

GUIDE TO THE GLOBAL TAXONOMY INITIATIVE

CBD Technical Series

GUIDE TO THE GLOBAL TAXONOMY INITIATIVE

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FOREWARD

Achievement of the objectives of the Convention on Biological Diversity – conservation of biodiversity, sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources – depends in large part on our understanding of biodiversity. Yet, only a fraction of the total number of species that make up the life on earth have been named or described. What's more, progress in taxonomy, the science of naming, describing and classifying organisms, is suffering from a shortage of expertise and declining resources. This so-called "taxonomic impediment" to implementation of the Convention was acknowledged by Parties to the Convention several years ago, and resulted in development of the Global Taxonomy Initiative (GTI).

The GTI is a crucial cross-cutting issue under the Convention and is relevant for virtually all of the work under the CBD. The programme of work for the GTI, which was adopted at the sixth Conference of the Parties in 2002 and further supplemented after in-depth review at the eighth Conference of the Parties in March 2006, is comprehensive in its scope and bold in its objectives. At a time when Parties are increasing their focus on implementation of the work under the

Convention, and striving to achieve the 2010 target of reducing the rate of biodiversity loss, the importance of taxonomy and the GTI cannot be understated.

The information presented in this Guide to the GTI demonstrates the important links between taxonomy and the conservation and sustainable use of biological diversity. It is my hope and belief that the Guide will be extremely useful, not only for those directly involved in implementing the Convention, and for taxonomists, but for anyone with a deep interest in biological diversity.

I wish to thank all those who have contributed to the development of this Guide, in particular Dr. Chris Lyal of the Natural History Museum in London, as well as the delegations to the tenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice and the various individuals who reviewed the Guide and contributed to its refinement.

Dr. Ahmed Djoghla
Executive Secretary
Convention on Biological Diversity

ACKNOWLEDGEMENTS

The Secretariat of the Convention on Biological Diversity wishes to thank all those who have contributed to development of this Guide to the Global Taxonomy Initiative. The initial draft of the Guide was reviewed by the tenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice. The Guide was revised following the in-depth review of the Global Taxonomy Initiative at the eighth Conference of the Parties to the Convention in March 2006.

External reviewers, including many members of the Coordination Mechanism for the Global Taxonomy Initiative, provided useful and important comments which improved the Guide considerably. The Secretariat would like to give special thanks to Dr. Chris Lyal of the Natural History Museum in London, who prepared the first draft of the Guide and devoted considerable time and energy to ensuring that the final product would be of the highest quality.

EXECUTIVE SUMMARY

Taxonomy is the science of naming, describing and classifying organisms. Taxonomists have named and described some 1.78 million species of animals, plants and microorganisms, only a fraction of the estimated 5 to 30 million species on Earth. Taxonomy is the tool by which the components of biological diversity are identified and enumerated, and therefore provides basic knowledge underpinning management of biodiversity.

The Parties to the Convention on Biological Diversity (CBD) have acknowledged the existence of a 'taxonomic impediment' to implementation of the Convention, referring to the shortage of taxonomic expertise, taxonomic collections, field guides and other identification aids, as well as to the difficulty in accessing existing taxonomic information. Consequently, the Global Taxonomy Initiative (GTI) was developed by the Parties to:

- Identify taxonomic needs and priorities;
- Develop and strengthen human capacity to generate taxonomic information;
- Develop and strengthen infrastructure and mechanisms for generating taxonomic information, and for facilitating sharing of and access to that information; and
- Provide taxonomic information needed for decision-making regarding the conservation of biological diversity, sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources (the three objectives of the CBD).

Effective implementation of the GTI will undoubtedly contribute to progress towards the 2010 Biodiversity Target. This is to achieve, by 2010, a significant reduction of

the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth.

The programme of work for the Global Taxonomy Initiative developed by the Parties has 19 planned activities. The first three of these relate to assessment of taxonomic needs at national, regional and global levels. There have been some assessments at national and regional levels, and further results of national assessments are expected over the next couple of years. The global assessment is currently being planned.

The fourth planned activity addresses public awareness and education. There has been some implementation of this activity, and more is expected including through the Global Initiative on Communication, Education and Public Awareness (CEPA) under the Convention.

The fifth and sixth planned activities address capacity-building to support access to and generation of taxonomic information, and strengthening of networks for regional cooperation. In spite of many efforts and initiatives that contribute to capacity-building, it is well-established that the world's taxonomic expertise is shrinking. Regional cooperation has been fostered to some extent, but more needs to be done and cooperation alone will not alleviate the need for increased capacity.

The seventh planned activity envisages development of a coordination global taxonomic information system. In this regard, the Global Biodiversity Information Facility and others have made considerable progress in improving interlinkages and in harmonizing approaches so that information can be shared.

The remaining 12 planned activities in the programme of work for the GTI address the role of taxonomy in supporting work

under the CBD on thematic areas and cross-cutting issues. The GTI is itself a cross-cutting issue, and the use of taxonomy is necessarily driven by user needs, so it is appropriate that the programme of work focuses on users. The specific planned activities address the following:

- Marine and coastal biodiversity;
- Agricultural biodiversity
- Forest biodiversity;
- Inland waters biodiversity;
- Dry and sub-humid lands biodiversity;
- Mountain biodiversity;
- Island biodiversity;
- Access to genetic resources and benefit-sharing;
- Invasive alien species;
- Traditional knowledge, innovations and practise;
- Ecosystem approach, impact assessment, monitoring and indicators; and
- Protected areas.

The Conference of the Parties, the governing body of the CBD, develops and refines the GTI, with support from various mechanisms and actors, including the CBD Secretariat, the Coordination Mechanism for the GTI, national focal points, and the Subsidiary Body on Scientific, Technical and Technological Advice. Responsibility for implementation of the GTI lies with many actors, in particular national governments, but also relevant organizations, funding agencies, and taxonomists themselves along with their institutions. Implementation of the GTI is facilitated and/or monitored through several means including national biodiversity

strategies and action plans, national reports, and various outreach activities and initiatives.

Implementation of the GTI depends largely on funding, not only for projects and initiatives specific to taxonomy but also for biodiversity-related projects and initiatives with a taxonomic component. To date, the Global Environment Facility has been a key supporter of many of the planned activities in the programme of work. There are also many other donors that support taxonomic activities and thereby contribute to implementation of the GTI.

This Guide is intended for all stakeholders, and its purpose is three-fold:

- Describe the rationale and context for the GTI;
- Describe the programme of work of the GTI, including examples of how and where various activities are being implemented; and
- Assist institutions, initiatives and individuals to become engaged in the activities mandated by the GTI, by providing information on funding, sources of further information and useful contacts.

This Guide cannot hope to deal in depth with an extremely complex and rapidly-developing field. Users are encouraged to seek further information from the numerous references to other sources made in the text, and to also visit the GTI portal on the CBD website, which provides links to further information sources about the GTI and its implementation.

1. INTRODUCTION

“The governments of the world that recognise the Convention on Biological Diversity have affirmed the existence of a taxonomic impediment to sound management and conservation of biodiversity. Removal of this impediment is a crucial, rate-determining step in the proper implementation of the Convention’s objectives. There is an urgent need to train and support more taxonomic experts, and to strengthen the infrastructure required to discover and understand the relationships among the world’s biological diversity.”

Darwin Declaration, 1988
(Anon. 1998)

The Global Taxonomy Initiative (GTI) was put in place specifically to remove the taxonomic impediment – the crucial need identified in the Darwin Declaration.

By 1998, the hindrance to Convention implementation caused by the lack of appropriate taxonomic information had become very apparent. Unless action was taken to redress the situation, the impact of the Convention on Biological Diversity (CBD - see text Box 1-1) would be blunted, and progress in meetings its objectives slowed.

1.1 Taxonomy and the taxonomic impediment

Taxonomy is the science of naming, describing and classifying organisms, and covers all plants, animals and microorganisms of the world. Using observations of organisms (morphological, behavioural, genetic, biochemical etc), taxonomists identify species and arrange them into classifications, describing as new any that are not scientifically known. In the 250 years since Linnaeus introduced the binomial system of naming, which is used for scientific names today (see text box 1-2), taxonomists have described and named some 1.78 million species of animals, plants and microorganisms. The full number of species on Earth is unknown, but probably lies somewhere between 5 million and 30 million (Millennium Ecosystem Assessment 2005).

Taxonomy is the tool by which the components of biological diversity are identified, named and enumerated. Consequently, it provides basic knowledge underpinning biodiversity management and implementation of the CBD. Locating information about an organism is very difficult if no name for it is available, since the name is

Box 1-1 The Convention on Biological Diversity

At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a comprehensive strategy for “sustainable development” – meeting our needs while ensuring that we leave a healthy and viable world for future generations. One of the key agreements adopted at Rio was the **Convention on Biological Diversity**. This pact among the vast majority of the world’s governments sets out commitments for maintaining the world’s biodiversity and associated ecological functions. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. It is a political and legal agreement, and identifies priorities for action and puts in place the globally-agreed policies to support such actions

Box 1-2 What's in a name?

Different kinds of animals, fungi and plants and microorganisms are called different 'species'. This reflects a real biological difference – a species is defined as a potentially interbreeding group of organisms that can produce viable offspring that themselves can interbreed. Thus animals of two different species, like a horse and a zebra, cannot interbreed, while animals of the same species can. Taxonomists provide unique names for species, labels that can help us find out more about them, and enable us to be sure that we are all talking about the same thing. Of course, there are names for organisms in many languages, but it is important, for example, when discussing the hedgehog to know whether one is talking about the small spiny insectivore *Erinaceus europaeus*, other members of the same family, cacti of the genus *Echinocerus*, or the orange fungus *Hydnum repandum*, all of which have the same 'common' name in English. For this reason the Latin 'scientific' name, is given as a unique universal identifier.

the unifying reference for all data. This is a potentially disastrous limitation to the ability to take informed management decisions (Hopkins and Freckleton, 2002; McNeely, 2002). If Parties to the Convention do not know what species live within their national boundaries, they will find it difficult to enact effective legislation concerning them, plan for conservation and sustainable use or protect national or subnational rights concerning benefits of the genetic resources of their biodiversity. Taxonomy provides a basic and vital tool for the implementation of the Convention on Biological Diversity.

Identification of some species may be easy, particularly in the case of large mammals; however, this is not the case for most organisms. The majority of invertebrates and many plants, for example, require expert skills to ensure a correct identification. This is not just because there are no simple-to-use identification guides – in many cases the species are not simple to identify and production of such guides is not possible. However, even where simple guides might be possible, these or other identification aids to assist the non-taxonomist are available for comparatively few groups and in comparatively few geographic

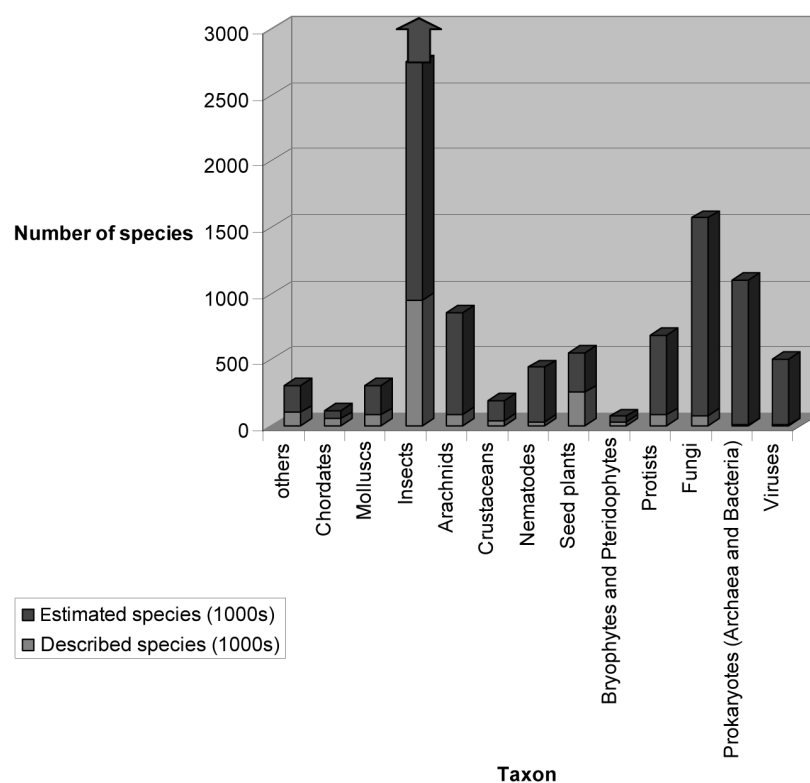
areas. The rate of production of such guides is very slow, other than for some charismatic groups such as birds and large mammals. Moreover, while much of the information that is currently available is in formats and languages suitable for the needs of taxonomists in the regions where the work is being done, it is not always sufficiently accessible in countries of origin, nor in styles useful to non-taxonomists (Lyal, 2004). The inability to identify (or obtain identifications for) the biota is a major part of the taxonomic impediment.

Not only can it be difficult to tell some species apart, but the majority of them have not been categorized or given formal scientific names (Text box 1-3). Although there is extensive taxonomic work on groups such as birds, most mammals and some higher plants, little is known of the distribution, biology, and genetics of the vast majority of species, even in those groups. Perhaps only 10% of vertebrates remain to be described, but well over 50% of terrestrial arthropods and up to 95% of protozoa are undescribed (Figure 1). At the most conservative estimate, the subject of the Convention on Biological Diversity - the biota itself - comprises more unknown species than known ones.

Box 1-3 How to name a species: the taxonomic process

Taxonomists begin by sorting specimens to separate sets they believe represent species. Once the specimens are sorted the next job is to see whether or not they already have names. This may involve working through identification guides, reading descriptions written perhaps 200 years ago, and borrowing named specimens from museums or herbaria to compare with the sample. Such comparison may involve external characters, a need to dissect internal structures, or even molecular analysis of the DNA. If there is no match the specimens may represent a new species, not previously given a name. The taxonomist then has to write a description, including ways in which the new species can be distinguished from others, and make up a name for it, in a Latin format. The name and the description must then be properly published so that other taxonomists can see what has been done, and be able to identify the species themselves. From finding the specimens to the name appearing in print can take several years.

Figure 1. Known and unknown species in the world. The numbers of unknown species are an estimate, based largely on data in 'The Web of life', UK Systematics Forum, 1988.



Although there are many species waiting to be described, there are far too few taxonomists to do the job, particularly in the countries where they are arguably most needed, the biodiversity-rich developing countries (Figures 2 and 3). Most taxonomists work in relatively biodiversity-poor but resource-rich industrialised countries. Institutions in these countries also hold the largest reference collections of specimens from developing countries, as well as the books and scientific papers required to identify species and to carry out taxonomic research. Collections, with the specimens properly identified and with the names up-to-date, are vital tools, especially in the absence of simple-to-use guides. Many species are only known to have been collected once, and are represented in collections only by the type specimen (Text box 1-4). However, if this collection is in an

institution not in the country of origin, and no good images are available, many other specimens may have been collected but remain unidentified or incorrectly identified.

Extensive libraries are needed because of the vast amount of taxonomic literature that has been published in thousands of journals and books over the past 250 years. This literature, just like collections, is a vital part of the taxonomist's equipment. For a large number of species only one description has ever been written, and that is in the original publication where the species was named. Without access to this publication and in the absence of an authoritatively-named collection there is no way of a taxonomist being sure of making a correct identification. Making this legacy literature accessible to workers in developing countries is a major undertaking. There is a current

Figure 2. Number of taxonomists in Asia working on each major taxon. From Shimura, 2003.

Number of Experts

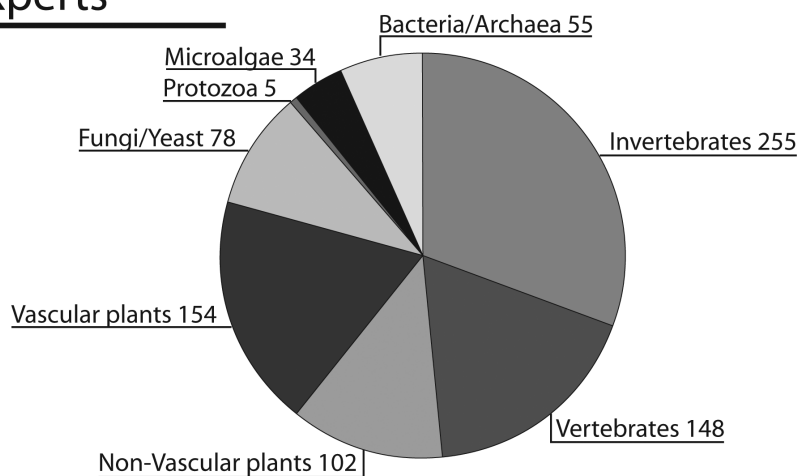
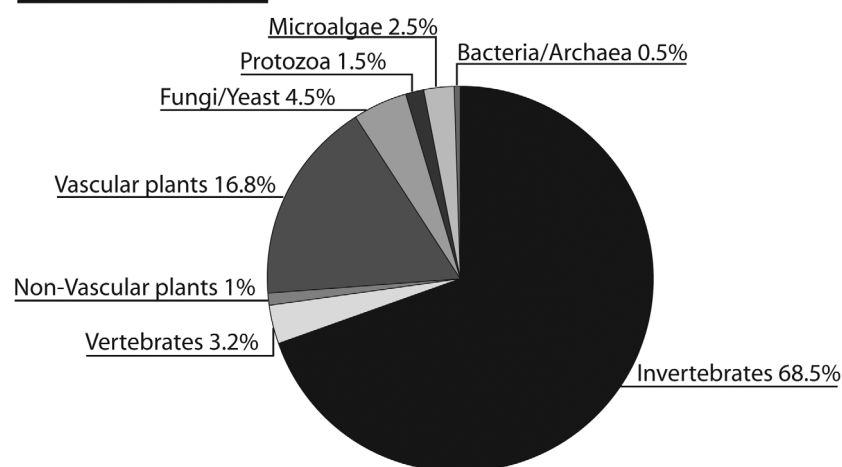


Figure 3. Ratio of sizes of major taxa based on known species in Asia. From Shimura, 2003.

Ratio of known Species



Box 1-4 The role of taxonomic collections

Collections of organisms are vital tools for taxonomists. Although a great deal of valuable information can be gained from published studies, the specimens or cultures themselves are the ultimate reference. However good a published description of a species may be, the author will inevitably leave out some characteristics. However, for studies after the publication, when more specimens of other species are found, some characteristics not originally described might need to be studied. With named specimens in a collection this is possible; without them it is very difficult. Some specimens are particularly important: the 'types'. These are specimens used by a taxonomist when describing a species for the first time, and form the 'international standard' – the reference specimens to which all others can be compared to assess whether or not they are of the same species. Most types are held in the large collections in industrialised countries rather than in the countries of origin. However, because species are often distributed across national boundaries, these collections provide a globally-invaluable resource for comparison and identification. A major need for all taxonomic institutions, however, is a collection containing specimens or cultures which have been authoritatively named, ideally by comparison with the type.

(and inevitable) move to transfer literature to the internet, which will certainly improve accessibility. However, this carries with it an absolute requirement for taxonomists in all countries to be connected to the internet with a high enough bandwidth to access the information vital to their work.

Although identification and the large number of unknown species have been highlighted above, these are by no means the only aspects of taxonomy of importance to the implementation of the CBD. The Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF) concluded that some of the key reasons for the importance of taxonomy include an understanding of key organisms that enable:

- i) A scientific basis for conservation, management and benefit-sharing of all levels of the biodiversity hierarchy;
- ii) Development of food security;
- iii) Identification and control of human disease vectors;
- iv) Identification and control of vectors' contribution to ecosystem dysfunction; and
- v) The promotion of health through an understanding of preventive and curative agents found in biodiversity¹

Information arising from properly identified specimens includes data that can be used outside taxonomy. For example, they can help predict distributions of species, both actual and potential (e.g. as a response to climate change, or if the organism is introduced into a new geographic area), and they can inform identification of priority areas for

protection based on distributions and rarity of taxa. In addition, they can provide baseline data to plot the changing fortunes of taxa and ecosystems under anthropogenic influence, predictions of interactions between species which come into contact through natural or artificial changes in distribution, linkages between different life-stages of organisms where these look dissimilar, and so on. The importance of taxonomy to the implementation of the CBD has been emphasized at great length in the expert meetings which led up to the GTI (Anon, 1998; Anon, 1998b; Anon, 1998c; Anon, 1999; Anon, 2000), by the meetings advising the CBD decision-making process, by the CBD Conference of the Parties, by the GEF STAP (Anon, 1999a), and by numerous other authors². As evidenced by the programme of work for the GTI described in this guide, taxonomy plays a key role in supporting virtually all of the work of the CBD.

The majority of developing countries lack a sufficient number of taxonomists, collections of their flora and fauna, and adequate libraries and collections of scientific papers to assist the taxonomic process. All these are needed; just hiring taxonomists without the necessary tools for them to do their work effectively will not be sufficient.

The lack of taxonomists, of collections, of libraries, of field guides and other identification aids, the difficulty in accessing information, coupled with the overwhelming number of species, both described and undescribed, make up the 'taxonomic impediment' to implementation of the Convention on Biological Diversity.

¹ Report of the STAP brainstorming on the use of taxonomic information. Key outcomes and suggestions. (1999).

² (e.g. Wemmer *et al.*, 1993; Cresswell & Bridgewater, 2000; Blackmore, 2002; Hopkins & Freckleton, 2002; Klopper *et al.*, 2002; McNeely, 2002; Steenkamp & Smith, 2002; Chavan & Krishnan, 2003; Golding & Timberlake, 2003; King & Lyal, 2003; Lowry & Smith, 2003; Navarro *et al.*, 2003; Raxworthy *et al.*, 2003; Canhos *et al.*, 2004; Iguchi *et al.*, 2004; Samper, 2004; Smith, 2004, Smith *et al.*, 2004; Suarez & Tsutsui, 2004; Yahner, 2004).

1.2 The Global Taxonomy Initiative

The response of the CBD to the recognition of the taxonomic impediment has been to develop a 'cross-cutting' programme to address it, the 'Global Taxonomy Initiative' (GTI). Because the GTI is a part of the CBD, the taxonomic activities that it espouses are in support of the three aims of the Convention.

The GTI has a dual nature, encompassing both policy and implementation. Firstly, as a 'cross-cutting issue' of the CBD it is part of an agreement that provides the legal and political backing for activities in support of its threefold objective³. This is the forum through which the Parties to the CBD develop policy, as articulated in the decisions of the Conference of the Parties (COP). This international policy can then be used to inform national policies by the Parties to the CBD⁴. Input to the COP comes from its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), the 'Coordination Mechanism' of the GTI (an informal advisory group), and any other expert meetings or processes that may be convened. Assistance in bringing this information together, and providing other documentation to develop the process, is provided by the Executive Secretary of the CBD and the Secretariat (SCBD), which includes a GTI Programme Officer.

The other aspect of the dual nature of the GTI is that of implementation. The adoption by the COP of a particular decision does not automatically mean that the aspirations expressed within it are implemented. Countries first have to take decisions of their own as to what extent they will put in place policies to implement locally what has been

decided globally. The activities outlined in the policies (e.g. the GTI Programme of Work (PoW)) need to be undertaken by, among others, taxonomists themselves. The success of the GTI depends largely on the participation of taxonomists and others, and the successful integration of taxonomic work with other Convention activities. This is a challenge. Mechanisms must be put in place to support implementation, and to record when and how implementation has taken place. Those implementing the GTI are by and large not engaged in policy development, and there may be very tenuous links between the implementers and the policy-makers. Taxonomists and their institutions may not be aware of the policy decisions that have been made, and how these can support the work that is required. Conversely, those tasked with reporting on the progress of the GTI (specifically GTI and CBD National Focal Points) may not be aware of what progress has been made, or, indeed, of who might be involved, since there is generally no mechanism in place to gather and synthesise this information.

The GTI is necessarily driven by user needs, those needs being identified in the context of Convention implementation. Taxonomists already produce vast amounts of basic, valuable information. However, the practices of information dissemination have not always done justice to the importance of that information. One aspect of the GTI is to ensure that the taxonomic information reaches not only taxonomists but also decision-makers and other non-taxonomist users, and in a format that they can employ.

In addition to effective dissemination of existing information, generation of new

³ Conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

⁴ The Parties to the CBD are the countries or regional economic organizations that have ratified, accepted, or approved the Convention (see Article 34 of the CBD text for details).

information is also a part of the GTI. As noted above, the majority of species are not yet described and named. Any taxonomic activity will at some level assist in implementation of the Convention, because better understanding of biodiversity should ultimately support better decisions about conservation and sustainable use of biodiversity. Nevertheless, the GTI focuses somewhat on taxonomy *applied* in the context of the implementation of the CBD. End-users of taxonomic information, be they protected area managers, scientists combating alien species, or national governments defining access regimes for medicinal plants, have an important short-term need for good information upon which to base their decisions. In short, effective implementation of the CBD depends largely on taxonomic information.

1.3 Purpose of the Guide

This Guide is for all stakeholders, in the hope that they can use it to enable and speed up implementation of the GTI. The purpose of the Guide is three-fold:

- Describe the rationale and context for the GTI;
- Describe the programme of work of the GTI, including examples of how

and where various activities are being implemented; and

- Assist institutions, initiatives and individuals to become engaged in the activities mandated by the GTI, by providing information on funding, sources of further information and useful contacts.

Importantly, this Guide tries to use language that is easy to understand for those not directly involved in CBD processes. Therefore, although references to decisions of the Conference of the Parties are often provided, the language used is not necessarily the same. If further clarity is needed, readers need to refer to the original text of COP decisions and other documents. A list of acronyms used in the document is provided at the end of the Guide.

Finally, although this volume outlines GTI activities, it cannot hope to deal in depth with an extremely complex and rapidly-developing field. The reader is urged to use the bibliography to understand further some of the activities taking place, in a multiplicity of fora, to remove the taxonomic impediment. In addition, those with web access are encouraged to visit the GTI portal on the CBD website, which provides links to further information sources about the GTI and its implementation.

2. BACKGROUND

The Convention on Biological Diversity

The Convention on Biological Diversity is the largest of the environmental conventions, and is so far signed and ratified by 188 Parties, including 187 countries. The objectives of the Convention are:

- Conservation of biological diversity;
- Sustainable use of its components; and
- Fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

The agreement covers all ecosystems, species, and genetic resources.

The CBD, as an international agreement, identifies a common problem, sets overall goals and policies and general obligations, and organizes technical and financial cooperation. However, the responsibility for achieving its goals rests largely with the countries themselves. The Convention sets out a series of binding commitments in its articles; countries that join it are obliged to fulfil these commitments. The decisions taken by the COP are not legally binding but, having been agreed by all of the Parties, are likely to at least inform national policies. Under the Convention, Governments undertake to conserve and sustainably use biodiversity. They are required to develop national biodiversity strategies and action plans (NBSAPs), and to integrate these into broader national plans for environment and development. Other commitments include:

- Identifying and monitoring the important components of biodiversity that need to be conserved and used sustainably.
- Establishing protected areas to conserve biodiversity while promoting

environmentally sound development around these areas.

- Rehabilitating and restoring degraded ecosystems and promoting the recovery of threatened species.
- Respecting, preserving and maintaining traditional knowledge of the sustainable use of biodiversity with the involvement of indigenous peoples and local communities.
- Preventing the introduction of, controlling, and eradicating alien species that could threaten ecosystems, habitats or species.
- Controlling the risks posed by organisms modified by biotechnology.
- Promoting public participation, particularly when it comes to assessing the environmental impacts of development projects that threaten biodiversity.
- Educating people and raising awareness about the importance of biodiversity and the need to conserve it.

All of these commitments require, to a greater or lesser extent, the use of taxonomy.

The Convention has identified work to be carried out in seven 'thematic' work programmes, addressing:

- Marine and coastal biodiversity;
- Agricultural biodiversity;
- Forest biodiversity;
- Inland waters biodiversity;
- Dry and sub-humid lands biodiversity;
- Mountain biodiversity; and
- Island biodiversity.

Each thematic programme sets out key issues for consideration, basic principles to guide the necessary work, expected outputs; as well as timelines and means for achieving these outputs.

In addition to the thematic areas there are a number of key 'cross-cutting issues' of relevance to all thematic areas. These include:

- Access to genetic resources and benefit-sharing;
- Traditional knowledge, innovations and practise;
- Biological diversity and tourism;
- Climate change and biological diversity;
- Economics, trade and incentives;
- Ecosystem approach;
- Global strategy for plant conservation;
- 2010 biodiversity target;
- Global Taxonomy Initiative;
- Impact assessment, liability and redress;
- Indicators;
- Liability and redress;
- Invasive alien species;
- Protected areas;
- Public education and awareness;
- Sustainable use; and
- Technology transfer and cooperation.

The CBD does not itself fund projects, and does not provide grants. However, there are many sources of funding used by those seeking to implement the Convention. The 'financial mechanism' of the CBD, the Global Environment Facility (GEF), can support taxonomic activities under certain circumstances. The GEF, and other sources of funding, are discussed in more detail below in section 5.

2.2 How does the CBD run?

The Convention's governing body is the Conference of the Parties (COP), comprising representatives of all governments (and regional economic integration organiza-

tions) that have ratified the treaty. The COP reviews progress under the Convention, identifies new priorities, and sets work plans. It can also make amendments to the Convention, create expert advisory bodies, review progress reports by member nations, and collaborate with other international organizations and agreements. The COP has taken a number of 'decisions', setting out in detail how the various aspects of work of the Convention should be developed.

The COP decisions provide a text which informs the national policies of the governments of the Parties. Given that the Parties have agreed to the text, this text provides a basis upon which work can be built. Throughout this document references to the relevant COP decisions are given as footnotes in the text.

The Conference of the Parties is supported and advised by several other bodies that are established by the Convention (see section 4 for further information):

- The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). The SBSTTA is a committee composed of experts from member governments competent in relevant fields. It plays a key role in making recommendations to the COP on scientific and technical issues.
- The Secretariat of the Convention on Biological Diversity (SCBD) based in Montreal, is linked to United Nations Environment Programme. Its main functions are to organize meetings, draft documents, assist member governments in the implementation of the programme of work, coordinate with other international organizations, and collect and disseminate information.
- The COP also establishes ad hoc committees or mechanisms as appropriate, in order to address particular issues.

The texts of all recommendations of SBSTTA and of COP decisions can be found on the web site of the CBD⁵. COP decisions dedicated to the GTI are annexed to this Guide and are found in the GTI portal within the CBD website.

2.3 The Global Taxonomy Initiative to support implementation of the CBD

The main elements of the taxonomic impediment, and the consequent need for a special emphasis on taxonomy to enable the CBD to be implemented effectively, were identified quite early in the Convention's existence. Within the remit of the Convention, the need for taxonomic input has been recognized in a number of areas:

- Developing national biodiversity strategies and action plans (Articles of the Convention 6, 7);
- Monitoring and assessing the effects of management practices and impacts of environmental and use changes (Articles 7, 14);
- Identifying appropriate *in-situ* conservation areas (Article 8);
- Developing protocols for sustainable use of biological resources (Article 10);
- Training and research programmes in conservation and sustainable use of biological diversity (Article 12);
- Promoting understanding of the importance of biological diversity (Article 13);
- Enabling access to genetic resources (Article 15);
- As part of technology transfer, information exchange and technical and scientific cooperation (Articles 16, 17, 18);
- Managing the distribution of benefits of biotechnology (Article 19);

- Addressing issues on biosafety (Cartagena Protocol); and
- Addressing problems within the thematic and cross-cutting areas of the CBD.

In all these areas a lack of available taxonomic expertise, data and national capacity among the majority of the Parties hinders implementation of the Convention. The impediments to the implementation of Article 7 on Identification and Monitoring have been particularly apparent. Following this recognition, the COP authorised and developed a taxonomic component of Convention activities through a number of decisions, from its third meeting to the eighth. A programme of work for the GTI was adopted in 2002 and supplemented in 2006 (COP decisions VI/8 and VIII/3), which among other things attempted to include all of the activities mentioned in earlier decisions (III/10, IV/1.D, V/9), although not all the detail available was included. The relevant texts of these decisions are annexed to this Guide.

Many of the problems forming the taxonomic impediment, and their possible solutions, were also explored in a series of expert meetings (Anon, 1998, 1998b, 1998c, 1998d, 1999, 2000). These documents have been strongly influential in the development of the GTI, and all were submitted to the COP, or to the SBSTTA to provide information to help formulate recommendations to the COP.

Overall, the COP has asked the GTI to “seek to provide the key information required for the implementation of the Convention on Biological Diversity, particularly Article 7, on identification and monitoring, through increasing the fundamental biological data essential to underpin the conservation, sustainable use and equitable sharing of the benefits from the utilization

⁵ <http://www.biodiv.org>

of biological diversity. That is, to address the problems of insufficient knowledge of all components of biological diversity (including their classification, description, value and function) and lack of taxonomic capacity, to overcome what has been termed “the taxonomic impediment”. (decision VI/8 – see annex 11). The decision went on to note that “In formulating the programme of work to achieve this end, the GTI should provide the global platform to help accelerate current taxonomic efforts in areas identified as high priority by countries and regional groupings of countries”. The GTI programme of work has been designed to focus on supplying the needed taxonomic information to support the major work areas of the Convention, and the need to support capacity-building to ensure the ability of countries to undertake the priority taxonomic work required to implement the Convention. This programme of work is intended to fulfil the following functions:

- (a) To contribute to the implementation of the Convention’s Strategic Plan;
- (b) To set operational objectives with clear expected outputs and ways and means through which to achieve the set objectives;
- (c) To provide the rationale for the choice of the operational targets, with indications of opportunities for further elaboration of the programme of work; and
- (d) To serve as a guide to all biodiversity stakeholders on specific objectives to which they can contribute individually or collectively, at the local, national or international level.

⁶ WSSD Plan of Implementation, Paragraph 44(s)

⁷ see decision VII/30

2.3.1 GTI and the 2010 biodiversity target

In a mission statement accompanying the Strategic Plan for the Convention on Biological Diversity (decision VI/26) the Parties to the Convention committed themselves to a more effective and coherent implementation of the three objectives of the Convention, and to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth. This last is the 2010 biodiversity target, which was subsequently endorsed by the World Summit on Sustainable Development. The WSSD also stated that “[Actions are needed to] Promote the implementation of the programme of work of the Global Taxonomy Initiative.”⁶

In an attempt to set out recommendations for monitoring progress towards the 2010 target the COP has identified a number of parameters⁷. These include “Reducing the rate of loss of the components of biodiversity, including: (i) biomes, habitats and ecosystems; (ii) species and populations; and (iii) genetic diversity”. Measuring species, populations and genetic diversity will require taxonomy. Importantly, taxonomic information could be of great value in working towards the 2010 target by providing, from specimens housed in collections worldwide, the baseline data to assess the rate of loss before 2000, so that progress towards attaining the target can be assessed.

2.4 Who is responsible for the GTI?

As noted above, the GTI is both a policy-development forum and a set of activities that need to be implemented to remove the

taxonomic impediment. Roles and responsibilities for the administration and policy aspects of the GTI are discussed in section 4 of this Guide.

Regarding implementation, Parties – in particular national governments – are required to implement the relevant Articles, and are obliged to put the decisions of the COP into practice. COP decisions frequently identify initiatives, institutions or sectors which, COP believes, should act in

implementation of the GTI because it falls within their remit. COP also asks funding bodies, and particularly the GEF, to finance GTI implementation. In that sense all of these are responsible to ensure that the GTI fulfils the requirements of the COP.

Importantly, there is an important role in implementation of the GTI not only for governments, but also for individual taxonomists, taxonomic institutions, conservationists, and funding agencies (see text box 2-1).

Box 2-1 Why should I participate in the GTI?

Governments and Government Departments

In the texts of the decisions on the GTI the COP has asked its constituent Parties and their Governments to undertake numerous actions, including provision of appropriate resources to ensure actions by others are carried out. The Governments themselves, having supported and agreed to the texts of these decisions, thus implicitly express their intention to be guided by them and have some obligation to support action to turn the policies into implementation. They would do this by developing appropriate national policies, providing resources in such a way that the COP decision elements can be implemented, and causing publicly-funded bodies to adopt the relevant policies. Governments, in the national reports, state how they have responded to these commitments. These national reports can be found on the website of the CBD. The routes through which Government departments inform and resource appropriate bodies can be used to gather information and appropriate performance indicators for use in the reports, otherwise a difficult and costly activity.

Taxonomic institutions

Taxonomy as a discipline has been in decline for the past few decades. This has been and continues to be a matter of concern. The decline has been associated with a lack of understanding of the importance of taxonomic information, and taxonomists have expressed concern that their work is not fully appreciated, nor taken up by other sectors. The massive political support for taxonomy expressed in the COP decisions is in direct contrast to this perception, and demands a response if it is to continue. Several funding organisations are supporting GTI activities, and this can be expected to develop further with demonstrations of the successful integration of taxonomy with work in other implementing sectors. Such integrated activities can also lead to a better quality of data

for use in related research, and long-term externally-funded activity. Taxonomic institutions are called upon in some decisions to take action, and indeed took part in the meetings leading up to the creation of the GTI. Many of the activities that are required to turn GTI into a reality will rest on the willingness of these institutions, and the individuals working within them, to undertake GTI implementation. The onus is now on taxonomy to grasp the opportunity that is presented by the GTI.

Individual taxonomists

Many funding opportunities are tied to biodiversity-related outcomes, rather than being for taxonomy alone. An individual taxonomist applying has to show how the taxonomic work proposed will contribute to the biodiversity aim, often in a logical framework that demands clear linkage of what taxonomy is undertaken and how the results are disseminated to the benefits to biodiversity that form the focus of the project from their point of view. This is essentially the GTI, and use of the ideas and examples discussed in this booklet may assist in preparation of grants of this type. Even if no direct linkage between taxonomic work and benefits to biodiversity (or CBD implementation) is required, donors are increasingly interested in the broader context into which the research they fund fits, and again the GTI provides this context. Many countries now require products from taxonomists in return for permission for collecting or undertaking research within their borders. These products, including lists of species, descriptions of new species published in the country, distributions of rare species etc, if useful and contributing to national policies, will assist both the countries and current and future researchers justifying continued work in the country. Such products may also facilitate additional funding for projects within the country and region. A key to identifying the relevant information lies in the GTI and the convention-related policies of the country and region, including the NBSAP. Taxonomists should become involved in taxonomic needs assessments in order to ensure that appropriate needs are taken into account.

Conservationists and other sectors implementing the CBD

There is a vast amount of information generated by taxonomic work that could be used to support and inform conservation and related activities. Examples of such successes are available as models referenced throughout this document. However, there is a widespread assumption that taxonomic information should be readily and freely available and equal disappointment when this proves to be a misapprehension. Partially because of the difficulty of obtaining appropriate taxonomic information, there has been a trend to avoid the need by simply using what can be identified, and operating on the assumption that the rest of the biota can be covered by the focus on the selected species. While it is true that in many cases decisions must be made with incomplete taxonomic information, the value of more complete taxonomic information in improving decision-making has been demonstrated a number of times. The provision of rapid assessment and monitoring of large components of the biota that are currently inaccessible will be a valuable tool. The

case has been made powerfully for involvement of taxonomy in the way set out by the GTI. However, without the willingness of the conservation and related sectors to ensure resources for production of needed taxonomic work and products are included in projects, this necessary information will continue to be unavailable.

Funding bodies

Many funding bodies, including the GEF, insist on a logical framework for any implementation activity to be drawn out. A common 'killer assumption' that is far too rarely recognised in such analyses is that all of the organisms that are encountered can be identified or, alternatively, that such identifications will not be necessary. Taxonomists are often used at the last minute for input on projects that belatedly realise the need for expert identification. Often, no resources in funding have been allocated to pay for the work needed on such projects, nor are resources included in the funding provided. The Scientific and Technical Advisory panel of the GEF has emphasised the importance of funding taxonomy for implementation of the CBD and to support the work of other UN agencies. The taxonomic impediment is a large problem, but the way to address large problems is to fund concerted action to solve them.

3. THE PROGRAMME OF WORK FOR THE GTI

3.1 Introduction

The objectives and major activities of the GTI have been summarized in a Programme of Work (PoW)⁸. Although this identifies certain priorities, it is not intended to be prescriptive, and flexibility must be maintained in order to meet the multitude of needs and priorities identified by individual Parties.

The PoW comprises 19 'planned activities'⁹ within five 'operational objectives' (Text box 3-1), plus one specific target under operational objective 3¹⁰. These are intended to contribute to the overall objective of implementation of the CBD (see the figure contained in the programme of work on the GTI, in annex 11). They outline what is needed, and provide some activities that have been identified already as priorities. Further work is being done to develop the PoW, and a set of desirable outputs are being identified.¹¹

The first operational objective aims to assess taxonomic needs and capacities at national, regional and global levels. This is an important first step because it determines where human and institutional capacity-building efforts should be focused. Certain types of capacity may best be addressed at regional levels, while other needs may be most effectively addressed at national levels. Among countries, national needs may vary widely.

Operational objective 2 focuses on building and maintaining the infrastructure and capacity needed to obtain, collate and curate the biological specimens that are the basis for taxonomic knowledge. Operational objective 3 aims to make information available, including ensuring that

countries of origin gain access to information concerning elements of their biodiversity. Taxonomic information needed for decision-making can only be generated and made available through an appropriate combination of capacity and infrastructure. Thus, operational objectives 2 and 3 are the basis for supporting operational objectives 4 and 5, which focus on the generation of information to support decision-making for conservation and sustainable use of biological diversity, within the thematic work programmes (operational objective 4) and cross-cutting issues (operational objective 5) addressed by the Convention.

