monitoring:** Follow-up actions are undertaken by the World Heritage Centre to ensure the implementation of recommendations and decisions of the World Heritage Committee at the time of site inscription, or at a later date.
- **Retroactive (or ad hoc) Monitoring:** Reporting by the World Heritage Centre, other sectors of UNESCO, and the advisory bodies to the World Heritage Bureau and the World Heritage Committee, on an opportunistic ad hoc basis, on the state of conservation of specific World Heritage sites. The states that are Parties to The Convention are required to submit, through the World Heritage Centre, specific reports and impact studies each time that exceptional circumstances occur or that work is undertaken which may have an effect on the conservation status of the site. Retroactive monitoring allows independent assessments to be made of the consequences of relevant happenings at or near the site; these may confirm or differ from the reports provided by the countries. Retroactive monitoring is, therefore, a very important way of keeping a check on the status of each site.

The World Heritage Fund and the extra-budgetary resources available to the World Heritage Centre are used, in part, to assist countries to carry out the initial site descriptions and to follow up on routine monitoring once the site is established. This monitoring is regarded as the responsibility of the nation states concerned. The World Heritage Fund is thus used to enhance national capabilities in this area should it prove necessary and the state requests it.

When threats to particular sites are recognised, the World Heritage Centre and UNESCO can often effectively mobilise international pressure to remove that threat or mitigate its consequences. This was recently done in Yellowstone National Park where the threat of mining within the park was removed. Similarly, the idea of a ringroad close to the pyramid site at Giza was dropped because of international pressure.

Natural Sites

Approximately 100 World Heritage sites are natural sites; together they total some 100,000,000 hectares. Many of these sites also have other designations additional to that of a World Heritage Site. Thus there are 37 Biosphere Reserves and 38 World Heritage sites which are inscribed in both the International Biosphere Reserve Network and the World Heritage Convention (the difference in number is because Ngorongoro and Serengeti are considered distinct World Heritage sites but both form a part of a single Biosphere Reserve). There are also about 30 sites that have the triple designation of World Heritage Site, Biosphere Reserve and Ramsar Convention site [*quod vide*].

For these natural sites the World Heritage Programme depends upon the site description criteria developed by the World Conservation Monitoring Centre (WCMC) for parks and protected areas. Much of the data and information for describing natural World Heritage Sites often originates from WCMC in the first place. In general, World Heritage natural site descriptions do not go into detail and so are not concerned with, for example, quantified terrain accounts, soil characteristics and species lists. Where, however, a single species is important to the value of the site, such as the Redwood Trees in the Redwood National Park, or the North American Bison in Wood Buffalo National Park this species is recognised as such in the site description and its status is monitored subsequently. Thus for natural sites, monitoring is also at the macro-level looking at the general conservation status of the site.

Nevertheless, the World Heritage Centre would find some of the information to be gathered by GTOS very useful for the status monitoring of both natural and cultural World Heritage Sites.

Many of the cultural sites are located in natural areas and have to be seen against this natural background since changes in the background are bound to affect the site. It would be useful, therefore, to know the nature of this background, how it is changing, what are the likely causes of these changes, and what effect they might have on the site. The same considerations apply to natural sites since they also are influenced by their setting. Variability in rainfall (amount and pattern) could affect both the local and background vegetation. Changes in surrounding land-cover and land-use might, for example, then affect the site water supply, fuel wood and food availability. The area might be becoming industrialised, or put under irrigation, or be developing into a transport communication centre, all of which could profoundly affect the site. Similarly, an increase in the land degradation extent and rate in the surrounding regions could change the whole character of the site.

Needs from GTOS

The type of information needed would vary from site to site but would, with few exceptions, not be detailed. It would be useful to the World Heritage Centre to receive information on changes in the environmental status of the site and its surrounds timed to fit in with the overall five (or ten) year site description cycle. Information on changes in vegetation cover (improving, worsening), changes in available water (river, lake, ground water) changes in crustal stress (related to vulcanism, earthquakes, etc.), changes in human occupation and human related activities (increase of settlements; changes in settlement type; industrialisation; removal of crustal material for building; mining; etc.), changes in low level atmospheric contaminants, and changes in water contaminants would all be of great value to both the Parties to The Convention and to the World Heritage Centre.

With few exceptions the types of information needed would be those derived from analysed and interpreted data and provided at a macro-scale in the form of easily understood indicators where, for example a change in index value shows improving or worsening conditions. A lot of this information could be put in the form of large scale maps in which the data are spatially referenced which would make it easier for managers and planners to comprehend. The scale of these geographical information system (GIS) based maps should preferably be at 1:250,000 (or 1:200,000) scale for the surrounding areas. Site maps would need to be at 1:50,000 or 1:100,000 scale but these would probably be outside the mandate of GTOS except in some of the natural sites which might themselves also be long term GTOS study sites. Maps of this sort would be of value not only to the World Heritage Centre but also to the States that are Parties to The Convention.

The relevance of the locations from which GTOS data and information come to the World Heritage sites where they will be used must be demonstrated by GTOS to the satisfaction of both the World Heritage Centre and the countries involved. In other words, is what GTOS can provide actually relevant to the sites concerned? Can this information be extrapolated from measurement site to utilisation site with a useful degree of reliability?

The World Heritage Fund might be used to assist Convention Parties to prepare such information in appropriately scaled GIS format. National facilities could be used where they exist or contracts could be placed with other appropriate GIS centres (such as the various Global Resource Information Database centres) to prepare relevant GIS map products at required scales.

3. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973)

The Convention

This international convention was adopted in Washington D.C. on 3 March 1973 and entered into force on 1 July 1975. As of October 1995, 130 states were Parties to The Convention. Russia represents all members of the Commonwealth of Independent States.³

CITES is administered by a Secretariat headed by a Secretary General and is now located at the UNEP Geneva Executive Centre where it operates under the auspices of UNEP. The Secretariat has a staff of 27 of which 16 are professionals. Three of these professionals are seconded from countries.

The policy making body of CITES is the Conference of the Parties (COP) which meets every two years; it last met in Fort Lauderdale, Florida in November 1994. A Standing Committee provides policy, co-ordination and administrative guidance between regular meetings of the Parties; it consists of representatives from each of the six major geographic regions (Africa, Asia, Europe, North America, South and Central America and the Caribbean, Oceania) determined proportionally according to the number of Parties in each region, the Depository country (Switzerland), the host country of the most recent meeting of the Conference of the Contracting Parties, and the host country of the next COP session. Four more special purpose CITES committees also report to the Conference of the Parties: the Animals Committee; the Plants Committee; the Identification Manual Committee; the Nomenclature Committee. Membership of the Animals and the Plants Committees is according to geographical representation; membership of the other two committees is on a voluntary basis. Together these four committees provide technical and scientific advice to the Conference of the Parties. Special Working Groups and Panels are convened as necessary (e.g. Panel of Experts on the African Elephant).

CITES is concerned with the regulation of international trade in specimens of species of wild fauna and flora. In other words, it is concerned with the export and import of wild animals and plants, both alive and dead, whole or in parts, and any derivatives from them. Regulation is based on a system of permits and certificates which are issued when internationally agreed

³ By 15/3/97, 134 states had ratified The Convention

conditions are met governing international trade in the species concerned. These permits and certificates have to be shown when consignments of specimens leave or enter a country that is a Party to The Convention.

The animal and plant species covered by The Convention are listed in three Appendices to The Convention according to the different degrees of regulation afforded:

- **Appendix I:** Species of commercial value that are threatened with extinction and for which international trade is consequently subject to particularly stringent regulation and control, and so is only authorised in exceptional circumstances.
- **Appendix II:** Species of commercial value not now threatened with extinction but which could become extinct if international trade in them is not strictly regulated. This Appendix also lists 'look-alike' species that closely resemble the regulated species; control of trade in 'look-alike' species makes the control of international trade in the regulated species much more effective.
- **Appendix III:** Species that are subject to regulation within the jurisdiction of one Party to The Convention and for which the co-operation of other Parties is needed in order to prevent or restrict the exploitation of those species.

The careful monitoring of international trade is an important means of achieving the aims of The Convention. Scientific authorities monitor export permits for all species listed in Appendix II. Advice is then given to management bodies for the limitation of export permits whenever it is considered that export would be detrimental to the maintenance of a species. The aim is to ensure that species on Appendix II are maintained throughout their range at levels consistent with their role in the ecosystems in which they occur and well above the level at which they might become eligible for inclusion in Appendix I. Trade records are also kept by all Parties and are reported to The Convention Secretariat on an annual basis. Together these annual reports provide statistically valid information on the total volume of world trade in CITES listed species which is invaluable for assessing the conservation status of those species.

Some countries, such as Cambodia, Laos, Saudi Arabia and Yemen, are not Parties to CITES. In trade with these countries The Convention then requires that Parties to The Convention should get documentation from the non-Parties that substantially conforms with the requirements of CITES permits and certificates.

The global volume of international trade and cross-border movement of wildlife and wildlife products is enormous. The CITES Secretariat confirms Trade Permits at the rate of some 300,000 per year which works out at over 1,000 per working day. The Moscow State Circus alone requires some 1,500 permits and cross-border permits per year. Trade figures are supplied to WCMC for incorporation in its Trade database.

The complexity of CITES is reflected in the last session of the Conference of the Parties (Fort Lauderdale) where there were 214 items on the agenda.

Funds Available

A Trust Fund for CITES provides financial support for achieving the aims of The Convention. This Trust Fund is financed from contributions made by the Parties according to the United

Nations scale of assessment. In the three year period 1993-1995 the total available to the Trust Fund from this source is Swiss francs 15,736,034 (in 1995 equal to \$14.3 million). Contributions are also accepted from States that are not Party to The Convention, and from other agencies and organisations. Direct support for specific CITES activities is sought from individual countries and from the Global Environment Facility (GEF). However, the GEF project development process is now thought too long and tortuous to be practical so that increasingly funds for projects are being sought from other more responsive and less bureaucratic sources. Many are now funded through industry.

Links with Other Conventions

The work of The Convention touches upon the interests of several other global Conventions and a large number of regional Conventions and Agreements. CITES is, however, entirely concerned with international trade which differentiates it from most other environment related global Conventions. However, it does touch in part upon the interests of The Convention on Biological Diversity, The Convention on Migratory Species and The Convention on Wetlands and effective links with the Secretariats of these Conventions have been developed. The most important organisations that work with CITES are the World Conservation Union (IUCN) and the World Conservation Monitoring Centre (WCMC) both of which provide technical background data on listed animal and plant species. The latter can also supply data to the CITES Secretariat in the form of spatially referenced maps, if so required, which have proved very useful. A valued element of WCMC is its Wildlife Trade Monitoring Unit which holds data and information on international trade in wildlife species and their products.

Needs from GTOS

The major question posed by the Cites Secretariat is how can GTOS help to serve the species that are traded? In the view of the Secretariat this can best be done by helping Parties to The Convention to improve their ability to inventory, survey and monitor the habitats of listed species, and to inventory and monitor the species themselves. This would help Parties to improve their ability to meet their obligations under the terms of The Convention. Of particular value to Parties would be training in various aspects of biological diversity inventory and monitoring. The development of relevant national data management systems linked to a central international database so that there could be on-line data exchanges would be particularly useful to Parties. At the moment all management and analysis of reported data is done either in the CITES Secretariat or at WCMC. The CITES Secretariat has recently asked reporting countries to indicate the software used in their initial analyses of the data they report as a first step in ensuring that these data are comparable and compatible.

The CITES Secretariat would like to know whether each of the CITES listed species can be used in a sustained manner in its natural habitat and at what level. Information provided through GTOS should be able to help in establishing these safe utilisation levels. Realistic and reliable data for listed plant species and their habitats are particularly hard to obtain. This applies especially to listed succulents with relatively restricted ranges, and to listed tropical timber trees where the effects of tree extraction on natural replacement are not sufficiently understood. There is still relatively little interest, even among conservationists, in threatened plants unless they are seen in relation to associated threatened animals. Obtaining useful data on CITES listed plants could, therefore, be an important area for GTOS. Similarly, GTOS might be an aid to many Parties that are Range States for CITES listed mega-fauna in getting accurate and precise population estimates of these animals throughout their ranges and relating these data to local

habitat extent, condition and trends. The South American wild Camelid species (Alpaca, Guanaco and Vicuña), tigers and crocodiles are all examples of CITES listed mega-fauna for which these types of data are wanted.