Section 3.2 below describes each of the planned activities in the programme of work. Examples and elements related to implementation of the planned activities are provided in some cases, but these examples are by no means exhaustive – there are many tools and data sources now available both in written form in libraries, and in electronic form on the internet, and no publication like this can hope to list them all. The discussions under each planned activity are by no means complete and should spur the development of further activity towards addressing the taxonomic impediment.

3.2 Planned activities

3.2.1 National taxonomic needs assessments

For most countries in the world, there is simply too little taxonomic expertise, information and infrastructure available to enable them to work with their biota in the way they need. This deficiency is known as the

⁸ Adopted in decision VI/8 and supplemented in decision VIII/3.

⁹ 18 planned activities were adopted in decision VI/8; one was added in decision VIII/3, and three of the others were elaborated.

¹⁰ Decision VIII/3, paragraph 7

¹¹ In decision VIII/3, paragraph 11(f) the COP requested the development of specific taxonomic, outcome-oriented deliverables for each of the planned activities. These will be developed and considered at COP-9.

Box 3-1 The Global Taxonomy Initiative Programme of Work

(note: the target under operational objective 3, and planned activity 13b, were added by decision VIII/3)

Operational objective 1: Assess taxonomic needs and capacities at national, regional and global levels for the implementation of the Convention.

Planned Activity 1: Country-based taxonomic needs assessments and identification of priorities.

Planned Activity 2: Regional taxonomic needs assessments and identification of priorities.

Planned Activity 3: Global taxonomic needs assessments.

Planned Activity 4: Public awareness and education.

Operational objective 2: Provide focus to help build and maintain the human resources, systems and infrastructure needed to obtain, collate, and curate the biological specimens that are the basis for taxonomic knowledge.

Planned Activity 5: Global and regional capacity-building to support access to and generation of taxonomic information.

Planned Activity 6: Strengthening of existing networks for regional cooperation in taxonomy.

Operational objective 3: Facilitate an improved and effective infrastructure/system for access to taxonomic information; with priority on ensuring countries of origin gain access to information concerning elements of their biodiversity.

Target under operational objective 3: A widely accessible checklist of known species, as a step towards a global register of plants, animals, microorganisms and other organisms.

Planned Activity 7: Develop a coordinated taxonomy information system

Operational objective 4: Within the major thematic work programmes of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

Planned Activity 8: Forest biological diversity.

Planned Activity 9: Marine and coastal biological diversity.

Planned Activity 10: Dry and sub-humid lands biodiversity.

Planned Activity 11: Inland waters biological diversity.

Planned Activity 12: Agricultural biological diversity.

Planned Activity 13: Mountain biological diversity.

Planned Activity 13b: Island biological diversity

Operational objective 5: Within the work on cross-cutting issues of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

Planned Activity 14: Access and benefit-sharing.

Planned Activity 15: Invasive alien species.

Planned Activity 16: Support in implementation of Article 8 (j).

Planned Activity 17: Support for ecosystem approach and CBD work on assessment including impact assessments, monitoring and indicators.

Planned Activity 18: Protected areas.

‘taxonomic impediment’ to implementing the Convention on Biological Diversity. The taxonomic impediment is therefore specifically about the taxonomic needs of non-taxonomists: conservationists, environmental managers, quarantine officers, foresters and so on. It is distinct from the taxonomic capacity of a country, which refers to what taxonomy can be done, and the levels of expertise, information and infrastructure, without considering needs.

Understanding the taxonomic impediment in a country or region so that it can be removed can only be done by working with the users of taxonomy in these other fields, and identifying their taxonomic needs and the way they use taxonomy. This process is known as a taxonomic needs assessment.

The Parties to the CBD have repeatedly identified the importance of national taxonomic needs assessments in decisions of the COP (see annexes 8 to 13). The PoW envisaged that the results of such assessments would be compiled in 2002, but progress has been slow. Some countries have used national biodiversity strategies and action plans (NBSAPs) as well as national reports under the Convention to indicate their need for taxonomic capacity, but few details have been provided. So far, national needs assessments have been or are being carried out by a few countries, for example UK and South Africa. In each case the assessment does not cover all possible stakeholders with an interest in taxonomic information, since resources have been too few to allow such a comprehensive process.

The GEF was requested to provide funds for countries to conduct capacity-building needs assessments for biodiversity (not limited to taxonomy), and there are approximately 50 such projects underway. Although many were scheduled to have been

completed by the end of 2005, progress has been slow, and it is not clear to what extent they will address taxonomic needs in detail. The GEF is not the only possible source of funds to support needs assessments, and national taxonomic needs assessments have been or are being carried out by a number of countries using other sources of funding – examples include:

- Assessment of needs associated with conservation issues by the UK¹²;
- Brazil’s comprehensive strategy for the modernization of Brazilian biological collections and consolidation of integrated biodiversity information systems¹³; and
- An assessment of national taxonomic needs for Ghana, currently underway with support from the United Kingdom.

Taxonomic needs information from all available sources will be gathered and made available through the GTI portal on the CBD website in 2006 and 2007.

Understanding what taxonomic information is required in order to meet CBD-related needs is vital for good management and of great importance in building national biodiversity strategies and action plans. Once the needs are known the available resources can be assessed and the results used to set goals and priorities for building necessary capacity. If countries are involved in regional taxonomic networks, needs can also be assessed within the context of those collaborations, especially when participation may include complementarities and sharing of research effort.

As with so many Convention-related activities, a taxonomic needs assessment has both policy and implementation outputs. For policy, assessments should state clearly

¹² <http://www.Nbn.org/downloads/files/Questionnaire.1.doc> (Accessed 17/11/2004)

¹³ Ministry of Science and Technology, March 2006

if and how lack of taxonomic capacity and/or information impedes implementation of NBSAPs. The needs assessment is also a working document which can be used to inform taxonomists and funding bodies of the taxonomic input required. The process of conducting a needs assessment itself can be used to raise awareness of the CBD and of taxonomic needs.

Some valuable suggestions on how to carry out a national needs assessment were provided by the report of the DIVERSITAS/Systematics Agenda 2000 Workshop (Anon, 1998c¹⁴). These suggestions are summarized below, with additional ideas and protocols developed through the UK and Ghanaian assessments.

The process can be seen as a seven-step operation:

- a) Selection of assessment focus;
- b) Assessment of national user needs and priorities for taxonomic information;
- c) Assessment of existing taxonomic knowledge about national biodiversity, its availability to and employment by users, and the sustainability of these sources;
- d) Assessment of current national taxonomic infrastructure;
- e) Assessment of current national human resources in taxonomy;
- f) Analysis of results; and
- g) Recommendations for action.

(a) Selection of assessment focus

The focus of the assessment is likely to be one or more of the focal areas of the CBD ('thematic areas' and 'cross-cutting issues'). Alternatively, it might be a sector such as 'Conservation' (the focus of the recent UK Assessment). Such targeting will assist

mapping to CBD COP decisions, which will be useful in formulating questions, subsequent analysis and targeting and prioritisation of resources as a response to the assessment. It will also assist the National CBD Focal Point in reporting on activities, since these are organised by CBD thematic areas and cross-cutting initiatives. The methodologies described below can also be applied to areas outside the direct focus of CBD, such as health or farming, although both of these have CBD implications.

Within these focal areas there are many non-taxonomist users of taxonomic information. Some of the most significant of these from the point of view of CBD implementation are:

- Conservation managers, environmental managers, resource managers, protected area managers;
- Environmental protection agencies;
- Agencies involved in managing and controlling invasive alien species and pests;
- Agencies responsible for quarantine;
- Agencies responsible for biosafety, including related to genetically modified organisms;
- Departments involved in implementing access and benefit-sharing legislation;
- Agriculture, horticulture, forestry, and fishery agencies;
- Forest product industries;
- Biotechnology industries;
- Ecotourism industries;
- Agencies and organizations involved in applied health and medical research; and
- The research community (biological science, global change, environmental science).

This list is not exclusive, and other areas of focus might be appropriate for an assessment.

¹⁴ UNEP/CBD/SBSTTA/4/INF/7 - <http://www.biodiv.org/doc/meetings/sbstta/sbstta-04/information/sbstta-04-inf-07-en.pdf>

These users may be government departments, NGOs, research institutions, amateur societies, educational bodies, private companies etc. Each might have different needs, and different sources for the information they use.

Ultimately, taxonomic information is used by individuals, and it is those who determine what is useful and desirable. Consequently, a taxonomic needs assessment may include gathering information from people such as quarantine officers, extension workers, village communities etc.

In addition to the users, there are likely to be national policy documents or reports that deal with the focal area. These might contain information on taxonomic needs, either explicitly or by inference (any call for 'monitoring and assessment', for example, implies a need for a taxonomic resource to identify the organisms being monitored). Since one of the benefits of carrying out a taxonomic needs assessment is to inform policy, and allow policies to be put in place to meet the needs identified, particular attention needs to be paid to extant policy documents.

Finally, having identified the sector or sectors that will be the focus for the assessment, a steering group representing different sectors including the focal sectors may be valuable. This group can inform the team carrying out the assessment of priority areas and suggest lines of questioning. In that case, the initial steps in the assessment project might be to:

- Decide which sector or sectors to focus on;
- Identify the stakeholders that should be included;
- Decide the paper and policy documents that should be examined; and
- Set up a multi-sector steering group.

(b) Assessment of national user needs and priorities for taxonomic information

There are two tools that will be of value in assessment of user needs. These are a questionnaire and interviews. Ideally, they should be used in conjunction, so that the subject can think about the questionnaire and enter data that, being of a standard format, is more simply analysed, and then interviewed to discover aspects that either do not fit on the questionnaire, or can be prompted by the questions. As the assessment continues, the interviewer will become increasingly aware of issues and needs that were not recognised initially, and can use the interviews to explore these. Although such issues may be discovered, the questionnaire should not be changed, since this will make subsequent analysis more difficult.

Questionnaire

A sample questionnaire is provided in Annex 6 to this Guide. This is based on the one used for the UK taxonomic needs assessment of conservation bodies, and may not be fully appropriate for other purposes. However, it does give some ideas which could be used.

Before sending out the questionnaire the recipient should have been contacted to give them warning, and an explanatory letter accompanying the questionnaire will need to be drafted.

In the UK and Europe, legislation gives people certain rights over data about them held electronically. For this reason the questionnaire includes a form on which the person filling it in can signify their agreement to the use of the data. Other countries may or may not have similar legislation, but it might be useful to include on the form a statement of the use of the information collected, and its distribution.

The first part of the form collects information about the organisation being

questioned, including their status. Different types of organisations may use taxonomic information in different ways, so this classification will assist analysis. A classification not included on the draft of the questionnaire is the nature of the ‘customers’ of the organisation. For example, an organisation may need taxonomic information because its staff manage the environment directly, because they advise those who do, because they advise government, or because they create analyses that are used by other researchers.

A potentially useful figure not included in the draft questionnaire is the number of people in the organisation that are working on the focal area. For example, the questionnaire may be completed by someone working in a one-man ecotourism business, or a government body with several hundred staff who might be using the resources. Such a figure, appropriately scaled, will assist in providing levels of need.

Although the focus has been determined by this stage, the users selected might be asked to identify the areas of CBD implementation they are focussed on. It may be that their interpretation differs from that of the assessment team, or that their interests (and resources) extend more widely than anticipated.

The thematic areas of the CBD are referred to in the draft questionnaire as ecosystems. However, this breakdown is quite possibly insufficiently detailed to account for sectoral interests in all countries, and a more detailed term for the ecosystem or environment may be useful (e.g. ‘mangroves’, ‘savannah’, ‘desert’ etc.).

In addition to the ecosystem the draft questionnaire has a table investigating the higher groups of organisms the users may be interested in. This table is grouped by broad ecosystem, and it might be useful to change this grouping. In addition, not all users may be

interested in groups as set out; ‘forest pests’, or ‘grassland herbivores’ are equally valid groups from a non-taxonomist user point of view, and the questionnaire may need to be modified to accommodate such assemblages.

The draft questionnaire also seeks to establish to what extent the activities of the user involve different taxonomic activities and tools. There is some overlap with earlier questions as the draft is written, and this could be changed. This table is essentially about what the organisation does rather than what it needs; needs, however, may be inferred from the responses, and investigated during an interview.

The next part of the form is focussed on what taxonomic products the organisation uses or needs. Before finalising the questionnaire the various categories and items should be considered carefully to see if any should be omitted or more added. For example, currently the form includes a set of ecological information elements which, although they fall under the heading of the GTI (taxonomy operating at ecosystem, species and genetic levels) may be outside the remit of most taxonomic organisations. For each item the organisation is asked to:

1. Rank the importance of the item on a scale of 1-5, 1 being ‘very important’ and 5 ‘unimportant’;
2. State whether the resources are available or unavailable;
3. Identify the source of the resources (e.g. in-country professionals, amateurs, local library);
4. Indicate whether the source is in their view sustainable; and
5. Make additional comments.

Finally, the questionnaire includes a blank page where the user is invited to add more detail to their taxonomic needs.

Interviews

Following the questionnaire it may be valuable to carry out an interview with the correspondent, during which points made in the answers can be followed up, and more detailed questions asked to clarify or explore problems and needs. For example:

- The interviewee should be encouraged to think of both current and expected future needs for taxonomic information.
- Where do they currently obtain taxonomic information, and are these sources adequate and sustainable?
- What kinds of taxonomic knowledge (e.g. species lists, identification tools, authoritative images, data from specimens in collections) about those groups are most essential?
- What format (e.g. field guides, formal taxonomic publications, dedicated reports, dynamic web-based) do they prefer the information to be in?
- What gaps in knowledge need to be filled?

It is difficult, and probably counter-productive, to set a prescriptive list of questions.

(c) Assessment of existing taxonomic knowledge about national biodiversity, its availability to and employment by users, and the sustainability of these sources

At least some taxonomic information about national biota exists for all countries, but this is scattered over a myriad of different sources, is of uneven quality, and may not be easily available electronically. Moreover, where it exists it may not be in a format or language that makes its employment simple for non-taxonomic users or even many taxonomists, especially in the country of origin.

Consequently an assessment of availability must include its main formats and the possibilities of distributing it to the appropriate personnel (Lyal, 2004). The types of knowledge that might be considered arise from the needs assessment, but are likely to include: (i) species lists for the country and areas within it, particularly protected areas; (ii) detailed data associated with specimens; (iii) taxonomic literature (including field guides and electronically-mediated information) pertaining to the biota of the country.

Two key data sources for species lists are existing literature and specimens held in collections. An important consideration is that taxonomic names do change through time, and consequently any list must be checked and corrected if it is to be of value.

Some information from the literature may be relatively easy to retrieve. This is most likely to be so for well-known groups, such as many vertebrates, some groups of vascular plants, and some of the more spectacular or economically important invertebrates. Such information can often be found in field guides, extant national or regional checklists and reports, and electronic databases. On the other hand some faunal or floristic lists, reports, and databases may be unavailable within the country, and will need to be sought elsewhere. More difficult to collect are species data discussed in detailed and specialist sources, such as monographs and primary taxonomic literature, both because of the distributed nature of the information within the publications, and the likelihood that they will not be available within the country.

Natural history collections potentially provide the most reliable records of species distribution, whether at national or other geographic scales, and thus have a role in compilation of species lists. A benefit of data from this source is that records can be

associated with voucher specimens, the identity of which can be checked. For the purposes of a national assessment, key national and extra-national collections could be identified and information of the holdings requested from the institution concerned. Routes to identifying these key collections are (a) asking institutions within the country about contacts and long-term scientific involvement with extra-national institutions; (b) searching the internet for relevant collections information; (c) checking the major web portals to such information (see section 6¹⁵); (d) checking available taxonomic literature for references to specimen repositories; and (e) asking the major world collection-holding institutions, which can generally be named by any competent taxonomist. Provision of the information by collection-holding institutions may, however, require a considerable amount of work, not least because many institutions do not keep records of their holdings associated with geographic origin. Information delivery might therefore involve a cost, which should be factored into the budget of the needs assessment. A valuable exercise that might arise from this part of the assessment could be networking relevant institutions to pool collections data.

For many taxonomic groups, information retrieval will be extremely time consuming and may not be possible with available resources. In such cases, estimates of species richness of such groups would be valuable so that plans can be made to acquire or develop additional information subsequently. Moreover, the information that is gathered may highlight gaps in data availability, and provide the basis for subsequent data- or specimen-collection projects. Plans for subsequent projects could be included within the NBSAP.

The creation of a list of species found within a country is not an academic exercise. Apart from supporting implementation of Article 7 of the Convention, it underpins many other aspects of Convention implementation. One key aspect is that of access and benefit-sharing, where knowledge of the species, subspecies, varieties and strains within a country's borders is a vital prerequisite to protecting genetic resources and their benefits (see below).

Detailed data associated with specimens can be of value for a number of reasons, including ecological modelling of species distributions. This system has been used to great effect in Mexico, where databases of specimen-level information have informed policy on a number of issues including invasive alien species, living modified organisms, and protected areas. The assessment will determine what collections are readily available and what can be found outside the country. Plans and priorities can then be developed for data repatriation. Issues regarding location of collections apply here also.

Taxonomic literature is a necessary tool for the majority of users. In order to maintain any functional taxonomic activity there must be access to the appropriate specialist literature. This is covered under 'libraries' below. Literature of a more generalist type including field guides and electronically-mediated information pertaining to the biota of the country is also of considerable value, particularly to non-taxonomists charged with implementation work. A review of field guides that deal with biota of the country would be comparatively simple, and stem perhaps from responses to questions by the users targeted in the assessment.

¹⁵ Many specimen records from numerous institutions are accessible through the Global Biodiversity Information Facility: <http://www.gbif.org>

(d) Assessment of current national taxonomic infrastructure

A survey of scientific infrastructure supporting taxonomic research is a key element of any taxonomic assessment. Three broad categories of taxonomic infrastructure include: i) collection facilities, ii) libraries, and iii) associated technical, management and other institutional support for taxonomists.

i) Collections facilities

These include museums, herbaria, arboreta, zoos, botanical gardens, culture collections and seed banks. The facilities might be housed in stand-alone institutions, universities, private institutions or governmental agencies such as agricultural research stations. As part of any assessment, the following information should be gathered for each collection:

- Taxonomic coverage and the kind(s) of specimens housed;
- Curation of collection (the proportion of specimens which are identified and / or sorted, those which are available for research, and whether specimen tracking systems are in place);
- Capacity for growth, in terms of space and infrastructural support;
- Quality of the facilities (e.g. adequacy of collection housing such as cabinets, supplies, maintenance, specimen preparation areas, curatorial and staff office and research space);
- Security (whether the collection is adequately protected from fire, pests, and other adverse conditions);
- Information availability and communications infrastructure (e.g. printed catalogues, electronic database(s)

and electronic links to other databases);

- Institutional structure (e.g. relevant policies, quality of business management, budgetary support, sustainability, whether loans of specimens can be received from other institutions); and
- Institutional long-term planning, particularly in terms of GTI goals.

ii) Libraries

Taxonomic research requires access to libraries with reference collections. Thus the libraries in natural history institutions, universities, agricultural or medical research centres, and other agencies should be surveyed for their capacity to support taxonomic research. General information to be gathered will include:

- Numbers and kinds of libraries;
- Extent of holdings (e.g. books, monographs, journals, electronic databases etc relevant to the particular area of the world and group(s) being studied);
- Financial support to enable continued purchase of relevant journals and books; and
- Communication capabilities (e.g. electronic access to holdings; electronic linkages to other libraries, ability to receive books on interlibrary loan).

iii) Associated scientific support (policies, infrastructure)

All scientific research, including taxonomy, requires a broad range of general supporting infrastructure. An assessment might include the following broad categories:

- Universities with appropriate expertise, relevant governmental and

nongovernmental institutions, field stations, etc.;

- Computing capacity and quality;
- Molecular, biochemical, morphological, cytological and other laboratory facilities;
- Research equipment available (microscopes, field vehicles, etc.);
- Ocean-going ships, other research vessels, and sorting gear; and
- Existing strategies and frameworks to develop and promote in-country research (including funding procedures, agencies, project evaluation, legislation, permit access policies, and multilateral institutional agreements).

(e) *Assessment of current national human resources in taxonomy*

For the GTI to contribute adequately to the implementation of NBSAPs, action may be needed to strengthen the human resources supporting taxonomic work. No country has all the taxonomists it needs, nor taxonomic expertise in all groups. Therefore, countries will want to assess current human resources in the light of national goals and needs, taking into account accessibility of expertise at regional levels. The following information will be useful in evaluating capacity:

i) *Professional research staff in each taxonomic institution (curators, research scientists):*

- Numbers;
- Demography (age structure of experts in the various areas of work);
- Taxonomic coverage (expertise); and
- Status (e.g. qualifications, participation in professional activities within the country and internationally).

ii) *Support staff:*

- Professional collection managers;
- Technicians or research assistants;
- Students (undergraduate, graduate, and postdoctoral);
- Parataxonomists (non-professionals having some curatorial or research responsibilities);
- Collectors;
- Interns and trainees;
- Volunteers (retired scientists, trained lay persons, amateurs etc.);
- Financial support staff (with expertise in funding agencies, financial administration, etc.); and
- Managers.

iii) *Capacity for education and training in taxonomy:*

- Education or training available (taxonomic coverage, content, course titles);
- Level of education available (B.Sc, M.Sc., Ph.D., other qualification, parataxonomy training, collections management, etc.);
- Numbers and kinds of trainees;
- Facilities for training; and
- Prospects for productive employment in relevant taxonomic work (institutions, number and kind of posts available, sustainability).

The results of such a survey could be used to inform prospective students and trainees through publication either as hard copy or on the internet.

While national human resources in taxonomy are being evaluated, countries could assess human resources at the international level that may have a relevant role in

building in-country capacity. Critical areas of needed information include:

- A list of in-country specialists working in foreign countries;
- A list of foreign taxonomists working in-country;
- A list of foreign taxonomists experienced in relevant groups; and
- The availability of training opportunities in foreign countries.

3.2.2 *Regional taxonomic needs assessments*

In many regions of the world it will be advantageous to pool resources and to act cooperatively in building taxonomic capacity. Regional activities in taxonomy as a key mechanism for implementing the GTI have been supported by the Conference of the Parties (see annexes 8 to 13). Assessment of needs and capacity at a regional level is therefore a valuable exercise.

The ideas presented for a national taxonomic needs assessment can be used in a modified form at regional level. To an extent this has been done in Africa, Central America and Asia in the context of regional GTI workshops (Herrera, 2001; Shimura, 2003), although in these cases the emphasis has been on the current and predicted capacity rather than the fully-articulated user needs. Country-level needs assessments themselves can provide the core input into the development of an assessment of regional capacity, the gaps in capacity across the region, and finally the setting of priority actions to fill the gaps. The African GTI workshop (Klopper *et al.*, 2001) took more this approach by requiring national reports from its participants and

then attempting to obtain an overview of them. A similar approach has been taken by participants in some of the formulation workshops for BioNET-INTERNATIONAL.

At least two European regional workshops have been held on the GTI. One of these led to development of the European GTI Toolkit¹⁶, an important resource for taxonomists and anyone involved in the GTI.

The GTI regional workshops were a mechanism proposed by COP to both identify regional issues and propose ways of dealing with them. The intent was to hold regional meetings of scientists, managers and policy-makers to prioritize the most urgent regional taxonomic needs and facilitate the formulation of specific regional and national projects to meet them. Combined with best available information on national taxonomic needs, the workshops were expected to produce regionally agreed plans of action with prioritised activities that would provide a clear focus for activities under the GTI. Four regional workshops have been held to date, in Central America, (Herrera, 2001) Africa (Klopper *et al.*, 2001) and two in Asia (Shimura, 2003¹⁷).

The main actors in this process were expected by COP to be national governments, taxonomic institutions and global, regional and bilateral funding agencies. Existing and proposed regional biodiversity projects such as SABONET in South Africa and BOZONET¹⁸ in East Africa as well as NBSAPs were expected to provide the main mechanism to identify the most urgent taxonomic information requirements at the regional level. Active regional networks of taxonomists would be best placed to facilitate the compilation of national needs assessments into cohesive regional syntheses. Some

¹⁶ <http://www.gti-kontaktstelle.de/toolkit/index.html>

¹⁷ <http://www.biodiv.org/doc/meetings/sbstta/sbstta-09/information/sbstta-09-inf-17-en.doc>

¹⁸ http://www.gefweb.org/Projects/Pipeline/Pipeline_6/BOZONET.pdf

regional assessments have already been done by such networks. For example, SABONET¹⁹ carried out an assessment of the needs of users of botanical information (Smith *et al.*, 1999; Steenkamp & Smith, 2002). Another approach was taken by ASEANET²⁰ in their assessments of pathogens and pests in their region (Evans, Lum & Muroch, L., 2002; Naumann & Jisoh, 2002).

The Parties to the CBD agreed that funding for regional needs assessments could be provided by the national Governments and bilateral funding agencies.

Needs assessments with a wider remit were carried out under the UNDP Capacity Development Initiative. This looked at all capacity development needs, including those for taxonomic activity, although not only in terms of the CBD. Reports for all regions, together with a summary report, have been placed on the internet²¹.

3.2.3 *Global taxonomic needs assessments*

The lack of knowledge of key groups of organisms of importance to humankind, many of which have global or multiregional distributions, calls for a global dimension to taxonomic activities. This is particularly important in the context of certain groups of organisms such as invasive alien species. Global cooperation to work on globally important groups will of necessity involve both developed and developing countries, and capacity-building in both will undoubtedly be required to achieve this.

The COP, at its eighth meeting, called on the CBD secretariat to consult with relevant organizations and funding agencies in order

to ensure that a global taxonomic needs assessment is carried out as soon as possible. There are many ways in which such an assessment could be carried out, and it is likely that the assessment will use multiple approaches. For example, regional taxonomic needs assessments could be evaluated and any actions that could be undertaken at the global level could be identified.

Regardless of the approaches used, it is clear that a global needs assessment will need to identify priorities. A global workshop held in Pretoria in 2002, with a follow-up in Paris 2003, attempted to identify global needs for demand-driven taxonomic capacity-building²². The first result of this was a 'Plan of Action and Resource Kit for Taxonomic Capacity-building'²³ (An outline strategy arising from the detailed discussions in these meetings is given in Annex 5). A global panel of experts made a number of recommendations at a workshop held under the auspices of DIVERSITAS in 1998 (Anon, 1999²⁴). The participants stressed the importance of a priority approach from the taxonomic perspective, and set some common criteria that could be applied at national as well as regional or global levels. These criteria are as follows:

Taxa of economic value. Because of interactions at both community and ecosystem levels, all species have a degree of economic value and, in some way, influence human welfare. Perhaps of greatest significance are species that have direct and immediate effects on human health, food supplies (including agricultural crops and fisheries), timber, biotechnology, and similar benefits. This includes both beneficial (e.g. pollinators, seed dispersers, scavengers) and

¹⁹ The Southern African Botanical Diversity Network - <http://www.sabonet.org.za/index.htm>

²⁰ The ASEAN taxonomic network

²¹ http://www.gefweb.org/Site_Index/CDI/cdi.html

²² document UNEP/CBD/SBSTTA/9/INF/16 available at www.biodiv.org

²³ <http://www.bionet-intl.org/opencms/opencms/resourceCentre/onlinePublications/3GTW/index.htm>

²⁴ document UNEP/CBD/SBSTTA/4/INF6 available at www.biodiv.org

non-beneficial species (e.g. disease vectors, crop pests, pathogens, invasive alien species that threaten indigenous biodiversity).

Taxa that characterize ecosystems. These species define structure and function within an ecosystem. For example, among plants many species of the family Rubiaceae occur as shrubs or small trees in the wet-dry tropical regions of the world, the Ericaceae and Epacridaceae characterize shrublands or heathlands, while the Laminariales are important structural determinants of temperate near-shore marine ecosystems. In the animal kingdom, corals and sponges are key marine organisms while many invertebrates have important recycling roles in terrestrial and aquatic ecosystems.

Marine and fresh water ecosystems are poorly known yet are extremely important as fish habitats, and as water and food sources for humans. Characterisation of their structure and function, and identification of indicator species that signal health or specific problems, are critical actions. Other ecosystems requiring attention are mountain areas, arid and semi-arid regions where organisms may have ephemeral lives associated with changes in moisture balance, and lowland tropical forest (in South America, Africa and Asia), where habitat loss is high. With a better understanding of the species composition of each ecosystem and interspecific interactions, identifying areas for appropriate land uses, and developing methods for the restoration of degraded sites will be greatly accelerated.

Taxa living in threatened areas. This category includes heavily exploited species, such as marine fishes that are poorly known taxonomically; species that form the biota of rapidly deteriorating or disappearing habitats or ecosystems; species threatened

with extinction; and species with very limited distributions.

Taxa which are indicator species or species groups. These are species or species groups that are highly sensitive to changes in either biotic or abiotic conditions in the environment, and that are useful in monitoring such change. A criterion for indicator species frequently met with in Convention documents is that choice of such species should include ease of identification – indicating a priority for taxonomic action.

By using these criteria and indicating the existing gaps in our knowledge of biodiversity, expert groups have suggested tools necessary to develop regional or global priorities. Taxonomic priorities might also be influenced towards important but poorly studied taxa; biogeographically little-known taxonomic groups, or geographically less well studied taxa (as found in most developing countries).

A global assessment is under way at the time of writing, focussed on the taxonomic needs associated with invasive alien species. The results of this will be made available through the GTI Portal once it is completed.

National Governments, taxonomic institutions and global, regional and bilateral funding agencies are expected to contribute to the development of global taxonomic needs assessments and priorities

3.2.4 Public awareness and education

The need to raise awareness and to educate the wider community on the importance of taxonomy as an underpinning of the Convention is critical to the success of the GTI. There is no doubt that the necessity for taxonomic input to CBD implementation is generally poorly-recognised, and perhaps few

realise the enormity of the task of establishing a taxonomic knowledge framework to support other biodiversity activities. Within the GTI PoW, and built on by the workshop in Paris the following groups have been identified as important 'targets' for increased awareness and education: a) officials of relevant Government sectors, including National Focal Points, and policy- and decision-makers; b) research scientists; c) conservation managers, and those involved with sustainable use and access and benefit-sharing issues; d) funding agencies; e) international bodies; and f) the general public.

Action to meet this need can and must be taken by those who understand the problem of the taxonomic impediment and the means to resolve it. Research institutions and non-governmental organizations are well positioned to advise and convince their respective governments of the taxonomic needs of a country. However, action will almost always devolve upon individuals motivated to raise their voices, an observation that led to participants in the 3rd Global Taxonomy Workshop to call for 'champions' of the GTI. The willingness and ability of individuals to make the case for the GTI in whatever fora are available to them is a key resource. In particular, taxonomists and their national CBD and GTI focal points should meet to discuss issues and develop ways together of meeting the taxonomic impediment.

Activities have taken place, both through presentations on the GTI made by SCBD staff and others, and the development of resources for general use. A brochure on the GTI is available in several languages from the SCBD. A series of case studies highlighting taxonomy's value to society, entitled 'Why taxonomy matters' has been

compiled by BioNET-INTERNATIONAL following suggestions at the Paris workshop, and are available on the web²⁵ and as separate folders for use in public awareness activities. In addition, case studies have been made available through the European GTI Toolkit²⁶.

At its eighth meeting in 2006, the COP decided that awareness-raising activities for taxonomy should be part of the Global Initiative on Communication, Education and Public Awareness (CEPA) under the Convention.

3.2.5 Global and regional capacity-building to support access to and generation of taxonomic information

A root cause for the taxonomic impediment lies in the limited taxonomic capacity in many nations, and its world-wide decrease. This hinders progress towards increasing the world's taxonomic information base and the utilization of current taxonomic knowledge. A key objective of the GTI is necessarily to address capacity development, at country, regional and global levels.

The priorities for capacity development at national and regional levels should be clearly indicated in the results of national and regional taxonomic needs assessments. Of course, most national assessments have, at the time of writing, not been completed. Additional information is available from the results of the UNDP Capacity Development Initiative²⁷, which in 2000/2001 carried out a global survey of capacity development needs in a variety of sectors, and noted taxonomic requirements. In order to provide guidance for action until more detailed information is available, some clear needs

²⁵ <http://www.bionet-intl.org/>

²⁶ <http://www.gti-kontaktstelle.de/toolkit/index.html>

²⁷ http://www.gefweb.org/Documents/Enabling_Activity_Projects/CDI/cdi.html

for taxonomic capacity-building in developing countries have been enumerated in decisions of the COP, and which have also been noted under almost every planned activity in the GTI PoW.

Much has been published on methods of capacity development and how they should be implemented. For example, a workshop held under the auspices of DIVERSITAS and Systematics Agenda 2000 discussed the development of a national taxonomy development strategy in some detail (Anon, 1998c)²⁸. Additional information and a strategy on how to build capacity were developed at the global workshop in Pretoria in 2002 and elaborated at a subsequent meeting in Paris in 2003 (Annex 5).

Three main areas of concern need to be addressed simultaneously: a) human capacity-building (training and employment), b) infrastructure capacity-building (i.e. buildings, collection furniture, information technology and laboratory equipment, utilities, management structure etc), and c) information availability. The last of these will be dealt with in section 3.2.7 below.

It is well-established that the world's taxonomic expertise is shrinking at the very time when the global taxonomic knowledge base needs to be expanded. The objective now must be to develop a new cadre of taxonomists and parataxonomists, capable of working independently within their own countries, but also being part of regional and global networks. This can only be achieved through major increases in training programmes throughout the world. There are numerous ways of delivering and targeting training, and these should be determined in accordance with the needs of individual countries and regions. Broadly, training could include vocational, technical

and academic delivery. It might include in-country and external courses, academic degrees, and joint work undertaken with appropriate individuals and teams. Developing university curricula is an issue, since relatively few students are interested in taking courses in taxonomy, and not many universities are now offering courses in the subject. These factors cannot be ignored in any capacity-building programme.

Human capacity-building includes not just taxonomic skills, but also those required to manage and support taxonomic institutions. If a taxonomic institution is to be successful, staff capabilities must encompass not only taxonomic, curatorial and information management skills, but also financial management, and skills in accessing grants and donor funds. Sharing some of these staff among institutions, or with a parent institution such as a university, may be an appropriate measure.

There is clearly little point in training personnel if no employment opportunities exist, and training should ideally be linked to availability of jobs in taxonomy. Increasingly, development agencies are insisting on this as a component of projects involving training, and the need has been recognized by COP (in decision IV/1.D). There is also a need to make employment a sustainable matter, since continuing grants may be difficult to maintain.

A key element in capacity-building is development of reference collections. Such collections in a country or region are vital for local identification capacity. These collections should contain specimens that have been identified authoritatively, preferably compared by taxonomic experts with 'type' specimens and exhibiting as broad a range of morphological variation from the same

²⁸ <http://www.biodiv.org/doc/meetings/sbstta/sbstta-04/information/sbstta-04-inf-07-en.pdf>

area as possible. Newly-collected specimens can be compared directly with these; enhancing the identification procedure and ensuring correct naming of specimens. Identification keys and guides are valuable, but greater confidence in identification can be gained through comparison with other specimens. Unfortunately, collections are expensive to maintain and require dedicated housing with high standards of environmental control. Many countries have at least an institute holding some collections of its fauna and flora. These are often part of an agriculture or forestry department, and links between such collections and their associated personnel and those in dedicated taxonomic institutions and networks are often lacking or at best informal, and these must be developed and maintained. Such collections may also lack the funding to be able to assist in meeting needs identified within NBSAPs for implementation of the CBD. Consequently, Parties and authorities responsible for museums and herbaria have been asked to strengthen reference collections in countries of origin, invest, on a long-term basis, in the development of appropriate infrastructure for their national collections, and develop appropriate collection housing to ensure the protection of the collections (see annexes 8 and 9). COP also noted that *“As part of that investment, donors, both bilateral and multilateral, in their commitment to the conservation and sustainable use of biological diversity in countries where they provide investment support, should support infrastructural needs of collection-holding institutions.”* (see annex 9)

It may be difficult to find specimens that have been collected from a country and identified, but stored in a collection outside that country. There may be no record of the specimen, or the species to which it

belongs, within the country. This has been discussed above under ‘taxonomic needs assessments’. Despite the availability of loans between museums and other collection-holding organisations, there is a need for countries to amass sufficient identified specimens to make their designated national collections functional. Often a core collection of such specimens is available, but collection development will include identification of newly-collected and legacy material, and the acquisition of previously-collected and identified specimens from elsewhere, when possible.

In some cases specimen repatriation agreements have been developed, but this is unlikely to be the most practicable route to build up the collections required. Many institutes operate a loaning system, whereby specimens can be lent to users worldwide. An alternative is for users to visit the institutes and use the collections to facilitate identification of their material. This has added value, in that it also enables the researchers to access libraries and forge relationships with colleagues in other countries. All collections facilities should make specimen images available where this is helpful or possible for the taxon concerned, either in paper publications or on the web. As with all activities, each of these alternatives can be costly, both to the developing country and the institute in the developed country. In a time of diminishing resources, these costs cannot be underestimated or ignored. All Governments, international and national funding agencies, biosystematic institutions and taxonomic organizations have a role to play in financing and otherwise supporting this activity.

Funding is of course needed for all capacity-building exercises, including training programmes, strengthening reference collections, making information housed in

collections available to countries of origin, producing and distributing taxonomic guides, strengthening infrastructure and disseminating taxonomic information. Funding is discussed in more detail in section 5 below.

Expert institutions in both developed and developing countries clearly have to be involved in any capacity-building projects. However, support is needed to ensure that this capability is capitalised on. SABONET in South Africa and BioNET-INTERNATIONAL with a number of regional networks spread over the world are both examples of capacity-building on a regional basis, the latter having a global dimension also.

3.2.6 Strengthening of existing networks for regional co-operation

Capacity-building needs are particularly apparent in developing countries, most of which have far too few human or infrastructural resources to deal with the taxonomic needs of the Convention (Anon, 1998c; Herrera, 2002; Smith *et al.*, 2002; Shimura, 2003). Much of the work being undertaken and which will be discussed below addresses issues particularly pertinent to developing countries. However, rather than attempt to build sufficient capacity nationally to address all taxonomic needs that are prioritised within a country, global and regional resources also need to be examined and tapped. The greatest concentrations of taxonomic activity, along with the largest collections and libraries, are in industrialised countries. Part of the strategy to implement the GTI must be to ensure their involvement. Such institutions, because they hold massive collections of organisms from other countries, wish to meet the obligations that this imposes. These include

repatriation of specimen data to countries of origin, loan of specimens, identification services and advice on a global scale, and receiving large numbers of scientific visitors. However, institutions in this class also have capacity-building needs, since extant resources are often insufficient for the tasks the institutions are called upon to undertake. There is no basis for any assumption that museums and herbaria in developed countries can meet all requests for information and specimen loans that they receive without additional resources.

At the regional level, there should be a clear balance between national and regional solutions. Convention-related issues, and the biota itself, often extend across national boundaries, and regional activities and resource use may be the most effective and efficient mode of action. For example, because countries within a region will share at least some of their biota, using the same names for the same species is basic tool to ensure efficient communication. With a common understanding of the names used, policies can be formulated to deal with transborder issues such as the conservation status of species, and controls over species with potential or actual benefits arising from their genetic makeup. Moreover, with the increasing importance of invasive alien species, cross-border collaborations are of greater importance. It is vital that all contiguous countries, and all countries along a particular pathway for invasive species, can recognise such species and concur on their nomenclature. However, gaining multinational acceptance and agreement on names is not as simple as it perhaps should be, especially as not all species will have been collected from each country, and each country may be using national and subnational lists compiled at different times and providing

different forms of names²⁹. Thus achieving a unified list will involve taxonomic scrutiny of the various name lists and probably of collections³⁰.

From an economic perspective, few nations can maintain sufficient taxonomic expertise and infrastructure to provide necessary information about the whole of their biota. Given the small proportion of existing species that have been formally identified – about 1.7 to 2 million out of a total number of somewhere between 5 and 30 million (MEA 2005) – the employment of sufficient numbers of taxonomists for the task is unfeasible for almost every nation. Regional capacity development may be a viable solution, building strong links at both operational and political levels between different institutes and Governments. The COP has recognised this in many of its decisions (see annexes 9 to 11) that call for prioritisation of a) strengthening regional and sub-regional networks for taxonomy; b) promoting regional collaboration in setting up regional agendas; c) promoting regional and sub-regional training programs; d) identifying ... regional priority taxonomic information requirements; and e) holding regional meetings of scientists, managers and policy-makers to prioritize the most urgent ... taxonomic needs and facilitate the formulation of specific regional and national projects to meet the needs identified. As noted, this model works well with many conservation and sustainable use issues, since these are often regional in nature, and are best addressed through multi-national consortia.

There are several models for the successful development of taxonomic capacity on a regional or sub-regional basis, including the regional LOOPS of BioNET-

INTERNATIONAL and GEF-funded networks such as SABONET and BOZONET.

3.2.7 Development of a coordinated Global Taxonomy Information System

Removing the taxonomic impediment requires an increase in provision of taxonomic information. This must be in terms of content, accessibility and rate of information development.