CITES is becoming increasingly involved with marine mammals, marine birds, marine fish and the whole coral reef situation. Species inventories and status monitoring for these groups at both global and national levels are now important to CITES. Improved observing and data gathering methods have to be developed and applied for all these groups but especially for Cetaceans where the harvesting versus conservation of whale species is a very sensitive issue. The current proposal to transfer the Minke Whale from CITES Appendix I to Appendix II will highlight this controversy. This is an area in which GTOS and GOOS could co-operate.

Up until now there has been no call for detailed biophysical data as there has been no need to understand the functioning of the ecological processes that underlay what is observed. Increasingly, however, it is realised that the ability to predict changes in habitat and the consequences of such changes is going to be an important part of the sustainable management of renewable natural resources. This will entail a move towards the construction of satisfactory environmental, ecological and management models, and these will need biophysical data to develop. The CITES Secretariat, therefore, recognises that the ability to gather these types of data is a useful part of GTOS that will have practical value for CITES.

Land-cover and land-use data in clearly designated and readily understood categories for the ranges of listed species and for the surrounding areas would be the most valuable data that could be supplied by GTOS to the CITES Secretariat and to relevant Parties. These data would be most useful when put in the form of spatially referenced maps at appropriate scales. In most cases the best scale would be 1:250,000 (or 1:200,000) but this would vary with the species concerned, the terrain type and the habitats involved. In some cases scales of 1:25,000 would be the most suitable. These maps should be based on satellite images supported by ground measurements made wherever possible in the range areas themselves. It is essential that these maps and their supporting data are in forms suitable for use by local field staff. An important part of all CITES related field studies is that measurements be repeated at appropriate intervals so that changes in the extent and quality of the available habitat can be determined and reported to CITES. This will enable the quotas for relevant traded species supported by these habitats to be adjusted accordingly. The documenting of changes in habitat and changes in land-use will help to understand properly some of the drastic changes that are already occurring such as in Argentina where the recent expansion of sheep farming in the grasslands of Patagonia has resulted in very dramatic reductions in the numbers of the indigenous wild Guanaco.

Basic habitat data required for CITES purposes would include terrain types, drainage patterns, soil types, available surface water and vegetation types, structure (physiognomy) and species composition (dominant species and species of relevance to the listed species concerned - for example, some species of epiphytic orchids and cacti have a limited range of host tree species). Above ground biomass measurements (alive, dead, green, plant part) are important for all studies on herbivorous animal species; in some cases below ground biomass measurements may be necessary. Data on the status and population dynamics of the listed species themselves (both animals and plants) are essential. These should include determination of seasonal and annual movements of listed animal species; their food habits and predator-prey relationships where these are relevant. The health of animal and plant species (pests, diseases, pathogens, etc.) is an important aspect of the sustainable management of renewable natural resources which is not often incorporated into observation systems; GTOS should consider adding it. Biological

diversity information is needed for both plants and animals in the same region as the listed species; only a few species in an area of high endemism may be commercially valuable. Weather data (long term, annual, seasonal) are important aids in understanding many ecological and habitat changes that might affect listed species. Weather data should include rainfall and other forms of precipitation (including occult where relevant), air temperature, wind speed and direction, incoming solar radiation, evaporation and evapotranspiration, and atmospheric humidity. Special studies of local micro-climates may be necessary in some cases (e.g. canopy conditions in tropical rain forests). Weather data (long term, annual and seasonal probabilities) for the range areas of CITES listed species and the surrounding regions can usefully be expressed in map form as these are readily understood by field workers.

Land-use information should include dominant agricultural activities, pastoral use including rangelands, forestry and timber extraction, irrigation schemes, fisheries, hunting and other wildlife harvesting forms, tourism, settlement pressures, mineral extraction and mining, and industrial development. Parks and protected areas in relation to the occurrence of the listed species should be known and shown on appropriate maps.

Additional specialised information may be needed in some instances. This could include data on land clearance, fires, water acidity and contamination (ground water, rivers and lakes), air borne contaminants (sulphur oxides, nitrogen oxides, particulates, etc.), and the effects of unusual physical events (volcanic eruptions, earthquakes, violent storms, tsunamis, etc.).

4. Convention on the Conservation of Migratory Species of Wild Animals (CMS) (1979)

The Convention

This international Convention was adopted in Bonn on 23 June 1979 and entered into force on 1 November 1983. As of October 1995, 47 states were Parties to The Convention.⁴

The Convention on Migratory Species is administered by a very small Secretariat under the auspices of UNEP and located in Bonn. It is staffed by a Co-ordinator and his Deputy and some support staff. UNEP partly supports the running of the Secretariat. Two further posts remain to be filled; an Information Specialist and a Scientific Agreements Officer. In addition the Conference of Parties has recently (1994) requested UNEP to provide a Fund Management and Administrative Officer for the Secretariat.

The policy making body of The Convention on Migratory Species is the Conference of the Parties which meets at intervals of about three years to review the implementation of The Convention; its last meeting was in Nairobi in June 1994. A Standing Committee, consisting of representatives from five geographic regions (Africa, Central and South America, Asia, Europe and Oceania), the Depository Country (Germany) and the host of the next Conference of Parties, provides policy and administrative guidance between regular meetings of the Parties. Currently this Committee consists of representatives from Australia (Chair), Germany, Netherlands, Niger, Panama and Saudi Arabia. A Scientific Council consisting of experts appointed by individual member states and by the Conference of the Parties gives advice on scientific matters. In addition, a number of working groups have been established under the

⁴ By 1/5/96, 49 states had ratified The Convention

auspices of the Scientific Council to promote work on Agreements for several groups of species such as small cetaceans, bats, and Asian - Australasian waterfowl.

The primary aim of The Convention is to conserve terrestrial, marine and avian migratory species over the whole of their migratory range. Animals that migrate across national boundaries or between areas of national jurisdiction and the high seas are particularly vulnerable to a wide range of threats which can include shrinking habitat in breeding areas, excessive hunting along migration routes, and degradation of feeding sites. The Convention, therefore, provides a means by which Parties can reduce or remove these risks and act to conserve migratory species and their habitats by:

- Adopting strict protection measures for migratory species that have been categorised as endangered.
- Concluding Agreements for the conservation and management of migratory species that have an unfavourable conservation status or which would benefit significantly from international co-operation. This is important because countries that share migratory species are often host to them at different stages of their life cycle.
- Undertaking any necessary joint research activities.

The Convention has two Appendices which list migratory species that would benefit from conservation measures taken by Range States (a Range State is a country in which a species is found, even if in transit):

- **Appendix I:** Lists species that are in danger of extinction throughout all or a significant part of their range. For example, the Siberian Crane, the White-tailed Eagle, the Hawksbill Turtle, the Mediterranean Monk Seal, and the Dama Gazelle. Range states are required to prohibit the taking of species on Appendix I (with few exceptions) and accord them full protection. Ships operating on the high seas outside national waters but under the flags of Range States are also covered by the limitations of Appendix I. Range States must also take steps to conserve the habitat of migratory species on Appendix I, to remove factors affecting their migration, and to control any factors that might endanger them.
- **Appendix II:** Lists migratory species whose conservation status would benefit from some form of international co-operative Agreement. These Agreements may range from legally-binding treaties to less formal Memoranda of Understanding. A species does not have to be faced with extinction to qualify for listing in Appendix II. For example, dolphins, seals, many species of waterfowl, the White Stork and the Monarch Butterfly are all currently listed on Appendix II. However, species on this Appendix do not get protection until an Agreement on them is concluded.

The Convention is both specific and flexible in its coverage since its provisions apply to distinct populations of a given species. Thus a species in need of safeguards in one region may be listed in either Appendix without necessarily creating obligations for other countries in which the conservation status of the species is favourable. If it is appropriate a species may be listed in both Appendices; thus there is no hierarchy of Appendices.

Four Agreements have so far been concluded within the framework of The Convention on Migratory Species. These cover the conservation of seals in the Wadden Sea, bats in Europe, small cetaceans in the Baltic Sea and the North Sea, and the western and central Asian populations of the Siberian Crane. New Agreements currently under negotiation in the draft stage are for migratory waterbirds of the African-Eurasian and Asian-Pacific regions, small cetaceans of the Mediterranean Sea and the Black Sea, and the Slender-billed Curlew. Other Agreements in an early stage of preparation include those for Sahelo-Saharan ungulates, albatrosses, bustards and marine turtles.

The Convention Secretariat is required to keep a Range State List for all the species listed in the two Appendices to The Convention. The database for this list is maintained in the Secretariat in Bonn. The Secretariat develops the list and gives it to the Scientific Council to check and approve. The Range State List is published on an ad hoc basis at approximately three year intervals. The most recent update was provided as an Information Document to the Committee of the Parties at its June 1994 meeting.

Funds Available

The Conference of Parties at its Fourth Session in June 1994, adopted a Budget of \$3,100,000 for the period 1995-1997, and to use an additional \$500,000 from the Trust Fund of The Convention on Migratory Species to finance consultancies for specific Convention related work to be undertaken in countries, especially developing countries.

Links with Other Conventions

The interests of The Convention on Migratory Species touch upon those of several others such as Biological Diversity, CITES, World Heritage, Ramsar and several related regional Conventions. Among the global Conventions there seems to be little direct overlap of interests. Among the regional Conventions, however, there could be overlap, especially in Europe where regional Conventions and Agreements concerning migratory species are being developed without reference to The Convention on Migratory Species. This is particularly true with regard to highly migratory fish species of economic importance. Also in the former USSR none of the newly emergent countries have acceded to The Convention on Migratory Species but they have together in 1994 concluded their own regional Convention on Migratory Species, again without reference to The Convention on Migratory Species.

The Convention Secretariat is currently developing a Memorandum of Understanding with the Ramsar Convention Secretariat [*quod vide*] to enhance co-operation and avoid duplication. Ramsar focuses on wetland conservation whereas The Convention on Migratory Species focuses on species that inhabit these wetlands. There could be an overlap of interests if CMS became too closely concerned with wetland conservation or if Ramsar became too concerned with individual species. Links with CITES and The Convention on Biological Diversity are being developed.

Links with the World Conservation Monitoring Centre

The Secretariat works closely with a number of NGOs one of the most useful being probably the World Conservation Monitoring Centre (WCMC). At present data originating from activities in The Convention on Migratory Species are provided to WCMC which enters them into its own databases and then feeds them into the Internet. Thus Convention data feed into

databases that are on line. The Convention Secretariat considers that WCMC could usefully provide profiles of key countries that are potential Convention member states; this could be done under contract to the Secretariat. There seems to be some reluctance on the part of WCMC to undertake this work. Also WCMC data do not seem to be as readily available as the Secretariat thinks they should be if they are to be of value to countries, particularly developing countries. The difficulties some developing countries have recently had in obtaining relevant marine turtle data from WCMC was cited as an example. These difficulties probably relate to the present financial policy of WCMC and to its own long term funding problems.

Needs from GTOS

The Convention on Migratory Species requires Parties to undertake within their territories inventories and surveys relevant to the migratory species concerned, as well as to carry out any necessary research. These activities relate not just to the migratory species themselves but also to the habitats in which the migratory species occur and through which they move when on migration; thus it covers both breeding grounds and feeding areas.

Many developing countries do not have the technical capacity or the finance necessary to undertake this work even though The Convention to which they are Parties requires that it be done. These countries, therefore, turn to The Convention Secretariat for assistance using the funds available to it. The Secretariat has no data handling capacity and so has to work on a contract basis through organisations and countries that have this capacity. Anything that could be done through GTOS to help in the carrying out of the basic species inventories, population studies and habitat studies would be welcomed by both the Secretariat and The Convention Parties. Such help could be direct in the form of field work, and indirect by provision of relevant data and information and by provision of advice on methods.

The most useful GTOS input would be land-cover and land-use data for the entire migration route of each migratory species, to include breeding grounds, feeding areas and the route itself. This could probably be best supplied through GTOS in the form of spatially referenced maps based on satellite information backed by ground measurements and observations from within the migration area itself. The most useful scale for these maps would be 1:250,000 (or 1:200,000) for the whole migration area of most migratory species, with special 1:100,000 or 1:50,000 scale map data for the breeding areas. Exact requirements would vary from species to species. If these data and information were derived from sites outside the migration areas and extrapolated to the migration regions, their relevance to the latter should be satisfactorily demonstrated.

Basic habitat data needed include near-surface geology, terrain type, structure (including slope, aspect and drainage), soil types and distribution, and water availability (surface water in springs, dams, lakes, rivers; ground water in wells, boreholes, sand-rivers, etc.). Land-cover and land-use should provide information in percentage classes indicating the size, extent and type of each category. These categories should be defined and structured with sufficient clarity that changes in them over time can be measured and depicted. Vegetation cover information should indicate vegetation category (forest, woodland, bush, grassland, marsh, swamp, etc.), vegetation cover and its extent, physiognomy and structure (crown cover and height), species composition by dominant species and by species important to the migratory animals. Biological diversity information is needed on both plants and animals within the migration region, including information on the occurrence and distribution of any rare and endangered species. Land-use information should include agricultural activity and dominant crop type, pastoral use including

rangelands (with livestock types), settlement patterns (scattered settlements, villages, towns, cities, etc.), communications (roads, railways, shipping facilities, airfields, etc.), and industrial development. Any parks and protected areas within the region should be shown on the maps so that migration movements can be seen in relation to them.

Basic weather data are needed for the whole of the migration area and its surrounds. More detailed weather data would be needed for key parts of the migration area such as the breeding grounds. Basic weather information should include precipitation (rainfall, snow fall and its water equivalent, dew where appropriate), air temperature, atmospheric humidity, and low level wind (direction and velocity). The extent of basic weather data and their annual and seasonal variability over the whole of the migration region should be shown on appropriately scaled maps.

In addition specialised information would be of value with many migratory species groups and with some individual species studies. These would include fire (present occurrence, extent and type; past burn history from fire scars), water chemistry studies relevant to birds, bats, fish, river dolphins, etc. (to show *inter alia* pH, turbidity, levels and types of pesticide, herbicide, and fertilizer derived contaminants, biological oxygen demand, organic carbon), higher level above ground weather data for use with migratory bird species (especially wind direction and velocity, rain storm incidence and locality, weather front data to indicate passage of pressure systems), specialised vegetation measurements would include 'green-flush events' with data on above ground biomass, consumable above ground biomass (consumable by the migratory species), consumable plant part availability, dead biomass, etc. For migratory species in high latitudes seasonal snow and ice data are very important (snowfall extent, type, depth, water equivalent; ice sheet and glacier extent and surface morphology, sea ice extent and morphology, lake freeze and thaw times, permafrost extent and depth below surface).

It is important that these data are in forms that can be used to show both seasonal changes and longer term changes over years or decades. The Secretariat is particularly interested in having advanced warning of impending or occurring climate and habitat modifications that could cause migratory species to change their migration routes, or alter their breeding and feeding behaviour. The Migratory Species Convention requires contracting Parties to ameliorate barriers to animal migration. The Convention Secretariat would, therefore, like to be able to advise Parties on the likely problems for migratory species that might arise from activities in their territories, such as the construction of large dams, that might result in the blocking of migration routes or in the changing of vital habitats. Similarly, the Secretariat would also like to provide advice to Parties on the possible location and suitability of corridors for the safe passage of migratory species. Suitably presented GTOS data would be invaluable for these purposes.

Migratory ocean species present different problems to those of terrestrial animals so that the gathering and interpretation of relevant ocean data would more properly be within the remit of GOOS and GCOS; they might form the basis of joint activities involving all three Global Observing Systems. Determining the extent and levels of the contamination of marine areas would be key activities.

5. BASEL Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989)

The Convention

This international Convention was adopted at Basel on 23 March 1989. It entered into force on 5 May 1992. By 4 September 1995 91 countries were Parties to The Convention.⁵

The Basel Convention is at the moment administered by a small Secretariat, headed by an Executive Secretary, which is located at the UNEP Geneva Executive Centre where it operates under the auspices of UNEP.

The policy making body of The Convention is the Conference of the Parties (COP) which meets every one or two years as necessary. The third session of the COP was in Geneva in September 1995; the next session will be in 1997. The Conference of the Parties established an open-ended ad hoc Committee of legal and technical experts to consider mechanisms for the implementation of the Basel Convention. The Conference of the Parties also established a Technical Working Group to advise it on technical matters related to the environmentally sound management of hazardous wastes. Part of this Working Group's responsibility is the production of *Technical Guidelines* that are meant to assist countries in their efforts to ensure the environmentally sound management of the wastes subject to the Basel Convention. The Technical Working Group has also developed a set of criteria that should be met if the recycling of hazardous wastes is to be done in ways that are environmentally sound.

The Basel Convention is the first global environment treaty that is concerned with the international transfer of hazardous wastes. Its primary aims are to reduce the generation of hazardous wastes, to encourage their disposal as close as possible to the source of generation, and to ensure that all hazardous wastes are managed in an environmentally sound manner. It is especially concerned with safeguarding the environment in developing countries against possible influxes of hazardous wastes originating in industrialised nations.

The Basel Convention, in general, only allows transboundary movements of hazardous wastes if the exporting Party does not have its own facilities for treating the wastes in an environmentally sound manner. These cross-frontier movements are, however, only allowed under a Prior Informed Consent (PIC) procedure in which the recipient state and all those states through which the wastes must pass to reach the recipient state provide their written consent to the exporting country before the wastes start on their journey.

The Convention contains a number of Annexes of which the following are relevant to this discussion:

Annex I: Lists 45 categories of hazardous wastes to be controlled under the Basel Convention. The first 18, termed 'waste streams', range from medical wastes, drugs, medicines, and wood preservatives, to wastes originating from a wide range of chemical and other industrial processes. The last 27 categories are wastes that have as constituents a variety of heavy metals, organic compounds, and other specific chemical substances.

⁵ By 15/3/97 the Basel Convention had been ratified by 109 states and the European Community

Annex II: Lists wastes requiring special attention. These comprise household wastes and the residues remaining after the incineration of household wastes.

Annex III: Lists characteristics that cause a substance or substances to be classified as hazardous through being, for example, explosive, flammable, infectious, poisonous, corrosive, toxic or ecotoxic.

Annex IV: Deals with hazardous waste disposal operations. **Annex IV-A** lists 15 disposal operations which do **not** lead to the possibility of resource recovery, recycling, reclamation, direct re-use or alternative uses. These include land-fill, incineration, dumping at sea or in water, permanent storage, and land treatments with liquids or sludges. **Annex IV-B** lists 13 operations which can lead to resource recovery, recycling, reclamation, direct re-use, or alternative uses. These include use as a fuel, recycling of liquids and solids, and land treatments that result in benefits to agriculture or to ecological improvement.

At its second session (March 1994) the COP decided to ban with immediate effect the export from OECD countries to non-OECD countries of hazardous wastes destined for final disposal, and to phase out by 31 December 1997 the export of hazardous wastes destined for recycling. This controversial decision will help safeguard developing countries from the dumping of hazardous wastes in their territories but at the same time will place many useful developing country recycling activities in jeopardy, particularly scrap metal recycling.

There are many ways of disposing of hazardous wastes (See Annex IV of The Convention) but two of the most commonly used are in-the-ground disposal, and incineration. Some hazardous waste material, particularly heavy metals, e.g. in the ash from incineration, is buried deep within stable geological areas (e.g. granite masses). Most in-the-ground disposal is, however, in the form of land-fill, either of various hazardous wastes together, or various hazardous wastes in combination with other non-hazardous waste material. Disposal in this form can be both legal and illegal. The incineration of hazardous wastes is when they are burned at high temperatures in a special facility and converted into gases and essentially incombustible solid residues. Incineration can pose environmental problems because the emission gases contaminate the air around the incineration site and downwind of it; they are also deposited on the earth's surface. The residues from incineration are often rich in toxic heavy metals so that residue transport and subsequent storage or disposal can have severe environmental risks.

The illegal dumping of hazardous wastes is perhaps the most frequent problem faced under The Convention. Usually this illegal dumping is in the form of unauthorised land-fills. The hazardous wastes in such illegal land-fills are often diluted with household wastes as cover for the hazardous materials. Such unauthorised dumping is usually accompanied by unauthorised transboundary transport of hazardous wastes from sources to the dumping sites with all the attendant *en route* risks that this entails. So frequent is this illegal traffic that Article 9 of The Convention is specifically about it.

Funds Available

Two Trust Funds have been set up under the terms of the Basel Convention. The first, the Trust Fund for the Basel Convention, is for support for the normal operations of The Convention Secretariat. This Trust fund is financed from contributions by Parties based on the scale of assessments for the apportionment of the expenses of the United Nations adjusted so that no one

contribution shall exceed 25 percent of the total; other countries, agencies and organisations can also contribute to it. The second, the Technical Co-operation Trust Fund, is for assisting developing countries (and other countries) in need of technical assistance in the implementation of the Basel Convention. This Trust Fund is financed through contributions made to it both by Parties and non-Parties. An Emergency Fund was also established which is to be used in emergency situations to minimise the damage from accidents arising from transboundary movements of hazardous wastes or in their disposal.

Links with Other Conventions

The work of the Basel Convention does not at present directly impinge on that of any other Convention considered in this report. There are circumstances, however, particularly with regard to illegal land-fill operations, where it could touch upon some site-related activities of the World Heritage Convention, The Convention on Biological Diversity, The Convention on Migratory Species, The Convention to Combat Desertification, The Convention on Wetlands, and perhaps even upon some of the support activities for CITES. The transport of hazardous wastes by sea does bring the interests of the Basel Convention very close to those of several global and regional Conventions that are concerned with the control of marine pollution.

Needs from GTOS

All Parties to the Basel Convention are required under Article 13 of The Convention to inform states that might be affected about accidents involving the transboundary movement of wastes, including hazardous wastes, that might present risks to the health of both humans and the environment. This information is also provided to the Secretariat.

All Parties are also required under Article 13 to transmit information on any actions that they have taken regarding the management and control of hazardous wastes. In particular they are asked to report on any transboundary movements of hazardous wastes (or other wastes) with which they have been involved, giving the categories of these wastes and the amounts moved in each category. More recently Parties have been asked to provide estimates on how much hazardous wastes they generated in a reporting year broken down into the categories according to Annex I of The Convention. This information is intended to help the COP to set waste minimisation targets and to improve hazardous waste management and disposal processes. These data are reported to the Secretariat, usually in the form of tables.

The Secretariat has been asked to set up an Information Management System (IMS) to handle these data but has not yet managed to do so effectively. The Secretariat seems to lack sufficient funds at present to finance the design and establishment of an IMS for The Convention. The Secretariat has been in contact with the Global Resource Information Database (GRID) which is capable of designing a suitable IMS; the Secretariat, however, is unable to meet the costs that GRID indicated that it would charge. A functional IMS is the major data-related need of The Convention. Free or low-cost help from GTOS in this regard would be welcomed by the Secretariat.

According to the Secretariat, the Basel Convention has no need of information from a Global Observing System such as GTOS. It would benefit, however, from site-specific or site-relevant habitat and environmental data for both land-fills and incineration locations if these could be supplied through GTOS.

Land-Fill Sites

Both geological and hydrological data are needed for land-fill sites and the areas around them. Chemicals from the land-fills can soak down into the ground through the clay or plastic site ground-seals (illegal land-fills usually do not have these ground-seals) where they can enter the ground water and be transported for long distances. Thus contamination of wells, springs, rivers, lakes and other water bodies can result from poorly placed land-fills. This is particularly true for illegal land-fills which are often placed without regard to geological and hydrological conditions. Contaminated ground water can lead to contaminated crops and livestock which can result in poor human and environmental health. It would be useful, therefore, to have geographically referenced land-cover and land-use data for important land-fill areas and their surrounding regions. These data should include terrain form and structure, basic geology (including fracture zones, cavities and sink-holes, measurements of crustal stress, and other features that would affect below ground drainage and water movement), and hydrology (drainage systems, run off, ground water amounts and movements). Information on human activities in and around the land-fill zones is essential for properly understanding the environmental and health implications of the land-fills. Human activities observed should include human health and factors affecting it, settlements, industry and agriculture (crops, livestock, irrigation, glass-house production, etc.). Odours, noise and vermin are features of most land-fill sites. Provision will have to be made for observing these both on-site and in the immediate neighbourhood. Land-fill emission gases need to be monitored both on-site and in the surrounding regions since some of these gases are potentially dangerous to people particularly those containing chlorinated hydrocarbons, mercury, and arsenic. Basic weather data should include precipitation (amount, spatial distribution, temporal distribution, dew and occult precipitation), air temperature, relative humidity, ground surface temperature, low level wind (speed, direction, seasonality), and evaporation.