A considerable problem in accessing taxonomic information is that it is mostly widely scattered and not accessible through any one source. At the time the GTI PoW was prepared, the expected strategy to deal with this problem was that (i) the current status of major taxonomic information systems (including their major foci) would be identified and then (ii) a coordinated approach to the development of a global taxonomic information infrastructure would be planned. While such a structured approach has not happened, a considerable amount of work is going toward addressing the problem. However, because of resource limitations and the relatively small numbers of people involved, this has not occurred to the extent that many users would like.

There are various sorts of information that are needed to underpin the GTI. The GTI PoW is not explicit about the concept of 'taxonomic information', but realistically it should be considered as the information that allows taxonomists to do their job as efficiently as possible, and allows non-taxonomists to access the information they need in the format most suitable for their needs. There is an overlap in needs between the different user sets, particularly in lists of

²⁹ For systematic and taxonomic reasons there is a gradual change in scientific names over time. Although the goal is stability of nomenclature, in many groups the rate of discovery of new species and the consequent changes in nomenclature prevent this state from being achieved in the near future. Although work is going on to address this aspect of the taxonomic impediment, a result of the situation to date is that different lists citing the same species may use different names for them.

³⁰ In Europe the *Fauna Europaea* project was put in place to achieve this end.

names, distributions, images etc. Currently the taxonomic information system is developing as a large number of independent, semi-independent or associated databases and information delivery services. In future, digital interoperability will allow a seamless interaction between the different information sources, and the possibility of interaction between data users and data providers. This is ultimately the goal of the global taxonomic information system as it is now envisioned.

Many information systems are increasingly being delivered via the internet, and overall there is a move to make taxonomy more internet-based. Given this trend, and the limitations of internet connectivity in many developing countries, a component of any capacity-building initiatives should be to ensure adequacy and sustainability of connection to the internet. This might (ideally) be accessed by all taxonomists and users of taxonomic information to the internet, or at least access by the appropriate libraries. These could then be a resource for people to come and use, or as a document or CD-ROM delivery service for downloaded materials.

The scope of the information required includes:

- a) *Lists of taxonomic experts of particular taxa at national, regional and global levels* (as called for in decision IV/1.D). Access to such lists should help people who need specific taxonomic expertise to find who might be available and suitable for a particular issue. A number of such databases are being developed at global, regional, national and taxon levels, and often overlapping. The most

complete at present is perhaps that maintained by the Expert Center for Taxonomic Identification (ETI)³¹ – this and others are listed in the GTI Portal on the CBD website.

- b) *Contact information of museums or herbaria worldwide*. This, although not highlighted in any COP decisions, is a clear need raised by many in meetings on the GTI. Increasingly, taxonomic centres are making contact details available on their web sites. At least one more inclusive database is available at 'Collection Managers Online'³². For botanical institutions *Index Herbariorum*³³ provides information for 3,240+ herbaria in 165 countries and 9,869+ staff members associated with these herbaria.
- c) *Bibliographic information to support taxonomic research* (called for in decision IV/1.D). Finding the appropriate publications can be a major challenge for researchers, especially if they do not have access to a large library. Increasingly, electronic media are being used, because of ease of compilation and updating, and the complexity of relationships between different databases that is possible. There are some services that can provide information. The Zoological Record³⁴ is an abstracting service that is available online³⁵ and, for years prior to 1978, as a set of printed volumes. Botanical taxonomic literature can be found on the internet at several sites, including the Kew Record of Taxonomic Literature³⁶ and in the botanical indexes at Harvard

³¹ <http://www.eti.uva.nl/>

³² <http://www.unm.edu/~museum/herb/cmo.htm>

³³ <http://sciweb.nybg.org/science2/IndexHerbariorum.asp>

³⁴ <http://www.biosis.org/products/zr/>

³⁵ <http://library.dialog.com/bluesheets/html/bl0185.html>

³⁶ <http://www.rbgekew.org.uk/bibliographies/KR/KRHomeExt.html>

University³⁷. For bacteria the situation is more controlled, in that bacterial names prior to 1980 have been suppressed, and the Bacteriological Code requires that new names are published either in the *International Journal of Systematic and Evolutionary Microbiology* (formerly *International Journal of Systematic Bacteriology*), published by the Society for General Microbiology in Reading, U.K., or are validated by this journal. The journal can be found online³⁸. Similarly, in virology all accepted names are kept in an "Index" by the ICTV, and can be accessed, with other useful information including a key to viruses and an index of viruses, at 'Virus Taxonomy Online'³⁹. Although the bacteria and viruses are probably of an appropriate size that the sources will answer many questions, animals and plants, because they are such large groups, may be served also by smaller sources of more focussed data. For example, there are several projects to make bibliographies relating to single taxa accessible via the internet (e.g. for mosquitoes at the Walter Reed Biosystematics Unit⁴⁰). Of course, there are numerous bibliographies and catalogues in printed form, but these can be difficult to locate, and there is no central resource that provides any information as to what and where they are. Corresponding directly with libraries in major collection-holding institutions is one possible route. The next step from making bibliographic resources available on the internet is

for the literature itself to be made available in this fashion.

- d) *Relevant publications, either as hard copy or in digitised formats* (called for in decision IV/1.D). Taxonomy is perhaps unique among scientific disciplines in requiring access to all of its published literature (unlike many sectors whose literature becomes outdated in a few years and is then of primarily historical and not scientific interest). Because taxonomists need to refer to the original descriptions of taxa, information about taxa is cumulative, and many species have been described or listed in the literature only once, the whole body of literature is required, not just the most recent papers. This gives a tremendous problem of scale. At present, the output of much taxonomy is expensive printed monographs, or papers in low-circulation journals available only in specialised libraries. A few of these libraries hold significant amounts of taxonomic literature, and these can provide copies, sometimes at cost. There are attempts to make literature accessible on the internet, in various formats, and this process is moving very rapidly. A project involving major systematic institutions in the UK and USA to digitise the net contents of their libraries and place more than 2 million items on the web, the 'Biodiversity Heritage Library' project, is now under way. The Global Biodiversity Information Facility (GBIF) has a programme for "Digital biodiversity literature resources" planned as one of six integrated

³⁷ <http://www.huh.harvard.edu/databases/cms/addenda.html>

³⁸ <http://ijs.sgmjournals.org/>

³⁹ <http://www.virustaxonomyonline.com/>

⁴⁰ <http://www.mosquitocatalog.org/main.asp>

thematic areas. PubMed⁴¹ is the US National Library of Medicine's free digital archive of biomedical and life sciences journal literature, although currently there are relatively few taxonomic papers there. Some teams are making PDFs of papers pertaining to a particular taxonomic group available. The Smithsonian Institution and the Natural History Museum (London) have collaborated in placing the 40,000 pages of the *Biologia Centralia-Americana* on the web⁴² (dealing with more than 50,000 species of animals and plants) as JPEG images that can be downloaded and are working to place all of the text into XML. The advantage of this is that the text will ultimately be in a form that is interoperable with other forms of data such as specimen data and names. This will be an important part of the global taxonomic information system. Although this component of the overall system is developing, it still requires support to assist both the technical developments needed and also the digitisation itself, given the vast amount of literature that will be required. In Europe, there have been a number of initiatives aimed at making literature available on the internet – see the European GTI Toolkit for links⁴³.

- e) *Location of collected specimens (type and vouchers)* (called for in decision IV/1.D). Although many specimens are known to be held in institutions outside their country of origin, there is relatively little information available as to where those specimens are. Most institutions do not have full catalogues of

their holdings and, where such catalogues exist, they often list only the names of the species held, but not country or region of origin. This situation is slowly changing with the advent of electronic cataloguing. However, while both paper and electronic catalogues are of great importance in assisting countries with assessing what animals and plants have been recorded from within their borders, they are costly to develop and maintain. Information enabling location of specimens is also available in original and subsequent literature dealing with individual species, which itself can be very difficult to obtain without good library facilities. In all likelihood the information will only become available through work on digitisation of specimen information, literature, and the collection-level descriptive programme being undertaken by some institutions. However, most institutions that hold the specimens do not have the resources available to develop or maintain the content of such systems.

One model of solving the problem of access to these data has been demonstrated by the National Commission for the Knowledge and Use of Biodiversity, Mexico (CONABIO). CONABIO staff members were sent to institutes outside the country to database specimens from Mexico. Both CONABIO and the collection-holders benefited from this activity, in that Mexico gained access to data on species occurring within the country and the institutions gained databases of their holdings, which otherwise

⁴¹ <http://www.pubmedcentral.nih.gov/>

⁴² <http://www.sil.si.edu/digitalcollections/bca/>

⁴³ <http://www.gti-kontaktstelle.de/toolkit/index.html>

would not have been compiled. CONABIO⁴⁴ has repatriated about 1.5 million specimens with a collection of nearly 120,000 high resolution digital images. These data are used on an almost daily basis by the general public and decision-makers.

- f) *The contents of collections at the species level.* This data component is closely related to the one above. The information is available only in a patchy manner. Information can be obtained by searching the web sites of collections or published catalogues of collection contents if these can be located. Many collections now provide data of their holdings at the specimen level through web portals such as GBIF or BioCASE and these can be searched to find species holdings.
- g) *Specimen-level information from collections, including all the data associated with the specimens held.* Information associated with specimens in natural history collections may facilitate conservation and sustainable use of biodiversity (Navarro *et al.*, 2003; Petersen *et al.*, 2003; Iguishi *et al.*, 2004; Suarez & Tsutsui, 2004). Such information often includes: identification(s) (with the authority responsible); date of collection; precise geographic location (latitude, longitude, altitude, depth); sex; breeding condition; habitat type; host identification; food preferences; soil, water, or sediment type; as well as other types of information such as abundance, song types, behavioural displays, and genetic tissue samples. If this information is not accessible in electronic databases or at least in pub-

lished monographs and reports (and much of it is not, or the publications themselves are unavailable), countries should consider plans to gather this information. The CONABIO model mentioned above is a good example of a solution to this problem. However, the cost has been high. Before GBIF, CONABIO spent around US\$1 for each repatriated record (around \$1.5 million on repatriating data was spent pre-GBIF). Currently, GBIF has repatriated for Mexico about 400,000 records for free. GBIF requires further funding to continue this work and thereby save developing countries a considerable amount of money.

Increasingly this information is being made available, particularly through gateways such as BioCASE⁴⁵ and GBIF⁴⁶, although institutions are also placing such data on their own web sites for individual collections. This type of data is potentially extremely valuable for CBD implementation, especially when associated with adequate nomenclature information to ensure confidence in the identity of the taxa being covered.

- h) *Organism names, in the form of authority files* (called for in decisions IV/1.D, VI/8 and VIII/3). The COP adopted a target under operational objective 3 which is “a widely accessible checklist of known species, as a step towards a global register of plants, animals, microorganisms and other organisms”, which is adapted from target 1 of the Global Strategy for Plant Conservation (GSPC) adopted in decision VI/9 (see text box 3-2 for a list of the 16 targets of the Global Strategy for

⁴⁴ www.conabio.gob.mx

⁴⁵ <http://www.biocase.org/>

⁴⁶ <http://www.gbif.org>

Plant Conservation). Such lists of names might also include classification details, synonymy etc. Because of the nature of taxonomic work, there are often changes in the names given to species over time. There are various reasons why this is necessary, although taxonomists strive for stability in nomenclature. The problem of being able to keep track of what names should be used⁴⁷ is being addressed by the development of widely-accessible lists of names for the various groups of plants, animals and microorganisms. In addition to printed catalogues which, while numerous, suffer from the problems of becoming rapidly out of date and can be difficult to obtain, databases are available sometimes on CD-ROM and more generally on the internet. The number of electronic databases probably runs into the thousands, and a publication such as this cannot hope to give an exhaustive list. However, a few examples serve to show what is available, and the sorts of product that can be developed to fill a need. For viruses⁴⁸ and bacteria⁴⁹ complete lists of names are accessible on the internet. Plant names can be found on the International Plant Names Index

(IPNI)⁵⁰, although this does not state whether the name is currently in use or not. There are an increasing number of global initiatives such as the catalogue of world Diptera (flies)⁵¹, the International Legume Database & Information Service (ILDIS)⁵² and Fishbase.⁵³ There are also numerous regional databases or checklists covering a range of organisms, both by taxon (e.g., checklist of the flora of Paraguay⁵⁴) and some aspect of their biology (e.g., the US Invasive species information system⁵⁵, LarvalBase – dedicated to larval stages of fish⁵⁶), or as a total biota. (e.g. the UK National Biodiversity network⁵⁷). Some of these are searchable together via single web portals at Species 2000⁵⁸ and GBIF⁵⁹. Species 2000, together with the Integrated Taxonomic Information System (ITIS)⁶⁰, make up the Catalogue of Life Partnership, and release annually a CD-ROM of all the names to which they give access (as of 2006 this covers 880,000 species, about half of all known species). Other large-scale initiatives that give access to names of multiple biotic kingdoms are Asia-Oceania⁶¹, Ecoport⁶², and the Universal Biological Indexer and Organizer (uBio)⁶³.

⁴⁷ COP IV/1.D, stated: "Institutions, supported by Parties and international donors, should coordinate their efforts to establish and maintain effective mechanisms for the stable naming of biological taxa." In practice this will involve taxonomists, their parent institutions and the bodies responsible for the International Codes of nomenclature

⁴⁸ <http://www.danforthcenter.org/iltab/ictvnet/asp/iVirusIndex.asp>

⁴⁹ <http://www.bacterio.cict.fr/>

⁵⁰ <http://www.ipni.org/index.html>

⁵¹ <http://www.sel.barc.usda.gov/diptera/biosys.htm>

⁵² <http://www.ildis.org/>

⁵³ www.fishbase.org

⁵⁴ <http://www.ville-ge.ch/cjb/bd/checklist/index.php>

⁵⁵ <http://www.invasivespecies.gov/>

⁵⁶ <http://www.larvalbase.org/>

⁵⁷ <http://www.nbn.org.uk/>

⁵⁸ <http://www.sp2000.org/>

⁵⁹ <http://www.gbif.org>

⁶⁰ <http://www.itis.usda.gov/>

⁶¹ <http://www.sp2000ao.nies.go.jp/text/about/>

⁶² <http://www.ecoport.org/index.html>

⁶³ <http://www.ubio.org/>

BOX 3-2 The 16 targets of the Global Strategy for Plant Conservation

- a) Understanding and documenting plant diversity:
 - (i) A widely accessible working list of known plant species, as a step towards a complete world flora;
 - (ii) A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels;
 - (iii) Development of models with protocols for plant conservation and sustainable use, based on research and practical experience;
- b) Conserving plant diversity:
 - (iv) At least 10 per cent of each of the world's ecological regions effectively conserved;
 - (v) Protection of 50 per cent of the most important areas for plant diversity assured;
 - (vi) At least 30 per cent of production lands managed consistent with the conservation of plant diversity;
 - (vii) 60 per cent of the world's threatened species conserved in situ;
 - (viii) 60 per cent of threatened plant species in accessible *ex situ* collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes;
 - (ix) 70 per cent of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated indigenous and local knowledge maintained;
 - (x) Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems;
- c) Using plant diversity sustainably:
 - (xi) No species of wild flora endangered by international trade;
 - (xii) 30 per cent of plant-based products derived from sources that are sustainably managed;
 - (xiii) The decline of plant resources, and associated indigenous and local knowledge, innovations and practices that support sustainable livelihoods, local food security and health care, halted;
- d) Promoting education and awareness about plant diversity:
 - (xiv) The importance of plant diversity and the need for its conservation incorporated into communication, educational and public-awareness programmes;
- e) Building capacity for the conservation of plant diversity:
 - (xv) The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy;
 - (xvi) Networks for plant conservation activities established or strengthened at national, regional and international levels.

A major need is to develop standards and protocols to allow electronic databases to be interoperable, so that all available information can be accessible through a single query, rather than having to address each database separately. Initiatives such as GBIF and the Taxonomic Database Working Group (TDWG)⁶⁴, are working on this issue.

One important feature necessary for the developing systems is the facility to accommodate different systems of nomenclature (see decision VI/8 in annex 11). Although ideally for any one group of organisms a single Linnean classification would be accepted by all workers worldwide, in practice this is rarely the case, and different workers recognise different species and higher taxon categories. In such cases, it is important to be able to match the concepts so that misunderstanding is avoided. Similarly, in the context of colloquial and traditional nomenclatures, it is important to be able to identify how the different concepts relate to one another, even when the concepts of the different systems do not precisely match.

i) *Images of organisms, particularly of type specimens and important characteristics for identification.* It is of paramount importance that recently collected specimens be compared to type specimens and other authoritatively identified specimens. When direct comparison to specimens is not possible, comparison to images of specimens, especially images that feature (magnified if necessary) characteristics needed for identification. These images may also

include drawings of particular features or kinds of organisms that do not lend themselves to photographs (e.g. various soft-bodied invertebrates). Examples where this has been done are Harvard University's MCZ type database⁶⁵, which has images of their insect types (and some useful software to manage collection data including images), the University of Michigan Museum of Zoology's bird collection⁶⁶, the Zoological Museum of Amsterdam's 'bird type specimens online', which provides access to 3D images of the types⁶⁷, and the New York Botanical Gardens Vascular Plant Type Catalog⁶⁸. Interestingly from the point of view of collections security, free provision of the images in the last-named institution has reduced the demand for loans of specimens. In addition to these types of initiatives, there are also many smaller initiatives by groups of people on specific taxa such as spiders, ants, earwigs, etc.

3.2.8 *Forest biological diversity*

The taxonomic needs associated with forests globally are immense. In the wet tropical forests, especially, the number of undescribed species is estimated to be in the millions, particularly of smaller organisms. Moreover, the most biologically rich areas tend to be in the lesser-developed regions of the world, where taxonomic expertise is least accessible. The importance of taxonomy to forest biodiversity in terms of the CBD has been stressed repeatedly, along with the requirement for capacity-building to respond to these needs.

⁶⁴ <http://www.tdwg.org/>

⁶⁵ <http://mcz-28168.oeb.harvard.edu/mcztypedb.htm>

⁶⁶ <http://www.lsa.umich.edu/ummz/areas/bird/index.asp>

⁶⁷ <http://ip30.eti.uva.nl/zma3d/home.html>

⁶⁸ <http://www.nybg.org/bsci/hcol/vasc/>

Specific needs for taxonomy in this thematic area highlighted through COP decisions are for taxonomic studies to support basic assessment and monitoring of forest biodiversity, with particular emphasis on the impact of climate change and of soil, air and water-borne pollution (decision VI/22). Inventories of forest species at the local and national levels are also required (decision IV/7). Not only monitoring tools are needed, but also the identification and selection of indicators of below-ground diversity in tropical, temperate, and boreal forests has been highlighted (decision VI/8). Such support is important for basic assessments, for identifying status and trends of forest biodiversity and to underpin restoration of forest ecosystems (decision V/4). Other uses are to provide guidance in the selection of sites to be protected, and in the valuation of resources (decision V/4).

Although much of the work called for is implicitly at the species level, some is at a finer grain. Assessment of “*the diversity of forest genetic resources, taking into consideration the identification of key functional/keystone species populations, model species and genetic variability at the deoxyribonucleic acid (DNA) level*” has been stated as a need (decision VI/22).

The outputs of work under the GTI will be, broadly, an increased knowledge of the species composition of forests, through both taxonomic studies and inventories. An expectation of the COP is that much of this work will be carried out at national level. Taxonomic resources additional to those currently available will be required to meet the needs imposed by the identification of criteria and indicators of forest biodiversity.

3.2.9 *Marine and coastal biological diversity*

Some 15% of all species described so far are marine, 80% of which belong to phyla restricted to the seas. The lack of knowledge of marine organisms is exemplified by the discovery in the past few decades of massive cold-water coral reefs at great depth in the oceans and the discovery of the first hydrothermal vent in 1977. In addition, tens of thousands of seamounts are estimated to lie in the world's oceans, but only a relatively small number of those have been sampled biologically, and a vast number of seamounts remain to be discovered. Not only are new ecosystems being found but, inevitably, many new species are still being discovered. In 2004 106 new species of fish were added to the Census of Marine Life (CoML) database⁶⁹ - some two new species a week arising from surveys. The CoML also found that “a specimen collected below 2000m is about 50 times more likely to be new to science than one found at 50m.” (CoML press release, Nov., 2004). Current knowledge of much of the marine ‘micro-fauna’ such as molluscs, crustaceans, polychaete worms and multicellular algae is incomplete, and that of nematodes and protists probably very poor. The biomass of small deep-sea organisms such as the meio-fauna (mainly nematodes) probably equals or exceeds the biomass of larger organisms; but data on comparative species richness are lacking. Concerns over the impact of destructive fishing practices (such as bottom trawling) and the potential loss of biodiversity of deep-water systems such as cold-water coral reefs are amplified by the limited information about the taxonomy,

⁶⁹ <http://www.coml.org/coml.htm>

biology and ecology of most of the species found in deep ocean areas⁷⁰

Most marine ecosystems are essential for the economy of many islands and archipelagos, as well as coastal countries relying heavily on biotic resources from the seas. Exploration of deep-sea systems and other marine ecosystems in international waters deserves special consideration, and the taxonomic component of this is of particular importance. The need for taxonomic capacity related to deep seabed biodiversity has been highlighted by COP (decision VIII/21). Marine research has lagged behind terrestrial research because sampling and observing require the use of ships and equipment that are expensive to own and maintain. Recent work, under initiatives such as the CoML, is reversing this relationship, and the concomitant demands on taxonomy to support the work are huge.

The need for taxonomic work to support the Convention's marine and coastal biodiversity work programme has been identified in the programme of work (see references to decision VII/5 in annex 4). In particular, emphasis has been given to:

- Strengthening of taxonomic expertise at regional and national levels;
- In the context of the work plan on coral bleaching, supporting the training of and career opportunities for relevant marine taxonomists, ecologists and members of other relevant disciplines, particularly at the national and regional level; and
- In the context of mariculture, supporting basic global-scale taxonomic studies and updating taxonomic databases including genetic diversity at the intra-specific level.

The coral reef work is focused largely on the need to assess and manage coral bleaching, but also accommodates other issues pertinent to this type of ecosystem. There are needs to assess the taxonomic, genetic, physiological, spatial, and temporal factors governing the response of corals, zooxanthellae, and other coral-reef-associated species to increases in sea-surface temperature. In the light of these findings, implementation of management actions and strategies to support reef resilience, rehabilitation and recovery should be put in place. These also require a taxonomic input, in the baseline assessments, long-term monitoring, and rapid response teams that are needed to measure biological and meteorological variables relevant to coral bleaching, mortality and recovery. Clearly, as with many aspects of the work of the GTI, the taxonomic activity will ideally be undertaken in partnership with organisations active in the field; such as the International Coral Reef Initiative, its partners and The Intergovernmental Oceanographic Commission (IOC) of UNESCO. As an example, the IOC Working Group on Coral Bleaching and Related Indicators of Coral Reef Health is undertaking work including indicators to detect environmental stress.

Another area where taxonomic work is needed is to address marine invasive alien species which are transported globally in ballast water. Taxonomic work in this area will require, among other things, a focus on pelagic juvenile stages of benthic organisms. The needs identified include identification guides for major groups, and of the appropriate taxa within them. Such guides should be targeted at non-specialists to help them identify and monitor such organisms, especially non-native fauna and flora. The mid-term

⁷⁰ <http://www.biodiv.org/doc/meetings/cop/cop-07/information/cop-07-inf-25-en.pdf>

evaluation report on the GloBallast Programme⁷¹ (Vousden & Okamura, 2003) noted *“Identification of introduced species requires training and considerable expertise. It would be highly ambitious to expect any of the countries to be able to identify introduced species with any certainty without assistance from experts in the field of invasion biology and taxonomy. The methodology taught during the PBS [Project baseline survey] relies on identifying all specimens collected to least taxonomic unit. The PBS consultancy team provided the PCU (project coordination unit) with a list of global taxonomic experts for distribution to all participating countries.”* The same report noted the importance of sustainability in the monitoring of ballast organisms, and in this context stated *“countries also realise that they will need advice on the taxonomy and other pertinent scientific aspects of any invasive species as, by their very nature, such species will probably not be familiar to local or even regional experts.”* (Vousden & Okamura, 2003).

For deep sea systems, priority areas for protection in the deep seas include seamounts, hydrothermal vents, cold-water corals and other vulnerable ecosystems (decision VII/5). Furthermore, the COP requested for a compilation and synthesis of information of deep seabed genetic resources, and has adopted a specific decision on the issue of deep seabed genetic resources beyond the limits of national jurisdiction (decision VIII/21). Because deep sea areas are difficult to sample and

require expensive technology, research efforts require considerable financial output, and thus collaborative efforts between organizations would provide a cost-effective approach. Some examples of this approach are the Census of Marine Life, the OASIS (Oceanic seamounts: an integrated study)⁷² project, the Sea Around Us Project⁷³, and Seamounts online⁷⁴. DIVERSITAS, in a report submitted to SBSTTA⁷⁵, included a Sample Framework Project on Marine waters.

Several tools providing information on marine organisms are available on the web, including databases of fish names, some with biological information or images of both larvae and adults⁷⁶, while Cephalopods are covered at ‘Cephbase’⁷⁷. These and many other data providers can be accessed through the Ocean Biogeographic information System, OBIS⁷⁸

3.2.10 Dry and sub-humid lands biodiversity

The programme of work for biological diversity in dry and sub-humid lands, encompasses Mediterranean, arid, semi-arid, grassland, and savannah ecosystems (decision V/23) and includes several elements for which taxonomic input is required. These include assessment of status and trends, identification of specific areas within dry and sub-humid lands of particular value for biological diversity and/or under particular threat, the develop-

⁷¹ <http://globallast.imo.org/>

⁷² <http://www.rhz.uni-hamburg.de/OASIS/Pages/page1.html>

⁷³ www.seaaroundus.org

⁷⁴ <http://seamounts.sdsc.edu>

⁷⁵ document UNEP/CBD/SBSTTA/4/INF/1

⁷⁶ <http://www.nmfs.hawaii.edu/library/tax.html> provides links to the California Academy of Sciences Catalog of Fishes, FishBase, LarvalBase, and the USDA Regulatory Fish Encyclopedia.

⁷⁷ <http://www.cephbase.utmb.edu/>

⁷⁸ <http://www.iobis.org/>

ment of indicators, and *in situ* and *ex situ* conservation of dry and sub-humid lands biodiversity.

Key elements of dry and sub-humid ecosystems, both in terms of sensitivity to disturbance and as indicators, are the organisms that maintain the crucial soil crust. Increasing knowledge of what these organisms are, how they are distributed and how they can be identified, has been recognised as important both for maintaining the integrity of dry and sub-humid ecosystems and for their value as indicators of ecosystem health. Thus particular needs that have been highlighted (in the GTI PoW) are increasing taxonomic capacity to identify crust-forming lichens and develop identification tools, improving knowledge of the micro-organisms in nutrient cycling, and increasing taxonomic information on pests and diseases. Dry and sub-humid lands also contain a significant number of land races and wild relatives of important crops such as wheat, barley, durum, and lentil. The genetic diversity of these land races and wild relatives, once catalogued, can provide an important source of genetic material with a high tolerance for drought, salinity, etc. for cross breeding. However, it has also been recognised that many countries, particularly developing countries, have so far not been able to provide sufficient financial support for the required assessment and taxonomic studies, and that there is a need to develop appropriate skills in taxonomy.⁷⁹ This is of particular relevance to dry and sub-humid lands, which encompass many developing countries especially in Africa and Asia.

Although there is a clear need for taxonomic skills to carry out identifications in

the first place, there is an equal need to provide easy to use tools for the subsequent use of non-specialists. A common theme through much of the GTI is that taxonomists ultimately do not carry out all identifications, but provide identification tools – keys, field guides, identification cards etc – that enable others without their specialised knowledge to identify organisms. The taxonomists themselves can then serve as backup support in the case of particular problems.

3.2.11 *Inland waters biological diversity*

Some groups of animals and plants in inland waters (e.g. many fish, crustacea) are of great social and economic importance. Moreover, monitoring and assessment of fresh-water ecosystems involves access to detailed taxonomic knowledge of a variety of groups, or the distillation of such knowledge in field-guides. However, there are serious gaps in taxonomic knowledge for many of the groups involved (see excerpts from decision VII/4 in annex 4).

The programme of work on biodiversity of inland waters (decision VII/4) identifies a focus for field guide production: “*the development of the series of regional guides to the taxonomy of freshwater fish and invertebrates (including adult terrestrial forms where appropriate) as an input to ecosystem monitoring for river and lake health*”. The production of such guides is, like many taxonomic activities that support the Convention, already in progress. Perhaps uniquely for taxonomic products, however, some of these are available on the internet in a site hosted by the World Bank (Kottelatt, 2001) (see section 5.2.1.5 of this Guide).

⁷⁹ AHTEG report on Biological Diversity of Dry and Sub-humid Lands, 2003 – document UNEP/CBD/SBSTTA/8/INF/2

A DIVERSITAS report submitted to SBSTTA⁸⁰, included two proposals on taxonomy and inventory of inland water biodiversity.

3.2.12 *Agricultural biological diversity*

‘Agricultural biodiversity’ is a broad term that includes all components of biological diversity of relevance to food and agriculture, and that constitute the agro-ecosystem (see decision V/5). The first Global Biodiversity Outlook (SCBD, 2001) identified three constituent functional groups:

- Producers (“*the domestic, cultivated, farmed and semi-wild species (mainly flowering plants, fishes, birds and mammals) whose production provides human food, together with the varieties and wild relatives that expand the genetic resource base for future breeding improvements*”);
- Support services (“*the wild and semi-managed species (mainly micro-organisms and invertebrates) that provide services supporting agricultural production, notably the soil biota, pollinators and the predators that affect pest species*”);
- Pests and pathogens (“*the wild species (mainly micro-organisms and invertebrates) that decrease agricultural production by causing disease or damage to producers*”).

Because the CBD has stressed the importance of mitigating the negative effects of agricultural systems and practices on other ecosystems (decision V/5), ‘agricultural

biodiversity’ also covers organisms in environments that may be impacted by farming practices. This is a natural concomitant of the application of the ‘ecosystem approach’ espoused by the CBD.

Some degree of taxonomic input is needed on each of these functional groups in order to deliver fully on their objectives within the thematic Programme of Work. This need ranges from basic identification of species living in agricultural ecosystems (beneficial, neutral and pests), to taxonomic research to establish the identity of wild relatives of agriculturally important species. Also important is basic knowledge on the functional relationships between organisms; the sort of data often recorded by taxonomists.

While the importance of broadening the genetic resource base of agricultural products through wild relatives has been mentioned in Convention literature several times⁸¹, there has been little discussion on what must be done, this perhaps being perceived as part of the work of the FAO under the various Plant and Farm Animal genetic resources programmes. However, the identities of the wild relatives of many crops are not well known, and considerable taxonomic work is required to identify and, in some cases, describe them. For example, Ethiopia represents one of the world’s eight major centres of crop plant diversity, the region providing the origin of 12 widespread crops and a number of others used within the area. However, the country’s flora and vegetation types are not fully known (Groombridge, 1992). This has led to a project proposed as a GTI Pilot from Ethiopia to complete a study of the country’s flora.

The organisms providing the ‘support services’, include those responsible for

⁸⁰ document UNEP/CBD/SBSTTA/4/INF/1

⁸¹ e.g., decisions III/11 and V/5

maintaining natural processes and cycles both below ground and above it. Two areas have been highlighted: soil biodiversity and pollinators.

3.2.12.1 Soil biodiversity

The importance of taxonomic work on soil micro-organisms (including symbionts) has been highlighted several times in COP decisions. An International Initiative for the Conservation and Sustainable Use of Soil Biodiversity has been established as a cross-cutting initiative within the programme of work on agricultural biodiversity (decision VI/5). The FAO and other relevant organizations have been invited to facilitate and coordinate this initiative, and more information can be found through the Soil Biodiversity Portal⁸². Soil biodiversity work requires a major taxonomic component, especially given the numbers of species (and relatively few of those species are believed known) and the difficulties involved in distinguishing them. Notably, the report of the Asian GTI workshop in 2002 stressed the very low numbers of taxonomists of micro-organisms who were active in the region (Wilson *et al.*, 2003).

A framework for action was adopted by the COP in 2006 (decision VIII/23, section B) in order to facilitate further implementation of the soil biodiversity initiative, and the framework highlights the important cross linkage between the initiative and the GTI. Products in this area are likely to include development of standard methods for identification of soil biodiversity to different taxonomic levels; and increased knowledge of soil biodiversity to aid in the identification of indicators of the “health” of below-ground biological diversity. One of the proposals submitted as a prospective

GTI Pilot Project focused on termites of significance to agricultural biodiversity, both as pest and beneficial elements, and included collecting data on termites in major taxonomic collections at a global level. These data would be used to elucidate the distribution patterns of beneficial soil-inhabiting species linked in with existing studies on the role of such termites in soil quality and fertility, and assess the decline of beneficial species in agricultural lands.

3.2.12.2 The International Pollinators Initiative (IPI)

Pollination is an essential ecosystem service that depends to a large extent on symbiosis between species, the pollinated and the pollinator. Reduction in numbers, or loss, of either will affect the survival of both taxa. Not all plants depend on animals for pollination, of course. Many plants are wind pollinated, such as grasses and many staple food crops. However, at least one-third of the world's agricultural crops depend upon pollination provided by insects and other animals. Some forest trees and other plants also require pollination by animals in order to reproduce. Pollinators, therefore, are essential for diversity in diet and for the maintenance of natural resources. The assumption that pollination is a “free ecological service” is somewhat misleading, in that resources, such as refuges of natural vegetation, are required. Where these are reduced or lost they become limiting and adaptive management practices are required. Such management must be based upon good information on the identities of the pollinators in order to be successful.

Throughout the world, agricultural production and agro-ecosystem diversity, as well as populations of native vegetation, are

⁸² <http://www.fao.org/AG/AGL/agll/soilbiod/fao.stm>

threatened by declining populations of pollinators. Many pollinators are bees, of which there are over 25,000 different species, and which visit and pollinate a diverse range of plants. Both the diversity of wild plants and the variability of food crops depend on this bee diversity. Though bees form the most important group of pollinators, other insects such as butterflies and moths, flies and beetles, and vertebrates such as bats, squirrels, birds and some primates, also pollinate plants. Some plants are visited by many different pollinators, while others have specific requirements. The same applies to the pollinators, some being generalists and others specialists. Therefore, pollination as a science requires detailed investigation, and the application of management practices is intricate. In most cases, there is a lack of knowledge about the exact relations between individual plant species and their pollinators, but studies in this field demonstrate that they are often quite specific.

Considering the urgent need to address the issue of worldwide decline of pollinator diversity, the COP established an *International Initiative for the Conservation and Sustainable Use of Pollinators* in 2000 (decision V/5, section II), and subsequently a plan of action, which includes an objective to address the lack of taxonomic information about pollinators (see excerpts of decision VI/5 in annex 4). The taxonomic requirements of the IPI are made explicit throughout the text of the plan of action, and clearly the availability of taxonomic knowledge on pollinators should be part of taxonomic needs assessments for the GTI. The plan of action is very specific about some of the needs already recognised. For example, there is a requirement to promote the development of identification keys for bee genera, since the number of bee genera for which such keys are not available is

‘unacceptably high’. As noted, there are other insect and vertebrate pollinators of agricultural and other important plants (for example the weevil pollinators of oil palms). Therefore easy-to-use keys and / or automated identification systems to families, genera and species of pollinators are required. This activity forms part of the first stage of activities on global monitoring of pollinators.

Element 3 of the plan is capacity-building, which states: “*One major area which needs addressing is the capacity of countries to address the taxonomic impediment, which derives from serious shortfalls in investment in training, research and collections management. It seriously limits our capability to assess and monitor pollinator decline globally, in order to conserve pollinator diversity and to manage it sustainably. The global taxonomic impediment is costly, especially when expressed in terms of those research initiatives in pollination and conservation ecology which are wholly dependent on access to sound bee taxonomy and are rendered wholly non-viable in its absence. There is also a global taxonomic deficit, that is, the unacceptably high numbers of bee genera for which identification keys are not available.*” An action to meet this is to “*Build taxonomic capacity to carry out inventories of the pollinator diversity and distribution in order to optimise their management, through, inter alia, the training of taxonomists and parataxonomists of bees and other pollinators.*” Additional activities in this section which involve a strong taxonomic element are to “*Develop tools and mechanisms for the international and regional exchange of information for the conservation, restoration and sustainable use of pollinators. This may include ... Developing and updating global and national lists of threatened pollinator*

species, and produce multilingual manuals on pollinator conservation and restoration for farmers.” Further suggested actions in the same text are: strengthening national institutions to support taxonomy of bees and other pollinators, through, among other things, (a) Maintaining continuity of taxonomic and reference collections of bees and other pollinators; (b) Recognition of centres of excellence in bee taxonomy and establishment of centres of excellence as appropriate; and (c) Repatriation of data through capacity-building and benefit-sharing.

The taxonomic needs outlined in the IPI are perhaps the most explicit in any Convention document other than the GTI decisions themselves.

3.2.12.3 Pests and pathogens

A major component of agricultural work all over the world has been associated with identifying the pests and diseases affecting domesticated plants and animals, and finding ways of treating them (including the use of natural enemies). The work identified ranges from basic alpha-taxonomy of pests and natural enemies, to how the information is presented and distributed, to assessment (and the taxonomic capacity that underlies it). Two needs assessments similar to this have been carried out recently by ASEANET, focussed on pests and pathogens in South East Asia (Evans *et al.*, 2002), and the other on arthropod pests of the same region (Naumann & Jisoh, 2002). Both made a number of recommendations, focussed on the necessity of bringing the relevant collections of organisms held in countries of the region up to a standard appropriate to meet the identification needs identified, and provision of information.

⁸³ see paragraph 11(g) of decision VIII/3, contained in annex 12

⁸⁴ <http://gmba.unibas.ch/index/index.htm>

⁸⁵ <http://www.icimod.org/>

The COP suggested a collection of case studies of pest and disease control mechanisms, including the role of natural enemies and other organisms at field and landscape levels (decision V/5). The clear link between pests and GTI was made when COP requested that the GTI be included in the joint work plan between the secretariats of the CBD and the International Plant Protection Convention⁸³.

3.2.13 Mountain biological diversity

Mountains cover about 25 per cent of the earth's terrestrial surface and are particularly fragile and important systems. They serve as refuges for many species, including endemic and endangered species, are frequently biological diversity hotspots, and can harbour a high genetic diversity of crops, livestock, and their wild relatives. Ecosystem types such as forests, dry and sub-humid lands, inland waters and agricultural systems, are an integral part of mountain habitats, and taxonomic information needs pertaining to these thematic areas is also applicable to their occurrence in mountain ecosystems. The only priority so far set for the GTI in this thematic area is for taxonomic work underpinning identification, monitoring and assessment of mountain biological diversity, but COP has requested others be developed (decision VII/27).

Within the programme of work for the GTI, the planned activity on mountain biodiversity was elaborated by COP in 2006 (see annex 13), with a focus on collating relevant information and expertise at regional levels. Several existing initiatives are identified as key actors including the GMBA⁸⁴, the Mountain Partnership, and the Mountain Forum. Others such as ICIMOD⁸⁵

are not specifically mentioned but are key actors nonetheless. Together these actors should identify research priorities and formulate of programmes and projects, as highlighted by workshops directed at developing technical cooperation networks of taxonomic institutions in the ANDEAN and South Asian subregions (ANDINONET⁸⁶ and SACNET⁸⁷ respectively).

3.2.14 Island biological diversity

A programme of work on island biological diversity was developed and adopted by the COP in 2006 (decision VIII/1). One of the priority actions (3.2) for Parties is to “compile detailed inventories of island species, assess their conservation status, including the main threat criteria, and develop the taxonomic expertise necessary to facilitate this.” (see excerpts from the decision in annex 4). Suggested activities to support this priority action included taxonomic studies or revisions of important island taxa, including marine, freshwater and terrestrial species, as well as taxonomic training and preparation of guides to enable researchers to identify poorly known biological groups, coral species and other associated island species.

Also in 2006, the COP adopted a planned activity on island biodiversity as part of the GTI programme of work. In this regard, the COP noted that islands incorporate all types of biodiversity and therefore the planned activities 8 to 18 of the existing programme of work also contribute to conservation and sustainable use of island biodiversity. Nevertheless, the COP recognized that special support is needed in the case of islands,

in particular for regional approaches to meeting taxonomic needs and building capacity.

3.2.15 Access and benefit-sharing

One of the three objectives of the Convention is “the fair and equitable sharing of benefits arising out of the utilization of genetic resources”. Article 15 of the Convention recognises the sovereignty of States over their natural resources and provides that “*access to genetic resources shall be subject to the prior informed consent of the Contracting Party providing such resources*”. It “*shall also be based on mutually agreed terms*” in order to ensure the possibility of sharing of benefits arising from the commercial or other utilization of these genetic resources.

However, no benefits can be shared if the genetic resources themselves are not known and utilized. The first step to bring about benefit-sharing is knowledge of the identity of species and strains of potential interest and their distributions. Thus inventories at sub-national and national levels can provide an immediate value as a base for both legislative action and investigation of potential or actual benefits.

These activities are of particular importance at the country level, at which most arrangements regarding access and benefit sharing must, or are most effectively, handled. The importance of inventories for access and benefit-sharing issues has led to the identification of their assessment and inventory (together with the information management systems to deal with this information) as key activities in this context. Parties are already

⁸⁶ <http://www.andinonet.org.ve/>

⁸⁷ <http://www.biodiversityasia.org/sacnet/>

committed to developing inventories of their biodiversity under Article 7 of the Convention. The more each country can properly inventory, collect, classify and utilize its biological resources, the greater will be the potential benefits to that country. A key component of this is national capacity-building in taxonomy and related disciplines. However, as discussed above, taxonomy is one science where no country has all of the expertise it needs. It is a globally collaborative science, which when handled well, builds supportive networks globally.

The primary goal of the GTI in this respect is to assist countries in carrying out inventory work in a timely and efficient manner. Inventory data can come from five sources:

1. *Published data:* These include checklists, catalogues, taxonomic revisions etc. Access to these may involve working with natural history libraries in major museums and herbaria. Increasingly, key works in the 'legacy literature' are being digitised and placed on the internet (e.g. the *Biologia Centrali-Americana* for animals and plants of Mesoamerica⁸⁸). However, in most cases past publications have not been digitised, and must be sought with the aid of specialists and librarians. Modern works are increasingly appearing electronically as well as in print, although it is still a very small proportion and cannot yet be considered an adequate source.

2. *On-line databases:* These, while also incomplete, are rapidly increasing in number and scope and give names and localities where the species concerned have been collected. They may be drawn from collections held in museums on a regional basis (e.g. the European Natural History

Specimen Information Network, ENHSIN or its successor, BioCASE⁸⁹, a global basis (GBIF⁹⁰, a portal which gives access to specimen, observational and nomenclatural data made available from many providers on a global basis) or be fully compiled lists from countries (e.g. the list of trees of El Salvador⁹¹). This action is meeting a need identified by the Convention, which agreed that such access is a necessity (decision IV/1.D), and an output for GTI in this area is interactive catalogues of material available, linked to taxonomic collections.

3. *Collections held by museums and herbaria both in and outside a country:* Most large institutions now regard repatriation of information as an important activity, and are willing to partner with countries to obtain grants for data capture and development. The issues associated with data repatriation have been explored in detail by Ruiz & Pooma (2000). A successful example in repatriating data from foreign collections, is a collaborative project among CONABIO, INBio, and the Missouri Botanical Garden Herbarium with the support of GBIF.

4. *Collecting and identifying new material:* This may be done by nationals or in partnership with non-nationals. The latter method is likely to be of particular value to countries with an under-developed taxonomic infrastructure. In this case, an agreement between the partners should clearly specify terms and conditions for collections, curation, management, and use of the specimens collected (based on full prior informed consent). All collecting must reflect national laws and permit regulations. Such agreements need to be realistic, of course. Some attempts made to protect genetic resources

⁸⁸ <http://www.sil.si.edu/digitalcollections/bca/>

⁸⁹ <http://www.biocase.org/>

⁹⁰ <http://www.gbif.org>

⁹¹ <http://internet.nhm.ac.uk/cgi-bin/botany/ESTrees/index.dsm1>

from misappropriation through overly restrictive legislation affecting collecting have slowed down implementation of the Convention, including the development of national inventories. A requirement that all specimens be identified to the species level, for example, would be very difficult for any non-national partner to deal with, particularly in the case of microfauna such as insects. In many collecting enterprises non-target taxa are collected by chance as a 'by-catch' of the target organisms and are unlikely to be identifiable by the collectors. Moreover, for collections of species-rich and poorly known organisms such as invertebrates and micro-organisms, most of the species collected within the target taxa would be unknown and need to be described before names are available, a time-consuming process. It should also be noted that discouraging such 'by-catch' by allowing only targeted collecting is a waste of precious time and resources, and will, in the long run, only slow the process of inventory and deprive future generations of key ecological and biodiversity data.

Among other priorities, the Global Taxonomy Initiative will concentrate on developing capacity in the collection and classification of biodiversity. Projects in this area will be designed to develop capacity in collecting and maintaining biological collections. Taxonomic information, specifically including genetic level data, will be critical in tracing the origin of resources.

A major element in increasing capacity to properly inventory and access biological resource information is effective information management. Therefore, a key element of the GTI is the development of appropriate IT tools to allow access to existing data, and

to provide efficient data entry of new information generated.

5. Use of indigenous knowledge: Indigenous and local communities have detailed knowledge of biodiversity elements which may be databased with the prior informed consent of these communities and appropriate safeguards (Pfeiffer & Uril, 2003). Traditional knowledge of the uses of a particular organism may be associated with the nomenclature used in the inventory. This provides evidence of prior use and is important to establish appropriate intellectual property rights. It also safeguards such knowledge in a period when oral traditions are being lost and with them the taxonomic and associated knowledge of the people. The people of the Cook Islands have produced a valuable database of their fauna and flora, in their National Heritage project⁹²

There are increasing issues regarding collection by non-nationals and subsequent taxonomic work on specimens collected taking place outside the country of origin. As part of their implementation of the CBD provisions on access and benefit-sharing, many countries are evaluating and changing the permit systems for researchers. It is an important step to safeguard rights, but if the system developed is too difficult, restrictive, expensive or time-consuming, researchers will not be able to do the key taxonomic work that the country needs, hindering the development of inventories, and other information needed to implement the Convention. Strong but practical processes of research, collections, and export permits are key components of a strong national access and benefit-sharing strategy. Current analyses of best practices and lessons learned from early regulatory

⁹² The Cook Islands Biodiversity Database: <http://www2.bishopmuseum.org/pbs/cookislands/>

changes will make it easier for all nations to effectively build a proper system.

This issue is of prime importance to regional and subregional initiatives being encouraged by the GTI. During the GTI regional meeting in Asia in 2000, trans-border research issues and permits were discussed and the workshop called for a streamlined approach to obtaining permission to undertake taxonomic research under the GTI (Wilson *et al.*, 2003). The issue has also been highlighted by the Coordination Mechanism of the GTI, who in their first meeting noted: *“Biological species do not observe national boundaries, and can only be understood and sustained if their variation can be studied and assessed in the natural habitats throughout their entire geographic range. Much taxonomic research depends on transnational activities and international cooperation involving joint fieldwork, travel of personnel, and the frequent exchange of data, samples, and biological specimens. The Coordination Mechanism advises the Executive Secretary to urge Parties to the Convention to facilitate such efforts of international cooperation for taxonomic research as are needed to help implementing activities of the Convention by, inter alia, establishing clear and unambiguous mechanisms for granting the necessary permissions for approved research projects, field work, collection of biological specimens, and free exchange of personnel, data and relevant materials.”*⁹³

The Convention has provided the “Bonn Guidelines on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising out of their Utilization” (decision VI/24). These guidelines were developed to assist Parties, Governments and other stakeholders in developing an

overall access and benefit-sharing regime. They include a number of references to taxonomic research, and recommendations as to how activities to implement the GTI might be accommodated. Relevant portions of the text are given in Annex 4. Specifically they recommend that “Taxonomic research, as specified in the Global Taxonomy Initiative, should not be prevented, and providers should facilitate acquisition of material for systematic use and users should make available all information associated with the specimens thus obtained”. An important provision is that permission for collection and research can be given for a particular set of uses, and any change of use may require a new application for prior informed consent. Uses associated with taxonomic research in the development of inventories might include: conducting research; collecting specimens; exporting specimens; retaining specimens; conducting different types of analysis (e.g. morphological, molecular or genetic); exchanging specimens freely outside the country; publishing data about the specimens (particularly distributional); importing necessary equipment and chemicals to carry out the research (preferably with tax exemption), etc.

In order to enable researchers to obtain information on what regulations are in force, and what permits are required, countries have been asked to designate ‘National Focal Points’ and establish ‘Competent National Authorities’, the first of whom might be responsible for informing those seeking information of relevant procedures, and information on the competent national authority responsible for granting access to a specific genetic resource. Together they could take a number of practical steps to

⁹³ available through the GTI Portal at www.biodiv.org

facilitate access to genetic resources for taxonomic research, such as:

1. Undertaking necessary steps at the national level for the requirements of taxonomic research to be taken into account.
2. Making information related to research, collecting and export permit requirements available on an appropriate national web site, together with appropriate contact points, at each of their Embassies or Consulates, and through the National CBD/GTI Focal Point and access & benefit-sharing Focal Point (recognizing that in most countries these permits are given by different offices and generally different Ministries, and may be multiple).
3. Making information regarding legal requirements for exchange of biological specimens and about current legislation and rules for access and benefit-sharing available through the GTI portal as recommended by COP⁹⁴.

A database on access and benefit-sharing measures including national and regional strategies, policies, legislations and regulations developed by Parties to assist with the implementation of access and benefit-sharing provisions of the Convention is available on the Convention website⁹⁵.

At the World Summit on Sustainable Development, in 2002, Governments called for action to “negotiate within the framework of the Convention on Biological Diversity,

bearing in mind the Bonn Guidelines, an international regime to promote and safeguard the fair and equitable sharing of benefits arising out of the utilization of genetic resources”. The CBD Ad Hoc Open-ended Working Group on access and benefit-sharing was mandated by the Conference of the Parties to elaborate and negotiate the international regime on access and benefit-sharing and to complete its work before the tenth meeting of the Conference of the Parties. In this context, it will be important for the negotiators of the international regime to keep in mind the need to develop a regime that will take into account the particular requirements of taxonomic research.

3.2.16 *Invasive alien species*

Invasive alien species (IAS) are species introduced deliberately or unintentionally outside their natural habitats to places where they have the ability to establish themselves, out-compete natives and take over the new environments⁹⁶. They are widespread in the world and occur in all categories of living organisms and all types of ecosystems. The threat to biodiversity due to invasive alien species is considered second only to that of habitat loss, and the impacts are predicted to increase in future for many types of ecosystems (MEA 2005). There are a large number of pathways or mechanisms by which invasive alien species can affect biodiversity⁹⁷.

The work under the Convention on IAS has highlighted the important role of taxonomy for understanding and management of

⁹⁴ see paragraph 6(b) of decision VI/8, in annex 10

⁹⁵ <http://intranet.biodiv.org/programmes/socio-eco/benefit/measures.aspx>

⁹⁶ This is not intended as a formal definition. There are various definitions for terms such as invasive alien species, alien species, exotic species, non-native species, etc. A glossary of relevant terms used in international fora is being developed and will be available through the portal on invasive alien species on the CBD website.

⁹⁷ see document UNEP/CBD/SBSTTA/11/INF/4

IAS⁹⁸. The following points in particular have been noted:

- Research and monitoring activities on IAS should attempt to include a base-line taxonomic study of biodiversity. At the national (or other appropriate) level this will ensure that IAS can be recognised and distinguished from the biota naturally present;
- Such a survey should include local communities; and
- Relevant extant databases pertaining to IAS should be inventoried and synthesised, including incident lists, potential threats to neighbouring countries, information on taxonomy, ecology and genetics of invasive alien species and on control methods. Since this decision, progress has been made and a list of IAS-related databases compiled⁹⁹.

The Global Invasive Species Programme (GISP), a key partner in implementation of

the Convention's work on invasive alien species, has produced a Global Strategy on Invasive Alien Species (McNeely *et al.*, 2001). This strategy also emphasises the need for building research capacity using a cross-sectoral and multi-disciplinary approach, and including "*Strengthening infrastructure for research on IAS (e.g. systematics, taxonomy, ecology) at national and regional levels*". It suggests that an international committee to correlate and manage updated taxonomic nomenclature for all IAS would be a useful resource. Also highlighted is the importance of building capacity to identify, record and monitor invasions and provide current lists of potential and established IAS.

The capacity necessary to meet the information needs was outlined in the Davis Declaration¹⁰⁰, an output from a Workshop on Development of Regional Invasive Alien Species Information Hubs, held in Davis, USA in 2001 (see Text box 3-3). The concept is to establish a

Box 3-3 The Davis Declaration

Workshop on Development of Regional Invasive Alien Species Information Hubs,
Including Requisite Taxonomic Services, In North America and Southern Africa
14-15 February 2001, Davis, California

We the participants in the aforementioned scientific workshop:

Recognize: The negative impacts of invasive alien species (IAS) on native biodiversity; ecosystem functions and services; the productivity of agriculture, forestry, wildlife, and fisheries; and human health are very costly to society. These costs are measured not just in economic terms, but also in damaged goods and equipment, food and water shortages, environmental degradation, loss of native species, increased rates and severity of natural disasters, disease epidemics, and harm to human welfare.

Every country has been impacted by IAS. Unless coordinated efforts involving the cooperation of all stakeholders are implemented to minimize the movement of IAS, invasions

⁹⁸ decisions V/8, VI/8, VI/23

⁹⁹ <http://www.gisnetwork.org/Documents/DRAFTIASDB.html>

¹⁰⁰ <http://www.invasivespecies.gov/laws/declarations.shtml>

will become more frequent and their impacts more severe as the globalization of trade, transport and human travel increase.

Coordinated efforts to restrict the movement of IAS require that all nations have access to taxonomic capabilities, information services, and useful tools to support and implement prevention policies and develop effective response strategies.

Invasions of non-native species are greatly increasing the need for taxonomic services, while the number of taxonomists and resources for taxonomic capacity-building are decreasing worldwide.

Initiatives relevant to strengthening IAS information services are proliferating, with agencies and organizations providing information for many purposes and on many geographic scales. These initiatives are not well coordinated. Some are overlapping or duplicative. Major gaps remain in coverage for some taxonomic groups and regions of the world.

Therefore, we

Conclude that: There is an urgent need to develop a comprehensive global strategy to strengthen and coordinate IAS taxonomic and information services.

Thus, we:

Encourage:

- Establishment of a global information system based on a network of regional information hubs for providing information services and tools relating to IAS and building wherever possible on existing efforts¹⁷⁸.
- Support of IAS information services by strengthening of the infrastructure for information technology and management, taxonomic identification, systematics research, vouchering and collections management worldwide.
- Development of tools to increase taxonomic capacity worldwide. These tools, which should be made available wherever possible in hard copy, on CD, and on the Internet, include, *inter alia*, a guide to taxonomic services for IAS; common nomenclatural standards; identification aids; searchable lists of floras and faunas; and training programs for new taxonomists and parataxonomists.
- Establishment of partnerships with key stakeholder groups, including industry, non-governmental organizations, and the general public, for developing and applying taxonomic services and information to combat IAS.

Note with Approval: The Global Invasive Species Programme's plans to promote taxonomy as a key component of national capacity in IAS prevention and management, encourage research to address taxonomic needs, and help coordinate a distributed IAS information network to include early warning and predictive functions.

Call upon:

- The Integrated Taxonomic Information System (ITIS), the Global Biodiversity Information Facility (GBIF), BioNET-INTERNATIONAL, and the Global Taxonomy Initiative (GTI) to make IAS a priority, establish global standards for IAS taxonomic classification, and improve the availability of accurate IAS taxonomic information.
- The Convention on Biological Diversity (CBD), International Plant Protection Convention (IPPC), and other relevant bodies to recognize the need and encourage support for better coordination, additional tools, and immediate capacity-building in IAS information and taxonomic services.
- National, regional and international research and development agencies to make resources available to better coordinate and increase the capacity of IAS information and taxonomic services, in order to meet the immediate needs of both developing and developed countries.

APPENDIX

Background. The workshop brought together scientists from Africa, North America, and international organizations who are participating in national, regional and global efforts to develop taxonomic services and/or information networks to better inform work on invasive alien species (IAS). The objectives of the workshop were to share experience in developing distributed information networks relevant to IAS and to provide recommendations on concepts and criteria for developing and coordinating IAS regional information hubs and requisite taxonomic services in order to facilitate identification, assessment, and rapid response to IAS. The workshop was sponsored by the U.S. Geological Survey (USGS) in cooperation with the Global Invasive Species Programme (GISP). It was hosted by the University of California at Davis, which is providing technical support to various domestic and international efforts for developing and coordinating IAS information services. Workshop presentations assessed the need for a distributed IAS information system, supported by essential taxonomic services, and provided overviews of initiatives at the global level, in eastern and southern Africa, and in the Western Hemisphere. Working sessions focused on IAS information management and technical issues, and on issues at the interface between IAS taxonomic services and information systems.

The workshop produced the Davis Declaration to focus international attention and resources on development and coordination of IAS information and taxonomic services, and a report (in preparation) containing specific recommendations for strengthening IAS-related taxonomic capacity and for implementing a global network of regional information hubs. The workshop products will provide important support for ongoing taxonomic initiatives (e.g., ITIS, GTI, BioNET-INTERNATIONAL) and for GISP plans to develop a global IAS information network. They will also provide guidance for planning pilot regional invasive species hubs in Mexico and South Africa, for which seed grants are being provided through the Environmental Diplomacy Fund of the U.S. Department of State.

global information network based on a series of regional information hubs providing information services on IAS. Each hub would develop a core set of information products, coordinate existing information systems and encourage new initiatives to meet regional needs, facilitate synthesis and integration of information from many countries and sources, ensure application of appropriate data standards and vocabularies, and provide quality control and documentation. A Global Invasive Species Information Network has been set up to achieve some of these objectives¹⁰¹.

Other recommendations from Davis include:

- (i) Support of IAS information services by strengthening the infrastructure for information technology and management, taxonomic identification, systematics research, voucher-ing and collections management worldwide;
- (ii) Development of tools to increase taxonomic capacity worldwide. These tools, which should be made available wherever possible in hard copy, on CD, and on the internet, include, *inter alia*, a guide to taxonomic services for IAS; common nomenclatural standards; identification aids; searchable lists of floras and faunas; and training programs for new taxonomists and parataxonomists; and
- (iii) Establishment of partnerships with key stakeholder groups, including industry, non-governmental organizations, and the general public, for developing and applying taxonomic services and information to combat IAS.

Further work on the information management element of the proposal was carried out at a joint meeting with the Clearing-house Mechanism in Montreal in 2002 (SCBD, 2002)¹⁰². The meeting endorsed the concept of regional hubs, and suggested that extant networks, such as those affiliated to BioNET-INTERNATIONAL, explore opportunities to utilise their infrastructure in their development. A number of technical issues were discussed, including standards for taxonomy, which were:

- (i) Increase the standardization of taxonomic usage within the network, taking into account the following:
- (ii) Encourage cooperation among hubs to ensure that all are using the same names for species;
- (iii) Recognize and communicate changes in taxonomic concepts of individual invasive species without delay across hubs;
- (iv) Encourage adoption by hubs of standard nomenclatures of higher taxonomic groups, where developed and accepted under the appropriate nomenclatural codes;
- (v) Use the taxonomic resources of GBIF, ITIS and/or Species 2000 that provide access to baseline taxonomic data to ensure interoperability;
- (vi) Enable the inclusion of unidentified or partially identified specimens in the information system;
- (vii) Allow species level updates of specimen-associated data, such as distribution and ecological impact, upon their eventual naming or re-identification in the information system;

¹⁰¹ <http://www.gisnetwork.org/>; <http://www.biodiv.org/doc/meetings/cop/cop-08/information/cop-08-inf-35-en.pdf>

¹⁰² <http://www.biodiv.org/doc/meetings/cop/cop-06/information/cop-06-inf-18-en.doc>

- (viii) Encourage hubs to recommend to affiliated institutions to follow best practices, such as:
 - i. Maintenance of voucher collections of invasive species (including genetic material), whether named or not;
 - ii. Specimen identification tracking systems with the potential of active links to the information network in the case of voucher specimens;
 - iii. Mechanisms for actively linking species-level data and the specimen-level data upon which they are based.
- (ix) Allow for multiple taxonomic interpretations by the information system. Where conflicting interpretations create confusion as to the status of a species as invasive, these should be flagged as requiring priority investigation.

Additional contributions to the implementation of Article 8(h) (the Convention Article dealing with IAS) are ongoing within other international fora including, but not limited to, the International Plant Protection Convention (IPPC), regional plant protection organizations, the Food and Agriculture Organization of the United Nations, the International Maritime Organization, and the Ramsar Convention.

3.2.17 Support in implementation of Article 8(j) - Traditional knowledge, innovations and practise.

Article 8(j) of the Convention concerns the knowledge, innovations and practices of

local and indigenous communities relevant to implementation of the Convention¹⁰³. Traditional knowledge systems include taxonomic information, which, if used in combination with Linnean taxonomies, could be of wider value, and also serve to protect the rights of the originators. However, access to and use of traditional knowledge must have the prior informed consent of the holders of that knowledge and be based on mutually agreed terms (see discussion of access and benefit-sharing and the GTI above). The value to indigenous peoples of this activity is to enhance their ability to participate in decision-taking with regard to Convention implementation and to enable them to manage their knowledge in a period when oral traditions are breaking down and written records are not available. Guides should be made available to ensure that there is clarity on species or variants in discussions between peoples in different regions or with different cultural backgrounds. As part of this process methods of depicting and correlating taxonomies based on traditional knowledge and those based on Linnaean nomenclature need to be developed.

Local and indigenous communities are encouraged to be involved in the implementation of the Convention, including the GTI. This aspiration is included within the GTI PoW, and formed part of a report by UNESCO, DIVERSITAS and WWF (Anon, 2000). However, care must be taken to ensure that such involvement is undertaken in the most effective manner and respects the rights of the peoples concerned.

¹⁰³ Article 8. *In-situ* conservation. Each contracting party shall, as far as possible and as appropriate: (j) Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices.

3.2.18 Support for ecosystem approach and CBD work on assessment including impact assessments, monitoring and indicators

The GTI was originally developed in the face of problems in implementing Article 7: Identification and Monitoring. The need for identification of components of biological diversity, and for assessment and monitoring of their status, underpins many implementation activities under the Convention. It follows that, wherever identification and monitoring activities are called for in a work programme, there is an implicit, if not explicit, requirement for taxonomic support¹⁰⁴ - work under the GTI. Where the requirement is not explicitly stated in a COP decision, there is often an acknowledgment of the need by the inclusion of a requirement for taxonomic capacity-building. Capacity-building in taxonomy is fundamental to identification, monitoring, indicators and assessments activities¹⁰⁵.

The ecosystem approach is a strategy for the integrated management of land, water and living resources that underlies Convention implementation. Within the Convention the term 'ecosystem' is defined in Article 2: "*Ecosystem' means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit*". Humans, with their cultural diversity, are an integral component of ecosystems in this approach. What this means is that any implementation activity should consider not only the animals, plants and micro-

organisms of a system, but also the way in which humans are engaged with that system, and how human activities, even at a distance, impact upon it.

Under the ecosystem approach, the Millennium Ecosystem Assessment (MEA)¹⁰⁶ was a key activity, and in fact was the main focus of the planned activity for the ecosystem approach under the GTI PoW. The MEA found, not surprisingly, that the taxonomic knowledge available for characterizing ecosystems varied considerably. The detailed findings of the MEA provide good insights into the extent of the taxonomic impediment for management of various types of ecosystems.

The GTI also has relevance to the suite of associated environmental conventions (e.g. the Convention on Migratory Species (CMS), the Convention on International Trade in Endangered species of Flora and Fauna (CITES) the Convention to Combat Desertification (CCD) and to the Commission on Sustainable Development (CSD)).

3.2.19 Protected areas

The COP adopted a programme of work on protected areas in 2004 (decision VII/28) and reviewed progress in 2006 (decision VIII/24). In addition to recognizing the important linkages between protected areas and GTI, the COP elaborated a planned activity on protected areas as part of the programme of work for the GTI.

The 2003 UN list of protected areas included more than 100,000 sites covering an area of 18.8 million square kilometres of

¹⁰⁴ Monitoring in a form which would require taxonomic support has been stated as necessary in, for example, the work on Marine and Coastal Biodiversity (decisions V/3, VI/3); Invasive Alien Species (decision VI/23); Agriculture (decisions III/11, V/5, VI/5); inland waters (decision VII/4); Forest Biodiversity (decision V/1/22); Implementation of Article 8(j) (decision V/16); Biodiversity and tourism (decision V/25); and the Global Plant Conservation Strategy (decision VI/9).

¹⁰⁵ See decisions III/10 and VI/7

¹⁰⁶ <http://www.millenniumassessment.org/en/index.aspx>

which 17 million square kilometres are terrestrial – some 11.5% of Earth's land surface. These protected areas represent almost all ecosystem types: forests, savannahs, grasslands, wetlands, and coastal and marine systems, although with different degrees of coverage. Between 10% and 30% of the planet's Amazonian rain forests, the Arctic Tundra and the tropical savannah grasslands are now held in protected areas. However, less than 10% of the world's wetlands and less than 0.5% of the world's coastal and marine systems are protected.

Protected areas support biodiversity by maintaining essential ecosystems and ecological services. They provide refuge for some of the world's spectacular, valuable and often threatened biota. However, protected areas established for the conservation of biota are likely to be placed and managed in terms of the larger better known species rather than the much greater number of smaller species that may occur there¹⁰⁷, and management decisions may be biased by this (Caro & O'Doherty, 1999; Andelman, & Fagan, 2000; Lindenmayer *et al.*, 2002). Accurate information about various biodiversity components of protected areas can considerably improve the management and selection of those areas. However, for most of the designated protected areas such information is not available. The PoW on protected areas includes the need for studies to improve the knowledge of the distribution, status and trends of biological diversity in protected areas, an activity that must

involve taxonomic work to identify the components of that biodiversity¹⁰⁸. In addition, the protected areas PoW calls for establishment of a comprehensive system of representative national systems of protected areas by 2010 by parties through expansion of protected areas in any remaining large, un-fragmented natural areas. In terms of determining appropriate sites for protected areas, data are needed on the range and ecological needs of the most species possible, and in particular about endemic and RET (Rare, Endangered, Threatened) species. However, such data are frequently either unavailable due to lack of description, or available only in large collections held in museums and herbaria. To meet these challenges, the following should be considered for any actual or proposed protected area:

- Access to specimen data from that area (i.e. via GBIF and the taxonomic institutions), particularly of endemics and locally/regionally rare entities;
- Knowledge of the role of the area in relation to the distribution of as many species as possible (using programmes such as WORLDMAP¹⁰⁹, and ecological niche modelling (Raxworthy *et al.*, 2003; Canhos *et al.*, 2004) again dependant on taxonomic input and access to collections);
- Rapid surveys on a selection of target groups of lower organisms, using initiatives such as Conservation International's Rapid Assessment programme;

¹⁰⁷ The approximately 1.78 million described species are not evenly spread across taxa, but are rather concentrated in the larger organisms such as vertebrates and vascular plants (where perhaps 90% have been discovered and named). There are, however, huge gaps among the smaller organisms, such as insects, fungi, algae and protozoa, which are both far more species-rich and often more important for ecosystem function. Moreover, listing of conservation status through the red databook system seems biased in favour of the larger organisms. Although there is no reason to believe that extinction rates are any lower for invertebrates than vertebrates, 24% of the 4,763 species of mammals are threatened, while only 0.06% of the 950,000 insects have so far been assessed as threatened (SCBD, 2001).

¹⁰⁸ UNEP/CBD/SBSTTA/9/6

¹⁰⁹ <http://www.nhm.ac.uk/science/projects/worldmap/>

- Rapid treatment of the survey results to produce (1) list of RTUs (recognizable taxonomic units, or morphospecies, which are likely to be species-level taxa but are not named and thus cannot be compared between sites) and their likely ecological roles; (2) list of species, including newly-described ones;
- Long-term monitoring of these taxa with continuing description of new species as collected; and
- Free sharing of these data, including identification aids, between geographically and ecologically related reserves.

Rigorous planning and management of protected areas requires close association between the conservation and taxonomic communities, including at the level of data sharing. It also demands focused capacity building of taxonomy (King & Lyal, 2003).

4. DEVELOPING THE GTI AND MONITORING ITS PROGRESS

As noted in the introduction to this Guide (section 1.2), the GTI has a dual nature, with both policy and implementation components. The function of the policy component of the GTI is to identify the priorities for action, which culminate in decisions of the COP including the programme of work. The policy aspect involves the National Focal Points within each country, the Conference of the Parties (COP) of the CBD and its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), the Secretariat of the Convention (SCBD) and the Coordination Mechanism of the GTI. Implementation occurs primarily as Parties translate that policy at international level into policies, strategies and activities at national level.

This section of the Guide first introduces the roles and responsibilities of the key actors in the development of policy, including the CBD secretariat, the Coordination Mechanism for the GTI, National Focal Points, the COP, and SBSTTA. In addition, it reviews some of the main mechanisms available to facilitate implementation of the GTI, including national reporting, national biodiversity strategies and action plans (NBSAPs), the roster of experts, outreach activities, taxonomic needs assessments, and pilot projects. Finally, some key obstacles and challenges to implementation of the GTI are discussed.

4.1 Roles and responsibilities

4.1.1 *The CBD Secretariat*

Responsibility for the administration of the GTI under the Convention rests with the Executive Secretary of the SCBD in Montreal. There is a programme officer

primarily responsible for the GTI, and other programme officers responsible for the thematic work programmes and other cross-cutting issues who may contribute to work on the GTI from time to time. On a day-to-day basis, some of the main duties of the CBD Secretariat include preparing documentation for SBSTTA, COP and other meetings, gathering and analyzing information for these documents, corresponding with interested parties and focal points, maintaining the GTI portal on the CBD website, forwarding requests of COP to Parties and others, following up on implementation of various activities under the GTI, and liaising with key organizations and partners in order to inform people of the GTI and how they can contribute to its implementation.

4.1.2 *The GTI Coordination Mechanism*

In managing the GTI the Executive Secretary is advised by a Coordination Mechanism, comprising delegates from each of the UN regions as well as from relevant international organisations. This was set up by the COP at its fifth meeting in 2000¹¹⁰ with a series of tasks to undertake, including the development of the PoW in concert with the Executive Secretary, and the in-depth review of the PoW that occurred at COP-8 in 2006. There are several aspects of the decision on GTI taken by COP-8 for which the Coordination Mechanism will be able to provide advice to the Executive Secretary, including but not limited to;

- Design and implementation of the global taxonomic needs assessment envisaged as planned activity 3 in the PoW;
- Development of specific taxonomic, outcome-oriented deliverables for

¹¹⁰ See the annex to decision V/9, contained in annex 9 to this guide.

each of the planned activities of the PoW, in advance of COP-9; and

- Fundraising and implementation for a project development seminar to assist countries in developing projects to address identified taxonomic needs.

Reports of formal meetings of the Coordination Mechanism are available on the GTI Portal. The group also communicates via email and is likely to use online discussion forums on the GTI Portal as an additional means to interact.

4.1.3 National Focal Points

All Parties have a CBD National Focal Point – an individual or office within Government that takes the lead in CBD matters. However,

in order to provide a more focused link between the SCBD and individual Parties on the GTI, Parties have been invited to designate National Focal Points for the GTI¹¹¹. These GTI National Focal Points should be one or more expert individuals or institutions who have the appropriate technical background and expertise to understand taxonomic needs in relation to the CBD. Focal Points have been or will be designated for a number of activities under the Convention, including the GTI. The identities and contact points of the GTI National Focal Points can be found on the GTI Portal or can be requested by contacting the Secretariat.

In order to help the GTI Focal Points be as effective as possible, some of the responsibilities of the job have been summarized (see Text-box 4-1). These activities are only

Box 4-1 Suggestions for action by CBD and GTI National Focal Points

These were identified by the meeting of the Coordination Mechanism for the Global Taxonomy Initiative (GTI) held in Kuala Lumpur on 8 February 2004, and circulated to Focal Points in a Notification by the Executive Secretary on 16 September 2004¹.

Parties should:

- *Appoint National Focal Points for the GTI (in accordance with decisions V/9 and VI/8 of the Conference of the Parties). These focal points should comprise one or more expert individuals or institutions who together have the appropriate technical background and expertise to understand taxonomic needs in relation to the Convention on Biological Diversity and have the capacity to fully perform the focal point role.*

National Focal Points for the Convention on Biological Diversity should:

- *Empower and support national focal points for the GTI in their efforts to make contact and communicate regularly with the taxonomic community in their country, where possible making use of existing networks.*

National Focal Points for the Convention on Biological Diversity and the GTI should:

- *Integrate taxonomy into all projects as appropriate to ensure implementation of decision VI/8, on the GTI programme of work, and that taxonomic needs are met in all thematic areas of the Convention on Biological Diversity.*

¹¹¹NOTIFICATION. Suggested actions for promoting implementation of the programme of work for the Global Taxonomy Initiative. Ref.: SCBD/STTM/LR/44307 <http://www.biodiv.org/doc/notifications/2004/ntf-2004-073-gti-en.pdf>

- *Create links with national biodiversity strategy and action plans, the clearing-house mechanism, (NCSAs), the Global Environment Facility and other relevant processes so that the need for taxonomy is understood in each of these processes and so that taxonomists understand what is required to fulfil the relevant commitments.*
- *Utilize opportunities within national capacity self-assessments and GEF enabling activities to identify priority taxonomic needs for implementing the Convention on Biological Diversity.*
- *Take responsibility for provision of information to the Secretariat of the Convention on Biological Diversity on:*
 - a. *Taxonomic needs assessments, including reviews or studies on specific taxonomic needs;*
 - b. *Directories of taxonomic expertise;*
 - c. *Registers of biological collections; and*
 - d. *Taxonomic initiatives and networks.*

National Focal Points for the GTI should:

- *Initiate, complete and/or update as, appropriate, national taxonomic needs assessments, ensuring that these address the taxonomic needs identified in the work programmes for each thematic and cross-cutting issue under the Convention on Biological Diversity.*
- *Prepare plans for the full national implementation of the GTI programme of work, utilizing national, regional and global capacities as appropriate.*
- *Work with government and relevant organizations to mobilize resources for the taxonomic capacity-building required to meet national obligations under the Convention on Biological Diversity.*
- *Participate in and help ensure the sustainability of national, regional and global initiatives and networks aimed at taxonomic capacity-building and technical cooperation.*
- *Work to bridge the gap between taxonomists and all user groups involved (through the establishment of web sites, mailing lists, bulletin boards, presentations at scientific conferences, workshops with end-users and other means).*
- *Popularise the GTI among taxonomists and provide an interface between taxonomy and the end-users of taxonomy.*
- *Raise the level of in-country recognition for the applied nature of much taxonomic work and the critical contribution of baseline taxonomic work to all activities related to the conservation and sustainable use of biodiversity and the effective implementation of the Convention on Biological Diversity.*
- *Be proactive in seeking to realize the benefits of cooperation with other sectors, for example, plant protection services, that have relevant capacities and capacity-building needs.*
- *Provide relevant information and ongoing feedback to the taxonomic and end-user communities (on the Convention on Biological Diversity and the GTI, other*

organizations and processes, contacts, government decisions, funding possibilities as well as case studies, etc.).

- *Help to increase recognition that most taxonomic expertise can only be provided by taxonomists.*
- *Build an understanding in government of the costs involved in providing taxonomic services and support the development of programmes aimed at improving long-term employment and career opportunities for taxonomists.*
- *Facilitate regional and global implementation of the GTI programme of work through communication and cooperation with GTI National Focal Points and other stakeholders internationally.*

a suggestion from the SCBD, and may be modified by Parties according to local needs and priorities. However, they do go some way to attempting to bridge the gap between policy and implementation.

4.1.4 COP and SBSTTA

The COP, as the governing body for the Convention, makes requests and invitations to Parties to carry out certain activities related to the GTI. In addition, however, the COP can also alert other organisations and initiatives as to the priorities and encourage them to play a role in meeting needs, and it can also alert funding bodies to priorities and needs, and encourage them to provide funding. The CBD itself is not a funding body and cannot provide financial support for implementation.

The COP often bases its decisions on the GTI on recommendations of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), which in recent years meets twice in each inter-sessional period between COPs. The SBSTTA helps to ensure that decisions of COP are grounded on scientific inputs, because government delegations tend to comprise scientific experts.

4.2 Mechanisms to facilitate Implementation

4.2.1 National reporting

Parties use various reporting mechanisms in order to monitor and provide information regarding their implementation of the Convention. Reporting provides feedback not only to the COP but also to the Parties themselves regarding the effectiveness of their activities towards implementation.

National reports under the Convention are prepared periodically, the most recent being the third national reports. The reporting formats are agreed by COP well in advance of reporting deadlines, and to date the formats have been comprehensive, inclusive of questions regarding implementation of Article 7 and the GTI.

In order to facilitate reporting in more detail on particular topics, the COP also requests or invites Parties to provide specific thematic reports. A few such thematic reports or questionnaires have been developed, including one for the Global Taxonomy Initiative which was distributed by the Secretariat in 2004 to solicit information for the in-depth review of the GTI.

The information contained in the national and thematic reports is posted on the website of the Convention¹¹² and can be analysed by any visitor to the website.

Unfortunately, not all governments submit national reports and thematic reports, and among those that do, the level of detail and rigour varies significantly. Government departments that compile the reports do not always have direct contact with the organisations or individuals providing the taxonomic expertise to implement the GTI. For this reason, and because gathering detailed information is costly, the reports cannot always provide a level of detail on implementation that would be helpful. Clarity in what has been achieved would not only demonstrate the progress that is being made, but would also identify more clearly what obstacles need to be overcome. In several GTI-related workshops the participants have identified a need for taxonomists and other people implementing the GTI to interact more closely with National Focal Points of the GTI and CBD (Klopper *et al.*, 2001; the Third Global Taxonomy Workshop¹¹³; the Paris 2003 meeting¹¹⁴). This might assist the Focal Points in compiling the reports.

4.2.2 NBSAPs

Governments use national biodiversity strategies and action plans (NBSAPs) to articulate their plans for implementing COP decisions in a national context. Ideally, the results of taxonomic needs assessments should be made clear in an NBSAP, specifying how the taxonomic impediment to implementation of the CBD can be addressed at national level. Many of these

NBSAPs are accessible through the CBD web site¹¹⁵.

4.2.3 Roster of experts

The clearing-house mechanism maintained a roster of experts for the various thematic areas and cross-cutting issues under the Convention, including the GTI. However, the maintenance of the roster was discontinued in 2006 (decision VIII/10). Other available databases of taxonomic expertise are highlighted on the GTI Portal.

4.2.4 Outreach

If people do not understand the importance of the Convention, or indeed of taxonomy to underpin its implementation, the implementation of the CBD will be impaired. Thus the need to raise awareness and to educate on the importance of taxonomy to underpin the Convention is critical to the success of the Global Taxonomy Initiative.

At its eighth meeting in 2006, the COP requested the Executive Secretary to undertake awareness-raising activities specific to taxonomy, as part of the Global Initiative on Communication, Education and Public Awareness (CEPA) under the Convention¹¹⁶.

In the Global Taxonomy Workshop in Pretoria the participants produced a strategy for building taxonomic capacity as part of the GTI. This strategy, refined at a subsequent meeting in Paris (Annex 5), includes a set of activities that stretch from the policy level to implementation. Key aspects involve outreach to all stakeholders, whether engaged in policy-level work, implementing the CBD in one of the thematic areas or other

¹¹² <http://www.biodiv.org/reports/analyzer.aspx>

¹¹³ <http://www.bionet-intl.org/opencms/opencms/resourceCentre/onlinePublications/3GTW/index.htm>

¹¹⁴ <http://www.biodiv.org/doc/meetings/sbstta/sbstta-09/information/sbstta-09-inf-16-en.pdf>

¹¹⁵ <http://www.biodiv.org/world/nbsaps.asp> - actual NBSAPs are accessible using the link from the side-bar on this page.

¹¹⁶ decisions VIII/3 and VIII/6.

cross-cutting issues, or in taxonomy itself. This is to ensure that they all are aware of the GTI as an overarching political framework and as a necessary integrated component of CBD implementation, and their own role in ensuring its success. The table reproduced in Annex 5 provides a list of partners who have committed themselves in one or other meeting to undertaking these actions. However, where outreach is concerned, every stakeholder, whether institutional or individual, has an equal responsibility and right to participate.

The very existence of the GTI and the massive endorsement it has received in a succession of CBD, COP and SBSTTA meetings is itself a powerful argument to use in explaining the importance of taxonomic integration with other CBD implementation.

Numerous activities have taken place in the past few years, including presentations on the GTI by the CBD Secretariat, members of the GTI Coordination Mechanism, and others at a number of workshops and meetings, including four regional and one global workshops on the GTI, and set-up meetings for Regional Taxonomic Technical Cooperation Networks. A number of papers have been written and published in various books and journals, including Cresswell & Bridgewater, (2000); Klopper *et al.* (2002); Lyal (2001, 2004, 2004a), Samper, (2004); Shimura (2003, 2004). A brochure on the GTI has been produced by the SCBD, the GTI Portal is maintained on the CBD site, and other websites are maintained by various GTI National Focal Points globally. There have also been publications in the CBD Technical Series related to taxonomy¹¹⁷.

While all of these things are useful and necessary, there needs to be a greater effort

at outreach outside of those already active in Convention activities. These include taxonomists themselves, funders, and users of taxonomic information.

4.2.5 Taxonomic needs assessments

As has been noted in Section 3, taxonomic needs assessments can be used to identify priority needs across the various sectors implementing the CBD. They may be carried out across whatever geographic area is deemed appropriate, and either attempt to examine the whole gamut of activities under the CBD or focus on one area, such as aspects of agricultural biodiversity (Naumann & Jisoh, 2002; Evans *et al.*, 2002), or conservation (UK report, unpublished).

The results of the needs assessment can be incorporated into the NBSAP, or taken as a free-standing document. In either respect, however, it displays needs, and allows the taxonomic community, the other sectors, and the policy-makers to prioritise actions and resources. Thus priorities can be simultaneously placed on the implementation and policy agendas. Moreover, in identifying particular needs, the output required to meet them, and the users of that information, the assessment results will provide information and a route for monitoring for the National CBD Focal Point, to assist understanding of how implementation is progressing.