Leachate from land-fills normally contains major elements and ions (e.g. calcium, magnesium, iron, manganese, sodium, ammonia, carbonate, sulphate and chloride), trace metals (e.g. mercury, chromium, nickel, lead, and cadmium), organic compounds (total organic carbon, chemical oxygen demand, individual organic species such as phenol, and chlorinated organic compounds), and micro-organisms. Any water chemistry observing programme for the site and the surrounding areas must take these likely leachate contaminants into account; a network of reference wells for this purpose will need to be established on-site and in the surrounding zone.

Incineration Sites

Normally incineration sites are located where the topography is such that there will be effective and rapid dispersion of emissions into the atmosphere, and that there are no nearby areas (especially downwind) which are sensitive to air pollution. The objective is to minimise the impact of these emissions on human health and human food sources since there is now increased concern about the risk posed by the deposition of airborne pollutants and their subsequent uptake into the food chain. Emission gases will contain carbon monoxide, carbon dioxide, nitrogen oxides, sulphur dioxide and organic substances including toxic halogenated compounds, volatile heavy metals, and particulate matter. The combustion process itself could produce undesirable or toxic products such as chlorinated dioxins and furans which would then also be emitted from the incineration plant. Any observing system in the region of incineration sites should, therefore, be able to measure most of these variables.

Many air pollution control devices used in waste incinerators use water for cleaning the emission gases thus producing waste water that contains the contaminants that have been removed. This waste water has itself to be stored securely or treated before it is discharged. Accordingly, there is a need for a water quality monitoring programme in and around all incineration waste disposal sites. Variables to be measured should include water temperature, pH, quantity of suspended solids, and concentrations of a wide range of contaminants.

6. United Nations Framework Convention on Climate Change

The Convention

This international Convention was adopted at the United Nations Headquarters, New York, on 9 May 1992. It entered into force on 21 March 1994. As of October 1995, 140 states are Parties to The Convention.⁶

The United Nations Framework Convention on Climate Change was initially administered by an Interim Secretariat, headed by an Executive Secretary, and located at the UNEP Geneva Executive Centre where it operated under the auspices of the United Nations Department of Policy Co-ordination and Sustainable Development. On 1 January 1996 the United Nations Secretary General appointed a head of The Convention Secretariat. The Secretariat moved during 1996 to its new location in Bonn, Germany.

The Conference of the Parties (COP) is the supreme policy and decision making body of The Convention and will oversee its implementation. The first session of the COP was held in Berlin in March-April 1995. The COP will meet annually unless it subsequently decides otherwise. An open-ended Committee on Science and Technology (the Subsidiary Body for Science and Technology Advice) was established at the first meeting of the COP in order to provide the COP with information and advice on scientific and technological matters relating to The Convention. The first meeting of the Subsidiary Body was held in August 1995. Up until that point scientific advice had been provided by the Intergovernmental Panel on Climate Change (IPCC). The Berlin session of the COP also established an ad hoc Working Group on the Berlin Mandate to develop new Protocols for the implementation of The Convention after the year 2000.

The main objective of The Convention is to achieve stabilization of greenhouse gas concentrations in the atmosphere at levels that would prevent dangerous anthropogenic interference with the climate system. These levels of greenhouse gas concentrations should be reached within a timeframe sufficient to allow ecosystems to adapt naturally to climate change. The Convention provides a framework within which governments can work together to carry out new policies and programmes that will have broad implications for the way that people live and work. The Convention emphasises that developed countries are mainly responsible for historic and current emissions and must take the lead in combatting global climate change. The Convention also recognises that the first priority of developing countries must be their own economic and social development and that their share of total greenhouse gas emissions will rise as they industrialise. It also acknowledges that countries that are economically dependent upon coal and oil could encounter difficulties if world energy demand changes, and that small

⁶ By 15/3/97, 165 states had ratified The Convention

island states and arid regions are especially vulnerable to the expected impacts of climate change.

The Convention has two Annexes:

- **Annex I:** Lists Parties that will each incorporate into its national communication to the COP a detailed description of the policies and measures that it has undertaken to implement its commitment to The Convention. Parties in this Annex are also required to provide a specific estimate of the effects that these actions will have on anthropogenic emissions by its sources and removals by its sinks during the current decade (ending by the year 2000). The Parties listed are mainly OECD countries and those from Eastern Europe.
- **Annex II:** Lists Parties that agree to provide new and additional financial resources to meet costs incurred by developing countries in meeting the terms of The Convention. Parties on this list also agree to helping to transfer environmentally sound technologies and knowledge to other Parties, especially developing country Parties, to help them implement the provisions of The Convention. The Parties listed are mainly OECD countries.

Developing country Parties are not required to provide national communications until three years after The Convention enters into force; least developed country Parties can provide their national communications at any time. The first 15 national communications have gone to the COP and are now being reviewed in depth; this is a lengthy process involving visits to each country to see national policies in action and to look at emission sources. Developing countries have seen this process as an intrusion into their affairs and the whole area of national communications has now become very politically sensitive.

The Berlin session of the Conference of the Parties unanimously accepted the Berlin Mandate which will consider reductions in emissions of greenhouse gases after the year 2000 which is when the present agreement runs out. The *ad hoc* Working Group on the Berlin Mandate will begin a process that will aim to set quantified limitations and reductions objectives within specified timeframes. The Working Group is required to complete its work as early as possible in 1997.

The COP also reaffirmed that developing countries would not yet be required to join the industrialised countries in accepting limits on their own greenhouse gas emissions because per capita emissions remain much lower than in industrialised nations. If past emissions still present in the atmosphere are also considered the imbalance between the two groups is even greater. This point was negotiated exceptionally well by the developing countries under the leadership of China and India.

Funds Available

A Financial Mechanism was established under The Convention and is responsible to the Conference of the Parties. At the moment this Mechanism is housed within the Global Environment Facility which is also the source of funding for Convention-related activities and projects, mainly in developing countries, during the interim period of The Convention. Financial contribution can be accepted through bilateral, regional and other multilateral channels for use in developing countries.

Links with Other Conventions

The Convention does not specifically call for co-operation with other Conventions. It does, however, recognise the need for adaptation to the impacts of climate change in coastal zone management, water resources, agriculture and for the protection and rehabilitation of areas affected by floods, and drought and desertification, particularly in Africa. The work of The Convention, therefore, touches directly upon that of The Convention to Combat Desertification, The Convention on Biological Diversity, The Convention on Wetlands and The Convention on Migratory Species. It also relates to the World Heritage Convention. It is to be expected that there will eventually be co-operation between the Secretariats of these Conventions leading to joint activities.

Needs from GTOS

Article 5 of The Convention on Climate Change deals with research and systematic observation. It requires that Parties "...support and further develop, as appropriate, international and intergovernmental programmes and networks or organisations aimed at defining, conducting, assessing, and financing research, data collection and systematic observation..." It also requires that they support efforts "...to strengthen systematic observation and national scientific and technical research capacities and capabilities, particularly in developing countries, and to promote access to, and the exchange of, data and analyses thereof obtained from areas beyond national jurisdiction..."

At the moment there is little or no acknowledged measurement carried out under The Convention, particularly in developing countries, of any variables relating to climate change, including measurements of the greenhouse gases themselves. The IPCC format for inventories is normally followed. In this no direct measurements are made but rather emission amounts are calculated from consumption or utilisation of substances that will result in greenhouse gas releases e.g. x tonnes of carbon dioxide will be emitted if y tonnes of coal are consumed. Clearly this cannot be done for climate change related variables such as those concerned with land-cover and land-use which must be measured and are very country or area specific.

The Interim Secretariat of the Framework Convention on Climate Change feels that at present the situation is too politically sensitive for there to be any immediate future in developing observation systems for use by the Parties under The Convention. The Interim Secretariat considers that developing countries are not satisfied at present with data provided by scientists because they feel that these data are too biased towards industrialised countries to the detriment of developing countries. Each of the latter has its own national data, its own data gathering systems and its own way of doing things. Many developing countries have no wish to make national data and information readily available to others in case their own data are used against them. This is at the heart of the unease that many developing countries feel about the national communications that are required from Parties under The Convention. That these are termed 'communications' rather than 'reports' also reflects the strong political feeling by developing countries against the diminution of national sovereignty that reporting to a body implies.

The Interim Secretariat feels that this view may change with time because developing countries were responsible for bringing Article 5 into The Convention as they wanted to share the experience, data and information of others. At the moment the Secretariat has before it a number of national programmes that can be regarded as rehearsals for the national communications that will eventually be submitted to the Conference of the Parties. The

Secretariat feels that there are a number of developing countries that are in the process of transforming themselves into newly developed countries e.g. Mexico and South Korea. When this transformation has taken place these countries will have grown closer to those that are industrialised at present so that their viewpoints will have converged; they will then be much more sympathetic to observing and measurement systems because they will be in a position to benefit from data exchange.

At the moment, therefore, the Interim Secretariat of The Convention on Climate Change is of the opinion that GTOS would be of little immediate help to both it and The Convention Parties but that this situation may change given sufficient time.

7. Convention on Biological Diversity (1992)

The Convention

This international Convention was adopted in Rio de Janeiro on 5 June 1992 during the United Nations Conference on Environment and Development. It entered into force on 29 December 1993. As of October 1995, 94 states were Parties to The Convention.⁷

The Convention on Biological Diversity is at the moment administered by an Interim Secretariat, headed by an Executive Secretary, which is currently located at the UNEP Geneva Executive Centre where it operates under the auspices of UNEP. The final placing of The Convention Secretariat has yet to be decided. Possible locations to be considered by the November 1995 Conference of the Parties are Geneva, Madrid, Montreal and Nairobi; of these Montreal seems the most likely. The Secretariat has provision for a staff of 19 of which nine will be professionals. FAO and UNESCO will each provide a professional staff member to the Secretariat; UNEP will provide two. Countries, organisations and agencies may also from time to time supply staff to the Secretariat for specific purposes.

The policy making body of The Convention on Biological Diversity is the Conference of the Parties (COP) which at present meets annually; it first met in Nassau, Bahamas in November 1994 and will meet again in Jakarta in November 1995. Under the provisions of Article 25 of The Convention the Conference of the Parties established the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). Representation on the SBSTTA is according to the following regional groupings: Africa, Asia and the Pacific, Eastern Europe, Latin America and the Caribbean, Western European and Others. This Subsidiary Body is responsible for providing advice to the COP on the implementation of The Convention. It is also responsible for the production of scientific and technical reports and other technical outputs from The Convention including scientific and technical assessments of the status of biological diversity, recommendations on methods to be used in such assessments including the use of indicators of biological diversity, and assessments of the effects of measures taken to conserve biological diversity. It will also provide advice on co-operation with international programmes related to the conservation and sustainable use of biological diversity, and on creating public awareness of the importance of conserving biological diversity. The SBSTTA can set up ad hoc Technical Panels of Experts as required. The SBSTTA meets annually in advance of the Conference of the Parties and reports to the COP on its work and findings. The forthcoming session of the Conference of the Parties (Jakarta 1995) will approve a work programme for the

⁷ By 18/2/97, 166 states had ratified The Convention

SBSTTA for the period 1996-1997. The same COP session will consider a proposal to establish a clearing house mechanism to promote and facilitate scientific co-operation among the Parties and between the Parties and other relevant bodies; this mechanism will operate under the authority of the Conference of the Parties.

There are three main aims of The Convention on Biological Diversity:

- The conservation of biological diversity;
- The sustainable use of the components of biological diversity;
- The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

To achieve its objectives The Convention promotes partnership among countries with regard to scientific and technical co-operation, access to genetic resources, access to financial resources, and the transfer of ecologically sound technologies.

All biological diversity actions should take into account the three basic levels of biological organisation: genomes and genes; the taxonomic unit, mainly the species; ecosystems, including communities, habitats and landscapes. Of these three levels the ecosystem approach is seen as the primary level for action under The Convention. Assessment of the status and trends of the components of biological diversity and the causes of biological diversity losses provide baseline data on which countries can formulate their strategies, plans and programmes for implementing The Convention. This will allow countries to identify components under threat and components that might become threatened and so need urgent action to prevent their loss. This requires the ability to identify, evaluate or develop the methods needed for the assessment, conservation and sustainable use of biological diversity.