In addition to providing a basis for future activities the process of preparing the assessment can act as a mechanism to highlight taxonomic needs that had been overlooked, and for raising the profile of taxonomy, the GTI and other aspects of the CBD, an outcome reported by the UK GTI Focal Point (*pers comm.*).

¹¹⁷ See in particular <http://www.biodiv.org/doc/publications/cbd-ts-21.pdf>

4.2.6 Pilot projects

A helpful guide in the development of the GTI would be some model projects to help the various communities understand the benefits and possibilities arising from the GTI. With this in mind some pilot projects of the GTI were identified in the PoW, under each of the planned activities. In addition, calls have been made¹¹⁸ for projects to exemplify the implementation of the GTI. Some 21 individuals and institutions responded to these calls, and some of these were listed in an information document to SBSTTA¹¹⁹. Overall, the main characteristic of a GTI project, be it capacity-building, information provision or taxonomic studies, is that it should be directed towards the removal of a taxonomic impediment hindering implementation of the Convention. This does not limit the work needed in any way; the only requirement is that an impediment is being addressed and the outputs will be used in a clear way to remove this impediment. Criteria that might be considered are clarity on:

- (a) Which identified taxonomic impediments are addressed (human resources, information, collections and facilities, etc.), including how such impediments were identified and the process through which they would be overcome;
- (b) How the project would provide taxonomic support to activities under the Convention;
- (c) How the proposed activities would allow parties to meet their obligations under the Convention, with particular reference to the maintenance

nance of long-term sustainability of in-country taxonomic information (if appropriate); and

- (d) How robust taxonomic information shall be made available openly and dynamically, while allowing for future upgrading, meeting protocols on intellectual property rights, and ensuring future access and benefit-sharing.¹²⁰

This is no different from the types of requirements that should be addressed for any implementation project – the work has to be rooted in a need and it has to be shown how the outputs will be used to meet that need. However, as has been noted above, with the vast numbers of species undescribed there is room for projects including monographic alpha-taxonomy¹²¹, cataloguing, producing keys and other identification aids, identifications, training and a multiplicity of others.

A number of projects implementing the GTI are in place, some funded by the GEF (see next section), and others by a variety of different organisations. Many projects are listed in the GTI Portal, and some are discussed further under the section on funding.

4.3 Obstacles to implementation

The most important obstacle to implementation of the GTI is the inadequacy of global taxonomic resources to meet all of the priorities that have been or might be identified to implement the CBD. Even the extant museums, herbaria, university taxonomists and culture collections face a number of competing priorities, some more attuned to meeting CBD objectives, others less so.

¹¹⁸ The COP, in decision V/9: "Urges parties, Governments and relevant organizations to...communicate to the Executive Secretary and the Global Taxonomy Initiative Coordination mechanism, by 31 December 2001, ... suitable programmes, projects and initiatives for consideration as pilot projects under the Global Taxonomy Initiative."; and in decision VI/8: "Endorses...further submission and elaboration of potential pilot projects."

¹¹⁹ <http://www.biodiv.org/doc/meetings/sbstta/sbstta-06/information/sbstta-06-inf-04-en.pdf>

¹²⁰ UNEP/CBD/SBSTTA/6/INF/4

¹²¹ primarily description of species

Capacity-building is noted as a need throughout this Guide, and throughout the COP decisions, but this takes financial and human resources, both to develop and sustain. When capacity exists, it has to be enabled to meet the needs, and this generally takes financial resources. Taxonomic work, just like other professional advice, needs to be paid for. In perhaps the majority of cases, taxonomic needs for CBD implementation are identified and met (or not met) on an *ad hoc* basis, and discussion on them does not extend beyond the project level. Practicing taxonomists are often asked advice (and expected to give it freely) on identities of species or to provide determinations for projects funded by multilateral or bilateral agencies where an original taxonomic component of the budget was either never considered, or even removed as unnecessary. This state of affairs is clearly not satisfactory, and does not encourage the establishment of systems that could deal with CBD needs most effectively. A key aim of the GTI must be to modify the manner in which taxonomy is perceived and practiced.

A second key obstacle to implementation of the CBD is poor communication and lack of understanding about the GTI. First, the decisions of the COP are not known to many practicing taxonomists and others implementing the CBD. Many do not even realise that what they are doing is implementing the CBD, or understand the CBD and its operation. Even those who do read the decisions do not necessarily understand the implications for their work, or just what is being asked of them. The National CBD or GTI Focal Point may not be able to communicate with all taxonomists, probably because they do not know who they are, they are not in the same government

department, or they are not government employees at all, but researchers at non-governmental institutions.

As noted earlier, this communication problem applies to national reporting as well. Within countries there is generally no line of communication between those implementing the GTI and the CBD. Thus the Focal Point will not be able to contact the taxonomists, and the taxonomists will not know that their activities with respect to the GTI are being reported on or that there is a need for such reports. This is not always the case, of course; in some countries the lines of communication are being developed. However, even here there is a widespread ignorance of the CBD and how taxonomic work might be developed to help implement it.

Taxonomists, like any other scientists, will have a set of scientific objectives that determine the work that they do. These are both individually and institutionally set, and both individuals and institutions are judged upon how well they meet their targets. While some of these targets may accord with activity to implement the GTI, not all of them will, and consequently there may be a conflict in priorities (Lyal & Weitzman, 2004). It cannot be assumed that by identifying a set of needs for implementing the Convention that this ensures that taxonomists will start work to meet them. Clear incentives in different forms are needed to change this situation. Institutional priorities and performance indicators might be broadened to include relevant targets, something that might involve discussions at government level between departments charged with implementing the CBD and those controlling museums, herbaria or universities. There will also certainly have to be funding considerations.

A third obstacle to implementation of the GTI is the perception that there will be no taxonomic problem in implementing the convention, or that it can somehow be overcome by focusing on organisms for which there is no problem. This, of course, deprives projects of information on the

majority of species which they will encounter, deprives ecosystem managers of tools with which they might do their job, and deprives countries of knowledge of their biodiversity and thus of the chance to assert rights of access and benefit-sharing.

5. FUNDING FOR THE GTI

Funding is necessary to address the shortage of taxonomists, of taxonomic information and of taxonomic infrastructure. In many cases, developing countries have very little or no physical reference collections of local biodiversity, nor trained personnel, and in developed countries taxonomy has been under-resourced for many years, leading to a general decline in infrastructure, and a dearth of younger professionals.

The CBD is not a funding agency, and does not provide financial support for implementation projects. Instead, it sets out the policy background which in turn provides a mandate to funding organizations and other donors to support implementation of the GTI. As taxonomy is a cross-cutting issue, support to the GTI is not limited to projects with a taxonomic focus – it also includes taxonomic components of any biological diversity project. Indeed, it is likely that most taxonomic funding opportunities lie in projects and programmes aimed at addressing particular sectors.

This section of the Guide provides an overview of the main sources of funding for the GTI, and then gives examples of projects that have been funded. Finally, some key points that need to be considered in mobilizing funding for the GTI are reviewed.

5.1 Sources of funding for the GTI

The Convention commits each country Party to provide financial incentives and resources for national biodiversity activities, and requires developed country Parties to provide financial resources including new and additional financial resources to enable developing country Parties to meet the costs of implementing measures which fulfil the

obligations of this Convention. A special financial mechanism in this regard was thereby established and its operation was later entrusted to the Global Environment Facility – a relatively new multilateral trust fund established to promote international cooperation for global environment benefits. Although the GEF is frequently identified as the main source of funding, this is most apparent for large-scale projects. Smaller-scale activities tend to take place with funding from other sources. Even the setting up of multinational taxonomic networks has been undertaken more times without GEF funding than with it.

The GTI PoW and other COP decisions make it very clear that funding may be sought from many sources. This section highlights a few funding sources, including all of the types of sources anticipated by Parties to the Convention – national sources, the GEF, and other multilateral, regional and bilateral mechanisms. A comprehensive listing of sources of biodiversity-related funding is available on the CBD website¹²².

5.1.1 National support to taxonomy

National budgetary supports to taxonomy may take varied forms depending on the administrative tradition and culture, and the level of available funding may also differ according to national circumstances and financial capabilities. In many countries, taxonomic funding is organized as budgetary support to such taxonomic institutions as museums, universities, libraries, herbaria, arboreta, zoos, botanical gardens, culture collection and seed bank.

In some countries, a significant portion of available funding is channelled through particular agencies or foundations. In the

¹²²<http://www.biodiv.org/financial/sources.shtml>

United States, for example, the National Science Foundation accounts for about one-fourth of federal support to academic institutions for basic research, and thus is the nation's principal support of fundamental academic research on plant biology, environmental biology and biodiversity. Its systematic biology and biodiversity inventories cluster seeks to discover, describe and inventory global species diversity, to analyze and synthesize the information derived from this global discovery effort into predictive classification systems that reflect the history of life, and to organize the information derived from this global program in efficiently retrievable forms that best meet the needs of science and society.

5.1.2 *The Global Environment Facility*

When the Convention on Biological Diversity was negotiated, governments realized that substantial investments would be required to conserve biological diversity, and agreed that the extent to which developing country Parties will effectively implement their commitments under this Convention will depend on the effective implementation by developed country Parties of their commitments under this Convention related to financial resources and transfer of technology. A special financial mechanism was thus created to facilitate flow of new and additional financial resources from developed countries to developing countries, and the Global Environment Facility was officially designated as the institutional structure to operate the financial mechanism.

The Global Environment Facility operates as the financial mechanism for several global environmental treaties, in particular those that combat climate change, land degradation, loss of biodiversity and persistent

organic pollutants. Although being administratively linked to the World Bank, the Global Environment Facility has its own independent organizational identity, including its own Assembly, Council, Secretariat, three Implementing Agencies (United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP) and the World Bank) and seven Executing Agencies (Food and Agricultural Organization of the United Nations (FAO), United Nations Industrial Development Organization (UNIDO), African Development Bank (ADB), Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), Inter-American Development Bank (IDB), and International Fund for Agricultural Development (IFAD)), as well as Scientific and Technical Advisory Panel (STAP)).

While designating the Global Environment Facility to operate the financial mechanism of the Convention, the Conference of the Parties established a memorandum of understanding with the GEF Council providing that the GEF financing in the focal areas will be in full conformity with guidance from the Conference of the Parties and its effectiveness will be reviewed periodically. Thus the GEF operational policy to finance taxonomy needs to be based on guidance from the Conference of the Parties. The Conference of the Parties has so far identified the following priority taxonomic areas for financial support by the GEF:

- (i) Identification and monitoring of wild and domesticated biodiversity components, in particular those under threat;
- (ii) Capacity-building, including taxonomy, to enable developing countries to develop and carry out an initial assessment for designing,

- implementing and monitoring programmes in accordance with Article 7, taking into account the special need of small island States;
- (iii) Country-driven activities within the context of its operation programmes to participate in the Global Taxonomy Initiative which take into account as appropriate, elements of the Suggestions for Action contained in the annex to decision IV/1 D;
 - (iv) Promotion of awareness of the Global Taxonomy Initiative in the relevant activities of the Global Environment Facility, such as the Country Dialogue Workshops, and facilitation capacity-building in taxonomy, including in its Capacity Development Initiative;
 - (v) National and regional taxonomic capacity-building, as a basis for implementing the programme of work for the Global Taxonomy Initiative, with particular attention to funding country-driven pilot projects identified under the Global Taxonomy Initiative, taking into consideration the special needs of least developed countries and small island developing States;
 - (vi) Assistance in the implementation of the Global Taxonomy Initiative, and integration of taxonomic capacity-building activities into thematic and cross-cutting programmes, including supporting activities and projects, such as, where appropriate, stand-alone capacity-building projects;
 - (vii) Implementation of the planned activities contained in the programme of work on the Global Taxonomy Initiative, including taxonomic needs assessments,

projects with a taxonomic focus or clearly identified taxonomic components, and regional activities on taxonomic capacity development and access to technology; and

- (viii) Projects which help to establish and operationalize their national focal points for the Global Taxonomy Initiative and capacity-building activities such as, inter alia, taxonomic training related to specific taxa and information technologies.

It is expected that GEF support to taxonomy will be centered on the above priority areas identified by the Conference of the Parties, but the extent to which the GEF will be able to implement the guidance depends on a variety of factors, including project proponents, project-hosting countries, project managers at both country offices and headquarters of Implementing/Executing Agencies and of course the GEF Secretariat and Council.

In principle, all project proposals for GEF funding must be initiated or driven by the project hosting countries. This has become all the more apparent under the Resource Allocation Framework that was adopted by the GEF Council in September 2005. During the fourth replenishment period of the GEF, eligible countries are allocated *ex ante* individually or as a group with certain amount of resources, and are expected to reallocate this funding among nationally prioritized biodiversity projects.

GEF project proposals are first considered by relevant project managers of country/regional offices or biodiversity desks of an Implementing Agency/Executing Agency, and subsequently submitted for further review at the Headquarters of the Implementing Agency/Executing Agency as well as by the

GEF Secretariat. The GEF Chief Executive Officer can normally approve enabling activity project proposals and medium-sized project proposals requesting less than US\$1 million. Project proposals requiring more than US\$1 million must be included in a work program for approval by the GEF Council, and individual project briefs must be finally endorsed by the GEF Chief Executive Officer. Implementing Agencies can approve funds for project preparation in the amount of US\$25,000.

Project proposals for GEF funding are considered mainly through three windows - enabling activity, operational programs, and short-term response measures, based on the GEF operational strategy. A Small Grants Programme has evolved into a standing global project whose resources have been replenished on a regular basis, and a special simplified procedure aiming at faster approval has also been developed for medium-sized projects.

Enabling activity (EA) – Grants for enabling activities were initially designed to help countries to prepare national strategies and action plans, and to assess needs, identify priorities and build consensus on particular issues, and are now also used to support capacity-building activities. Since 1997, the GEF has issued several guidelines for enabling activities including expedited approval procedures, and the need for addressing taxonomy has been included in these guidelines. For instance, the ‘Revised Guidelines for Additional Funding of Biodiversity Enabling Activities (Expedited Procedures)’¹²³ provided for assessing capacity-building needs and defining country-specific priorities for initial assessment and monitoring programs, including

taxonomy. The new round of enabling activity is guided by the ‘Operational Guidelines for Expedited Funding of National Self Assessments of Capacity Building Needs’¹²⁴. The funding ceiling for enabling activity under expedited procedures for individual countries has been raised several times, and currently stands at US\$450,000 for national strategy and action plan, clearing house mechanism, and capacity-related activities of all subject areas of the Convention. The GEF has approved over 300 enabling activity projects for biodiversity, and only a limited number of countries have utilized this funding window to address national capacity needs of taxonomy and the Global Taxonomy Initiative.

Medium-sized projects (MSPs) – Medium-sized project proposals, limited to a maximum of US\$1 million, may be submitted on a rolling basis throughout the year, and may be approved by the GEF Chief Executive Officer. Preparation guidelines and templates¹²⁵ have been suggested by the GEF Secretariat for easy use by proponents when submitting new proposals. MSPs are required to satisfy the requirements of a GEF operational program or short-term response measure together with a strategic priority. Several species-based conservation projects have been financed as medium-sized projects, but taxonomy-oriented activities in general do not feature prominently in this window of funding.

Full projects (FPs) – Full project proposals are normally included in a work program coordinated by the GEF Secretariat for approval of the GEF Council at a meeting or intersessionally. Most full projects also use project development facility (PDF) funds to cover project preparatory expenses. GEF

¹²³ http://www.gefweb.org/Documents/enabling_activity_projects/enabling_activity_projects.html

¹²⁴ Ibid

¹²⁵ http://www.gefweb.org/Documents/Medium-Sized_Project_Proposals/MSP_Guidelines/msp_guidelines.html

accepts full project proposals based on the requirements of its operational programs, and the GEF operational programs¹²⁶ have been developed on arid and semi-arid zone ecosystems (OP1), coastal, marine, and freshwater ecosystems (OP2), forest ecosystems (OP3), mountain ecosystems (OP4), conservation and sustainable use of biological diversity important to agriculture (OP13), integrated ecosystem management (OP12), and sustainable land management (OP15). These operational programs do not make specific reference to the Global Taxonomy Initiative, but allow for identification activities and monitoring components.

Short-term response measures – this modality of funding considers proposed activities that are not an integral part of an operational program, such as those with a focus on threatened or endangered species or ecosystems, actions to reduce immediate threats to migratory species, and programs to facilitate implementation of unforeseen opportunities for national action and international cooperation to reduce specific risks of biodiversity loss. Proposals approved under short-term response measures include the popular taxonomy project entitled as “Inventory, Evaluation and Monitoring of Botanical Diversity in Southern Africa: A Regional Capacity and Institution Building Network” (SABONET).

Small Grants Programme (SGP) – this global project can offer individual grants of up to US\$50,000 to non-governmental organizations (NGOs) and community-based organizations (CBOs). Coordinated by UNDP, participating countries have their own national coordinator and national steering committee to review and approve project proposals under the Small Grants

Programme¹²⁷. The Programme has increasingly applied the requirements of the GEF operational programs to guide its operations, and a number of projects financed under the Programme involve taxonomic field work.

5.1.3 *Other multilateral sources*

Multilateral institutions, including the United Nations system entities and regional cooperation organizations, may make contributions to implementation of the Global Taxonomy Initiative activities. The United Nations Environment Programme (UNEP) and the Food and Agriculture Organisation of the United Nations (FAO) have occasionally been involved in several global and regional taxonomic projects. The World Bank sponsored the Global Invasive Species Programme through the Bank Netherlands Partnership Programme and the Development Grant Facility.

Governing bodies of multilateral institutions have a general preference for development-oriented projects, in particular those related to the Millennium Development Goals, and thus convincing utilitarian evidence needs to be built for further taxonomic initiatives. The United Nations Development Programme and regional development banks can also be tapped for purposes of the Global Taxonomy Initiative.

5.1.4 *Bilateral sources*

According to pledges made by donor countries, official development assistance is expected to increase significantly in the coming years, and thus offers opportunities for increasing financial support to taxonomy and the Global Taxonomy Initiative activities.

¹²⁶ http://www.gefweb.org/Operational_Policies/Operational_Programs/operational_programs.html

¹²⁷ <http://sgp.undp.org/>

Many donor governments are already active in taxonomy-related projects and activities.

Switzerland through the Swiss Agency for Development and Cooperation has contributed to the Bio-NET International Fund since 1996.

The Darwin Initiative¹²⁸ is a bilateral programme that seeks to make UK expertise available to biodiversity-rich developing countries. Its focus is supporting implementation of the CBD, and in the process has supported a number of projects that are very much aligned with the GTI. It has supported more than 400 projects covering a wide range of subjects related to the conservation and sustainable use of biodiversity in over 80 countries around the world. More than 50 of these projects have had a major taxonomic focus, aligned with the GTI.

The Belgian Development Corporation and the Royal Belgian Institute of Natural Sciences have carried out a number of GTI-related projects¹²⁹. The focus of this support from Belgium is for institutions or individuals from developing countries in need of taxonomic and curatorial training. Such training should invariably have a clearly identified output in terms of increased taxonomic and/or curatorial capacity for the developing country or its region.

In Sweden, the International Foundation for Science (IFS) carries out the mission to build the scientific capacity of developing countries in sciences related to the sustainable management of biological and water resources. Since 1974, the Foundation has provided support to more than 3500 grantees in some 100 developing countries in Africa, Asia and the Pacific, and Latin America and the Caribbean.

These four countries are examples but there are many others who also support

taxonomic projects. Bilateral assistance often seeks to promote scientific and technical linkages between target countries and donor countries, and thus the extent to which bilateral assistance can support taxonomic activities very much depends upon efforts of partner scientific organizations or institutions of donor countries. Successfully financed taxonomic projects normally involve initiatives of taxonomic personnel and institutions in a developed country and effective involvement of taxonomic personnel and institutions in a developing country and strong endorsement of the latter's government.

5.1.5 *Nongovernmental sources*

There are a variety of funding sources outside the governmental sector, such as revenues generated by taxonomic institutions and conservation organizations, grant-making foundations and corporate charities. Major taxonomic institutions are often in a position to attract financial flows from donor governments, businesses and individuals, and may channel portion of such flows to their partner institutions in the developing world. For instance, the Missouri Botanic Gardens supported the development and testing of taxonomic tools and contributed towards red listing initiatives. The Royal Botanic Gardens KEW has been a long-term partner in botanical research and conservation to many botanical institutions worldwide.

Conservation organizations, particularly initiated in major donor countries and with a worldwide network, have emerged as a significant and stable source of global support to biodiversity activities in the developing nations. In 2004, five major international conservation organizations attracted US\$773

¹²⁸ <http://www.darwin.gov.uk/>

¹²⁹ <http://bch-cbd.naturalsciences.be/belgium/cooperation/aa-temp/gti/call.htm>

million from individuals, US\$96 million from corporations and US\$270 million from foundations. These organizations have proven to be not only an effective tool for tapping dispersed private donations from the developed countries, but they also contribute to sensitization of biodiversity concerns and galvanization of political support for biodiversity action in both developing countries and developed countries. Unlike development agencies with ever changing priorities, many of these organizations have sole agenda on biodiversity and related areas, and also have professional tendency towards new discovery and fundamental research.

Private grant-making foundations are another source of funding for taxonomic activities. The Rufford Maurice Laing Foundation, the Moore Family Foundation; the Gordon and Betty Moore Foundation; the MAVA Foundation for Nature Conservation (MAVA Stiftung für Naturschutz) are major donors for the IUCN Red List Programme. The MacArthur Foundation sponsored the African Biodiversity Training Program - a collaborative project between the Field Museum of Natural History Chicago and Makerere University to train graduate students studying birds, amphibians, small mammals and fungi. The Alfred P. Sloan Foundation supported the creation of the Consortium for the Barcode of Life (CBOL) which is hosted by the Smithsonian Institution's National Museum of Natural History.

5.1.6 Special fund for the GTI under BioNET-International and other organizations

The COP, at its eighth meeting in 2006, invited BioNET-International and other relevant organizations, in consultation with the Coordination Mechanism for the GTI, to set

up a special fund for the GTI, and to report to COP-9 on progress. Within one week of COP-8 there was already one inquiry from a country about how to make use of the fund. The modalities of the operation of the fund are expected to be established soon, and it is hoped that donors will contribute generously to the fund. Donors that already support GTI-related activities may use the fund as a means to channel some of their support.

5.2 Examples of GTI projects

This section provides some examples of taxonomic projects financed by various sources of funding, including through national, multilateral and non-governmental sources. The projects may not have been explicitly conceptualized under the Global Taxonomy Initiative, but they do make clear contributions to the implementation of the activities envisaged by the Global Taxonomy Initiative.

5.2.1 National Project – Partnerships for Enhancing Expertise in Taxonomy (US)

The US National Science Foundation (NSF) has established a special competition, Partnerships for Enhancing Expertise in Taxonomy (PEET)¹³⁰, to support competitively reviewed research projects that target groups of poorly known organisms. Projects financed by the program must train new taxonomists and must translate current expertise into electronic databases and other products with broad accessibility to the scientific community. Many U.S. academic institutions and non-academic not-for-profit organizations including academic institutions, botanical gardens, freshwater and

¹³⁰ http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5451&org=BIO&from=fund

marine institutes, and natural history museums, have been involved in the partnerships program, and collaborating scientists in foreign countries can be accommodated through consultant mechanisms administered by the submitting U.S. organization. Some eighty taxonomic projects have been since 1994 financed by this program in the amount of over US\$46 million.

Application for this program follows the general guidelines contained in the NSF Grant Proposal Guide (GPG). Project proposals (maximum 15 pages) generally need to address five themes: taxonomic focus, methods of study, training, conceptual issues and dissemination of results. There is no co-financing requirement for proposals under this program.

5.2.2 GEF Project – The Indonesian Biodiversity Collection Project

The Indonesian Biodiversity Collection Project received a \$7 million grant over six years from the GEF through the World Bank¹³¹. The aim of the project was to strengthen institutional capacity of the Research and Development Center for Biology in Indonesia. The project had four components:

- Project Management and Coordination (staffing, management, institutional and sustainability issues);
- Systematic Collections and Research (storage, restoration, stabilization, and organization);
- Collections Information Systems Management (operation of the Indonesian Biodiversity Information System and development of IT skills); and

- Scientific Collaboration and Services (interns from Indonesian universities, mentors for specialist assistance in certain taxa, degree-and non-degree training, and publications).

In the Bogor Zoology Museum all specimens have been rehabilitated, moved and re-housed in a new 8,000 m², two-storey, purpose-built museum, donated by the Government of Japan. The new collection halls have state-of-the-art environmental control systems, with air conditioning system, dehumidifiers, hygroscopic wall panels, and all-new storage systems such as metal cabinets, drawers, unit trays and compactors. In the Bogor Herbarium nearly 200,000 specimens have so far been remounted on acid-free archival materials and re-stored in insect-proof metal cabinets. Air-conditioned rooms are provided for biosystematic studies. Type specimens are segregated and housed in a separate air-conditioned room. Nearly 1000 full-size, insect-proof metal cabinets have replaced the old metal boxes. The use of toxic chemicals for preservation has been stopped and replaced with drying and freezing technology in both institutes.

Eighteen staff members, including ten new recruits, are pursuing higher degrees (5 PhDs and 13 masters) in taxonomy. In both institutes all collection managers have been trained in collection management in leading institutes abroad. Specialists from around the world are coming to Bogor as ‘mentors’ to help organize parts of the collection and to share their experience with staff. Interns from university herbaria across Indonesia have been hosted in the Herbarium and Museum for 3-6 months to expand the

¹³¹ http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000009265_3961219143409

benefits and experience gained beyond the central facilities. This has stimulated interest in, and attention to, the roles of collections in biodiversity conservation and established firm relationships among national specialists.

The specimen-based Indonesian Biodiversity Information System has been developed. It consists of two databases (plants and animals), containing about 240,000 plant and 80,000 animal specimen records respectively. The project has also facilitated a publication program, mainly of Indonesian-language field-guides to promote biodiversity awareness. Nineteen titles have been produced.

5.2.3 GEF Project – SABONET (the Southern African Botany Diversity Network)

The Southern African Botanical Diversity Network (SABONET) is a capacity-building network of southern African herbaria and botanic gardens, with the objective of developing local botanical expertise. The ten countries participating in SABONET were Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe. SABONET's aims were to develop a strong core of professional botanists, taxonomists, horticulturists, and plant diversity specialists within the ten countries of southern Africa, competent to inventory, monitor, evaluate and conserve the botanical diversity of the region in the face of specific development challenges, and to respond to the technical and scientific needs of the Convention on Biological Diversity.

Although SABONET was not set up as a GTI project and, indeed, antedates the GTI, it meets a number of GTI objectives and can be used as a model. SABONET was a GEF Project implemented by the UNDP. South

Africa's National Botanical Institute (NBI) was the Executing Agency, responsible for the overall management and administration of the project. In addition to the GEF/UNDP funding, the project was co-funded by the USAID/IUCN ROSA through the NETCAB (Regional Networking and Capacity Building Initiative) Programme. SABONET ran from 1996 to 2005.

Southern Africa, as defined within the project, has a flora of over 30,000 species of flowering plants and ferns, including the whole of one of the world's six floristic kingdoms (the Cape Floristic Region, known locally as 'fynbos'). The region also includes seventeen centres of plant diversity as identified by the IUCN/WWF:

- Arid and semi-arid ecosystems (with roughly half of the world's known succulents);
- Coastal, marine and freshwater ecosystems (including several RAMSAR and World Heritage Sites);
- Forest ecosystems (most of which are under some form of threat); and
- Mountain ecosystems.

Despite this great botanical diversity, the countries of the region are poorly equipped in both infrastructure and human resources to inventory, monitor, and evaluate this heritage. Over the last few decades, support for the national herbaria and botanic gardens of southern Africa has been intermittent and sub-critical. In addition, many plant species are threatened with extinction, mainly through agricultural, mining, industrial, and urban activities. The 1997 IUCN Red List of Threatened Plants listed 2,652 plant species as threatened in the ten countries of southern Africa.

The outputs of SABONET included a project newsletter, occasional report series,

trained southern African plant taxonomists, horticulturists and plant diversity specialists, electronic information systems on the region's plant diversity (including maps and relational databases), regional human and infrastructural inventories, regional and national plant checklists and Red Data lists, and a Regional Botanic Gardens Conservation Strategy.

Additional information on SABONET can be found on the internet¹³².

5.2.4 GEF Project – Botanical and Zoological Taxonomic Networks in Eastern Africa (BOZONET): Linking Conservation to Taxonomy

This UNDP project will support the countries of East Africa (Ethiopia, Kenya, Tanzania, and Uganda) to remove barriers to the flow of relevant taxonomic information, from networked centres of expertise, to the range of end-users of such information, and to assist those end-users in the use of this information for the sustainable conservation of biodiversity, through inventory, description, monitoring, and dissemination.

5.2.5 GEF Project – Biodiversity Resources Development Project for Costa Rica

The Biodiversity Resources Development Project for Costa Rica¹³³ was funded by the GEF through the World Bank and ran from 1998 to 2005. Its objective was to demonstrate that increased knowledge and information about particular species enhance their value and increase the marketability of biodiversity services, by enhancing the knowledge

of Costa Rica's species, testing methodologies for undertaking a cost effective inventory, and maximizing the value of those species and the social return to the investment in knowledge through conservation and sustainable use. The project's four components were:

- Develop a framework for undertaking a biodiversity inventory of priority sub-groups within four major taxonomic groups at selected sites within five conservation areas;
- Undertake collection and cataloguing activities related to the inventory;
- Develop and test potential applications based on the inventory; and
- Strengthen the institutional capacity at the National Biodiversity Institute (INBio).

The project built on work previously carried out by INBio¹³⁴. The taxonomic groups included in this project are Hymenoptera, Coleoptera, Diptera, and fungi. These four groups were chosen because, together, they cover a wide spectrum of species richness and a broad range of niches and habitats. They also cover a range of collecting and cataloguing logistical challenges and represent a range of prior taxonomic knowledge and difficulty. Species from each group are represented at the national and international level, and can provide experience relevant to other countries. These four taxonomic groups are expected to generate a large number of potential applications and potential uses.

Five conservation areas were chosen as sites for collection activities, selected

¹³² <http://www.sabonet.org.za/index.htm>

¹³³ http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000009265_3980312102353

¹³⁴ <http://www.inbio.ac.cr/en/default.html>

because of their high coverage of Costa Rican biodiversity, significant endemism, and outstanding biological importance for Costa Rica and Meso-America, as well as their human, financial, and infrastructure resources.

Training of parataxonomists was undertaken by international specialists and Costa Rican scientists. The project is notable for the close collaboration between staff of northern institutes and local personnel.

5.2.6 *Bilateral – Example projects supported by the UK Darwin Initiative*

The project “Taxonomic capacity-building in support of biodiversity conservation in Thailand”¹³⁵, funded through the UK Darwin Initiative, aimed to establish capacity in Thailand for developing and maintaining national reference collections and identification facilities for insects in support of biodiversity conservation and research in Thailand. The outputs included keystone insect reference collections, expandable taxonomic database, expandable interactive website facility, application of remote sensing and GIS techniques, training of Thai museum staff and partners.

The project “Taxonomic training for a neglected biodiversity hotspot within Lao PDR”¹³⁶ aimed at providing training in tropical botanical taxonomy to staff in key institutes in Lao PDR, and to establish the foundation for National Species Database and Threatened Plant List. The outputs included: multilingual botanical dictionary, National Species Database, Threatened Plant List, plant checklist, incorporation of collections into herbaria, and scientific papers.

¹³⁵ <http://www.darwin.gov.uk/projects/details/13003.html>

¹³⁶ <http://www.darwin.gov.uk/projects/details/13007.html>

¹³⁷ <http://www.e-taxonomy.eu/index.php>

¹³⁸ <http://www.enbi.info/forums/enbi/index.php>

5.2.7 *Bilateral – Example projects supported by the Belgian Development Corporation and the Royal Belgian Institute of Natural Sciences*

The projects funded in 2004, the first year of the seed money availability, were:

- Herpetological Species Richness and Community Structure on the Kaieteur National Park Tepui (Guyana)
- Biodiversity assessment at three protected areas in northwest Cambodia
- Training Program for the Study of Biodiversity and Management of Rodents and Shrews in Eastern Congo (Kisangani)

5.2.8 *Regional European Union Initiatives*

At European level there are several projects that focus on elements of the GTI. One of these is the European Distributed Institute of Taxonomy (EDIT¹³⁷), which is a network sponsored by the European Commission which aims at starting to overcome the taxonomic impediment through collaboration and joint work programmes, including capacity-building. It has a budget of almost 12 million euros for the five year period 2006-2011. A second is the European Network for Biodiversity Information (ENBI¹³⁸), which focuses on information-sharing.

5.2.9 *Non-governmental – Investing in Nature: an eco-partnership between the HSBC Group, WWF, Botanic Gardens Conservation International and Earthwatch*

In 2002, the HSBC Group established, in eco-partnership with WWF, Botanical

Gardens Conservation International (BGCI) and Earthwatch, the Investing in Nature programme¹³⁹ with US\$50 million to fund conservation projects around the world over five years. Through BGCI, a US\$11.6 million donation from the programme will fund a living gene bank in botanic gardens around the world to protect 20,000 endangered plant species. It also helps BGCI raise public awareness of the value of plants through its 500 member gardens in 111 countries, revitalizing conservation in 16 major gardens in Argentina, Brazil, India, Indonesia, and the Middle East, and funding education programmes in Canada, China, Japan, the UK and the US.

5.3 Mobilizing funding

Obtaining funds to support GTI activities is challenging. The whole purpose of the GTI is to remove the taxonomic impediment to implementation of the CBD by providing the taxonomic information and skills required in a timely manner. In this context, it is critical that proposals for GTI-related activities show the linkages between those activities and achievement of the objectives of the CBD. The introduction and rationale of the GTI programme of work is a useful starting point in making those linkages.

Linking projects to identified needs and priorities – An important first step in attracting funding is clarifying needs and priorities. Assessment of taxonomic needs and capacities is the first objective of the programme of work for the GTI. Funding should generally be allocated primarily to activities that are particularly critical at national or regional level. This usually means a focus on the needs of particular users. At the same time,

however, there is a need for investment in basic alpha taxonomy, revisionary work and cataloguing in the long-term, because the taxonomic impediment is partly attributable to the unavailability of names for a vast majority of species. Donor agencies will need to be made aware that in some cases the taxonomic work that is more directly aligned with their priorities rests on basic taxonomic studies that have not been undertaken. As such, these form a necessary part of the process of implementation and should be considered eligible for funding. In any case, it is absolutely essential that potential donors are convinced of a need, and how that need relates to achievement of the CBD's objectives, otherwise the likelihood of success in mobilizing funding will be lower.

Understanding existing funding – Another key to mobilizing funding is understanding what other projects and initiatives have been or will be funded. This allows proposals to be developed that build on existing or past work in a complementary manner without unnecessary duplication. Governments will need to have a good understanding of past and current projects at national level in order to conduct their national taxonomic needs assessments. External resources may also be available, including the reports of the GEF and UK Darwin Initiative on their contributions to funding the GTI. In addition, governments recently requested the secretariats of the Convention and the GEF to conduct a joint analysis of funded projects related to the GTI – this analysis should be completed in the near future and will be made available through the GTI Portal.

Understanding how to prepare funding proposals – Taxonomic fund-raising involves expertise in both taxonomy and in

¹³⁹ <http://www.hsbc.com/hsbc/csr/community/investing-in-nature>

fund-raising. In cases where taxonomists and other biodiversity-specialists are responsible for developing projects, they may find fund-raising to be a challenge. Fortunately, there are some mechanisms available for developing fund-raising skills. For example, the COP has recently proposed a project development seminar, focussing on identified country-level needs, to promote formulation of country-driven projects, exploring development of new projects or enhancement of existing projects¹⁴⁰. This seminar is intended primarily for countries that have already identified their needs or have submitted proposals for GTI-related projects. Some countries are currently assessing taxonomic needs (see section 3.2.1), and the seminar will likely be convened once those assessments are completed.

There are many different sources of funding for biodiversity activities including the GTI. Multilateral, regional and bilateral financial and development agencies have

been the main sources of international assistance. Governments, non-governmental organisations, the private sector and research institutions are all active in financing, or mobilizing finance for, conservation and sustainable use of biological diversity. In spite of this diversity of sources, there are some commonalities between them which should be recognized in any effort to mobilize funding (see Text-box 5-1). General steps in developing an application for funding are highlighted in text box 5-2.

Awareness-raising – Funding decisions are partly political, requiring a balance among competing national and global priorities. Consequently, the taxonomic share of available finances will depend in part on the ability of the taxonomic community to raise awareness about taxonomic needs and to lobby governments to factor taxonomy into budget allocation decisions. All stakeholders should therefore take a long-term interest in awareness-raising.

Box 5-1 Common requirements of funding bodies for that may support the Global Taxonomy Initiative

In considering applications to a funding body to implement the GTI, the following issues should be considered:

- Alignment with remit of funding body. All funding bodies, whether national, bilateral or multinational, have their individual remit, limiting what and who they are able to fund. Within this remit they will have priorities. Both the priorities and the remit may or may not be closely aligned to the GTI, and any application for funding must fit the funding body criteria and priorities as well as those of the GTI to be successful.
- Clarity on purpose of project in terms of donor priorities.
- Explicit linkage to CBD implementation. Taxonomy is unlikely to be supported for its own sake by many donors in the development and implementation sector (funders in more academic sectors may take a different view). However, taxonomy in support of identified needs stands a better chance to be funded (e.g. conservation, sustainable use, quarantine, indicators of environmental damage). Many donors will require an

¹⁴⁰ decision VIII/3, paragraph 15

explicit and demonstrable link between the taxonomic work being proposed and the outcome, in terms of CBD implementation.

- Linkage to national and regional priorities:
 - National biodiversity strategy and action plan;
 - Capacity Development Initiative;
 - Country Dialogue Workshops;
 - National programmes.
- Consistency with International Conventions.
- Clarity of linkage between activities and outputs (i.e. if we do these activities we will get these outputs, and therefore achieve the desired product).
- Financial sustainability:
 - “A GEF project must be cost-effective, replicable and include an incentive-based design to ensure financial sustainability after the conclusion of GEF support.”
 - Financial sustainability can be demonstrated through, for example:
 - a. Direct financial commitment from the government;
 - b. Indirect commitment through allocation;
 - c. Stakeholder contribution;
 - d. Trust funds;
 - e. Long-term co-funding.
- Technical sustainability:
 - Data collection and monitoring techniques need to be realistic and within the country's and institution's long-term capacity;
 - Data collection needs to be replicable and standardized (both nationally and regionally);
 - Technical training needs to be applied, maintained and captured within the relevant agencies. Continuity of human resources is critical. Absence of staff for training and long-term maintenance should not jeopardize project goals;
 - Technical objectives and relevance needs frequent review by a technically-qualified group.
- Socio-political sustainability:
 - Include all political parties/stakeholders in project design (political cycles rarely conform to project lifetimes);
 - Identify Focal Points / contacts and discuss aims at an early stage;
 - Plan for continuous sensitisation and awareness within the project (this helps address changes in political parties, policy amendments and staff movements);
 - Review the social status and perceptions of the domestic population as it relates to project objectives – the better to realign and improve;
 - Identify the needs of decision-makers and politicians and try to embrace within project concepts to ensure commitment and sustainability.

Box 5-2 Steps in developing a project application for funding

1. Become familiar with national policies of the country or countries concerned, including the NBSAPs and the outcomes of any taxonomic needs assessments.
 2. Become familiar with the COP decisions on the GTI, and those relevant to any thematic areas or other cross-cutting issues of the Convention to which the proposed project is relevant.
 3. Ensure that the project meets needs identified within national policies, or is consistent with them, and is consistent with the CBD Articles and relevant decisions.
 4. Consider possible donors, multilateral (e.g. GEF (through UNDP, UNEP, World Bank), or the European Union), bilateral (e.g. USAID, CIDA, GTZ, DFID, DANIDA, SIDA) or partnership (e.g. the UK Darwin Initiative, the USA's NSF). There may also be possibilities through the Development Banks and other UN agencies such as the FAO. It is important to remember that for projects with a stated global benefit (Medium Sized and Full Projects, of <\$1,000,000 and >\$1,000,000 respectively) the GEF only provides co-financing, not the full amount.
 5. Especially if considering a multilateral or bilateral donor make contact with:
 - a. The National GTI Focal Point(s), if appointed
 - b. The National CBD Focal Point
 - c. The National or regional representative of the donor body (this may be at the appropriate embassy or consulate if a bilateral arrangement is being considered)
- In the case of the GEF:
- d. The local representative of the appropriate GEF implementing agency (UNEP / UNDP / World Bank).
 - e. The National GEF Operational Focal Point, who will have to endorse the project.
- And discuss the proposed project with them to establish its suitability and develop the initial funding proposal.

6. INFORMATION SOURCES AND USEFUL CONTACTS

6.1 Taxonomic tools and information sources

There are a number of tools available to assist taxonomists and others to meet taxonomic needs under the Convention. While an exhaustive list cannot be given here, some of the more important and useful tools are reviewed, many of which are available on the internet.

6.1.1 Nomenclature references

Stability of scientific nomenclature is important¹⁴¹. Taxonomists, editors and reviewers need to be aware of the provisions of the various Codes of Nomenclature. These codes can be acquired as hard copy or through the internet.

Zoology. The *International Code of Zoological Nomenclature* (International Commission on Zoological Nomenclature, 1999, ISBN 0 85301 006 4) is available on the internet¹⁴² or from the Secretariat of the ICZN, c/o The Natural History Museum - Cromwell Road - London SW7 5BD – UK. In addition, Thompson BIOSIS maintains a nomenclatural glossary for zoology on the internet¹⁴³.

Botany. The *International Code of Botanical Nomenclature* (currently the ‘St Louis Code’, to replace the earlier ‘Tokyo Code’) is available on line¹⁴⁴. The printed and only currently official version of the Code has been published as ‘International Code of Botanical Nomenclature (St Louis Code)’. *Regnum Vegetabile* **138**. Koeltz Scientific Books, Königstein. ISBN 3-904144-22-7.

Bacteriology. The *International Code of Nomenclature of Bacteria (1990 Revision)* has been published by the American Society for Microbiology, Washington DC. (Lapage, *et al.* (eds), 1992). The ‘List of bacterial names with standing in nomenclature’ includes, alphabetically and chronologically, the nomenclature of bacteria and the nomenclatural changes as cited in the *Approved Lists of Bacterial Names* or validly published in the *International Journal of Systematic Bacteriology* or in the *International Journal of Systematic and Evolutionary Microbiology* is available on line¹⁴⁵.

Virology. The International Code of Virus Classification and Nomenclature is available on line¹⁴⁶ and in Regenmortel *et al.* (2000). The International Committee on Taxonomy of Viruses web site¹⁴⁷ hosts or links to a vast amount of information on virus taxonomy, and is a vital resource.

6.1.2 Other taxonomic tools

There are a number of tools for analysis and compiling specialist databases that are available for use by those studying and analysing biodiversity from the taxonomic perspective. The list given below is by no means exhaustive, and only serves to exemplify what is available. There is no uniformity in the descriptions of the packages, since these are based on information provided on the web sites explaining or promoting the products. The ‘Phylogeny Programs’ web site¹⁴⁸ lists additional phylogenetic analysis programmes, and also provides links to servers

¹⁴¹ see decision IV/1.D in annex 8 to this Guide

¹⁴² <http://www.iczn.org/iczn/index.jsp>

¹⁴³ <http://www.biosis.org/support/glossary/>

¹⁴⁴ <http://www.bgbm.fu-berlin.de/iapt/nomenclature/code/SaintLouis/0000St.Luistitle.htm>

¹⁴⁵ <http://www.bacterio.cict.fr/index.html>

¹⁴⁶ <http://www.ncbi.nlm.nih.gov/ICTV/rules.html>

¹⁴⁷ <http://www.ncbi.nlm.nih.gov/ICTV/>

¹⁴⁸ <http://evolution.genetics.washington.edu/phylip/software.html>

providing phylogenetic analyses on line without charge.

ArcView¹⁴⁹ is a desktop geographic information system. With ArcView one can create intelligent, dynamic maps using data from virtually any source and across most popular computing platforms. ArcView provides the tools to allow one to work with maps, database tables, charts, and graphics simultaneously. One can also use multimedia links to add pictures, sound, and video to maps.

Biótica¹⁵⁰ is designed to handle curatorial, nomenclatural, geographical, bibliographical and ecological data. Its purpose is to assist the capture and updating of such data.

BioLink¹⁵¹ is designed for those working with taxon- and specimen-based information, particularly taxonomists, ecologists, collection managers and biogeographers. It is suitable for use by individual researchers, large collection-holding institutions, or global collaborations. The programme manages taxon-based information such as nomenclature, distribution, classification, ecology, morphology, illustrations, multimedia and literature. Specimen-based information includes collection sites, collectors and collection dates, museum storage locations, loans and accession and catalogue numbers. BioLink also records information on ecological characteristics, traps and bulk samples.

Biota 2¹⁵² manages specimen-based biodiversity and collections data for ecologists, biodiversity inventories, and collections managers. It can manage images and literature citation records linked to species, specimen,

collection and locality records. It also includes a Web server offering query-based access to data and images.

The **DELTA**¹⁵³ format (DEscription Language for TAXonomy) is a flexible method for encoding taxonomic descriptions for computer processing. It has been adopted by the International Taxonomic Databases Working Group (TDWG) as a standard for data exchange. DELTA-format data can be used to produce natural-language descriptions, interactive or conventional keys, cladistic or phenetic classifications, and information-retrieval systems.

DiGIR¹⁵⁴ is a protocol and a set of tools for linking a community of independent databases into a single, searchable “virtual” collection. The DiGIR protocol was developed by the University of Kansas Biodiversity Research Center Informatics group in collaboration with the Museum of Vertebrate Zoology at UC Berkeley and the California Academy of Sciences. DiGIR is currently a public open source project with an international team of contributors, including Centro de Referência em Informação Ambiental (CRIA), Brazil. It, along with BioCASE, is used to link many of the data providers to GBIF.

GARP¹⁵⁵ (Genetic Algorithm for Rule-set Production) is an algorithm that determines characteristics of a species native habitat based on environmental data observed at known collection points. A GARP analysis looks for similarities in the environmental profiles of the collection locations and forms conclusions about the range of the species based on factors such as

¹⁴⁹ <http://www.esri.com/software/arcview/>

¹⁵⁰ http://www.conabio.gob.mx/informacion/biotica_ingles/doctos/acerca_biotica.html

¹⁵¹ <http://www.bioblink.csiro.au/index.html>

¹⁵² <http://viceroy.eeb.uconn.edu/biota>

¹⁵³ <http://biodiversity.uno.edu/delta/>

¹⁵⁴ <http://www.specifysoftware.org/Informatics/informaticsdigir/>

¹⁵⁵ <http://www.specifysoftware.org/Informatics/informaticsdesktopgarp/>

temperature, precipitation, elevation, and soil type.

ITIS Taxonomic Workbench¹⁵⁶ - The ITIS Taxonomic Workbench is a Windows-based software tool used for editing and manipulating taxonomic data for submission into the ITIS online system. It covers names relationships, references, and distributional data.

KE EMu¹⁵⁷ provides collections management facilities for museums, art galleries, herbaria and botanic gardens. KE EMu is a feature rich museum management system designed to provide comprehensive management and access to very large and diverse collections. Unlike other museum software, KE EMu integrates an extensible multi-discipline catalogue with interpretative information and multimedia resources. Natural history support includes taxonomic definitions, specimen identification, type status, field trips and a gazetteer. KE EMu supports multi-discipline querying with automatic adjustment of display based on the object's type. EMu supports all museum management functions, including accessioning, deaccessioning, program and exhibition development and general event management, loans and external movements, internal locations and internal movement histories, conservation and condition checks, insurance, indemnity, valuation. All management modules conform to the 'SPECTRUM' standard for museum documentation. EMu allows association of specimen data, names, images, documentation and other information. It is used by many major museums. Supporting a range of

industry standards, including DiGIR, Darwin Core, XML and Dublin Core, KE EMu is used by the world's largest natural history museums.

Linnaeus II¹⁵⁸ facilitates biodiversity documentation and species identification. It is devised for systematists and biodiversity researchers. It supports the creation of taxonomic databases, the construction of easy-to-use identification keys, and allows the display and comparison of distribution patterns.

LUCID¹⁵⁹ is a set of programmes that can be used for creating and editing identification keys. It also handles with images and taxonomic descriptions.

MacClade¹⁶⁰ provides theory and tools for the graphic and interactive analysis of molecular and morphological data, phylogeny, and character evolution. The program includes many tools for data manipulation, including molecular sequence alignment. *MacClade* reconstructs and displays character evolution on the phylogenetic tree, and, as the user manipulates the tree on screen, the program gives feedback via tree graphics, statistics, and charts. Systematists and other evolutionary biologists can use its flexible tools to analyze phylogeny and character evolution, and its ease of use allows beginning students to grasp phylogenetic principles in an interactive environment.

Mantis¹⁶¹ is a biological database manager that can store taxonomic and specimen data, images and sounds. It includes management tools for citations, specimen loans, and addresses. It can generate publication-ready "Material examined" lists and publication-ready "Specimen measurements" tables. It

¹⁵⁶ <http://www.itis.usda.gov/twb.html>

¹⁵⁷ <http://www.kesoftware.com/emu/>

¹⁵⁸ <http://www.eti.uva.nl/Products/Linnaeus.html>

¹⁵⁹ <http://www.lucidcentral.com/>

¹⁶⁰ <http://www.sinauer.com/detail.php?id=4707>

¹⁶¹ <http://140.247.119.145/Mantis/>

can store information about parasites, host plants etc. and includes label design tools.

MEKA¹⁶² is a programme to enable rapid identification of biological specimens. The user picks character states present in specimens from a list of possibilities. As the character states are scored by user selection, MEKA eliminates taxa that no longer match the list of scored character states. Windows display different aspects of the underlying database. As the identification progresses the windows are updated automatically. An index screen makes it easy to find and score particular classes of character states. MEKA allows the user to perform identifications by scoring character states in any order, making it possible to identify fragmentary Specimens.

Mesquite¹⁶³ is software for evolutionary biology, designed to help biologists analyze comparative data about organisms. Its emphasis is on phylogenetic analysis, but some of its modules concern population genetics, while others do non-phylogenetic multivariate analysis. Because it is modular, the analyses available depend on the modules installed. Analyses include, reconstruction of ancestral states (parsimony, likelihood), tests of process of character evolution, including correlation, Simulation of character evolution (categorical, DNA, continuous), parametric bootstrapping (integration with programs such as PAUP and NONA), morphometrics (PCA, CVA, geometric morphometrics), and coalescence (simulations, other calculations), tree comparisons and simulations (tree similarity, Markov speciation models).

NONA¹⁶⁴ is a Windows command line/text program used to search for most

parsimonious trees, calculate consensus trees, etc. It is extremely fast, in general MUCH faster than competing software. Winclada¹⁶⁵ is written to utilize NONA either directly as a search engine for phylogenetic analysis, or the two programs may be used separately.

PAUP¹⁶⁶ ('Phylogenetic Analysis Using Parsimony') is a widely-used program used for cladistic analysis based on the input of a character matrix. It can analyse both morphological and molecular data, and includes parsimony, distance matrix, invariants, and maximum likelihood methods as well as many indices and statistical tests.

Platypus¹⁶⁷ - Platypus is a relational database program developed by the ABRs Fauna Online project that is used to automatically compile and generate the web files for the *Australian Faunal Directory*. It manages taxonomic, geographic, ecological, host-taxon, palaeontological, bibliographic and graphic information, as well as botanical names and specimen collection data. Data compiled in Platypus can readily be made available to GBIF. The expected users are taxonomists, collection managers, ecologists; and compilers of checklists, catalogues, bibliographies, graphics and biodiversity information.

Specify¹⁶⁸ is a research application, a database, and network interface for biological collections information. It manages specimen data such as descriptions of collecting locations, participants and determination histories as well as information about collections transactions such as loans, exchanges, accessions and gifts. It is

¹⁶² <http://www.mip.berkeley.edu/meke/>

¹⁶³ <http://mesquiteproject.org/mesquite/mesquite.html>

¹⁶⁴ http://www.cladistics.com/about_nona.htm

¹⁶⁵ <http://www.cladistics.com/>

¹⁶⁶ <http://paup.csit.fsu.edu/>

¹⁶⁷ <http://www.deh.gov.au/biodiversity/abrs/online-resources/software/platypus/index.html>

¹⁶⁸ <http://www.specifysoftware.org/Specify>

designed to facilitate accurate, consistent and efficient data entry. For example, a user only has to enter information about a location once and that description then applies to all events and specimens that reference it. Similarly, information about a person only has to be entered once, and that person can then be associated with specimens as a collector, donor, determiner, borrower or loan provider. Specify can serve XML-structured specimen records using the DiGIR protocol, now used for many collections.

TreeBASE¹⁶⁹ is a relational database of phylogenetic information hosted by the University at Buffalo. TreeBASE stores phylogenetic trees and the data matrices used to generate them from published research papers. TreeBASE accepts all types of phylogenetic data (e.g., trees of species, trees of populations, trees of genes) representing all biotic taxa.

6.2 Key partners

There are an increasing number of national and international initiatives with objectives supporting or congruent with those of the GTI. Annex 7 provides contact information for some of the key bodies and organizations that contribute to the GTI. This section provides details on two key institutions that play leading roles in the implementation of the GTI programme of work, namely BioNET-INTERNATIONAL (with a focus on capacity-building) and the Global Biodiversity Information Facility (with a focus on information-sharing). There is also a short explanation about the CBD's clearing-house mechanism.

BioNET-INTERNATIONAL¹⁷⁰, the Global Network for Taxonomy, is a global

initiative for capacity-building in taxonomy in developing countries. It is comprised of sub-regional LOOPs (Locally Organised and Operated Partnerships) of developing country institutions, supported by a consortium of developed country institutions, and managed by the BioNET-INTERNATIONAL Technical Secretariat. Its purpose is to enable developing countries to achieve realistic self-reliance in taxonomy to support regional and national programmes for eradication of poverty, via sustainable use of natural resources and agricultural development, and conservation of biodiversity (including implementation of the Convention on Biological Diversity). BioNET-INTERNATIONAL and its LOOPs have been active in developing and implementing the GTI. Building on past collaboration, the BioNET and CBD Secretariats have agreed to strengthen cooperation at the LOOP and global levels, with efforts particularly focussed on the 2010 biodiversity target. Areas identified for joint work include taxonomy-related aspects of the clearing-house mechanism, biosafety, technology transfer and, via the Global Taxonomy Initiative, other areas of the Convention. Established LOOPs exist in the Caribbean (CARINET), Northern, East, West and southern Africa (NAFRINET, EAFRINET, WAFRINET and SAFRINET respectively), South East Asia (ASEANET), East Asia (EASIANET), the Andean Countries (ANDINONET), the South Pacific (PACINET) and Europe (EuroLOOP). Proposed LOOPs awaiting government endorsements are South Asia (SACNET), North Eurasia (NEURASIANET) the South America Southern Cone (LATINET), Mesoamerica (MESOAMERINET).

¹⁶⁹ <http://www.treebase.org/treebase/>

¹⁷⁰ <http://www.bionet-intl.org/>

The Global Biodiversity Information Facility (GBIF)¹⁷¹

The mission of GBIF is to make the world's primary data on biodiversity freely and universally available via the Internet. The GBIF vision is that it will contribute to economic growth, ecological sustainability, social outcomes and scientific research by increasing the utility, availability and completeness of primary scientific biodiversity information available on the Internet. GBIF works cooperatively with and in support of several other international organizations concerned with biodiversity. These include (but are not limited to) the CHM and the GTI of the CBD, and regional biodiversity information networks, such as the European Network for Biodiversity Information (ENBI)¹⁷², which may also provide tools and training. Functionally, GBIF encourages, coordinates and supports the development of worldwide capacity to access the vast amount of biodiversity data held in natural history museum collections, libraries and databanks. Near term GBIF developments will focus on species and specimen- and observation-level data. Technically, GBIF is evolving to be an interoperable network of biodiversity databases and information technology tools using web services and Grid technologies. In the near term, GBIF will provide a global metadata registry of the available biodiversity data with open interfaces. Anyone can then use it to construct thematic portals and specialised search facilities. Building on the contents of this registry, GBIF will provide its own central portal that enables simultaneous queries against biodiversity databases held by distributed, worldwide sources. In the long term, molecular, genetic, ecological and

ecosystem level databases can be linked to the system. These will facilitate and enable data mining of unprecedented utility and scientific merit. As its work programs progress, GBIF will enable users to navigate and put to use the world's vast quantities of biodiversity information. This information is vital to generating economic, environmental, social and scientific benefits from the sustainable use, conservation and study of biodiversity resources.

The **clearing-house mechanism (CHM)**¹⁷³ of the Convention on Biological Diversity seeks to support the Convention's thematic and cross-cutting programmes of work by promoting cooperation in six key areas: tools for decision-making, training and capacity-building, research, funding, technology transfer, and the repatriation of information. Its aims are to: promote and facilitate technical and scientific cooperation, within and between countries; develop a global mechanism for exchanging and integrating information on biodiversity and; develop the necessary human and technological network. The clearing-house mechanism is coordinated by the Executive Secretary and overseen and guided by an Informal Advisory Committee (IAC) set up by the Parties to the Convention. In addition, a network of National Focal Points for the mechanism addresses matters relating to technical and scientific cooperation. The GTI portal is the part of the CHM dedicated to the GTI.

6.3 Further information

Further information on the GTI is available through the GTI Portal. In addition, the

¹⁷¹ <http://www.gbif.org>

¹⁷² <http://www.enbi.info/forums/enbi/index.php>

¹⁷³ <http://www.biodiv.org/chm/default.aspx>

annexes to this Guide are also intended to provide additional information. Annex 1 is a list of acronyms used in this guide and, in cases of organizations, associated web links. A list of references and other publications for further reading is compiled in Annex 2 to this Guide. Annex 3 lists documents specific to taxonomy and the GTI which have been produced under the auspices of the CBD. Annex 4 summarizes excerpts from COP decisions which are not specific to the GTI but which cross-reference the GTI in the

context of other work programmes. Annex 5 contains the strategy for taxonomic capacity-building developed at the Third Global Taxonomy Workshop, held in Pretoria in 2002, and a workshop in Paris, held in 2003. Annex 6 gives a sample questionnaire that can be adapted for use in national taxonomic needs assessments. Annex 7 provides contact information for key partners and organizations. Annexes 8 through 13 contain decisions on the GTI from the third to the eighth meetings of the COP.

ANNEX 1.

ACRONYMS USED IN TEXT

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
ABRS	Australian Biological Resources Study	The ABRS is a Program within Parks Australia Division of the Department of the Environment and Heritage. Its aim is to provide, through strategic partnerships, the underlying taxonomic knowledge necessary for the conservation and sustainable use of Australia's biodiversity.	http://www.deh.gov.au/biodiversity/abrs/
AHTEG	Ad-Hoc Technical Expert Group	Group of experts set up by the CBD to advise on any particular issue. Members are drawn from the CBD Roster of Experts	
ANDINONET		A Technical Cooperation Network to support capacity building in Taxonomy for the Countries of the Andean Community (Bolivia, Colombia, Ecuador, Peru and Venezuela)	http://www.bionet-intl.org/andinonet/
ASEANET		A Technical Cooperation Network to support capacity building in Taxonomy for the Countries of the ASEAN region.	
BioCASE	Biological Collections Access Service for Europe	BioCASE will establish a web-based information service providing researchers with unified access to biological collections in Europe while leaving control of the information with the collection holders. The aim is to enhance	http://www.biocase.org/

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
		the over-all value of biological collections as an essential, but presently fragmented and under-exploited European research infrastructure for environmental sciences, systematics, and life sciences in general, by means of implementing a sustainable and expandable information service, which provides researchers with unified access to all European collections, while leaving the control over the information supply in the hands of the information providers. BioCASE, along with DiGIR, are used by GBIF to link many of its data providers.	
BOZONET	Botanical and Zoological Taxonomic Networks in Eastern Africa	See text	
CABI	CAB International	CAB International is a not-for-profit organisation. Its purpose is the generation, dissemination and use of knowledge in the applied biosciences to enhance development, human welfare and the environment.	http://www.cabi.org/
CBD	Convention on Biological Diversity		http://www.biodiv.org

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
CCC	Coral Cay Conservation	It is a not-for-profit organisation at the “cutting edge of ecotourism”. It sends teams of volunteers to survey some of the world’s most endangered coral reefs and tropical forests. Its mission is to protect these crucial environments by working closely with the local communities who depend on them for food and livelihood.	http://www.coralcay.org/index.php
CCD	United Nations Convention to Combat Desertification		http://www.unccd.int/main.php
CETAF	Consortium of European Taxonomic Facilities		http://www.cetaf.org/
CoML	Census of Marine Life	See text	http://www.coml.org/coml.htm
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna.		http://www.cites.org/
CMS	United Nations Convention on Migratory Species		http://www.wcmc.org.uk/cms/
CONABIO	National Commission for the Knowledge and Use of the Biodiversity	A Mexican Inter-Ministerial Commission mainly dedicated to: conform and keep updated the National System of Biodiversity Information (SNIB); support projects and studies focused on the knowledge and sustainable use of	http://www.conabio.gob.mx/

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
		biodiversity; advise governmental institutions and other sectors; undertake special projects; share the knowledge of biological diversity; follow up of international agreements related to biodiversity; and provide services to the public.	
COP	Conference of the Parties	The COP is the governing body of the Convention on Biological Diversity, and advances implementation of the Convention through the decisions it takes at its periodic meetings. Some other UN Conventions also have a COP.	
CSD	UN Commission on Sustainable Development		http://www.un.org/esa/sustdev/
ENHSIN	European Natural History Specimen Information Network		http://www.nhm.ac.uk/science/rco/enhsin/
ENBI	European Network for Biodiversity Information	For using, monitoring and understanding the world's biodiversity it is necessary to utilize the existing biodiversity information to its full potential. Primary biodiversity data will therefore have to be digitised and made accessible through an integrated shared information	http://www.enbi.info/forums/enbi/index.php

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
ETI	Expert Center for Taxonomic Identification	infrastructure. The major objective of ENBI is to establish a strong European network for this purpose.	http://www.eti.uva.nl/
		The ETI is a non-governmental organization in operational relations with UNESCO. It stated mission is to develop and produce scientific and educational computer-aided information systems, to improve the general access to and promote the broad use of taxonomic and biodiversity knowledge worldwide. It maintains on its web site a list of taxonomists with a global basis.	
FAO	Food and Agriculture Organization of the United Nations		http://www.fao.org/
GBIF	Global Biodiversity Information Facility	See section 6	http://www.gbif.org
GEF	Global Environment Facility	Financial mechanism for the Convention on Biological Diversity. See text for more details.	http://www.gefweb.org/
GISIN	Global Invasive Species Information Network		http://invasivespecies.nbii.gov/as/gisin.htm (moving to: http://www.gisnetwork.org)

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
GISP	Global Invasive Species Programme. See text for details	See text for details	
GMBA	Global Mountain Biodiversity Assessment		http://www.unibas.ch/gmba/
GSPC	Global Strategy for Plant Conservation	CBD strategy linked to the GTI – see text	http://www.biodiv.org/programmes/cross-cutting/plant/default.asp
GTI	Global Taxonomy Initiative		
IAS	Invasive Alien Species		
ICIMOD	International Centre for Integrated Mountain Development		http://www.icimod.org/
IOC	Intergovernmental Oceanographic Commission (UNESCO)	IOC provides member states of the United Nations with an essential mechanism for global co-operation in the study of the ocean. The IOC assists governments to address their individual and collective ocean and coastal problems through the sharing of knowledge, information and technology and through the coordination of national programs.	http://ioc.unesco.org/iocweb/index.php

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
IOS	The International Oceanographic Commission of UNESCO		
IPI	International Initiative for the Conservation and Sustainable Use of Pollinators	Programme set up within the Agricultural Biodiversity thematic Area of the CBD	http://www.biodiv.org/programmes/areas/ agro/pollinators.asp
IPNI	International Plant Names Index	The International Plant Names Index (IPNI) is a database of the names and associated basic bibliographical details of all seed plants. Its goal is to eliminate the need for repeated reference to primary sources for basic bibliographic information about plant names. The data are freely available and are gradually being standardized and checked. IPNI will be a dynamic resource, depending on direct contributions by all members of the botanical community.	http://www.ipni.org/index.html
ITIS	Integrated Taxonomic Information System	A source of taxonomic information for some groups of plants, animals, and microbes of North America and the world. ITIS is a partnership of U.S., Canadian, and Mexican agencies; other organizations; and taxonomic specialists. ITIS is also a partner of Species 2000 and the GBIF.	http://www.itis.usda.gov/index.html .

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
LOOP	Locally Owned and Operated Partnership of BioNET- INTERNATIONAL	Regional Technical Cooperation Networks in Taxonomy set up as part of BioNET-INTERNATIONAL	
MEA	The Millennium Ecosystem Assessment	The Millennium Ecosystem Assessment (MA) is an international work program designed to meet the needs of decision makers and the public for scientific information concerning the consequences of ecosystem change for human well-being and options for responding to those changes. The MA was launched by U.N. Secretary-General Kofi Annan in June 2001 and it will help to meet assessment needs of the Convention on Biological Diversity, Convention to Combat Desertification, the Ramsar Convention on Wetlands, and the Convention on Migratory Species, as well as needs of other users in the private sector and civil society. If the MA proves to be useful to its stakeholders, it is anticipated that an assessment process modeled on the MA will be repeated every 5–10 years and that ecosystem assessments will be regularly conducted at national or sub- national scales.	http://www.millenniumassessment.org/en/index.aspx
NHM	The Natural History Museum, London	Globally-significant collections, library and source of taxonomic expertise.	http://www.nhm.ac.uk

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
NSBAP	National Biodiversity and Action Plan		
ICIPE	International Center for Insect Physiology and Ecology	ICIPE's mandate is to conduct research, train, and develop methods for managing pests and disease vectors in environmentally friendly ways and enhance the useful effects of arthropods. This mandate is reflected in the operative 4-H paradigm, of improving human, animal, plant and environmental health.	http://www.icipe.org/
ICTV	The International Committee on taxonomy of Viruses	See text	http://www.ncbi.nlm.nih.gov/ICTV/
IPPC	International Plant Protection Convention	The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. It is governed by the Interim Commission on Phytosanitary Measures (ICPM)	https://www.ippc.int/IPPC/En/default.jsp
ITIS	International Taxonomic information System	See text	http://www.itis.usda.gov/
IUCN	The World Conservation Union	Has members from some 140 countries include 77 States, 114 government agencies, and 800-plus NGOs. More than	http://www.iucn.org/

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
		10,000 internationally-recognised scientists and experts from more than 180 countries volunteer their services to its six global commissions. Its 1000 staff members in offices around the world are working on some 500 projects. For more than 50 years this 'Green Web' of partnerships has generated environmental conventions, global standards, scientific knowledge and innovative leadership.	
OASIS	Oceanic seamounts: an integrated study		http://www.rrz.uni-hamburg.de/OASIS/ Pages/page1.html
PoW	Programme of Work (generally, in the Guide, of the GTI)		
RBGK	Royal Botanic Gardens, Kew		http://www.rbgekew.org.uk/
SABONET	The South African Botanical Network	See text	
SACNET	Southern Asian network for taxonomic capacity-building	SACNET is a regional loop of BioNET- INTERNATIONAL. It will function as the node for exchange of information and expertise in Taxonomy in the region; organise capacity building activities; liaise with other such Networks globally and support implementation of the work	http://www.biodiversityasia.org/sacnet/

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
		programme of the Convention on Biological Diversity through the Global Taxonomy Initiative (GTI) in South Asia.	
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice	Its functions include: providing assessments of the status of biological diversity; assessments of the types of measures taken in accordance with the provisions of the Convention; and responding to questions that the COP may put to the body. How SBSTTA carries out its work is described in its <i>modus operandi</i> , which can be found in Annex 1 of decision IV/16 (as amended by decision V/20).	
SCBD	Secretariat of the Convention on Biological Diversity		
SI	Smithsonian Institution	Globally-significant collections, library and source of taxonomic expertise.	http://www.si.edu/
SPP	Species Plantarum Project	A long term project aiming to record essential taxonomic information on vascular plants on a world basis. It may be likened to a World Flora. It is expected that it will include accepted names and synonyms with places of publication and types, short descriptions of all taxa from family to infraspecific rank, keys, distributions, references to literature	

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
SP2000	Species 2000	See text	http://www.sp2000.org/
uBio	Universal Biological Indexer and Organizer	uBio is an initiative within the science library community to join international efforts to create and utilize a comprehensive and collaborative catalog of names of all living (and once-living) organisms. The Taxonomic Name Server (TNS) catalogs names and classifications to enable tools that can help users find information on living things using any of the names that may be related to an organism.	http://www.ubio.org/
UNDP	United Nations Development Programme	Acts as an implementing agency for the GEF.	
UNEP	United Nations Environment Programme	Acts as an implementing agency for the GEF.	
UNESCO	United Nations Educational, Scientific and Cultural Organisation		http://www.unesco.org/science/index.shtml
WFCC	World Federation of Culture Collections	The WFCC is a Multidisciplinary Commission of the International Union of Biological Sciences (IUBS) and a	http://www.wfcc.info/

ACRONYM / TERM	NAME OF INSTITUTION	DESCRIPTION	URL IF APPROPRIATE
		Federation within the International Union of Microbiological Societies (IUMS). The WFCC is concerned with the collection, authentication, maintenance and distribution of cultures of microorganisms and cultured cells. Its aim is to promote and support the establishment of culture collections and related services, to provide liaison and set up an information network between the collections and their users, to organise workshops and conferences, publications and newsletters and work to ensure the long term perpetuation of important collections.	
WSSD	World Summit on Sustainable Development	1992 Summit in Johannesburg	http://www.johannesburgsummit.org/
WWF	World Wide Fund for Nature	WWF is a global organization acting locally through a network of family offices. All these offices do all they can to halt the accelerating destruction of our natural world.	http://www.panda.org/

ANNEX 2.

REFERENCES AND FURTHER READING

(n.b., see also many CBD documents listed in annex 3, and other documents referenced in footnotes throughout the text of this guide)

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ANNEX 3.

CONVENTION DOCUMENTS SPECIFICALLY ON TAXONOMY AND THE GLOBAL TAXONOMY INITIATIVE

This annex lists documents prepared for SBSTTA, recommendations of SBSTTA, documents prepared for COP, COP decisions, and other documents.

Documents submitted to SBSTTA

UNEP/CBD/SBSTTA/2/5

Practical approaches for capacity-building for taxonomy. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-02/official/sbstta-02-05-en.pdf>

UNEP/CBD/SBSTTA/3/Inf.32/

GEF Workshop: Removing the taxonomic impediment. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-03/information/sbstta-03-inf-32-en.pdf>

UNEP/CBD/SBSTTA/4/6/

Further advancement of the Global Taxonomy Initiative. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-04/official/sbstta-04-06-en.pdf>

UNEP/CBD/SBSTTA/4/6/CORR.1

Further advancement of the Global Taxonomy Initiative. (corrigendum) <http://www.biodiv.org/doc/meetings/sbstta/sbstta-04/official/sbstta-04-06-corr1-en.pdf>

UNEP/CBD/SBSTTA/4/INF/1

The Global Taxonomy Initiative: Shortening the Distance Between Discovery and Delivery. Report of a meeting held at Linnean Society, London, UK on September 10-11 1998 <http://www.biodiv.org/doc/meetings/sbstta/sbstta-04/information/sbstta-04-inf-01-en.pdf>

UNEP/CBD/SBSTTA/4/INF/6

The Global Taxonomy Initiative: recommendations from DIVERSITAS Element 3, including an assessment of present knowledge of key species groups <http://www.biodiv.org/doc/meetings/sbstta/sbstta-04/information/sbstta-04-inf-06-en.pdf>

UNEP/CBD/SBSTTA/4/INF/7

The Global Taxonomy Initiative: Using Systematic Inventories to Meet Country and Regional Needs. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-04/information/sbstta-04-inf-07-en.pdf>

UNEP/CBD/SBSTTA/5/4

Item 3.3 of the Provisional Agenda Review of the Global Taxonomy Initiative. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-05/official/sbstta-05-04-en.pdf>

SBSTTA/5 inf GTI.

Mechanisms for management of the GTI, with a consideration of traditional and indigenous knowledge perspectives on current taxonomic systems. Report of a meeting held 20 December 1999 at UNESCO, Paris. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-05/information/sbstta-05-inf-gti-en.pdf>

UNEP/CBD/SBSTTA/6/10

The Global Taxonomy Initiative. Draft work programme. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-06/official/sbstta-06-10-en.pdf>

UNEP/CBD/SBSTTA/6/INF/4

Global Taxonomy Initiative. Progress report on the Global Taxonomy Initiative <http://www.biodiv.org/doc/meetings/sbstta/sbstta-06/information/sbstta-06-inf-04-en.pdf>

UNEP/CBD/SBSTTA/6/INF/4/ADD1

Global Taxonomy Initiative. Progress report on the Global Taxonomy Initiative Regional Meeting of Scientists in Central America, Costa Rica, 6-9 February 2001 <http://www.biodiv.org/doc/meetings/sbstta/sbstta-06/information/sbstta-06-inf-04-add1-en.pdf>

UNEP/CBD/SBSTTA/8/3

Progress in the implementation of the programmes of work on cross-cutting issues [includes a component on the GTI] <http://www.biodiv.org/doc/meetings/sbstta/sbstta-08/official/sbstta-08-03-en.pdf>

UNEP/CBD/SBSTTA/9/3

Progress in the implementation of the work on cross-cutting issues [includes a component on the GTI] <http://www.biodiv.org/doc/meetings/sbstta/sbstta-09/official/sbstta-09-03-en.pdf>

UNEP/CBD/SBSTTA/9/INF/16

Global Taxonomy Initiative: Progress and implementation of the programme of work <http://www.biodiv.org/doc/meetings/sbstta/sbstta-09/information/sbstta-09-inf-16-en.pdf>

UNEP/CBD/SBSTTA/9/INF/17

Preliminary report of first Global Taxonomy Initiative workshop in Asia <http://www.biodiv.org/doc/meetings/sbstta/sbstta-09/information/sbstta-09-inf-17-en.pdf>

UNEP/CBD/SBSTTA/9/INF/30

Draft guide to the Global Taxonomy Initiative. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-09/information/sbstta-09-inf-30-en.pdf>

UNEP/CBD/SBSTTA/10/3

Progress report on the implementation of the programmes of work on relevant cross-cutting issues [includes a component on the GTI] <http://www.biodiv.org/doc/meetings/sbstta/sbstta-10/official/sbstta-10-03-en.pdf>

UNEP/CBD/SBSTTA/10/16

The Global Taxonomy Initiative: Development of the process and the guidelines for the in-depth review of the programme of work <http://www.biodiv.org/doc/meetings/sbstta/sbstta-10/official/sbstta-10-16-en.pdf>

UNEP/CBD/SBSTTA/10/17

Outline of the Global Taxonomy Initiative guide. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-10/official/sbstta-10-17-en.pdf>

UNEP/CBD/SBSTTA/11/5

In-depth review of the implementation of the programme of work for the Global Taxonomy Initiative. <http://www.biodiv.org/doc/meetings/sbstta/sbstta-11/official/sbstta-11-05-en.pdf>

UNEP/CBD/SBSTTA/11/5/Add.1

In-depth Review of the Implementation of the Programme of Work for the Global Taxonomy Initiative: Elements of Planned Activities for the New Programmes of Work <http://www.biodiv.org/doc/meetings/sbstta/sbstta-11/official/sbstta-11-05-add1-en.pdf>

Recommendations of SBSTTA**SBSTTA Recommendation II/2:**

Practical approaches for capacity-building for taxonomy. (This was endorsed by COP III/10, and thus forms part of that decision.) <http://www.biodiv.org/recommendations/?m=SBSTTA-02&id=6993&lg=0>

SBSTTA Recommendation IV/2.
Further advancement of a Global
Taxonomy Initiative. <http://www.biodiv.org/recommendations/?m=SBSTTA-04&id=7012&lg=0>

SBSTTA Recommendation V/3.
Review of the Global Taxonomy Initiative.
<http://www.biodiv.org/recommendations/?m=SBSTTA-05&id=7020&lg=0>

SBSTTA Recommendation VI/6
The Global Taxonomy Initiative;
programme of work. <http://www.biodiv.org/recommendations/?m=SBSTTA-06&id=7037&lg=0>

SBSTTA Recommendation IX/3.
Global Taxonomy Initiative.
<http://www.biodiv.org/recommendations/?m=SBSTTA-09&id=7459&lg=0>

SBSTTA Recommendation X/12
Global Taxonomy Initiative: development
of the process and the guidelines for the in-
depth review of the programme of work
and outline of the Global Taxonomy
Initiative guide. <http://www.biodiv.org/recommendations/default.aspx?m=SBSTTA-10&id=10693&lg=0>

SBSTTA Recommendation XI/2
In-depth review of the implementation of
the programme of work for the Global
Taxonomy Initiative. <http://www.biodiv.org/recommendations/default.aspx?m=SBSTTA-11&id=10960&lg=0>

Documents submitted to COP

UNEP/CBD/COP/4/INF/28
The Darwin Declaration. Submission by
the Government of Australia <http://www.biodiv.org/doc/meetings/cop/cop-04/information/cop-04-inf-28-en.pdf>

UNEP/CBD/COP/6/INF/23
The Global Taxonomy Initiative. Report on
progress and status <http://www.biodiv.org/doc/meetings/cop/cop-06/information/cop-06-inf-23-en.pdf>

UNEP/CBD/COP/8/17/ADD1
Elaboration of Relative Roles of the CHM
in Dealing with Taxonomic Databases
Including: The Inter-American
Biodiversity Information Network,
BioNET, the Global Biodiversity
Information Facility, Species 2000, the
Integrated Taxonomic Information
System and Natureserve. <http://www.biodiv.org/doc/meetings/cop/cop-08/official/cop-08-17-add1-en.pdf>

UNEP/CBD/COP/8/INF/46
Outcomes and Recommendations of the
Meeting on “Biodiversity – the
megascience in focus”.
<http://www.biodiv.org/doc/meetings/cop/cop-08/information/cop-08-inf-46-en.pdf>

COP decisions

COP decision IV/1:
Report and recommendations of the third
meeting of the Subsidiary Body on Scientific,
Technical and Technological Advice, and
instructions by the Conference of the Parties
to the Subsidiary Body on Scientific,
Technical and Technological Advice. D.
Global Taxonomy Initiative. <http://www.biodiv.org/decisions/default.aspx?m=COP-04&id=7124&lg=0>

COP decision V/9:
Global Taxonomy Initiative:
Implementation and further advance for the
Suggestions for Action. <http://www.biodiv.org/decisions/default.aspx?m=COP-05&id=7151&lg=0>

COP decision VI/8:
Global Taxonomy Initiative.
<http://www.biodiv.org/decisions/default.aspx?m=COP-06&id=7182&lg=0>

COP decision VII/9:
Global Taxonomy Initiative.
<http://www.biodiv.org/decisions/default.aspx?m=COP-07&id=7746&lg=0>

COP decision VIII/3:
Global Taxonomy Initiative: in-depth review of the implementation of the programme of work for the Global Taxonomy Initiative.
<http://www.biodiv.org/decisions/default.aspx?m=COP-08&id=11015&lg=0>

Reports of the GTI Coordination Mechanism

Reports of the meetings of the GTI Coordination Mechanism are available through the GTI Portal.

Other documents

UNEP/CBD/WG-ABS/1/INF/2
Access and benefit-sharing and the Global Taxonomy Initiative. Document submitted to First meeting of the Ad-Hoc Open-ended Working Group on Access and Benefit-Sharing (Bonn, Germany, 22 - 26 October 2001) <http://www.biodiv.org/doc/meetings/abs/abswg-01/information/abswg-01-inf-02-en.pdf>

ANNEX 4.

KEY ELEMENTS OF COP DECISIONS RELEVANT TO THE GTI

The text below is simply extracted from the decisions cited, and in each case refers to the GTI. The relevant decisions should be consulted to ensure that the text is seen in full context. Moreover, there are many other aspects of the decisions which will depend on the involvement of the GTI for implementation, although this is not made explicit. Text from supporting documents (SBSTTA documentation, information documents etc) is generally not included here, although it provides a very valuable additional source of information and more detail on where taxonomic information is required.