Funds Available

A Trust Fund for The Convention on Biological Diversity has been established which will be financed by contributions from the Parties to The Convention based upon the United Nations scale of assessments for the apportionment of the expenses of the United Nations. It has been suggested, however, that this scale be adjusted so that no one contribution shall exceed 25 per cent of the total and no contributions are required when the UN scale indicates there should be a contribution of less than 0.1 per cent. These suggestions will be considered at the Jakarta (1995) meeting of the COP. It is expected that the Trust Fund will receive some \$4.7 million from this source in 1995. Additional voluntary contributions to the Trust Fund can be accepted from Parties, countries, agencies and organisations. Funding for field projects is currently sought through the Global Environment Facility (GEF) and bilateral funding agencies.

Links with Other Conventions

The interests of The Convention on Biological Diversity touch upon those of several global Conventions and a large number of regional Conventions and Agreements. The global Conventions include The Convention on Wetlands, The Convention on Migratory Species, CITES, The Convention on World Heritage, and The Convention to Combat Desertification. The interests of The Convention on Climate Change are also considered relevant to it. The Secretariat of The Convention on Biological Diversity is currently building good working relations with these Conventions through regular consultations. The Convention Secretariat works closely with the World Conservation Union (IUCN), the World Conservation Monitoring

Centre (WCMC), and the World Wide Fund for Nature (WWF). It expects to work with many other organisations in the future.

Needs from GTOS

The Convention on Biological Diversity is still in the early stages of development so that its data gathering, observation and information needs are not yet clear and it is, therefore, still difficult for the Secretariat to be exact about the full range of its future requirements. These needs will become more apparent as the Conference of the Parties further develops the work programme of The Convention. Nevertheless the Secretariat feels that GTOS could play an important role in achieving the goals of The Convention.

The SBSTTA considers that there is a need to develop or refine models of the processes that are responsible for the maintenance of biological diversity and for the underlying ecological processes that support this diversity. It states that proper understanding of ecological processes and functions should be the basis for the conservation and sustainable use of all the components of biological diversity. Biophysical data and information obtained through GTOS would, therefore, be of direct value to The Convention for building the required models.

The SBSTTA has also suggested that The Convention Secretariat prepare a periodic report on biological diversity to be known as the '*Global Biodiversity Outlook.*' This will provide a brief summary of the status and trends of biological diversity at global and regional levels. It will also report on the progress made under The Convention in ensuring the conservation of biological diversity, in establishing the sustainable use of its components, and in obtaining the fair sharing of any benefits that may arise from the utilisation of genetic resources. This proposal will be considered further at the Jakarta (1995) meeting of the COP. GTOS should be able to help gather relevant data and information for inclusion in the section of the '*Global Biodiversity Outlook*' that is concerned with the status and trends of biological diversity. This would include information on the changes on the status and extent of selected important or key species and species associations as well as their associated habitats.

So far approximately 1.7 million species have been identified; the real number of species occurring today is uncertain and is a matter of some controversy. The latest scientific estimate, including microbial life forms, is somewhere between 12 million and 13 million; some naturalists, however, still put the upper limit at about 100 million species. Identifying and locating multispecies associations and obtaining knowledge of the interactions between species in those associations are probably more important to understanding biological diversity than a simple species tally. Loss of ecosystem diversity leads to loss of ecosystem resilience with consequent inability to adapt to changing environmental conditions. GTOS should develop aspects of its programme to record data relevant to biological diversity assessment and trends at both species and habitat levels. GTOS should be able to follow changes in the status and extent of key indicator species (e.g. the Redwood tree) as well as the fate of indicator groups of species (e.g. Pieirid versus Nymphalid butterflies in tropical rainforests). It should be able to help determine where and what types of biological resources are threatened with loss, and to indicate where these losses will irreparably damage ecosystem function. GTOS should also aid in determining where, when and how much various ecosystems will alter in response to global atmospheric, climate and land-use changes and how these changes will impair their capacity to sustain life.

GTOS is international and it can, therefore, provide information on biological diversity issues that transcend national boundaries such as migratory species, the effects of widespread droughts, and patchy but extensive distribution of certain species and biological communities.

The SBSTTA has recommended to the COP that The Convention develop a priority programme on the conservation and sustainable use of coastal and marine biological diversity. This should include consideration of the sustainable use of living coastal and marine resources, mariculture and the control of alien organisms. The SBSTTA considers that research and monitoring are urgently needed to assess the status and trends of marine and coastal biological diversity, evaluate the success of management and conservation actions, and develop more effective managerial practices. Research and monitoring actions should include biological, physical, social, cultural and economic studies.

It is important in this respect that the programme should address the impacts of land-based activities on marine and coastal biological diversity that are the result of inputs of pollutants (including persistent organic and radioactive substances, excessive nutrients and sediments) especially those arising from municipal waste, industrial effluents, deforestation, watershed degradation, mining, and unsustainable forms of agriculture. The Convention Secretariat considers that GTOS could play an important role in the gathering of data and information for this marine and coastal areas programme. It also considers that this programme is one in which all three global observing systems (GOOS, GCOS, GTOS) could develop joint activities.

Biological diversity is also about the species, varieties and genetic resources of domesticated animals and plants and their distribution and utilisation worldwide. The Convention Secretariat would like to expand on this area in conjunction with other organisations. Further development of the '*FAO/UNEP Domestic Animal Diversity List*' might be an aspect of this expansion. Relevant data on the occurrence and extent of various crop and livestock types and the habitats in which they are found could be obtained by GTOS as part of its land-use observations.

Spatially referenced data on land-cover and land-use would be of great use to the Parties and to the Secretariat. These data assembled into appropriately scaled maps would be particularly useful for showing the occurrence of ecosystems, habitats, and species rich associations, areas of high endemism, and species distributions. Useful scales would be 1:250,000 and 1:200,000 for general illustration, and scales of 1:50,000 to 1:25,000 for small areas. The ability to define and describe ecosystems, habitats and species associations using standard sets of variables measured with good quality control through GTOS would be valuable.

How data will be handled and managed by The Convention on Biological Diversity is not yet clear. Some data management will undoubtedly be done in the Secretariat and some will be contracted to organisations such as WCMC. Data will also be handled by relevant national and regional agencies and organisations. It would be useful if GTOS could advise on appropriate data management methods that would enable compatibility between these systems.

8 United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (1994)

The Convention

This international Convention was adopted in Paris on 17 June 1994. It will enter into force on 26 December 1996.⁸

As it has not entered into force the United Nations Convention to Combat Desertification is administered by an Interim Secretariat, headed by an Executive Secretary. This is currently located at the UNEP Geneva Executive Centre where it operates under the auspices of the United Nations Department of Policy Co-ordination and Sustainable Development. When The Convention enters into force a Permanent Secretariat will be established by the Conference of the Parties.

The International Negotiating Committee for Desertification (INCD) for the United Nations Convention to Combat Desertification will continue to meet about twice a year until The Convention enters into force. The INCD is developing recommendations for the first session of the Conference of the Parties (COP) which will become the policy and decision making body of The Convention when it enters into force. Special provision is made for international agencies and qualified non-governmental organisations to attend COP sessions and contribute to its work. Once The Convention enters into force the COP will meet at least annually for its first four sessions. As a subsidiary body of the Conference of the Parties an open-ended Committee on Science and Technology (CST) will be established to provide the COP with information and advice on scientific and technological matters relating to combatting desertification and mitigating the effects of drought. It will identify priorities for research and advise on joint research programmes for new technologies. Full Terms of Reference for the CST are currently being developed for consideration by the first session of the Conference of the Parties. The COP will be able to establish ad hoc Panels of Experts to advise through the CST on specific issues; these Panels will be composed of experts whose names are drawn from an approved roster.

Desertification as considered by The Convention is the degradation of land in arid, semi-arid and dry sub-humid areas. It is thought to be caused primarily by a combination of unsustainable human activities and climatic variability. The Convention aims to promote effective action to counter desertification and to mitigate the effects of recurrent serious droughts through innovative local programmes and supportive international partnerships. Countries affected by desertification will implement The Convention by developing and carrying out national, sub-regional and regional action programmes. Criteria for developing these programmes are detailed in the four regional implementation Annexes to The Convention. The four regions are Africa (considered first priority because that is where desertification is thought to be most severe), Asia, Latin America and the Caribbean, and the Northern Mediterranean. Action programmes under The Convention will be developed through consultations among affected countries, donors, and intergovernmental and non-governmental organisations. This process should improve co-ordination and help to channel development assistance to where it can be most effective.

⁸ By 13/3/97, 68 states had ratified The Convention

Funds Available

No separate Trust Fund or other such funding arrangement will be established by The Convention to Combat Desertification, unlike the case in most other Conventions. Instead, at its first session, the Conference of the Parties will identify an existing organisation that will house a 'Global Mechanism' for funding. This Mechanism will not actively administer funds. Instead it will co-ordinate, facilitate and otherwise support efforts to improve the effectiveness and efficiency in the use of existing sources of funds for combatting desertification, and will suggest other financing methods and other sources of financial assistance. As part of its facilitating role the Mechanism will prepare an inventory of relevant existing co-operation programmes. The largest source of funds for the work of The Convention is recognised as the affected countries themselves. Bilateral and multilateral aid and loans are the two biggest sources of external funding. Additional funds will come from UN agencies and organisations, development banks and other international financial institutions, non-governmental organisations and industry. Support for activities to combat desertification will be sought from the Global Environment Facility (GEF) for projects that are relevant to the three GEF focal areas (biological diversity, climate change, international waters). Voluntary contributions to support specific activities will also be sought from appropriate sources.

Links with Other Conventions

The work of The Convention relates very closely to that of several other Conventions, particularly the United Nations Framework Convention on Climate Change and The Convention on Biological Diversity. It is expected that the Permanent Secretariat will develop close working links with these Conventions, including the development of joint programmes where these are appropriate. Article 8 of The Convention specifically calls for these joint programmes in the fields of research, systematic observation and information collection and exchange. Co-operation between The Convention to Combat Desertification and The Conventions on Climate Change and Biological Diversity is seen as an advantage by the Interim Secretariat because both the latter have access to the Global Environment Facility to support projects. The Interim Secretariat of The Convention is, therefore developing links with the other two Conventions at an informal level which can be followed up by the Permanent Secretariat as soon as it is established.

Needs from GTOS

The United Nations Convention to Combat Desertification is especially strong in calling for information collection and exchange, and systematic observations relevant to assessing the state and trends in desertification and the effectiveness of remedial measures. Article 16 is specifically on information collection, analysis and exchange. Parties are required:

"...to integrate and co-ordinate the collection, analysis and exchange of relevant short term and long term data and information to ensure systematic observation of land degradation in affected areas and to understand better and assess the processes and effects of drought and desertification. This would help, *inter alia*, early warning and advance planning for periods of adverse climatic variation in a form suited for practical application by users at all levels; including especially local populations."

Article 16 calls specifically for Parties to strengthen the functioning of the global network of institutions for the collection, analysis and exchange of information as well as for systematic observation at all levels. Emphasis is given for the need to use compatible standards and systems; relevant data and stations, including those in remote areas; modern technology for the collection, transmission and assessment of data on land degradation; and to link national, subregional and regional data and information centres more closely with global information sources. Article 16 also requires that socio-economic data be collected and analysed and that these data should be properly integrated with physical and biological data. It also requires Parties to "...exchange and make fully, openly and promptly available information from all publicly available sources relevant to combatting desertification and mitigating the effects of drought."

Article 16 also calls upon Parties:

"...to support and further develop bilateral and multilateral programmes and projects aimed at defining, conducting, assessing and financing the collection, analysis and exchange of data and information, including, *inter alia*, integrated sets of physical, biological, social and economic indicators."

Annex I of The Convention is concerned with the implementation of The Convention in Africa. Article 8 of Annex I requires that national action programmes, as appropriate, shall include measures to improve knowledge of desertification by promoting research and the collection, processing and exchange of information on the scientific, technical and socio-economic aspects of desertification. It also requires these national programmes to include measures to "...monitor and assess the effects of drought." This is to be done by developing strategies to evaluate the effects of natural climate variability on regional drought and desertification, improving early warning and response capacity, and "...monitoring and assessing ecological degradation to provide reliable and timely information on the process and dynamics of resource degradation in order to facilitate better policy formulations and responses."

The other three Annexes to The Convention (Asia; Latin America and the Caribbean; Northern Mediterranean) contain less detail than the Annex on Africa. Nevertheless, to varying degrees they call for National Action Programmes to include provision to survey the environment in affected areas, to assess the causes and consequences of desertification, and to strengthen or establish information, evaluation and early warning systems in afflicted regions.