COP Decision	Text
<i>Island biological diversity</i>	
VIII/1	<p><i>Annex (programme of work)</i></p> <p>Priority action 3.2. Compile detailed inventories of island species, assess their conservation status, including the main threat criteria, and develop the taxonomic expertise necessary to facilitate this.</p> <p>Supporting action 3.2.4: Undertake taxonomic studies or revisions of important island taxa, including marine, freshwater and terrestrial species.</p> <p>Supporting action 3.2.11: Provide taxonomic training and prepare guides to enable researchers to identify poorly known biological groups, coral species and other associated island species.</p>
<i>Forest biological diversity</i>	
V/4	Noting the importance of supporting work on taxonomic, ecological and socioeconomic issues for the restoration of forest ecosystems and conservation and sustainable use of forest biological diversity
VIII/15	<p>Decision on the framework for monitoring implementation of the achievement of the 2010 target and integration of targets into the thematic programmes of work:</p> <p>22. <i>Emphasizes</i> the need for taxonomic studies in forest biodiversity, taking into account the relevant activities in the programme of work for the Global Taxonomy Initiative</p>

COP Decision	Text
<i>Marine and coastal biological diversity</i>	
V/3	<p>Section I. Coral reefs</p> <p>6. Urges Parties, other Governments and relevant bodies to implement response measures to the phenomenon of coral bleaching by:</p> <p>(e) Supporting <i>capacity-building measures, including training of and career opportunities for marine taxonomists</i>, ecologists and members of other relevant disciplines, particularly at the national level;</p> <p>Annex – Priority areas for action on coral bleaching</p> <p>A. Information-gathering:</p> <p><i>Issue:</i> Our ability to adequately project, and thus mitigate, the impacts of global warming on coral-reef ecosystems and the human communities which depend upon coral-reef services is limited by the paucity of information on:</p> <p>(a) The <i>taxonomic</i>, genetic, physiological, spatial, and temporal factors governing the response of corals, zooxanthellae, the coral-zooxanthellae system, and other coral-reef-associated species to increases in sea-surface temperature;</p> <p><i>Response:</i></p> <p>(b) Implement and coordinate baseline assessments, long-term monitoring, and rapid response teams to measure the biological and meteorological variables relevant to coral bleaching, mortality and recovery, as well as the socio-economic parameters associated with coral-reef services. To this end, support and expand the Global Coral Reef Monitoring Network and regional networks, and data-repository and dissemination systems including Reef Base - the Global Coral Reef Database. Also, the current combined Sida-SAREC and World Bank programme on coral-reef degradation in the Indian Ocean, as a response to the 1998 coral-bleaching event, could be used as an example;</p> <p>B Capacity-building</p> <p><i>Issue:</i> There is a substantial lack of trained personnel to investigate the causes and consequences of coral bleaching events.</p> <p><i>Response:</i> Support the training of and career opportunities for marine taxonomists, ecologists, and members of other relevant disciplines, particularly at the national and regional level.</p>
VI/3	<p><i>The Conference of the Parties:</i></p> <p>3. Invites the Executive Secretary to continue developing further the work plan on physical degradation and destruction of coral reefs as contained in annex I to recommendation VI/2 of the</p>

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	<p>Subsidiary Body on Scientific, Technical and Technological Advice;</p> <p>Annex II to SBSTTA recommendation VI/2 – Specific work plan on coral bleaching, activity 2(f):</p> <p><i>Support the training of and career opportunities for marine taxonomists, ecologists, and members of other relevant disciplines, particularly at the national and regional level.</i></p>
VII/5	<p>Annex I – Elaborated programme of work, operational objective 2.1, suggested activities:</p> <p>(j) To promote, in collaboration with the Global Taxonomy Initiative, the strengthening of taxonomic expertise at regional and national levels.</p> <p>Appendix 1 to annex I – Specific work plan on coral bleaching, section 3 on capacity-building:</p> <p>(b) Support the training of and career opportunities for relevant marine taxonomists, ecologists and members of other relevant disciplines, particularly at the national and regional level.</p> <p>Appendix 5 to annex I - Research and monitoring priorities associated with Programme Element 4 on Mariculture:</p> <p>(c) (i) Support for basic global-scale taxonomic studies, possibly in conjunction with the Global Taxonomy Initiative (GTI);</p> <p>(f) (iii) Update of taxonomic databases including genetic diversity at the intra-specific level.</p>
VIII/21	<p>Conservation and sustainable use of deep seabed genetic resources beyond the limits of national jurisdiction:</p> <p>9. <i>Emphasizes</i> the urgent need, especially in developing countries, to build capacities relating to deep seabed biodiversity, including taxonomic capacity; to promote scientific and technical cooperation and technology transfer; and to exchange information regarding activities undertaken within the deep seabed beyond the limits of national jurisdiction.</p>
<i>Biological diversity of dry and sub-humid lands</i>	
VII/4	<p>4. <i>Requests</i> the Executive Secretary, in consultation with Parties, to develop targets for the implementation of the programme of work, taking into account especially national action programmes to combat desertification, the Global Strategy for Plant Conservation, the <i>Global Taxonomy Initiative</i>, the Strategic</p>

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	Plan of the Convention, as well as the Plan of Implementation of the World Summit on Sustainable Development, for consideration by the Subsidiary Body on Scientific, Technical and Technological Advice. Such a process could follow the approach taken in the development of the Global Strategy for Plant Conservation (decision VI/9, annex) and be in line with decision VII/8, on monitoring and indicators;
VIII/15	Decision on the framework for monitoring implementation of the achievement of the 2010 target and integration of targets into the thematic programmes of work: 17. <i>Emphasizes</i> the need for taxonomic studies in the implementation of the programme of work on the biological diversity of dry and sub-humid lands, taking into account the relevant activities in the programme of work for the Global Taxonomy Initiative;
<i>Biological diversity of inland waters</i>	
VI/2	3. <i>Emphasizes</i> the importance of review and elaboration of the programme of work on biological diversity of inland water ecosystems, as outlined in the progress report of the Executive Secretary on thematic programmes of work, and of the implementation of <i>activity 11 of the programme of work on the Global Taxonomy Initiative</i> ;
VII/4	17. <i>Encourages</i> Parties, other Governments and relevant organizations to improve national, regional and global <i>data</i> on inland water ecosystem goods and services, their uses and related socio-economic variables; <i>on species and all taxonomic levels</i> ; on basic hydrological aspects and water supply; and on the threats to which inland water ecosystems are subjected; 19. <i>Recognizes</i> the usefulness of these guidelines to create baseline or reference data sets for inland water ecosystems of different types and to address the <i>serious gaps that exist in knowledge of taxonomy</i> , distribution, and conservation status of freshwater species;
VII/4	Annex – Programme of Work <i>Activities of the Parties</i> 3.1.1. Encourage, and where possible support, applied research to gain an improved understanding of the status, trends, <i>taxonomy</i> and uses of biological diversity in inland water ecosystems, including transboundary systems where applicable. 3.1.3. <i>In line with the Global Taxonomy Initiative (GTI) encourage studies aimed at improving the understanding of the taxonomy of the biological diversity of inland water ecosystems.</i>

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	<p>3.1.4. <i>Support efforts to achieve international consistency and interoperability of taxonomic nomenclature, databases and metadata standards, as well as data-sharing policies.</i></p> <p><i>Supporting activities of the Executive Secretary</i></p> <p>3.1.7. <i>As part of the agreed programme of work for the GTI, support and assist, in collaboration with suitable partners, the development of the series of regional guides to the taxonomy of freshwater fish and invertebrates (including adult terrestrial forms where appropriate) as an input to ecosystem monitoring for river and lake health (as specified by decision of the Conference of the Parties to the Convention on Biological Diversity).</i></p> <p><i>Activities of the Parties</i></p> <p>3.2.3. (b) (ii) <i>The taxonomy of the group should be reasonably well understood;</i></p> <p>3.2.3. (c) <i>In view of the great economic importance of some groups (e.g. inland water fish species and aquatic macro-invertebrates), and of the large gaps in taxonomic knowledge for many species, capacity-building in taxonomy should focus on inland water biodiversity of economic as well as ecological importance.</i></p>
<i>Agricultural biological diversity</i>	
V/5	<p>‘II. International Initiative for the Conservation and Sustainable Use of Pollinators’</p> <p><i>The Conference of the Parties</i></p> <p>15. <i>Decides to establish an International Initiative for the Conservation and Sustainable Use of Pollinators as a cross-cutting initiative within the programme of work on agricultural biodiversity to promote coordinated action worldwide to:</i></p> <p><i>(b) Address the lack of taxonomic information on pollinators;</i></p>
V/5	<p>Annex – Programme of work on agricultural biodiversity, section A:</p> <p>3. The proposed elements of the programme of work have been developed bearing in mind the need:</p> <p>(c) To ensure harmony with the other relevant programmes of work under the Convention on Biological Diversity, including those relating to forest biological diversity, inland water biological diversity, marine and coastal biological diversity, and dry and subhumid lands, as well as with cross-cutting issues such as access and benefit-sharing, sustainable use, indicators, alien species, <i>the Global Taxonomy Initiative</i>, and issues related to Article 8 (j);</p>

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VI/5	<p>Annex II – Plan of action for the International Initiative for the Conservation and Sustainable use of Pollinators:</p> <p>6. The aim of the International Initiative for the Conservation and Sustainable Use of Pollinators is to promote coordinated action worldwide to:</p> <p>(b) <i>Address the lack of taxonomic information on pollinators;</i></p> <p>7. The Initiative is to be implemented as a cross-cutting initiative within the programme of work on agricultural biodiversity, with appropriate links to other thematic programmes of work, particularly those on forest biological diversity and the biodiversity of dry and sub-humid lands, and with relevant cross-cutting issues, <i>particularly the Global Taxonomy Initiative</i> and work on invasive alien species. The Initiative provides an opportunity to apply the ecosystem approach.</p> <p>Section III. Elements of the Plan. Element 1. Assessment.</p> <p><i>Rationale: In addition to the “taxonomic impediment” (see element 3), there is also a global “taxonomic deficit,” that is, the unacceptably high numbers of bee genera for which identification keys are not available</i></p> <p>Activities:</p> <p>1.3 Assess the state of scientific and indigenous knowledge on pollinator conservation, in order to identify gaps in knowledge and opportunities for application of knowledge; including:</p> <p>(a) <i>Taxonomic knowledge</i></p> <p><i>1.4 Promote the development of identification keys for bee genera</i></p> <p>Element 3. Capacity-building.</p> <p><i>Rationale: One major area which needs addressing is the capacity of countries to address the taxonomic impediment, which derives from serious shortfalls in investment in training, research and collections management. It seriously limits our capability to assess and monitor pollinator decline globally, in order to conserve pollinator diversity and to manage it sustainably. The global taxonomic impediment is costly, especially when expressed in terms of those research initiatives in pollination and conservation ecology which are wholly dependent on access to sound bee taxonomy and are rendered wholly non-viable in its absence. There is also a global taxonomic deficit, that is, the unacceptably high numbers of bee genera for which identification keys are not available.</i></p> <p>Activities</p> <p><i>3.4. Build taxonomic capacity to carry out inventories of the pollinator diversity and distribution in order to optimise their management, through,</i></p>

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	<p><i>inter alia, the training of taxonomists and parataxonomists of bees and other pollinators.</i></p> <p>Ways and means:</p> <p><i>The taxonomic elements would also be promoted through the Global Taxonomy Initiative.</i></p> <p>Element 4. Mainstreaming. Activities:</p> <p><i>4.3. Strengthen national institutions to support taxonomy of bees and other pollinators, through, inter alia:</i></p> <p><i>(a) Assessing national taxonomic needs (this would contribute to activity 1.3);</i></p> <p><i>(b) Maintaining continuity of taxonomic and reference collections of bees and other pollinators;</i></p> <p><i>(c) Recognition of centres of excellence in bee taxonomy and establishment of centres of excellence as appropriate;</i></p> <p><i>(d) Repatriation of data through capacity-building and benefit-sharing.</i></p> <p>Ways and means</p> <p><i>The taxonomic elements would also be promoted through the Global Taxonomy Initiative.</i></p> <p><i>Timing of expected outputs</i></p> <p>Progressively increased capacity at national level for taxonomy, information management, assessment and communication.</p> <p>Consideration of pollinators and related dimensions of agricultural biodiversity incorporated into national biodiversity and/or agricultural sector plans in 50 countries by 2010.</p>
VIII/23	<p>B. International Initiative for the Conservation and Sustainable use of Soil Biodiversity, Annex on the Framework for Action</p> <p>2. The Initiative is to be implemented as a cross-cutting initiative within the programme of work on agricultural biodiversity, through the coordination, and with the technical and policy support of FAO, with appropriate links to other thematic programmes of work of the Convention, particularly those on the biodiversity of dry and sub-humid lands, mountain and forest biological diversity, and with relevant cross-cutting issues, particularly the Global Taxonomy Initiative and work on technology transfer and cooperation.</p>

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<i>Mountain biological diversity</i>	
VII/27	<p>10. Requests the Executive Secretary: (f) With the assistance of the Global Taxonomy Initiative Co-ordination Mechanism to develop and incorporate activities and targets appropriate to mountain ecosystems within the GTI programme of work for consideration at SBSTTA-11, taking into account the COP-7 decision on targets.</p> <p>Programme of work:</p> <p>Action 1.5.3. Develop, validate and implement sustainable use practices for plants, animals and microorganisms at the genetic, species, population, community and ecosystem levels.</p> <p>Goal 3.1. To develop work on identification, monitoring and assessment of mountain biological diversity</p> <p>Action 3.1.2. Conduct mountain surveys in priority areas, for conservation and sustainable use of mountain biological diversity. These surveys should consider inventories at genetic, species and ecosystem levels.</p> <p>Action 3.1.3. Apply, whenever appropriate, the programmes of work of the global initiatives such as the Global Taxonomy Initiative, Millennium Ecosystem Assessment and the Global Invasive Species Programme.</p>
<i>Access and benefit-sharing</i>	
VI/24	<p>Section A, Annex – Bonn guidelines on access to genetic resources and fair and equitable sharing of the benefits arising out of their utilization.</p> <p>11. The objectives of the Guidelines are the following:</p> <p><i>(1) Taxonomic research, as specified in the Global Taxonomy Initiative, should not be prevented, and providers should facilitate acquisition of material for systematic use and users should make available all information associated with the specimens thus obtained.</i></p> <p>16. Recognizing that Parties and stakeholders may be both users and providers, the following balanced list of roles and responsibilities provides key elements to be acted upon:</p> <p>(b) In the implementation of mutually agreed terms, users should:</p> <p>(viii) When supplying genetic resources to third parties, honour any terms and conditions regarding the acquired material. They should provide this third party with relevant data on their acquisition, including prior informed consent and conditions of use and record and maintain data on their supply to third parties. <i>Special terms and conditions should be established under</i></p>

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	<p><i>mutually agreed terms to facilitate taxonomic research for non-commercial purposes;</i></p> <p>34. Prior informed consent should be based on the specific uses for which consent has been granted. While prior informed consent may be granted initially for specific use(s), any change of use including transfer to third parties may require a new application for prior informed consent. Permitted uses should be clearly stipulated and further prior informed consent for changes or unforeseen uses should be required. <i>Specific needs of taxonomic and systematic research as specified by the Global Taxonomy Initiative should be taken into consideration.</i></p> <p>36. An application for access could require the following information to be provided, in order for the competent authority to determine whether or not access to a genetic resource should be granted. This list is indicative and should be adapted to national circumstances:</p> <p><i>(f) Accurate information regarding intended use (e.g.: taxonomy, collection, research, commercialization);</i></p> <p>42. The following principles or basic requirements could be considered for the development of mutually agreed terms:</p> <p>(e) Different uses may include, <i>inter alia</i>, taxonomy, collection, research, commercialization;</p> <p>44. The following provides an indicative list of typical mutually agreed terms:</p> <p>(f) Whether the genetic resources can be transferred to third parties and conditions to be imposed in such cases, e.g. whether or not to pass genetic resources to third parties without ensuring that the third parties enter into similar agreements except for taxonomic and systematic research that is not related to commercialization;</p> <p>Appendix II: Monetary and non- monetary benefits</p> <p>2. Non-monetary benefits may include, but not be limited to:</p> <p>(k) Access to scientific information relevant to conservation and sustainable use of biological diversity, including biological inventories and <i>taxonomic</i> studies;</p>
VI/24	<p>Section B. Other approaches, including the development of an action plan for capacity-building – Annex: Draft elements for an Action Plan for capacity-building for access to genetic resources and benefit-sharing</p> <p>3. The following key areas, which require capacity-building initiatives, should be considered in a flexible and transparent manner, based on a demand-driven approach, taking into account the different situations, needs, capabilities and</p>

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	<p>stages of development of each country and should avoid duplication of efforts between various capacity building initiatives:</p> <p><i>(b) Assessment, inventory and monitoring of biological resources, and traditional knowledge including taxonomic capacity, within the context of the Global Taxonomy Initiative;</i></p> <p>5. The following mechanisms could be used for the implementation of capacity-building measures for access to genetic resources and benefit-sharing:</p> <p><i>(l) The Global Taxonomy Initiative;</i></p>
VII/19	<p>F. Needs for capacity-building identified by countries to implement the Bonn Guidelines – Annex: Action plan on capacity-building for access to genetic resources and benefit-sharing:</p> <p>5. Capacities should be strengthened at the systemic, institutional and individual levels in the following key areas:</p> <p><i>(b) Assessment, inventory and monitoring of genetic resources, and traditional knowledge including taxonomic capacity, inter alia, within the context of the Global Taxonomy Initiative, and of in situ and ex situ conservation activities;</i></p> <p><i>(c) The capacity of indigenous and local communities to assess, inventory and monitor genetic resources and related traditional knowledge, with their approval and consent, using the Global Taxonomy Initiative and other relevant initiatives;</i></p> <p>9. Actions at the regional and subregional levels and at the international levels:</p> <p><i>(h) The Global Taxonomy Initiative;</i></p>
VIII/4	<p>Section A, Annex. Potential elements for inclusion in the international regime on ABS:</p> <p>Environmentally sound research utilizing genetic resources and associated traditional knowledge is promoted, and commercial and non-commercial scientific research, including taxonomic research, are distinguished.</p>
<i>Alien species that threaten ecosystems, habitats or species</i>	
V/8	<p><i>The Conference of the Parties</i></p> <p>14. <i>Requests</i> the Executive Secretary to collaborate with the Global Invasive Species Programme, the Food and Agriculture Organization of the United Nations, the International Maritime Organization, the World Health Organization and other relevant organizations, and other relevant</p>

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	<p>internationally and regionally binding and nonbonding instruments to assist the Parties to the Convention in:</p> <p>(g) <i>Assessing priorities for taxonomic work;</i></p> <p>Annex II – Outline for case-studies on alien species</p> <p>To the extent possible, case-studies should be short and succinct summaries of experience on alien species at the country and regional levels. A case-study should focus on the prevention of introduction, control, and eradication of alien species that threaten ecosystems, habitats or species.</p> <p>Case-studies should include the following sections (a summary of the information may be provided under each heading, and a more detailed paper may be attached; if the information were not available, this should be indicated in the appropriate section):</p> <p>1. <i>Description of the problem</i></p> <p>(c) Description of the alien species concerned: biology of the alien species (<i>the scientific name of species should be indicated if possible</i>) and ecology of the invasion(s) (type of and potential or actual impacts on biological diversity and ecosystem(s) invaded or threatened, and stakeholders involved)</p> <p>(e) Assessment and monitoring activities conducted and methods applied, including difficulties encountered (e.g. <i>uncertainties due to missing taxonomic knowledge</i>)</p>
VI/23	<p>24. Urges Parties, Governments and relevant organizations, at the appropriate level, with the support of relevant international organizations to promote and carry out, as appropriate, research and assessments on:</p> <p>(h) <i>Priorities for taxonomic work through, inter alia, the Global Taxonomy Initiative;</i></p> <p>Annex: <i>Guiding principle 5: Research and monitoring</i></p> <p>In order to develop an adequate knowledge base to address the problem, it is important that States undertake research on and monitoring of invasive alien species, as appropriate. <i>These efforts should attempt to include a baseline taxonomic study of biodiversity.</i> In addition to these data, monitoring is the key to early detection of new invasive alien species. Monitoring should include both targeted and general surveys, and benefit from the involvement of other sectors, including local communities. Research on an invasive alien species should include a thorough identification of the invasive species and should document: (a) the history and ecology of invasion (origin, pathways and time-period); (b) the biological characteristics of the invasive alien</p>

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	<p>species; and (c) the associated impacts at the ecosystem, species and genetic level and also social and economic impacts, and how they change over time.</p> <p><i>Guiding principle 8: Exchange of information</i></p> <p>1. States should assist in the development of an inventory and synthesis of relevant databases, including taxonomic and specimen databases, and the development of information systems and an interoperable distributed network of databases for compilation and dissemination of information on alien species for use in the context of any prevention, introduction, monitoring and mitigation activities. This information should include incident lists, potential threats to neighbouring countries, information on taxonomy, ecology and genetics of invasive alien species and on control methods, whenever available. The wide dissemination of this information, as well as national, regional and international guidelines, procedures and recommendations such as those being compiled by the Global Invasive Species Programme should also be facilitated through, <i>inter alia</i>, the clearing-house mechanism of the Convention on Biological Diversity.</p>
VIII/27	<p>50. <i>Emphasizes</i> the need for taxonomic studies to deal with invasive alien species, and <i>encourages</i> implementation of the planned activity on invasive alien species within the programme of work of the Global Taxonomy Initiative</p>
Article 8(j) and related provisions	
V/16	<p>Annex – Programme of work on the implementation of Article 8 (j) and related provisions of the Convention on Biological Diversity</p> <p><i>Task 13.</i> The Ad Hoc Working Group to develop a set of guiding principles and standards to strengthen the use of traditional knowledge and other forms of knowledge for the conservation and sustainable use of biological diversity, taking into account the role that traditional knowledge can play with respect to the ecosystem approach, <i>in situ</i> conservation, <i>taxonomy</i>, biodiversity monitoring and environmental impact assessments in all biodiversity sectors.</p>
Identification, monitoring and assessment	
III/10	<p><i>The Conference of the Parties</i></p> <p><i>Reaffirming</i> the central importance of the implementation of Article 7 in ensuring that the objectives of the Convention are met,</p> <p><i>Stressing the fundamental role of taxonomy in identifying the components of biological diversity,</i></p>

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	<p><i>Recognizing the lack of taxonomic capacity in many countries,</i> <i>Recognizing</i> also the necessity of capacity-building to enable Parties to carry out identification, monitoring and assessment within the remit of the Convention,</p> <p><i>Noting</i> the review of methodologies for assessment of biological diversity contained in annex I of document UNEP/CBD/COP/3/13 and the discussion of indicators contained in annex II of that document,</p> <p>1. <i>Urges</i> Parties to identify indicators of biological diversity and to develop innovative methods of implementing Article 7 as a high priority, in particular commending the value of rapid biological diversity assessment approaches as an efficient and cost-effective way of assessing biological diversity and identifying priorities for action, and recognizing also the role of remote sensing as a useful tool for monitoring;</p> <p>2. <i>Endorses</i> the recommendation II/1 of the Subsidiary Body on Scientific, Technical and Technological Advice concerning indicators, monitoring and assessment of biological diversity;</p> <p>3. <i>Endorses the recommendation II/2 of the Subsidiary Body on Scientific, Technical and Technological Advice concerning capacity-building for taxonomy;</i></p> <p>8. <i>Recommends to Parties that they explore ways to make taxonomic information housed in collections world-wide readily available, in particular to countries of origin;</i></p> <p>10. <i>Requests</i> the institutional structure of the interim financial mechanism of the Convention to provide financial resources to developing countries in order to address the need for capacity-building, <i>including taxonomy</i>, to enable them to develop and carry out an initial assessment for designing, implementing and monitoring programmes in accordance with Article 7, taking into account the special need of small island States.</p> <p>Annex: SBSTTA Recommendation II/1:</p> <p>4. <i>It was noted that improvement of taxonomic knowledge was fundamental to the development of indicators and assessments.</i></p> <p>Annex: SBSTTA Recommendation II/2:</p> <p>Agenda item 3.4: Practical approaches for capacity-building for taxonomy [the text is reproduced in full in a separate annex to this Guide)]</p>

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VI/7	<p>Annex: Guidelines for incorporating biodiversity-related issues into environmental impact assessment legislation and/or process and in strategic environmental assessment</p> <p>36. Any activity aimed at the incorporation of biodiversity considerations into national environmental impact assessment systems should be accompanied by appropriate capacity development activities. <i>Expertise in taxonomy</i>, conservation biology, ecology, and traditional knowledge is required as well as local expertise in methodologies, techniques and procedures. Environmental impact assessments should involve ecologists with extensive knowledge on the relevant ecosystem(s) in the assessment team.</p>
<i>Protected areas</i>	
VII/28	<p><i>Annex - Programme of Work on Protected Areas</i></p> <p>4. The present programme of work on protected areas features goals and activities that are specific to protected areas. Some elements of existing programmes of work on forests, inland waters, dry and subhumid lands, coastal and marine and mountain biological diversity as well as the Global Strategy for Plant Conservation and the <i>Global Taxonomy Initiative</i> also apply to protected areas. The goals and activities contained in these existing programmes of work should also be applied and implemented, as and whenever appropriate for their respective protected areas. Other relevant guidelines developed under cross-cutting issues of the CBD should also be taken into account when implementing the programme of work.</p> <p><i>Suggested activities of the Parties</i></p> <p>4.4.3. Encourage studies to improve the knowledge of the distribution, status and trends of biological diversity.</p>
VIII/24	<p>7. <i>Recognizes</i> the importance of linkages to avoid overlap with relevant activities in thematic programmes of work (such as the programmes of work on forest, inland water, dry and sub-humid lands, marine and coastal, and mountain biodiversity) and under other cross-cutting issues (such as Global Strategy for Plant Conservation and Global Taxonomy Initiative) where these programmes of work contribute to the implementation of the programme of work on protected areas;</p>

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<i>Global Strategy for Plant Conservation</i>	
VI/9	<p>Annex: Global Strategy for Plant Conservation</p> <p>5. Within the ultimate and long-term objective, a number of sub-objectives can be identified as follows:</p> <p>(a) <i>Understanding and documenting plant diversity:</i></p> <p>(iv) Promote research on the genetic diversity, systematics, <i>taxonomy</i>, ecology and conservation biology of plants and plant communities, and associated habitats and ecosystems, and on social, cultural and economic factors that impact biodiversity, so that plant diversity, both in the wild and in the context of human activities, can be well understood and utilized to support conservation action;</p> <p>14. The Strategy is not intended to be a “programme of work” analogous to existing thematic and cross-cutting programmes of work under the Convention. It does not, therefore, contain detailed activities, expected outputs, etc. Rather, the Strategy provides a framework by means of setting outcome-orientated targets (these differ from the “process” targets used so far under the Convention). It is envisaged that the activities necessary to reach those targets could be developed within this framework. In many cases, activities are already under way, or envisaged in existing initiatives. These include:</p> <p>(c) Relevant activities under the programmes of work of the Convention on Biological Diversity, including those relating to agricultural biodiversity, forest biological diversity, inland water biological diversity, marine and coastal biological diversity, and dry and sub-humid lands, as well as activities involving cross-cutting issues such as access and benefit-sharing, sustainable use, indicators, alien species, <i>the Global Taxonomy Initiative</i>, and issues related to Article 8(j).</p>
<i>Guidance to the financial mechanism</i>	
III/5	<p><i>The Conference of the Parties,</i></p> <p>2. <i>Decides</i> to provide the following additional guidance to the Global Environment Facility in the provision of financial resources in conformity with decisions I/2 and II/6 of the first and second meetings of the Conference of the Parties. In this regard, the Global Environment Facility shall provide financial resources to developing countries for country-driven activities and programmes, consistent with national priorities and objectives, recognizing that economic and social development and poverty eradication are the first and overriding priorities of developing countries:</p>

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	b) <i>For capacity-building, including taxonomy, to enable developing countries to develop and carry out an initial assessment for designing, implementing and monitoring programmes in accordance with Article 7, taking into account the special need of small island States (Note: The Conference of the Parties endorsed recommendation II/2 of the Subsidiary Body on Scientific, Technical and Technological Advice, concerning capacity-building for taxonomy);</i>
IV/1.D	The Conference of the Parties: 9. <i>Stresses</i> the urgent need for adequate financial resources to implement a Global Taxonomy Initiative and <i>requests</i> the institutional structure of the financial mechanism of the Convention to provide financial resources, particularly to assist in implementing, through country-driven activities within the context of the operational programmes of the Global Environment Facility, the Suggestions for Action annexed to the present decision.
IV/13	The Global Environment Facility should: 4. In accordance with decision IV/7 and with Article 7 of the Convention and also within the context of implementing national biological diversity strategies and plans, provide adequate and timely financial support to Parties for projects and capacity-building activities for implementing the programme of work of forest biological diversity at the national, regional and subregional levels and the use of the clearinghouse mechanism to include activities that contribute to halting and addressing deforestation, <i>basic assessments and monitoring of forest biological diversity, including taxonomic studies and inventories, focusing on forest species, other important components of forest biological diversity and ecosystems under threat;</i>
V/9	The Conference of the Parties: 6. <i>Urges</i> eligible Parties and consortia of eligible Parties to seek resources for above priority actions through the financial mechanism, and requests the financial mechanism to continue promoting awareness of the Global Taxonomy Initiative in its outreach activities, such as the Capacity Development Initiative and the Country Dialogue Workshops, and to investigate ways both within and outside its operational programme structure to facilitate capacity-building in taxonomy, and the implementation of the short-term activities referred to in the annex to the present decision.
V/13	<i>The Conference of the Parties,</i> 2. <i>Decides</i> to provide the following additional guidance to the Global Environment Facility in the provision of financial resources, in conformity with

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V/13	<p>decisions I/1, II/6, III/5 and IV/13 of the Conference of the Parties. In this regard, the Global Environment Facility shall provide financial resources to developing country Parties for country-driven activities and programmes, consistent with national priorities and objectives, recognizing that economic and social development and poverty eradication are the first and overriding priorities of developing countries. The Global Environment Facility, as the institutional structure operating the financial mechanism, should provide support:</p> <p><i>k) To continue promoting awareness of the Global Taxonomy Initiative in the relevant activities of the Global Environment Facility, such as the Country Dialogue Workshops, and to facilitate capacity-building in taxonomy, including in its Capacity Development Initiative;</i></p>
VI/17	<p>10. The Global Environment Facility as the institutional structure operating the financial mechanism should provide financial resources:</p> <p><i>(f) For national and regional taxonomic capacity-building, as a basis for implementing the programme of work for the Global Taxonomy Initiative, with particular attention to funding country-driven pilot projects identified under the Global Taxonomy Initiative, taking into consideration the special needs of least developed countries and small island developing States;</i></p>
VII/20	<p>7. <i>Invites</i> Parties, other Governments, regional and international organizations to take full account of the importance of taxonomic capacities in achieving the goals of the Convention, to support taxonomic activities to attain the 2010 target, and to provide all necessary support to national, and where appropriate regional, taxonomic centres of research and expertise; and <i>urges</i> the Parties, other Governments and the Global Environment Facility, in accordance with its mandate, and other relevant funding organizations to provide adequate and timely support to developing countries to assist in the implementation of the Global Taxonomy Initiative, and for integrating taxonomic capacity-building activities into thematic and cross-cutting programmes, including supporting activities and projects, such as, where appropriate, stand-alone capacity-building projects;</p>
VIII/15	<p>Paragraphs 24 to 26 are copies of paragraphs 12 to 14 of decision VIII/3 on the GTI which is reproduced in different annex to this guide.</p>
<i>Other references to GTI</i>	
VIII/6	<p>Global Initiative on Communication, Education and Public Awareness, annex I on the short-list of priority activities, under Priority activity 3:</p> <p>Develop messages to overcome these gaps and to provide information on the following, <i>inter alia</i>... The relevance of taxonomy for nature conservation supporting sustainable development.</p>

COP Decision	Text
VIII/15	<p>Framework for monitoring implementation of the achievement of the 2010 target and integration of targets into the thematic programmes of work:</p> <p>12. <i>Emphasizes</i> the need for capacity-building, access to and transfer of technology in accordance <i>inter alia</i> with Article 16.2 of the Convention and adequate financial resources, especially for developing countries, particularly the least developed and small island developing States amongst them, and countries with economies in transition, in order to enable them to develop knowledge, including taxonomic knowledge, to gain access to relevant information on their biodiversity, and to better implement activities to achieve and monitor progress towards the goals and targets;</p>
VII/23	<p>Scientific and technical cooperation and the clearing-house mechanism</p> <p>6. <i>Requests</i> the Executive Secretary to use the clearing-house mechanism, in collaboration with the informal advisory committee, to continue to strengthen collaboration with international partners and organizations for review at the eighth meeting of the Conference of the Parties and to report on that collaboration, including an elaboration of the relative roles of the clearing-house mechanism and information facilities dealing in particular with taxonomic databases including, IABIN (Inter-American Biodiversity Information Network) hubs, BioNet LOOPs (Locally Owned and Operated Partnerships), NatureServe CDCs (Centres for Data Conservation), nodes of the Global Biodiversity Information Facility and Species 2000 and the Integrated Taxonomic Information System's Catalogue of Life;</p> <p>[note: this report was made to COP 8 in document UNEP/CBD/COP/8/17/Add.1]</p>
III/4	<p>Clearing-house mechanism to promote and facilitate technical and scientific cooperation</p> <p><i>The Conference of the Parties,</i></p> <p><i>Noting also:</i></p> <p>(a) The crucial part played by technical and scientific cooperation on all aspects of biological diversity, including <i>taxonomy</i> and transfer of technology, in ensuring the capacity of the clearing-house mechanism to play an important role in the implementation of the Convention;</p>
V/21	<p>Cooperation with other bodies</p> <p><i>The Conference of the Parties,</i></p> <p>7. <i>Requests</i> the Executive Secretary to take the study into consideration and, in collaboration with the Secretariat of the Convention on Migratory Species, to develop a proposal on how migratory species could be integrated into the</p>

COP Decision	Text
	work programme of the Convention on Biological Diversity, and the role the Convention on Migratory Species could play in the implementation of the Convention on Biological Diversity with regard to, <i>inter alia</i> , the ecosystem approach, <i>the Global Taxonomy Initiative</i> , indicators, assessments and monitoring, protected areas, public education and awareness, and sustainable use, including tourism;

ANNEX 5.

OUTLINE STRATEGY FOR TAXONOMIC CAPACITY-BUILDING

This table arose from the Third Global Taxonomy Workshop, held in Pretoria in 2002, and a workshop in Paris, held in 2003. It was submitted to SBSTTA 9 as part of an information document¹⁷⁴. A sample of partner commitments¹⁷⁵ to a strategy for delivering taxonomic capacity and products needed by users including those in the following sectors: agriculture; forestry; environment managers; conservationists; policy and decision makers; indigenous and local communities; private sector (national and multinational); publicly-owned companies; ecotourism; biosecurity; biosafety; access and benefit-sharing; bioindicators; biotechnology and health issues (including emerging diseases). Many of the partners listed will be taking action at some level in most if not all areas; although only the largest components of their undertaking are listed

Strategy element	Actions identified by Partners at the workshops	Partners committed to date
1. End-user focus: Meet stakeholder needs.	<ol style="list-style-type: none"> 1. Carry out needs assessments, including identifying full range of stakeholders and users; 2. Incorporate market research techniques in assessing stakeholder needs, including methods of ensuring stakeholder take-up of taxonomic products; 3. Establish discussion fora; 4. Form partnerships with users; 5. Establish regional coordination; 6. Improve stabilisation of names and develop concordances between different classifications; 7. Increase the rate at which specimens are identified and new species described; 8. Sharing of biodiversity data with developing country end-users; 9. Make taxonomic products more relevant to non-taxonomic issues; 10. Assist with delivery of products; 11. Include feedback on products from users and 'lessons learned' in projects. 	<ol style="list-style-type: none"> 1. GBIF, GISP, ICIPE, NHM, UNESCO, WFCC 2. – 3. GBIF, IUCN 4. CCC, GBIF, GISP, ICIPE, IPPC, ITIS, IUCN, RBGK, SP2000, UNESCO 5. BioNET LOOPS 6. GBIF, ITIS, NHM, RBGK, SP2000 7. GBIF, RBGK 8. CCC, ENBI, NHM, RBGK 9. ABRIS, GBIF, GISP, ICIPE, ITIS, RBGK, SPP, SP2000 10. ABRIS, GISP, SPP, UNESCO, WFCC 11. GBIF, GISP, IUCN

¹⁷⁴ UNEP/CBD/SBSTTA 9/INF/16

¹⁷⁵ <http://www.bionet-intl.org/2gtw/paris/commitments.htm>

Strategy element	Actions identified by Partners at the workshops	Partners committed to date
2. Political partnership: Generate effective political and multi-sectoral commitment to fulfil national and international obligations	<ol style="list-style-type: none"> 1. Establish regional coordination; 2. Work with CBD and other conventions and related UN bodies; 3. Participate in global initiative on biodiversity communication, education and public awareness (CEPA); 4. Raise awareness through Interim Commission on Phytosanitary Measures regarding need for support to taxonomy; 5. Participate in bodies reporting to government on biodiversity issues; 6. Raise profile of taxonomy with key sectors of society, including policy and decision-makers and champion taxonomy nationally and regionally; 7. Engage decision makers; 8. Conduct media campaigns; 9. Develop education programmes. 	<ol style="list-style-type: none"> 1. BioNET LOOPS 2. ABRs, CCC, GBIF, GISP, IUCN, SPP, UNESCO 3. UNESCO 4. IPPC 5. ABRs, CCC, GBIF, GISP, ICPE, IUCN, RBGK 6. ABRs, GBIF, GISP, ICPE, IUCN, NHM, RBGK, SPP, SP2000, UNESCO, WFCC 7. ABRs, CCC, GBIF, GISP, ICPE, IUCN, RBGK, UNESCO 8. GBIF 9. CCC, GBIF, NHM, UNESCO
3. Global partnership: Enhance collaboration, cooperation and partnerships, building to global scales.	<ol style="list-style-type: none"> 1. Improve effectiveness of National Focal Points; 2. Drive pro-activity of groups, networks and societies in linking together; 3. Promote access and benefit-sharing for inclusiveness of all; 4. Strengthen networking between institutes, individuals and countries; 5. Increase collaboration with BioNET-INTERNATIONAL LOOPS; 6. Build on the collaboration of CBD and IPPC; 7. Establish regional coordination. 	<ol style="list-style-type: none"> 1. GBIF, NHM 2. ABRs, CCC, GBIF, IUCN, NHM, SPP, UNESCO 3. GBIF, IUCN, RBGK, WFCC 4. CETAF, GBIF, IUCN, NHM, SPP, UNESCO 5. UNESCO, WFCC 6. GISP, IPPC, 7. BioNET LOOPS

Strategy element	Actions identified by Partners at the workshops	Partners committed to date
4. Awareness and action: Improve access to and analysis of policy-level information within the taxonomic community.	<ol style="list-style-type: none"> 1. Develop and sustain awareness of development programme processes and objectives; 2. Develop and sustain awareness of NBSAPs; 3. Develop and sustain awareness of relevant Convention COP decisions, including on thematic areas, cross-cutting Issues as well as the GTI; 4. Develop and sustain awareness of donor policy backgrounds; 5. Analyze information obtained to relate taxonomic output to development objectives; 6. Contribute to harmonising the format of national reports under various conventions; 7. Promote support to taxonomy as it relates to phytosanitary issues of National Plant Protection Organisations (NPPOs); 8. Liaise through International Phytosanitary Portal (in future); 9. Build awareness of taxonomic networks among Regional Plant Protection organisations; 10. Establish regional coordination 	<ol style="list-style-type: none"> 1. ABRs, GISP, IUCN, WFCC 2. IUCN, WFCC 3. ABRs, GISP, NHM, IUCN, RBGK, WFCC 4. GISP, IUCN, WFCC 5. GISP, IUCN, WFCC 6. IUCN 7. ABRs, GISP, IPPC 8. IPPC 9. BioNET LOOPS 10. BioNET LOOPS
5. Capacity-building: Build human and infrastructural capacity to meet sustainable development needs.	<ol style="list-style-type: none"> 1. Develop long-term strategy for sustaining capacity 2. Develop capacity within current structures and processes; 3. Identify and include new elements, structures and processes; 4. Improve access to new information technologies 5. Access and mobilise resources 6. Assist in development of curricula in tertiary institutions 7. Pursue current activities in relation to training in taxonomy and parataxonomy 8. Help assess taxonomic needs assessments for NPPOs using "Phytosanitary Capacity Evaluation" 	<ol style="list-style-type: none"> 1. CCC, GBIF, GISP, IUCN, RBGK, UNESCO 2. ABRs, CABI, GBIF, GISP, IUCN, NHM, SPP, UNESCO, WFCC 3. GBIF, GISP, UNESCO 4. GBIF, GISP, RBGK 5. GBIF, GISP 6. UNESCO 7. ABRs, UNESCO 8. IPPC

Strategy element	Actions identified by Partners at the workshops	Partners committed to date
	<ol style="list-style-type: none"> 9. Support advanced training in taxonomy, curation and other relevant disciplines 10. Establish Regional Biodiversity Centres based on existing infrastructure 11. Establish regional coordination 	<ol style="list-style-type: none"> 9. CABI, University of Amsterdam, National Herbarium (Netherlands), 10. CABI, ICIPE, WFCC 11. BioNET LOOPS
<p>6. Science: Sustainably maintain and enhance taxonomic science skills and knowledge base to enable responsiveness to emerging needs.</p>	<ol style="list-style-type: none"> 1. Support and strengthen existing collections, institutions and networks; 2. Generate interest in taxonomy as a science and encourage people to join discipline; find mechanisms and incentives for employing taxonomists; 3. Develop and improve training programmes and curricula; 4. Develop mechanisms for linking taxonomists to end users; 5. Complete the Catalogue of Life; 6. Adopt new technologies and techniques; 7. Establish regional coordination. 	<ol style="list-style-type: none"> 1. ABRs, CCC, GBIF, NHM, RBGK, UNESCO, WFCC 2. IUCN, NHM, RBGK, UNESCO, WFCC 3. CCC, GBIF, GISP, NHM, UNESCO, WFCC 4. GBIF, GISP, IUCN, RBGK, WFCC 5. ABRs, GBIF, ICIPE, RBGK, SPP, SP2000 6. GBIF, RBGK 7. BioNET LOOPS
<p>7. Taxonomic information: Improve access to and exchange of taxonomic information and products. <i>[This is one of GBIF's major goals]</i></p>	<ol style="list-style-type: none"> 1. Decrease publication time for taxonomic works; 2. Improve accessibility of publications; 3. Develop and link databases of taxonomic information; 4. Improve access to specimens and data; 5. Exploit appropriate information technology; 6. Improve access and communication among experts; 7. Improve transfer and interpretation of taxonomic products from providers to users; 8. Establish regional coordination. 	<ol style="list-style-type: none"> 1. ABRs, GBIF, SPP, UNESCO 2. ABRs, CCC, Fauna Europea, GBIF, NHM, RBGK, SI 3. ABRs, European Catalogue of Names, GBIF, ITIS, IUCN-SIS, NHM, NSF, RBGK, SP2000 4. ABRs, ENBI, GBIF, ITIS, IUCN, NHM, RBGK, WFCC 5. ENBI, ETI, GBIF, ITIS, IUCN, NHM, RBGK, SP2000, WFCC

Strategy element	Actions identified by Partners at the workshops	Partners committed to date
		6. ETL, GBIF, GISP, IUCN, SP2000, WFCC 7. CCC, ETL, GBIF, GISP, ITIS, RBGK, SP2000, UNESCO, WFCC 8. BioNET LOOPS
8. Timeliness: Accelerate the full taxonomic cycle: discovery, description, determination and dissemination.	1. Improve and develop new tools and technologies in taxonomic research; 2. Improve response times - provide quicker and more accurate identification and description; 3. Examine new approaches to components of the taxonomic cycle and the cycle in total; 4. Establish regional coordination.	1. ETL, GBIF, NHM, RBGK, WFCC 2. ABRs, ETL, GBIF, NHM, SPP, WFCC 3. ABRs, UNESCO, WFCC 4. BioNET LOOPS
9. Resourcing: Access and mobilise resources (ensure resources are available for production of appropriate product)	1. Identify new resources via new areas of application (e.g. trade; expand ecotourism products to new groups); 2. Enhance skills/institutional capacity in writing/managing successful proposals; 3. Improve communication skills; 4. Improve media relation skills; 5. Develop co-funding partnerships based on end-user needs; 6. Assist with workshops aimed at developing project proposals for funding; 7. Establish regional support and coordination.	1. CCC 2. CCC, GISP, NHM 3. - 4. NHM 5. ABRs, GBIF, GISP, NHM, RBGK, SPP, WFCC 6. GISP, UNESCO, WFCC 7. BioNET LOOPS

ANNEX 6.