The Committee on Science and Technology will oversee all technical and research oriented activities undertaken by the Parties under the terms of The Convention - this will include inventory, observing, assessment and related activities. The Committee will not meet until the first session of the Conference of the Parties. The present Interim Secretariat cannot, therefore, undertake any significant work in this area or make any firm commitments until the Parties have formally agreed as to what is needed. The Interim Secretariat is, however, taking part on a very informal level in some activities that might have relevance to the future work of The Convention. GTOS is one such area.

The Interim Secretariat envisages three types of useful desertification data coming from GTOS:

- Data useful to the Parties to monitor the state and trends in desertification in their countries, and for monitoring the effectiveness of any remedial actions that may have been taken.

- Data useful to scientists for understanding desertification processes and for using in developing, testing and validating models.
- Data and information that can be used directly by local people, or which could be directly obtained by local people. This is especially important in the development and use of practical Early Warning Systems for detecting the onset of drought conditions, as exemplified by some of the work already being carried out in eastern Africa.

These data types are listed above according to the priority ranking assigned to them by the Interim Secretariat.

The view of the Interim Secretariat is that all monitoring and assessment work carried out under GTOS must have a strong element of practicality so that GTOS is not just science driven. The International Panel of Experts on Desertification (IPED), which advised the Secretariat during the process of negotiating The Convention, stressed that, for proper understanding of desertification processes, it is important that good reliable basic data are gathered so that any remedial management and mitigation measures proposed will rest on a sound scientific base. Data gathering procedures should be modified for use in each country so that they are suitable for understanding the particular problems of that country. There should, however, be a common core of data for use in all desertification studies. GTOS could help to develop a minimum data set for use by the Parties of The Convention to Combat Desertification. This minimum core data set should comprise relatively few variables carefully chosen so that they give a realistic, scientifically based picture of the extent and state of desertification in the measurement area. By comparing these core data from desertification sites worldwide a meaningful picture of global desertification can be constructed. Changes over time would show trends in desertification.

IPED considered that minimum data sets to be collected under The Convention should include sets of relevant climate, soil, water, land-use and socio-economic variables. Climate data should be suitable for the computation of values down to district levels and should include albedo, solar radiation, rainfall (daily figures for further computation), temperature (daily maximum and minimum) air humidity (dew point), wind, dust, and hydrology (ground water, major surface waters). Soil and water variables should be those used by FAO in the Global Assessment of Human-Induced Soil Degradation (GLASOD) and other related projects. They should include indicators of wind and water erosion, salinisation, alkalization, gypsification, water logging, and soil fertility. Data should be used for secondary data computation at the district level scale. Priority should be given to collecting as complete data sets as possible for this limited number of variables. The key land-use variables that are needed are current land-use, changes in land-use over ten year periods, crop yields of major staple crops, and numbers and types of livestock. Again these data are needed down to the district level. In the socio-economic area the critical variables needed are human population (including ten year population changes), human migration data (seasonal, annual), mortality rates (infants, adults), disease status (annual), income per capita, income distribution, sources of income, migration of livestock, market prices of staple foods (monthly, at selected markets), energy (type, availability, price). Wherever possible the entire minimum data set should be collected according to the standard procedures of the World Bank and the relevant United Nations Specialised Agencies (e.g. FAO, WHO, WMO).

The minimum data set outlined above is the top priority for data collection under The Convention and is to be undertaken for all desertification prone regions at the expense of more

comprehensive data sets for limited areas. At times, however, GTOS could be called upon to produce a wide range of additional information for use by the Parties. Land-cover data would be very important. Land-use information should pay particular attention to methods of cultivation now in use including traditional forms, current soil conservation practices, methods of water harvesting and water spreading being used (or that have been abandoned) such as the traditional Iranian qanat systems. Pastoral observations should include information on current livestock management practices (seasonal movements, grazing/browsing regimes, watering methods and schedules) paying particular attention to how mixtures of livestock are managed and how different age classes of the same livestock type are treated. A wide range of soil data would also be of great value including soil particle sizes, buried soil horizons, overall erosion rates, rainfall penetrability, run off, soil moisture, plant rooting depth, and ground water availability and quality. Meteorological data collected at locations and time intervals sufficient to show the spatial and temporal distribution and variability of key elements would be important. A system of long term study sites would have to be established if basic biophysical data are to be collected for use in understanding the underlying environmental and ecological processes involved in desertification.

The Interim Secretariat believes it would be useful to have desertification and drought related data put in the form of spatially referenced maps at appropriate scales. These types of maps are particularly valuable for work in the field as they are readily understood by most field workers. Land-cover, land-use, soils, and weather data are some of the important variables that can be usefully put in map form. Such maps also make excellent teaching and training material.

The Secretariat considers that there is still a need for a sound, scientifically based assessment of global and regional desertification since none of those carried out in recent years has been satisfactory. The minimum data set to be gathered under GTOS in all desertified and desertifying areas would contribute materially to this assessment. Depending on how GTOS is established and operates it could be a major partner in this assessment, or even be responsible for the whole assessment.

The Interim Secretariat sees merit in exploring the possibility of a close working relationship develop between GTOS permanent secretariat of The Convention and The Convention Parties so that GTOS could play an important role in the work of The Convention to Combat Desertification. At an early stage, therefore, GTOS should, either directly or indirectly through its sponsors, press for observer or some other participant status on the Committee on Science and Technology of The Convention.

The preliminary view of the Interim Secretariat is that it would be helpful, particularly in raising funding for GTOS activities from financial sources such as the GEF, to merge the three Global Observing Systems so that they could work together more effectively.

IV. Findings

All but one of the Secretariats of the eight selected Conventions expressed interest in obtaining terrestrial observation data through GTOS. Details of the data needs for each Convention, as far as could be determined, are given individually under each Convention.

The exception, the Secretariat of the United Nations Framework Convention on Climate Change, felt that many of its developing country Parties would consider the systematic collection of national environmental and renewable natural resource data too politically sensitive an issue for The Convention to take up at this stage. The Secretariat felt, however, that this attitude could well change in the long term future as more and more developing country Parties transformed themselves into newly industrialised states.

Another Convention Secretariat, that of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, had some data needs that were very much more specialised than those of the other Conventions that were consulted. These specialised data are more fully outlined in the section on the Basel Convention but essentially there is a need to monitor the various toxic substances and chemicals that might find their way into the atmosphere, ground water, and food production systems from hazardous waste disposal sites such as land-fills and incinerators. If GTOS is to be involved in provision of these specialised data it would entail designing a subprogramme of GTOS specifically for the Basel Convention. However, the Basel Convention also needs general geographical and habitat data for the zones in and around areas where land-fill and incineration sites are located. These latter data types are identical to those that are needed for most of the other Conventions. A special problem facing the Secretariat and the Parties of the Basel Convention is to locate illegal land-fill sites. The Secretariat wondered, therefore, whether appropriately scaled spatially referenced geographical and habitat data supplied through GTOS could be used to identify potential areas in which illegal land-fill sites might be placed in the future.

The remaining six Conventions form a cluster whose interests and data needs overlap. In most cases observational data are required primarily for improved practical management of the sites, including their conservation.

The data needs of the seven Conventions, as seen by their Secretariats, fall into six broad groups:

- General site specific habitat data, including land-cover, land-use, ecological structure, and species composition. Data required are often detailed, and can include biophysical data for studies of environmental and ecological processes.
- General habitat data, as above, but for the zones in which Convention sites occur; includes extensive socio-economic data categories. Data are usually needed at broader scales than those for The Convention sites.
- Near surface weather data to establish diurnal, seasonal, and long term trends and patterns. The observation system should be suitable for use at both high and low latitudes and high and low altitudes.

- Data types not yet routinely incorporated into most broad observational programmes, e.g. crustal stress and tectonic movements; biological diversity assessments; population status and trends of particular species of plants and animals.
- Specific observations peculiar to individual Convention objectives e.g. seasonal weather front and pressure system data for use by The Convention on Migratory Species; measurements of specified toxic substances and chemicals for use by the Basel Convention.
- New fields for specialised observational programmes e.g. marine mammals, especially of the open oceans; coral reefs; intertidal coastal areas.

The spatially referenced data include a full range of land-cover and land-use information that would allow the Secretariats and the Parties to build up a picture of the large zone in which their particular sites are located. This information would allow them to develop effective, realistic management strategies and plans based on scientific knowledge of the environmental, ecological and developmental pressures that these areas and their contained sites are experiencing. The data required in this format are given in the sections on the individual Conventions.

Some Secretariats recognised the benefits to be gained from detailed studies of biophysical processes relevant to the ecology of each site or to its immediate vicinity, and would encourage GTOS to be able to supply data from such studies to those who can use them. Several of The Conventions are moving towards the development and testing of environmental, ecological and management models for which biophysical process data are important. These models would help to predict likely changes in ecosystems in response to environmental, ecological and human pressures and so would allow more practical, scientifically based management policies and plans to be formulated.

Without exception all the Secretariats in this group said that they (and by inference, their Parties) wanted to obtain through GTOS observational data that allowed them to note and measure habitat changes over time in order to show responses to changing conditions (including global change). The methods used by GTOS should allow distinctions to be made between changes arising from seasonality, short term variability, and long term trends. GTOS should, therefore, wherever possible use methods of data gathering and analysis that facilitate comparison between times at the same site and between sites where appropriate. A flexible approach to data collection, analysis, and management would allow the use of several approved harmonised methods that would result in data of acceptable predetermined levels of accuracy and precision.

Many sites often relate to more than one Convention. For example, some specific wetlands are of concern to the World Heritage Convention, The Convention on Wetlands, The Convention on Migratory Species and possibly CITES. It is important, therefore, that GTOS should use harmonised data acquisition methods at all Convention related sites so that the same data types are passed to the different Conventions in the same formats thus encouraging The Conventions to work more closely together and facilitating comparisons between their various sites to the benefit of them all.

As there is so much overlap among these Conventions several Secretariats suggested that a minimum core set of carefully chosen sensitive variables should be developed by GTOS to be

gathered at each site covered by any of The Conventions. The use of such a cross-Convention set of common variables would greatly aid in ensuring that information, data and predictive models could be shared usefully among The Conventions. The majority of other data gathered at each site would then relate specifically to the individual convention concerned.

Quality assurance procedures and quality control practices within GTOS are major concerns to all The Convention Secretariats. Can they and their Parties believe the data that are reported through GTOS? These concerns also include the need for GTOS to adopt harmonised methods for the measurement of variables, and to use accepted common definitions for the classification of some of them (e.g. soils, vegetation, taxa). The latter is particularly important for Conventions whose technical experts have already agreed on workable definitions or classifications for some variables; would these be at variance with those to be used by GTOS? The Convention on Wetlands, for example, already has an approved global classification of wetlands that rests in part on vegetation. Would GTOS use this classification in providing land-cover and habitat data to The Convention Secretariat? If not, would it be able to put its own land-cover and habitat data classes in terms of the wetlands classification that The Convention is now obliged to use?

The validity of extrapolating or otherwise applying data from long term GTOS study sites to those sites designated under The Conventions is another concern expressed by several Secretariats. This concern applies to both the general geographical and habitat data, and, in particular, to data on bio-physical processes. As there will be relatively few GTOS long term study locations they will often be at considerable distances from The Convention sites. The feeling of some Secretariats is, therefore, that data from these distant localities will not always be sufficiently relevant to The Convention sites.

Two potentially useful sectors were identified by several Secretariats as posing specific data gathering problems: tectonic earth movements and their consequent dangers; and the assessment and monitoring of biological diversity.

- Several Secretariats said that it was important to their Conventions that they should have a better understanding of the risks of future earth movements to their areas of interest. Sites were often at risk from earthquakes, volcanic eruptions, land-slides, mudslides and similar phenomena. Knowledge of the likelihood and possible consequences of such happenings would be of great help in developing practical management plans. Thus an appropriate observational programme within GTOS for crustal stress, and tectonic movements and their consequences would be of practical use to several Conventions.
- There was a growing interest in being able to inventory the biological diversity of sites covered by The Conventions and then to subsequently monitor changes in this diversity in the long term. The methods to carry out such inventories are poorly understood and there are few trained staff, especially in developing countries, capable of undertaking them. If such inventories could be arranged through GTOS as part of its observation programme it would be welcomed.

Several Secretariats said that they lacked proper facilities to manage, analyse and interpret the data that are supplied to them by their Convention Parties. Indeed, the Basel Convention identified this as its most important single information and data need. Several others said that they would welcome advice from GTOS on the data management aspects of their work programmes. They asked that GTOS consider providing this advice both to them and to their

parties. Essentially what is being requested is help to design a common data management programme that The Convention Secretariats and their Parties could all use. It was recognised by the Secretariats that it would be of benefit if the same data management systems were used by all seven of these Conventions since it would greatly increase the value and practicality of the information generated by them.

Similarly, all seven Secretariats recognise the importance of collecting land-cover, land-use and weather data in a spatially referenced manner and expressing these in the form of appropriately scaled spatially referenced maps. Such maps can be used easily by both management and scientific field staff for practical work, make excellent tools for training, and are a great help in public relations exercises to promote awareness of the purposes and work of The Conventions. The Secretariats have no way of directly undertaking this type of geographical information system work so that it would have to be done with donor funding on a contract basis through national Geographical Information System (GIS) facilities or outside GIS specialists (e.g. GRID, WCMC). This was recognised by most Secretariats, but it was felt that such arrangements could perhaps be best done under the auspices of GTOS.

Some Secretariats reported that their Conventions had been asked to produce global assessments of the state and trends of some natural resources, of concern to their Convention. Thus The Convention on Wetlands is to produce a global assessment of wetlands, The Convention to Combat Desertification is to produce a global assessment of desertification, and The Convention on Biological Diversity is responsible for assessments of selected taxa and habitats. All hope that data from GTOS will help in these exercises; some Secretariats went so far as to suggest that GTOS could take an active role in the assessment process.

There is thus considerable interest in GTOS and its products among the Secretariats of The Conventions contacted. Most see a real need for the kinds of information that could be provided through GTOS and think that it could greatly assist Convention Parties in meeting their obligations under the terms of The Conventions, particularly those developing countries that have as yet inadequately developed technical capabilities and still have a shortage of national technical staff. It is not yet clear how an operational GTOS would actually function and it now becomes a pressing matter to spell this out in a practical manner that can be readily understood by potential users of GTOS, such as The Convention Secretariats. Hopefully, the new version of the GTOS proposal, to be ready by the end of December 1995, will help in this respect. However, until the GTOS Sponsors have decided how they would like to proceed with GTOS it is difficult to move further with the users.

GTOS is unquestionably a good idea whose time has come. Unfortunately, the Sponsors are not yet in a position to put in the money necessary to get GTOS off the ground. Nevertheless, the Sponsors must somehow find enough money to keep a small Interim Secretariat for GTOS functional for the next two years (1996-1997). In that period the Interim Secretariat must use its resources to build an awareness of GTOS and its potential. This can be done by the involvement of both the Interim Secretariat and the Sponsors in a series of contact missions to those with sufficient funds to start GTOS. By using their own staff and consultants in this way Sponsors can draw on financial sources additional to those that they have provided to the Interim Secretariat, so widening the financial base of GTOS. It might be worth considering beginning with visits (followed by proposals) to some of the larger foundations such as Carnegie, Leverhume, Mellon, Rockefeller and Sasakawa to seek once-only start-up grants for an establishment period of GTOS. This is how the Monitoring and Assessment Research Centre (MARC) began its career. These visits should go along with two-way familiarisation visits to

potential financially supporting agencies as outlined in the next chapter. These actions will help to enhance the reputation of GTOS and make it more appealing to many potential users, such as The Convention Secretariats, so encouraging them to support GTOS financially.

V. GTOS Short Term Strategy

As yet GTOS has no agreed form. It is difficult to consider in detail any of its functions without an understanding of the form which it will take. This point was raised by all The Convention Secretariats. Form and function are not the same thing and they cannot be interchanged satisfactorily.

RECOMMENDATION 1: A full-time **Interim Secretariat** should be established and staffed by the Sponsors as soon as possible for an initial period of not less than two years. It should have a professional staff of at least two with General Service support. A more Permanent Secretariat (perhaps supported from other funding sources) can be negotiated by the Sponsors at a later date.

It is important to spread the word about GTOS as widely as possible so that Governments, particularly those of developing countries rapidly become aware of what GTOS is, what it does, and the benefits that can come from working with or through it. The Governing Bodies of the Sponsors provide one means of getting this message to Governments. If an Information Paper on GTOS was to be put before the Governing Body of each of the Sponsors it could result in supportive decisions from those Bodies. For example, if the paper is properly constructed so that GTOS is seen in the context of the work programmes of both the agency and The Conventions, it could result in a decision from that Governing Body calling upon Parties to relevant Conventions to take note of GTOS activities and to support them whenever appropriate.

RECOMMENDATION 2: Each of the Sponsors of GTOS should introduce GTOS to its Governing Body through a short Information Paper to be presented at the first possible session of that Body.

At an early stage GTOS should develop a carefully thought out, attractive but cost effective publication programme. This will help GTOS to establish its name since GTOS actions and findings will become well known. This must be done in such a way that full credit is always given to co-operating countries and partner organisations. This is particularly important when working with The Conventions which mostly already have their own publication series. Disputes over publication procedure is one of the most disruptive elements of co-operative ventures between organisations. Any Letter of Agreement, Memorandum of Understanding or project document should always make clear what is to be done about publications so as to avoid disputes later. Joint series publications is one approach that should be explored.

RECOMMENDATION 3: At an early stage GTOS should develop a well thought out, attractive but cost effective publication programme designed in such a way that full credit is always given to co-operating countries and organisations.

Most of The Convention Secretariats said that many developing countries are basically not in favour of monitoring or observational systems. These countries see the distribution or communication of national data as an actual or potential infringement of national sovereignty.

This is regarded by some Secretariats as a major practical constraint to developing an operational GTOS. However, several large developing countries have already made the transition to a mainly industrial economy (e.g. Brazil, China, India, Indonesia) while many others are well on their way to achieving this state. These newly industrialised countries are already beginning to see the advantages of an observational system such as GTOS; several (e.g. China) have established their own national monitoring programmes. They might, therefore, now be more sympathetic towards GTOS. It is known, for example, that China would like to participate in GTOS through the Chinese CERN programme; this might provide a starting point for more substantive discussions with China about GTOS. If some or all of these newly industrialised countries would openly express support for GTOS it would help in getting developing countries to do the same. It would be particularly useful if each could be persuaded to provide \$200,000 to GTOS for the first two to three years of its operation.

RECOMMENDATION 4: The GTOS Sponsors should at the earliest opportunity try to interest leading newly industrialised developing countries to support GTOS. Visits should be made to some to discuss their potential role in GTOS (say to Brazil, China, Indonesia, South Africa, and South Korea), with a view to soliciting their practical support to GTOS.

There is little doubt that a terrestrial observing system such as GTOS will be of very great practical and scientific value to each of the seven international Conventions discussed here. The Secretariats have all said as much. Based on the responses of this selection of Conventions it is likely that there are other international and regional Conventions that would profit from a similar association with GTOS.

RECOMMENDATION 5: GTOS should consider other Conventions as possible GTOS users, especially the regional Conventions whose interests touch upon the global Conventions discussed in this report. Contact should be made with them.

Most Convention-related GTOS activities will occur within states that are Parties to The Convention and will be carried out through their national agencies. Ensuring that this is done according to agreed harmonised GTOS methods and protocols will not be too difficult to arrange for developed country Parties. For some developing country Parties, however, it may be necessary to create the entire system. If this is the case, funds will have to be sought from elsewhere (bilateral aid, multilateral aid, foundations, etc.) on a case by case basis. It is for these reasons as much as any other that it is important that GTOS not be overambitious at the start so that costs can be kept low; it should start simply and build as far as is possible upon what is already there.

RECOMMENDATION 6: For reasons of cost and practicality GTOS should begin its operations modestly starting simply, and building as much as possible on facilities and systems that are already in place.

In order to facilitate the comparability and compatibility of data from similar sites at different times, GTOS should develop a minimum set of variables that will be measured directly at each site. This will help to make more obvious any similar changes that have taken place at most sites due to environmental, ecological and management pressures.

RECOMMENDATION 7: GTOS should establish a core minimum set of variables to be measured at each site to agreed levels of accuracy and precision and at agreed time intervals appropriate to each variable.

All The Convention Secretariats have asked for more data types than is practical for GTOS to obtain, and certainly more data than they really need. GTOS should, therefore, examine very carefully the data needs of each Convention in order to reduce the number of variables to be measured to relatively few of sufficient meaning and sensitivity that they will give a proper understanding of what is happening; if this is done correctly it will also allow informed inferences to be made about the behaviour of the unmeasured variables. This approach is the only practical one for GTOS as its work load, especially in the early years, must be kept within reasonable bounds.

RECOMMENDATION 8: GTOS should carefully review the data needs of each Convention with a view to reducing the number of variables to be measured to the minimum necessary for obtaining a proper understanding of what is happening at each series of Convention sites.

Most of The Convention Secretariats call for GTOS to adopt standard methods and protocols for the measurement of variables. The reason for this is the perfectly laudable one of trying to ensure that data from GTOS are compatible and comparable throughout GTOS, which would facilitate common data usage. Few data measurement methods, however, can be employed satisfactorily in all locations and under all conditions. It is more flexible and practical, therefore, to have an agreed harmonised set of methods that will result in data of predetermined acceptable levels of accuracy and precision. This approach really would contribute to data compatibility and comparability.

RECOMMENDATION 9: GTOS should develop harmonised sets of methods for measuring variables so that data have agreed acceptable levels of accuracy and precision so helping to ensure data compatibility and comparability.

GTOS users need to know about the existence of data runs relevant to particular areas and types of investigations. In order to maximise the benefits of using such data, users also need to know the history of these data. Why were they measured? How were they measured? Who did the measuring? At an early stage, therefore, GTOS should start to put together a catalogue of available relevant data. At the same time GTOS should start a metadatabase and make it available to GTOS users worldwide. This is essential if harmonised methods for data gathering, analysis and management are to be used. Harmonisation is an important part of quality assurance and quality control procedures, the need for which was stressed by most Convention Secretariats. Harmonisation activities should form an on-going element of the GTOS programme for which separate funding should be sought.

RECOMMENDATION 10: As parts of its harmonisation programme GTOS should assemble a '*Catalogue of Available Relevant Data*' and an on-going historical metadatabase. Funding should be sought for a GTOS harmonisation programme that encompasses these elements.

Several Convention Secretariats suggested that it would be useful if GTOS could recommend data management procedures that would be common to all GTOS users. The six Conventions that deal with renewable natural resources thought, since their areas of interest were so closely

related, that a data management system common to them all would be useful even if that system is not adopted by all other GTOS users. It would enable them to exchange data readily and co-operate more efficiently in joint activities.

RECOMMENDATION 11: GTOS should develop an observational data management system common to all The Convention Secretariats and which they can recommend to their Parties.

Developing countries are often unable to bridge the gap between the collection of observation data and, after analysis, using them for management and for setting policies. It is important for the long term future of GTOS that this gap is removed or narrowed whenever it is encountered.

RECOMMENDATION 12: GTOS, together with The Convention Secretariats involved, and any co-operating agencies, should assist developing countries to utilise observational data for resource management and policy making by advising on needed national infrastructure, staffing, and training.

The need for training within GTOS was mentioned by several Convention Secretariats since there is often a shortage of trained technicians in developing countries. GTOS can and should advise on technician training needs, it can even develop appropriate job descriptions, but it should not attempt to provide any training programmes. Where necessary, however, training elements should be built into GTOS projects for which external funding is to be sought. UNITAR may be able to assist in this respect.

RECOMMENDATION 13: GTOS should include training elements in projects for which funding is to be sought. GTOS should not itself offer direct training.

Conventions need data that relate directly to their particular sites and the zone or zones in which those sites are set. Existing GTOS stations may not be near Convention sites. How to relate data from distant GTOS stations to Convention sites in a meaningful way is a concern to several Convention Secretariats. GTOS will thus either have to extrapolate from its own relevant stations, or it will have to assist the Government and The Convention to establish GTOS observation stations in the site area. For the studies required at many Convention sites the establishment of new GTOS stations would be the most practical approach, though this would vary from site to site. A cluster approach which linked several Convention sites to a major GTOS station might be one procedure to explore.

RECOMMENDATION 14: GTOS should demonstrate to potential users the relevance of data from GTOS stations distant from Convention sites.

Land-cover and land-use data for the zone within which particular Convention sites are located are needed by nearly all The Conventions. This information is usually requested as either zone specific spatially referenced data, or spatially referenced maps. How to obtain these data in a meaningful way is a concern to Secretariats. This sort of information can be extrapolated from GTOS Tier 5 indirect activities provided that suitable verification and ground sampling can be done in the site areas by national scientists or GTOS field teams. Preparation of the maps would have to be by contract with either national GIS facilities, or with outside GIS centres (e.g. GRID, WCMC). Funding would be from external donors in most cases.

RECOMMENDATION 15: GTOS should consider procedures for supplying users with spatially referenced maps of variables for sites and zones at specified scales since this is one of the data forms most requested by Conventions.

At an early stage GTOS must develop a data release policy. GTOS is dealing with information and data about which all countries are very sensitive. It must, therefore, be clearly understood by all parties to GTOS exactly what can and cannot be done with information and data gathered under the auspices of GTOS. This policy must also consider secondary data generated through the analysis and transformation of primary data, often outside the countries where the primary data were obtained. A data release policy is very difficult to develop and should not be rushed.

RECOMMENDATION 16: At an early stage GTOS should begin to develop a data release policy for primary and secondary data gathered or developed under the auspices of GTOS.

GTOS has no firm funding. The Convention Secretariats quite rightly found it difficult to comprehend how a body could work with them to ensure data acquisition in the field when it had no firm financial basis. A lot can and should be done by building on existing facilities both in the field and in operational co-operative organisations as has been proposed by the GTOS ad hoc Scientific and Technical Planning Group. This can only be accomplished by discussions, visits to co-operating organisations, and some small expert group consultations. An indication of some firm financial backing from the Sponsors (say \$100,000 per year) specifically for these visits would go a long way towards reassuring The Convention Secretariats that GTOS is a serious proposition; this would help to unlock Convention financial support for Convention-related GTOS activities.

RECOMMENDATION 17: Funds from the GTOS Sponsors, or arranged through them, should be made available to the GTOS Interim Secretariat for familiarisation visits to potential co-operating organisations and countries, and for holding some small expert consultations.

As GTOS will rest very heavily on support from donors it is important that at an early stage GTOS discuss its aims, objectives and work programme with each of the major bilateral, multilateral and foundation donors. This should be a two way exchange of information. The donors would become informed about GTOS, but, perhaps more importantly, GTOS would learn about the donor agencies and what each can and cannot do under its Terms of Reference. Each donor has its own list of preferred countries which it will support; some will only support large projects, others only small projects; some can approve projects quickly, others take much longer; some will only support agricultural projects, others will give priority to other forms of sustainable land-use, including conservation. GTOS must know how to approach these donors and what forms of documentation are needed for each.

RECOMMENDATION 18: Familiarisation and contact visits to the major donors should be an early priority for GTOS. These can, if necessary, be arranged through the GTOS Sponsors. Potential donors should include CIDA, DANIDA, EU, FINNIDA, GTZ, IBRD, IDRC, NORAD, SIDA, UK-ODA, UNDP and USAID. Familiarisation visits to other possible supporting countries such as Australia, Belgium, France, Italy, New Zealand, Switzerland and Russia should also be considered at a later time.

Any proposal to go to a Convention Conference of the Parties should have all the cost implications shown together with clear indications of the kinds of information, data, data

products, and other benefits that can be expected. This is particularly important if some GTOS activities are to be considered for funding through special funds within Conventions. The Secretariats of most Conventions do not have large funds available to them so that they will probably only be able to provide token support to GTOS. An indication of Convention funds and funding mechanisms is given in this report as part of the outline of each Convention.

RECOMMENDATION 19: GTOS project documents to go to donors, especially those to go through The Conventions, should have all costs properly and fully shown. All information, data and other practical benefits from the project should be clearly spelled out.

Most of the Secretariats at first regarded GTOS as a separate data gathering agency which could help The Conventions get the data that the Parties need or which the Parties are obliged to communicate under the terms of their Convention. Thus initially GTOS was thought of as having its own funding, sources of support, and technical capabilities. Only later did most realise that GTOS lacked these capabilities and needed financial support from a variety of sources including from, or through, The Conventions themselves. In spite of this realisation the Secretariats remained sympathetic towards GTOS. Most Secretariats considered that some funding for GTOS could be obtained directly through the financial mechanisms of The Conventions, but nevertheless thought that most should be sought from donors in the form of aid to national project or programme proposals that had first been formally approved by the Conference of Parties. The COP need only approve the programme of which the individual projects or activities form a part.

RECOMMENDATION 20: GTOS should plan its operations under The Conventions as a series of programme packages each of which can be put to relevant donors separately. Each package before submission to a donor must have the prior agreement of The Convention Secretariat, the Scientific and Technical Committee of The Convention, the Conference of the Parties of The Convention, and the Governments of the countries where the work will take place.

Conventions that have been operating for some years have an easier working relationship between Secretariat and Parties than do more recently adopted Conventions. Consequently, the Parties of older Conventions tend to pay more attention to suggestions for the work programme originating from the Secretariat than do Parties of the more recent Conventions. In the older Conventions, therefore, GTOS and the Secretariats should work together quite closely in the development of GTOS proposals.

RECOMMENDATION 21: GTOS should work very closely with the Secretariats of well established Conventions to draw up relevant GTOS project proposals.

Getting formal approval of a Conference of the Parties may, however, not be as simple as it might at first seem. Many developing countries see any inventory or observing activities as an infringement of their national sovereignty, even when these activities are carried out by their own nationals and agencies; communicating national data to others is often regarded as a particularly unwelcome infringement of national rights and to be resisted even though The Convention to which they are Parties might require that it be done. A Conference of the Parties may, therefore, have built in scepticism about any form of observing system. Consequently, great care must be exercised in presenting GTOS proposals to ensure that the practical economic benefits of participation in GTOS are obvious to the Parties. It is essential, therefore,

that GTOS proposals go to the COP with the full and enthusiastic backing of the Scientific and Technical Committee of The Convention. Each committee is usually made up of government experts appointed by the Parties from a Roster of Experts that the COP has already approved. The Committee, therefore, is conversant with the views of the Parties and will, if it agrees with the proposal, be able to suggest ways of presentation that might make the proposal more attractive to a COP. The composition of these Committees changes every two to three years so that contact by GTOS must be kept up and not left at a once-only level.

RECOMMENDATION 22: GTOS must work through the project approval process of each Convention. It is particularly important in this respect that GTOS establish good working relations with each of the Scientific and Technical Committees of The Conventions.

In the newer Conventions which are still in the process of establishing how they will work it is important, where the rules allow, that GTOS establish some sort of observer status on the Scientific and Technical Committees. This might be done directly through the GTOS Interim Secretariat or through one of the sponsoring organisations. The presence of GTOS on the Committee at an early stage will help Committee members to become familiar with GTOS before the Committee has to start considering proposals from GTOS. The advantages of precognition were shown during the present series of visits to Convention Secretariats; one Secretariat said that "... GTOS cannot be worthwhile to The Convention because if it was we would have heard of it before - and we have not."

RECOMMENDATION 23: GTOS should obtain observer status on the Scientific and Technical Committees of relevant Conventions, especially the newer ones that are still developing their work programme and operating methods.

Two new Conventions can be of great importance to the future of GTOS, namely The Convention to Combat Desertification, and The Convention on Biological Diversity. Both these Conventions are just beginning to develop their programmes. GTOS should, as soon as possible, press for observer status on the Scientific and Technical Committee of each. Sponsors of GTOS should ensure that there are sufficient travel funds to allow regular GTOS representation at meetings of the two Scientific and Technical Committees, particularly during the formative first years. GTOS should in addition ask representatives from the two Secretariats (or from the two Committees) to attend some GTOS work programme planning meetings to ensure that from the start the needs of these two Conventions are adequately reflected in GTOS.

RECOMMENDATION 24: GTOS should regularly attend meetings of the Scientific and Technical Committees of The Convention to Combat Desertification and The Convention on Biological Diversity. Representatives of both these Committees should be invited to attend some GTOS programming meetings.

Annex 1: Persons Consulted

Convention Secretariats

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (SBC)

Iwona Rummel-Bulska
Executive Secretary

Åsa Jonasson Granados
Senior Programme Officer

Convention Concerning the Protection of the World Cultural and Natural Heritage

Bernd von Droste
Director, World Heritage Centre

Harold Eidsvik
Senior Programme Specialist
World Heritage Centre

Herman van Hooff
Programme Specialist
World Heritage Centre

Convention on Biological Diversity

Calestous Juma
Executive Secretary

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Izgreva Topkov
Secretary General

Convention on the Conservation of Migratory Species of Wild Animals (CMS)

Arnulf Müller-Helmbrecht
Co-ordinator

Douglas Hykle
Deputy Co-ordinator

Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar)

Delmar Blasco
Secretary General

Convention to Combat Desertification Interim Secretariat

Robert J. Ryan Jr.
Special Advisor

Olivier Jalbert
Legal Advisor

United Nations Framework Convention on Climate Change

Jacob Swager
Coordinator, Communication, Assessment and Review

Mukul Sanwal
Adviser, National Communications

Alexandre P. Metalnikov
Adviser, Ocean climate interactions

Organisations Co-Sponsoring GTOS

Food and Agriculture Organization of the United Nations (FAO)

Wim G. Sombroek
Director,
Land and Water Development Division

Robert Brinkman
Chief, Soil Resources
Management and Conservation Service Land and Water Development Division

Marc Bied-Charreton
Chief, Environmental Information Management Service
Sustainable Development Department

John S. Latham
Remote Sensing Officer (Agriculture)
Environmental Information Management Service
Sustainable Development Department

Dominique Lantieri
Remote Sensing Officer (Agriculture)
Environmental Information Management Service
Sustainable Development Department

Stein W. Bie
Director, Research, Extension and Training Division
Sustainable Development Department

L. Odell Larson
Chief, Statistical Development Service
Statistics Division

Jean Viseur
Senior Officer, Statistical Development Service
Statistics Division

United Nations Educational, Cultural and Scientific Organization (UNESCO)

Gisbert Glaser
Director, Bureau for Co-ordination of Environmental Programmes

F. Wolfgang Eder
Director, Division of Earth Sciences

Robert Missotten
Programme Specialist
Division of Earth Sciences

Baghoui Rouhban
Programme Specialist, Division of Earth Sciences

Andras Szöllösi-Nagy
Director, Division of Hydrological Sciences

Mohamed Skouri
Senior Programme Specialist
Division of Ecological Sciences

Jane Robertson
Programme Specialist
Division of Ecological Sciences

Gönar Kullenberg
Executive Secretary
Intergovernmental Oceanographic Commission

Jean-Paul Rebert
Director, GOOS Support Office
Intergovernmental Oceanographic Commission

United Nations Environment Programme (UNEP)

Harvey Croze
Assistant Executive Director, UNEP

Division of Environment Information and Assessment

Arthur Lyon Dahl
Co-ordinator, UN System-wide Earthwatch
Division of Environment Information and Assessment

Marion E. Cheatle
Programme Officer
Division of Environment Information and Assessment

Peter J. Peterson
Officer-in-Charge
International Register of Potentially Toxic Chemicals (IRPTC)

Peter Usher
Chief, Climate Unit

World Meteorological Organization (WMO)

Michel Jarraud
Deputy Secretary-General

Frederic Delsol
Director
Atmospheric Research and Environment Programme Department

John M. Miller
Chief, Environment Division
Atmospheric Research and Environment Programme Department

Victor G. Boldirev
Director, World Climate Programme Department

Arthur Askew
Chief, Water Resources Division
Hydrology and Water Resources Department

Thomas W. Spence
Director, Joint Planning Office
Global Climate Observing System

Hal Kibby
Senior Scientist
Joint Planning Office
Global Climate Observing System

International Council of Scientific Unions (ICSU)

Julia Marton-Lefèvre
Executive Director

Elizabeth Merle
Administrator

Others Consulted

David J. Norse
Chairman
Ad hoc Scientific and Technical Planning Group
Global Terrestrial Observing System

Carl Cristian Wallen
Consultant, UNEP

Jürgen Nauber
Secretary General
German National Committee
UNESCO Man and the Biosphere (MAB) Programme

Françoise Burhenne-Guilmin
Head, IUCN Environmental Law Centre

James Thorsell
Senior Advisor - Natural Heritage
IUCN - The World Conservation Union