SAMPLE QUESTIONNAIRE FOR A TAXONOMIC NEEDS ASSESSMENT

This questionnaire is based on that developed for the UK taxonomic needs assessment of conservation bodies, and may not be fully appropriate for other purposes. However, it does give some ideas which could be used.

IMPORTANT

The personal details you provide are protected by the provisions of the Data Protection Act. Under the terms of this legislation the Board of Trustees of the NHM, our data controller, is responsible for processing this information fairly and lawfully.

How will my information be used?

Some of the information on taxonomic needs that is collected will be made available publicly in the form of a report that may be published on the World Wide Web. This will include the names of the organisations consulted and key needs identified by particular groups of organisations.

This information will only be made available with your explicit permission, all other information will be kept private and only used for statistical purposes.

- ☐ Please tick this box if you are happy for the information outlined above to be made available

You may withhold permission for *any* of your details to be published via the internet at any time.

By submitting the form enclosed you consent to the Museum collecting and processing the data you provide within the terms of the Data Protection Act and using that data only for the purposes outlined above.

You have a right to access or amend these data at any time by contacting the GTI focal point at the Natural History Museum.

N.B. This component was incorporated into the UK needs assessment in order to comply with UK and EU law.

Part 1 – About your organisation

Details of Organisation	
Name and Address of organisation	
Homepage (URL)	

Name of person who has filled in questionnaire	
Name	
Position in organisation	
Phone/Fax	
Email	

Is your organisation (please tick one or several)	
<input type="checkbox"/> A statutory agency	<input type="checkbox"/> A private company
<input type="checkbox"/> A government department	<input type="checkbox"/> A research institution
<input type="checkbox"/> A national non-governmental organisation	<input type="checkbox"/> An amateur society
<input type="checkbox"/> A regional non-governmental organisation	<input type="checkbox"/> A university or other educational body
<input type="checkbox"/> An environmental management body	<input type="checkbox"/> A small business
Other (please specify);	

Please Provide a brief statement of the role and interests of your organisation

Please indicate the Ecosystem(s) to which your activities relate. Write '1' for most and '2' for some.	
<input type="checkbox"/> Agricultural biodiversity	<input type="checkbox"/> Forest biodiversity
<input type="checkbox"/> Dry and sub-humid lands biodiversity	<input type="checkbox"/> Inland waters biodiversity
<input type="checkbox"/> Marine and coastal biodiversity	<input type="checkbox"/> Island biodiversity
<input type="checkbox"/> Mountain biodiversity	
<input type="checkbox"/> More detailed term (one-4 words only)	

Please indicate the CBD Cross-Cutting Issue to which your activities relate. Write '1' for most and '2' for some.	
<input type="checkbox"/> Access to genetic resources and benefit-sharing	<input type="checkbox"/> Invasive alien species
<input type="checkbox"/> Traditional knowledge, innovations, and practices	<input type="checkbox"/> Biodiversity and tourism
<input type="checkbox"/> Climate change and biodiversity	<input type="checkbox"/> Economics, trade and incentive measures
<input type="checkbox"/> 2010 biodiversity target	<input type="checkbox"/> Global Taxonomy Initiative
<input type="checkbox"/> Ecosystem approach	<input type="checkbox"/> Global Strategy for Plant Conservation
<input type="checkbox"/> Impact assessment	<input type="checkbox"/> Indicators
<input type="checkbox"/> Liability and redress	<input type="checkbox"/> Protected areas
<input type="checkbox"/> Public education and awareness	<input type="checkbox"/> Sustainable use of biodiversity
<input type="checkbox"/> Technology transfer and cooperation	

With which of the following groups of species is the work of your organisation most concerned (please tick one or several and if appropriate specify species)	
Terrestrial Species	
<input type="checkbox"/> Birds	
<input type="checkbox"/> Insects and spiders	
<input type="checkbox"/> Mammals	
<input type="checkbox"/> Microorganisms	
<input type="checkbox"/> Plants (Cryptogamic)	
<input type="checkbox"/> Plants (Vascular)	
<input type="checkbox"/> Reptiles and amphibians	
<input type="checkbox"/> Invasive alien species	
Marine Species	
<input type="checkbox"/> Birds	
<input type="checkbox"/> Fish	
<input type="checkbox"/> Invertebrates	
<input type="checkbox"/> Mammals	
<input type="checkbox"/> Microorganisms	
<input type="checkbox"/> Plants	
<input type="checkbox"/> Invasive alien species	
Freshwater	
<input type="checkbox"/> Fish	
<input type="checkbox"/> Invertebrates	
<input type="checkbox"/> Micro-organisms	
<input type="checkbox"/> Plants	
<input type="checkbox"/> Invasive alien species	
Other (please specify);	

Which of the following activities is your organisation involved in: (please tick one or several)	
<input type="checkbox"/> Identification, assessment and monitoring	<input type="checkbox"/> Conservation
<input type="checkbox"/> Legal and policy	<input type="checkbox"/> Capacity-building
<input type="checkbox"/> Developing reference collections	<input type="checkbox"/> Assessment of phylogenetic diversity
<input type="checkbox"/> Molecular assessment methods	<input type="checkbox"/> Producing identification aids/tools
<input type="checkbox"/> Developing ecological indicators	<input type="checkbox"/> Indicator species taxonomy
<input type="checkbox"/> Compiling biodiversity inventories	<input type="checkbox"/> Environmental impact assessment
<input type="checkbox"/> Climate change monitoring	<input type="checkbox"/> Developing rapid assessment techniques
<input type="checkbox"/> Environmental monitoring	<input type="checkbox"/> Environmental research
<input type="checkbox"/> Environmental consulting	<input type="checkbox"/> Analysing species distribution
<input type="checkbox"/> Managing protected areas	<input type="checkbox"/> Selecting/designating protected areas
<input type="checkbox"/> Habitat restoration	<input type="checkbox"/> Species reintroductions
<input type="checkbox"/> Identifying wild relatives	<input type="checkbox"/> Natural resources exploitation
<input type="checkbox"/> Disease control	<input type="checkbox"/> Ecotourism
<input type="checkbox"/> Basic taxonomic training	<input type="checkbox"/> Professional/accredited training
<input type="checkbox"/> Publishing educational materials Government	<input type="checkbox"/> Providing information to inform
<input type="checkbox"/> Enforcing Government policy	<input type="checkbox"/> CITES
<input type="checkbox"/> Legislation and species protection	
Other (please specify)	

Part 2 – About your organisation's use of taxonomic information

Please read through the following list of information and services. Please identify which of these services are most important for the work of your organisation and in column 2 rank them according to importance from 1 (very important) to 5 (unimportant). In column 3 state whether the resources are available or unavailable. In column 4 please identify the source of the resources (e.g. in-country professionals, amateurs, local library), and in column 5 indicate whether the source is in your view sustainable. Column 6 is for your comments.

1. Taxonomic information and services you use, or would use if they were available	2. Importance	3. Available (y/n)	4. Source	5. Sustainable (y/n/?)	6. Additional Comments
Species Lists					
• Lists of scientific names of animals/plants					
• Lists of common names of animals/plants					
• Information on name changes					
• Lists of invasive alien species					
• Lists of protected animals/plants					
• Lists of species in other countries (e.g. neighbours, sources of pests)					
• Other (please specify)					

1. Taxonomic information and services you use, or would use if they were available	2. Importance	3. Available (y/n)	4. Source	5. Sustainable (y/n/?)	6. Additional Comments
Identification Tools					
• Field guides (paper)					
• Identification keys (paper)					
• Identification tools (CD-ROM)					
• Identification tools (web based)					
• Images/Photographs of animals/plants					
• Specialised identification services (taxonomic)					
• Formal (taxonomic) plant/animal descriptions					
• Access to specimens of animals/plants					
• Other (please specify)					

1. Taxonomic information and services you use, or would use if they were available	2. Importance	3. Available (y/n)	4. Source	5. Sustainable (y/n/?)	6. Additional Comments
Ecological Information (relevant data can sometimes be obtained from taxonomic institutions, although this is generally not the primary source of information)					
• Habitat requirements of animals/plants					
• Phenological information					
• Information on the conservation status of species					
• Information on animal/plant interactions					
• Other (please specify)					
Species Distributional Information					
• Point data from specimens (via the web)					
• Point data from specimens (other source)					
• Information on local species distributions					
• Information on national species distributions					

1. Taxonomic information and services you use, or would use if they were available	2. Importance	3. Available (y/n)	4. Source	5. Sustainable (y/n/?)	6. Additional Comments
• Information on regional species distributions					
• Distribution maps					
• GIS data					
• Other (please specify)					
Educational Information					
• Public education materials					
• Information on literature					
• Training courses/materials					
• Specimens for student examination					
• Other (please specify)					

Please use the following page to provide more detailed information on the taxonomic information or services you require for biodiversity conservation which are currently unavailable (e.g. specific species/areas, or other types of information not included in the above list)

Many thanks for your time

ANNEX 7.

USEFUL CONTACT ADDRESSES

(n.b., internet links for these and many other relevant organizations are provided throughout the text of this guide)

BioNET-INTERNATIONAL

The Global Network for Taxonomy
Technical Secretariat,
Bakeham Lane,
Egham, Surrey,
TW20 9TY,
United Kingdom.
Telephone: + 44 (0) 1491 829036/7/8
Facsimile: + 44 (0) 1491 829082
E-mail: bionet@bionet-intl.org.
URL: <http://www.bionet-intl.org/>

BioNET Regional Networks (LOOPS – Locally Organized and Operated Partnerships):

ANDINONET (Andean countries)
<http://www.andinonet.org.ve>

CARINET (Caribbean)
<http://carinet.ecoport.org>

EAFRINET (East Africa)
<http://eafrinet.ecoport.org>

NAFRINET (North Africa)
nafrinet@yahoo.fr

SAFRINET (Southern Africa)
<http://safrinet.ecoport.org>

ASEANET (South-east Asia)
<http://aseanet.org>

EASIANET (East Asia)
<http://www.easianet.nies.go.jp/hk>

EuroLOOP (Europe)
ulenberg@science.uva.nl

PACINET (South Pacific)
Gilianne.brodie@jcu.edu.au

WAFRINET (West Africa)
b.james@cgiar.org

LATINET (South America Southern Cone)
ticky@csnat.unt.edu.ar

MesoAmeriNET (Mesoamerica)
alherrer@inbio.ac.cr

NEURASIANET (North Eurasia)
nema@zin.ru; mab.ru@relcom.ru

SACNET (South Asia)
<http://www.biodiversityasia.org/sacnet>

CABI Publishing: North American office

CAB International
10 East 40th Street
Suite 3203
New York, NY10016
USA
Tel: +1 212 481 7018
Toll Free: +1 800 528 4841
Fax: +1 212 686 7993
E-mail: cabi-nao@cabi.org

CABI Publishing: European office

CAB International,
Wallingford, Oxfordshire,
OX10 8DE
UK
Tel: +44 1491 832111
Fax: +44 1491 829292
E-mail: orders@cabi.org

Clearing-House Mechanism,

Secretariat of the Convention on Biological
Diversity,
413 Saint-Jacques, Suite 800,
Montréal, Québec,
Canada H2Y 1N9,
Telephone: +1 514 288 2220,
Fax: +1 514 288 6588,
E-mail: secretariat@biodiv.org
URL:
<http://www.biodiv.org/chm/default.aspx>

**EDIT – European Distributed Institute
of Taxonomy.**

<http://www.e-taxonomy.eu/index.php>

**Food and Agriculture Organization of
the United Nations**

Viale delle Terme di Caracalla
00100 Rome, Italy
Telephone: (+39) 06 57051
Cable address: FOODAGRI ROME
Telex: 625852/610181 FAO I
Fax: (+39) 06 570 53152
Email: FAO-HQ@fao.org

Global Biodiversity Information Facility

GBIF Secretariat,
Universitetsparken 15,
DK-2100 Copenhagen,
Denmark
Tel: +45 35 32 14 70
Fax: +45 35 32 14 80
E-mail: gbif@gbif.org
URL: www.gbif.org

Global Environment Facility

1818 H Street, NW,
Washington, D.C., 20433,
USA.
Tel: (+1) 202-473-0508.
Fax: (+1) 202-522-3240.
URL: <http://www.gefweb.org>

Global Invasive Species Programme

Claremont 7735,
Cape Town,
South Africa
Telephone: +27 21 799 8800
Fax: + 27 21 797 1561
URL: <http://www.gisp.org>

IUCN – The World Conservation Union

Rue Mauverney 28
Gland 1196
Switzerland
Phone: +41 (22) 999-0000
Fax: +41 (22) 999-0002
webmaster@iucn.org

The Ramsar Convention on Wetlands

Rue Mauverney 28
CH-1196 Gland
Switzerland
Tel: 41 22 999 0170
Fax: 41 22 999 0169
ramsar@ramsar.org

Royal Botanic Gardens, Kew

Richmond, Surrey TW9 3AB
UK
Tel: 44 (0)20 8332 5000
Fax: 44 (0)20 8332 5197
<http://www.rbgekew.org.uk/>

Smithsonian Institution

National Museum of Natural History
10th Street and Constitution Ave. NW
Washington, D.C. 20560
Tel: 202.633.1000
info@si.edu

Species 2000

School of Plant Sciences,
The University of Reading
Reading, RG6 6AS
United Kingdom

tel: +44 (0)118 931 6466
 fax: +44 (0)118 975 3676
 e-mail: sp2000@sp2000.org
 URL: www.sp2000.org

United Nations Development Programme

Global Environment Facility Unit (UNDP-GEF) 304 East 45th Street 9th Floor New York, NY 10017 U.S.A.
 URL: <http://www.undp.org/gef/>.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

UNESCO – MAB,
 Division of Ecological Sciences 1, rue Miollis Paris 75732 Cedex 15 France Tel: +33 1 45 68 40 67 Fax: +33 1 45 68 58 04
 E-MAIL: MAB@UNESCO.ORG

United Nations Environment Programme

United Nations Avenue, Gigiri
 PO Box 30552, 00100
 Nairobi, Kenya
 Tel: (254-20) 621234
 Fax: (254-20) 624489/90
 URL: <http://www.unep.org>

UNEP – World Conservation Monitoring Centre

219 Huntingdon Road
 Cambridge CB3 0DL, UK
 Tel: +44 (0)1223 277314
 Fax: +44 (0)1223 277136
 email: info@unep-wcmc.org

The World Bank

Global Environment Division,
 1818 H Street, NW,
 Washington, DC,
 USA.
 Tel. (+1) 202-473-1816.
 Fax: (+1) 202-522-3256.
 URL: <http://www.worldbank.org>

ANNEX 8.

COP DECISION III/10 ENDORSING SBSTTA RECOMMENDATION II/2 ON PRACTICAL APPROACHES FOR CAPACITY-BUILDING FOR TAXONOMY

The SBSTTA,

Recalling paragraph 7 of decision II/8, which requested the second meeting of the SBSTTA to address the issue of the lack of taxonomists that are required for Parties to implement the Convention and to advise the Conference of the Parties at its third meeting on ways and means to overcome this problem, taking into account existing studies and ongoing initiatives while adopting more practical direction of taxonomy linked to bio-prospecting and ecological research on conservation and sustainable use of biological diversity and its components;

Recognizing that biological collections are the basis of taxonomy and are also sources of genetic resources;

Having examined the note by the Secretariat (UNEP/CBD/SBSTTA/2/5) and finding an extraordinary level of agreement that enhanced taxonomic capacity is a *sine qua non* for the implementation of the Convention;

Recommends that the Conference of the Parties consider the following:

1. There is a scarcity of taxonomists, taxonomic collections, and institutional facilities, and there is a need to take measures to alleviate this situation worldwide, to facilitate and assist countries in implementing the Convention on Biological Diversity. In particular, national institutions and regional and subregional networks should be established or strengthened and linkages enhanced with taxonomic institutions in developing and developed countries. In strengthening the taxonomic base, consideration must be given

to the information needs for bio-prospecting, habitat conservation, sustainable agriculture and the sustainable utilization of biological resources.

2. Capacity-building for taxonomy should be linked to the effective implementation of the Convention on Biological Diversity, particularly the national identification of areas of high diversity to threatened taxa, taxa that are or may be of value to humanity, and those with potential use as biological indicators for conservation and sustainable use of biological diversity.

3. Development of guidelines and programme priorities for funding, including for the financial mechanism under the Convention, should take account of the specific needs for capacity-building in taxonomy to serve areas such as bio-prospecting, habitat conservation and the sustainable use of biological diversity. Such support should recognize the need for adequate, long-term housing of collections and records and long-term research.

4. For new taxonomists to be recruited, there is a need to provide employment opportunities. It is urgent that Parties take this need into consideration and integrate it into the programme of capacity-building.

5. Where appropriate, national taxonomic needs assessment and action plans should be developed by setting national priorities, mobilizing available institutional resources, and identifying available funds. Countries could benefit from regional and subregional collaboration.

6. The importance of establishing regional and subregional training programmes was recognized. Attention should also be given to the training of specialists, parataxonomists, and technicians in this field. The field of taxonomy must be integrated with training activities such as biological monitoring and assessments. Maximum use should be made of existing institutions and those organizations active in these fields.

7. There is an urgent need to make the information on existing taxonomic knowledge, including information about the taxa in worldwide collections, available to countries of origin.

8. Taxonomic information to assist capacity-building in taxonomy should be included within the clearing-house mechanism. The taxonomic work embodied in existing archives and inventories, field guides and publications needs to be updated and readily accessible through worldwide services and the duplication of work already conducted should be avoided. The dissemination of information should further the objectives of the Convention and be linked to user needs. This sharing of information will require greater international collaboration. It should also be recognized that traditional taxonomic systems offer a valuable perspective on biological diversity and should be considered part of the total taxonomic knowledge base at national, regional and subregional levels.

9. Since taxonomy generally involves the use of biological collections, those

concerned should consider the adoption of mutually agreed upon material transfer agreements or equivalent instruments in accordance with the provisions of the Convention on Biological Diversity for exchange of biological specimens and information relating to them.

10. The Conference of the Parties should consider instructing the Global Environment Facility to support a Global Taxonomy Initiative, providing the necessary funds for the following actions related to capacity-building in taxonomy:

- (a) *developing* national, regional and subregional training programmes;
- (b) *strengthening* reference collections in countries of origin including, where appropriate, the exchange of paratypes on mutually agreed upon terms;
- (c) *making* information housed in collections worldwide and the taxonomy based on them available to the countries of origin;
- (d) *producing* and distributing regional taxonomic guides;
- (e) *strengthening* infrastructure for biological collections in countries of origin, and the transfer of modern technologies for taxonomic research and capacity-building; and
- (f) *disseminating* taxonomic information worldwide, inter alia, by the clearing-house mechanism.

ANNEX 9.

COP DECISION IV/1

Report and recommendations of the third meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, and instructions by the Conference of the Parties to the Subsidiary Body on Scientific, Technical and Technological Advice

D. Global Taxonomy Initiative

Note: paragraphs 1 and 3 have been retired by the COP.

The Conference of the Parties,

Noting decision III/10, supporting a Global Taxonomy Initiative, and the activities being supported by the financial mechanism on taxonomy,

Recognizing the need for taxonomic input in many activities aimed at the conservation and sustainable use of biological diversity and the lack of taxonomic capacity in a majority of countries,

Recalling that paragraph 3 of decision III/10, in which the Conference of the Parties endorsed the recommendation II/2 of the Subsidiary Body on Scientific, Technical and Technological Advice concerning capacity-building for taxonomy through a Global Taxonomy Initiative,

Taking into account the urgency for the availability of taxonomic information to countries of origin, and the need of developing countries to develop national collections and human and institutional capacities in taxonomy,

1. *Acknowledges* the work already under way by the financial mechanism in response to decision III/10 of the Conference of the Parties, and requests the Global Environment Facility to report on

these experiences at the fifth meeting of the Conference of the Parties;

2. *Stresses* the urgent need for the further implementation of recommendation II/2 of the Subsidiary Body on Scientific, Technical and Technological Advice concerning capacity-building in all fields of taxonomy to assist in the implementation of the Convention, through the incorporation of targeted actions in its workplan, including promoting regional activities to set regional agendas;

3. *Endorses*, as initial advice, the Suggestions for Action in the annex to the present decision to develop and implement a Global Taxonomy Initiative, and *requests* the Subsidiary Body on Scientific, Technical and Technological Advice to examine and provide advice on the further advancement of a Global Taxonomy Initiative;

4. *Recognizes* that the implementation of a Global Taxonomy Initiative should occur on the basis of country-driven projects at the national, regional and sub-regional levels;

5. *Invites* the United Nations Environment Programme to assist in the global implementation of a Global Taxonomy Initiative, as offered by the Executive Director in his address to the Conference of the Parties at its fourth meeting;

6. *Encourages* Governments to make available appropriate resources to enhance the availability of taxonomic information;

7. *Encourages* Governments to develop bilateral and multilateral training and employment opportunities for taxonomists, particularly for those dealing with poorly known organisms;

8. *Stresses* the need to consider indigenous and traditional knowledge as an important existing information source that should be taken into account, and made available through appropriate mechanisms;

9. *Stresses* the urgent need for adequate financial resources to implement a Global Taxonomy Initiative and *requests* the institutional structure of the financial mechanism of the Convention to provide financial resources, particularly to assist in implementing, through country-driven activities within the context of the operational programmes of the Global Environment Facility, the Suggestions for Action annexed to the present decision.

Annex

SUGGESTIONS FOR ACTION

1. The Executive Secretary should, as a matter of urgency, seek means outside of core funding of the Convention, to appoint a Programme Officer with appropriate operational resources to have responsibility for the further development of a Global Taxonomy Initiative, through the network of existing global, regional and national relevant institutions and organizations. The officer should especially coordinate actions to meet the need, recognized by the meeting, for each country to conduct a national taxonomic needs assessment, and to link to national reporting under the Convention on Biological Diversity and immediately coordinate a global directory of taxonomic expertise and biological collections. This information resource should be made available in both electronic and paper form.

2. Parties and authorities responsible for museums and herbaria should invest, on a long-term basis, in the development of appropriate infrastructure for their national collections. As part of that investment,

donors, both bilateral and multilateral, in their commitment to the conservation and sustainable use of biological diversity in countries where they provide investment support, should support infrastructural needs of collection-holding institutions.

3. Parties and international donors should encourage partnerships between institutions in developed and developing countries so as to promote scientific collaboration and infrastructure rationalization. Such collaboration should include the development of national, subregional, regional and global training initiatives. Taxonomic institutions in each nation, both individually and regionally, should develop national priorities in taxonomic training, infrastructure, new technology, capacity-building and market needs.

4. Parties and authorities should adopt internationally agreed levels of collection housing (climate control, fire protection systems, pest control, acceptable levels of workplace health and safety) that ensure protection of collections and the well-being of all people working on and accessing collections.

5. Parties and international donors should provide training programmes at different educational levels, relevant to the needs of individual countries, including vocational, technical and academic training. Parties should also recognize that ongoing employment for trainees is part of an effective training scheme.

6. Parties and authorities should utilize information systems to maximum effect in taxonomic institutions. In developing priority-setting criteria for information products, taxonomic institutions should consider the needs of the wide range of users of that information, including biological diversity managers. In particular, taxonomic information, literature and checklists should be put into electronic form.

7. Parties to the Convention on Biological Diversity should report on measures adopted to strengthen national capacity in taxonomy, to designate national reference centres, and to make information housed in collections available to countries of origin.

8. Institutions, supported by Parties and international donors, should coordinate their efforts to establish and maintain effective mechanisms for the stable naming of biological taxa.

9. Governments members of the Organization for Economic Cooperation and Development (OECD) should endorse and support the recommendations from the OECD Megascience Forum's Biodiversity Informatics Subgroup, regarding the development of a Global Biodiversity Informatics Facility (GBIF) to allow people in all countries to share biological diversity information and to provide access to critical authority files.

Implementing the actions

10. The Executive Secretary should ensure that the clearing-house mechanism (in collaboration with the OECD Megascience Forum's Biodiversity Informatics Subgroup Initiative) develop protocols and strategies for coordinating access to and distribution of taxonomic information contained in collections. In addition, the clearing-house mechanism, through its national focal points, should establish and update directories of taxonomists and their research and identification expertise.

11. *In addition, Parties should:*

- (a) Ensure that institutions responsible for biological diversity inventories and taxonomic activities are financially and administratively stable, so as to have potential for continued and growing training and employment opportunities;

- (b) Assist institutions to establish consortia to conduct regional projects;
- (c) Select or use centres of expertise at different geographical levels, capable of offering training programmes individually or in combination, where such centres include universities, museums, herbaria, botanical and zoological gardens, research institutes and international or regional organizations;
- (d) Give special attention to international funding of fellowships for specialist training abroad or for attracting international experts to national or regional courses. Appropriate areas for funding should include conventional academic courses, expeditions, collaborative research projects, secondments, institutional partnerships, regional flora and fauna, internships and tutorial guidance;
- (e) Provide programmes for re-training of qualified professionals moving into taxonomy-related fields;
- (f) Adapt training methods to the particular technical or academic backgrounds and experience of candidates. Content of courses should respond to external user demands and modern needs, taking into account cost-effectiveness in their delivery;
- (g) Ensure training programmes address gaps in knowledge and the need for specialists in given taxonomic groups, and offer a comprehensive view of biological diversity issues, including new scientific/technological approaches

- to taxonomy (e.g. molecular biology/informatics);
- (h) Provide business management training, of the nature commonly offered to private-sector executives, for managers of biological-diversity institutions, as part of other efforts to strengthen those organizations;
 - (i) Develop and maintain a register of practising taxonomists, areas of expertise and description of collections through electronic and other means, which should be available on the Internet;
 - (j) Hold workshops to determine national taxonomic priorities, in the context of national biological-diversity studies and action plans. Once national priorities have been identified, support development of regional taxonomic priorities, including plans to database collections using mutually agreed software, quality control and core-data requirements.

ANNEX 10.

**COP DECISION V/9: GLOBAL TAXONOMY INITIATIVE:
IMPLEMENTATION AND FURTHER ADVANCE OF THE SUGGESTIONS FOR
ACTION**

The Conference of the Parties,

1. *Establishes* a Global Taxonomy Initiative Coordination Mechanism to assist the Executive Secretary to facilitate international cooperation and coordinate activities under the Global Taxonomy Initiative in accordance with the terms of reference contained in the annex to this decision;

2. *Urges* Parties, Governments and relevant organizations to undertake the following priority activities to further the Global Taxonomy Initiative:

- (a) The identification of national and regional priority taxonomic information requirements;
- (b) Assessments of national taxonomic capacity to identify and, where possible, quantify national and regional-level taxonomic impediments and needs, including the identification of taxonomic tools, facilities and services required at all levels, and mechanisms to establish, support and maintain such tools, facilities and services;
- (c) Establishment or consolidation of regional and national taxonomic reference centres;
- (d) The building of taxonomic capacity, in particular in developing countries, including through partnerships between national, regional and international taxonomic reference centres, and through information networks;

(e) Communication to the Executive Secretary and Global Taxonomy Initiative Coordination Mechanism, by 31 December 2001, of suitable programmes, projects and initiatives for consideration as pilot projects under the Global Taxonomy Initiative;

3. *Requests* that the Executive Secretary, with the assistance of the Global Taxonomy Initiative Coordination Mechanism:

- (a) Draft as a component of the strategic plan for the Convention on Biological Diversity a work programme for the Global Taxonomy Initiative defining timetables, goals, products and pilot projects, emphasizing its role in underpinning conservation, sustainable use and equitable sharing of benefits, for consideration by the Subsidiary Body on Scientific, Technical and Technological Advice;
- (b) Initiate short-term activities, including regional meetings of scientists, managers and policy makers to prioritize the most urgent global taxonomic needs and facilitate the formulation of specific regional and national projects to meet the needs identified, and to report thereon to the Conference of the Parties at its sixth meeting;
- (c) Synthesize the findings of previous meetings of experts on the

Global Taxonomy Initiative (as contained in the note by the Executive Secretary on the review of the Global Taxonomy Initiative (UNEP/CBD/SBSTTA/5/4)), relevant sections of national reports submitted to the Conference of the Parties and recommendations of the Subsidiary Body on Scientific, Technical and Technological Advice on the Global Taxonomy Initiative, as advice for the proposed regional meetings;

- (d) Use the Global Taxonomy Initiative as a forum to promote the importance of taxonomy and taxonomic tools in the implementation of the Convention;

4. *Requests* all Parties and Governments to designate a national Global Taxonomy Initiative focal point by 31 December 2000, linked to other national focal points, and participate in the development of regional networks to facilitate information-sharing for the Global Taxonomy Initiative;

5. *Invites* all interested international and regional conventions, initiatives and programmes to indicate their support for the Global Taxonomy Initiative and its Coordination Mechanism, through the Executive Secretary, and in so doing to specify their particular areas of interest and any support for the implementation of the Global Taxonomy Initiative that could be forthcoming;

6. *Urges* eligible Parties and consortia of eligible Parties to seek resources for the above priority actions through the financial mechanism, and requests the financial mechanism to continue promoting awareness of the Global Taxonomy Initiative in its outreach activities, such as the Capacity Development Initiative and the Country Dialogue Workshops, and to investigate

ways both within and outside its operational programme structure to facilitate capacity-building in taxonomy, and the implementation of the short-term activities referred to in the annex to the present decision.

ANNEX: TERMS OF REFERENCE FOR THE COORDINATION MECHANISM OF THE GLOBAL TAXONOMY INITIATIVE

Mandate

Building on the guidance contained in recommendation V/3 of the Subsidiary Body on Scientific, Technical and Technological Advice, the Coordination Mechanism shall assist the Executive Secretary to facilitate international cooperation and to coordinate activities on matters pertaining to the implementation and development of the Global Taxonomy Initiative (GTI). The Executive Secretary in carrying out this mandate will work closely with the clearing-house mechanism and report on progress of the Global Taxonomy Initiative to every other meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, and, as appropriate, to the Conference of the Parties. The first meeting of the Coordination Mechanism shall take place no later than 30 November 2000. Meetings of the coordination mechanism can only take place with adequate representation from all regions, and subject to available resources.

Specific short-term activities to be undertaken prior to the sixth meeting of the Conference of the Parties

The Executive Secretary with the assistance of the Coordination Mechanism shall:

- (a) Develop a work programme for the Global Taxonomy Initiative, consistent with the Convention strategic plan, for considera-

tion by the Subsidiary Body on Scientific, Technical and Technological Advice;

(b) Convene regional meetings of scientists, managers and policy makers to prioritize the most urgent global taxonomic needs for consideration by the Subsidiary Body on Scientific, Technical and Technological Advice in finalizing the Global Taxonomy Initiative work programme;

(c) Establish mechanisms to use the Global Taxonomy Initiative as a forum to promote the importance of taxonomy and taxonomic tools in the implementation of the Convention's programmes of work.

Membership

The Executive Secretary, in consultation with the Bureau of the Subsidiary Body on

Scientific, Technical and Technological Advice shall at the earliest opportunity select 10 members of the Coordination Mechanism, with due regard to geographical balance to allow two representatives from each region, on a rotational basis. The Executive Secretary shall invite a limited number of leading relevant organizations such as the United Nations Environment Programme, the United Nations Educational, Scientific and Cultural Organization, the Food and Agriculture Organization of the United Nations, the International Council of Scientific Unions, the Global Biodiversity Information Facility, the Global Environment Facility, and BioNET-INTERNATIONAL to participate in the work of the Coordination Mechanism.

ANNEX 11.

COP DECISION VI/8: GLOBAL TAXONOMY INITIATIVE

The Conference of the Parties,

Understanding taxonomy to be a priority in implementing the Convention on Biological Diversity,

Noting that some groups of organisms provide particular taxonomic difficulties in national and regional monitoring and assessment work, particularly organisms at the micro level,

Recognizing the need for a programme of work at the national, regional and global levels, and the particular value of regional activities,

1. *Endorses* the programme of work for the Global Taxonomy Initiative, as annexed to the present decision, and the further submission and elaboration of potential pilot projects, including those listed in the progress report by the Executive Secretary on the Global Taxonomy Initiative and the report on progress and status of the Global Taxonomy Initiative;

2. *Urges* Parties, Governments, international and regional organizations, and other relevant organizations to promote, and, as appropriate, carry out, the programme of work;

3. *Recognizing* the value of supporting and building on existing national, regional, subregional and global initiatives, partnerships and institutions, invites the Executive Secretary to encourage the involvement of such entities to support Parties, Governments and relevant organizations in carrying out the programme of work, and recommends the continuation of the regional workshops on the Global Taxonomy Initiative to facilitate this process;

4. *Emphasizes* the need to coordinate activities with other existing initiatives, such as the Global Biodiversity Information Facility and the clearing-house mechanism of the Convention on Biological Diversity;

5. *Requests* the Executive Secretary to complete the guide to the Global Taxonomy Initiative, and provide information and clarification to Parties and Governments concerning the Global Taxonomy Initiative, in particular on the process for developing projects aimed at implementing the programme of work, including existing guidance from the financial mechanism;

6. *Requests* all Parties and other Governments to:

- a. Designate a National Focal Point for the Global Taxonomy Initiative, linked to other National Focal Points, as requested in decision V/9, paragraph 4;
- b. Provide updated information, through the clearing-house mechanism, about legal requirements for exchange of biological specimens and about current legislation and rules for access and benefit-sharing in terms of the needs of the Global Taxonomy Initiative;
- c. Initiate the setting up of national and regional networks to aid the Parties in their taxonomic needs in implementing the Convention on Biological Diversity;

7. *Considers* capacity development at the national and regional levels as a driving force in implementing the programme of work;

8. *Decides* that the post of Global Taxonomy Initiative Programme Officer

within the Secretariat of the Convention on Biological Diversity be made permanent, with funding from the core budget of the Convention, and that adequate operational funds be provided to enable the occupant of the post to carry out her or his duties.

Annex

PROGRAMME OF WORK FOR THE GLOBAL TAXONOMY INITIATIVE

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3. Operational objective 3 - Facilitate an improved and effective infrastructure/system for access to taxonomic information; with priority on ensuring countries of origin gain access to information concerning elements of their biodiversity.

4. Operational objective 4 - Within the major thematic work programmes of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and

sustainable use of biological diversity and its components.

5. Operational objective 5 - Within the work on cross-cutting issues of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

III. MONITORING AND ASSESSMENT OF THE GTI

I. INTRODUCTION

1. Broadly understood, taxonomy is the classification of life, though it is most often focused on describing species, their genetic variability, and their relationships to one another. For the purposes of the Convention taxonomy is taken in its broadest sense and is inclusive of systematics and biosystematics at the genetic, species and ecosystem levels.

2. The Global Taxonomy Initiative (GTI) covers the taxonomic work required to support the implementation of the Convention at all three levels of biodiversity (genetic, species and ecosystem), and is concerned with all organisms, i.e. plants, animals and micro-organisms.

3. The GTI has been established under the Convention on Biological Diversity to underpin decision-making in conservation of biological diversity, sustainable use of its components and equitable sharing of the benefits derived from the utilization of genetic resources, by addressing:

- a. The lack of taxonomic information on the identity of components of biological diversity in many parts of the world; and
- b. The need to build capacity for taxonomic activity in all regions, but especially developing countries, including reference materials,

databases, and taxonomic expertise relevant to the objectives of the Convention on Biological Diversity.

4. In its decision V/9, adopted at its fifth meeting, the Conference of the Parties requested the Executive Secretary to draft as a component of the Strategic Plan for the Convention on Biological Diversity a programme of work for the GTI defining timetables, goals, products and pilot projects.

5. The Conference of the Parties established the GTI specifically to support its work programmes in the thematic areas (marine and coastal biological diversity, agricultural biodiversity, dry and sub-humid land biological diversity, inland water biological diversity, forest biological diversity and mountain biological diversity), and in the cross-cutting issues (invasive alien species, access and benefit-sharing, scientific assessments, indicators, traditional knowledge) under the Convention.

6. Section II contains a programme of work for the GTI. It presents successively (i) the overall objectives of the programme of work, (ii) activities addressing taxonomic needs assessments at the global, regional and national levels, and (iii) targeted actions within the broader work programmes of the Convention on Biological Diversity.

II. PROGRAMME OF WORK

A. Overall objectives

1. What has the Conference of the Parties asked the GTI to be?

1. In its decision III/10, on identification, monitoring and assessment, the Conference of the Parties established the need for specific action under the Convention in capacity-building in taxonomy, through its endorsement of SBSTTA recommendation II/2.

2. In decision IV/1 D, the Conference of the Parties endorsed, as initial advice, a

set of Suggestions for Action to develop and implement a Global Taxonomy Initiative. The Conference of the Parties stressed the urgent need for the further implementation of recommendation II/2 of the Subsidiary Body on Scientific, Technical and Technological Advice concerning capacity-building in all fields of taxonomy to assist in the implementation of the Convention, through the incorporation of targeted actions in its work plan, including promoting regional activities to set regional agendas.

3. In decision V/9, the Conference of the Parties adopted a range of activities for the GTI, including the preparation of a programme of work for the GTI defining timetables, goals, products and pilot projects. The format adopted has taken into account that provided in decision V/20, on the operations of the Convention, which specifies the following parameters:

- a. Planned activities;
- b. The expected products;
- c. The timing of each of these activities and products;
- d. The actors carrying out these activities and cooperation with relevant organizations;
- e. The mechanisms used to realize and/or support the goals and activities, or to generate the expected products; and
- f. Financial, human-resource and other capacity requirements.

4. Also in decision V/9, the Conference of the Parties urged that "pilot projects" for the GTI be submitted to the Executive Secretary and the GTI Coordination Mechanism by Parties, Governments and relevant organizations by 31 December 2001.

2. What should the GTI achieve?

5. The GTI should seek to provide the key information required for the

implementation of the Convention on Biological Diversity, particularly Article 7, on identification and monitoring, through increasing the fundamental biological data essential to underpin the conservation, sustainable use and equitable sharing of the benefits from the utilization of biological diversity. That is, to address the problems of insufficient knowledge of all components of biological diversity (including their classification, description, value and function) and lack of taxonomic capacity, to overcome what has been termed “the taxonomic impediment”.

6. In formulating the programme of work to achieve this end, the GTI should provide the global platform to help accelerate current taxonomic efforts in areas identified as high priority by countries and regional groupings of countries.

7. The GTI programme of work has been designed to focus on supplying the needed taxonomic information to support the major work areas of the Convention, and the need to support capacity-building to ensure the ability of countries to undertake the priority taxonomic work required to implement the Convention.

8. This programme of work is intended to fulfil the following functions:

- a. To contribute to the implementation of the Convention’s Strategic Plan (in preparation).
- b. To set operational objectives with clear expected outputs and ways and means through which to achieve the set objectives;
- c. To provide the rationale for the choice of the operational targets, with indications of opportunities for further elaboration of the programme of work; and
- d. To serve as a guide to all biodiversity stakeholders on specific objectives to which they can contribute

individually or collectively, at the local, national or international level.

3. Operational objectives

9. In considering the following five operational objectives, it will be necessary to address capacity-building specifically with regard to human resources, systems and infrastructure needs in taxonomy, at the local, national, regional and global levels. It has been recognized that, for operational objectives 4 and 5, further setting of priorities might be required for integration within the work plans of the Convention:

Operational objective 1: Assess taxonomic needs and capacities at national, regional and global levels for the implementation of the Convention.

Operational objective 2: Provide focus to help build and maintain the human resources, systems and infrastructure needed to obtain, collate and curate the biological specimens that are the basis for taxonomic knowledge.

Operational objective 3: Facilitate an improved and effective infrastructure/system for access to taxonomic information; with priority on ensuring that countries of origin gain access to information concerning elements of their biodiversity.

Operational objective 4: Within the major thematic work programmes of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

Operational objective 5: Within the work on cross-cutting issues of the Convention, include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

10. Diagram 1 summarizes the rationale and linkages between the above operational objectives.

11. It is important to note that the planned activities described in sections B and C below are designed to be mutually rein-

forcing in achieving the overall objective of the GTI, and outputs from one objective will help facilitate greater achievement of the other activities. Particular stress may be placed upon the necessity outlined in planned activity 3 for capacity development at

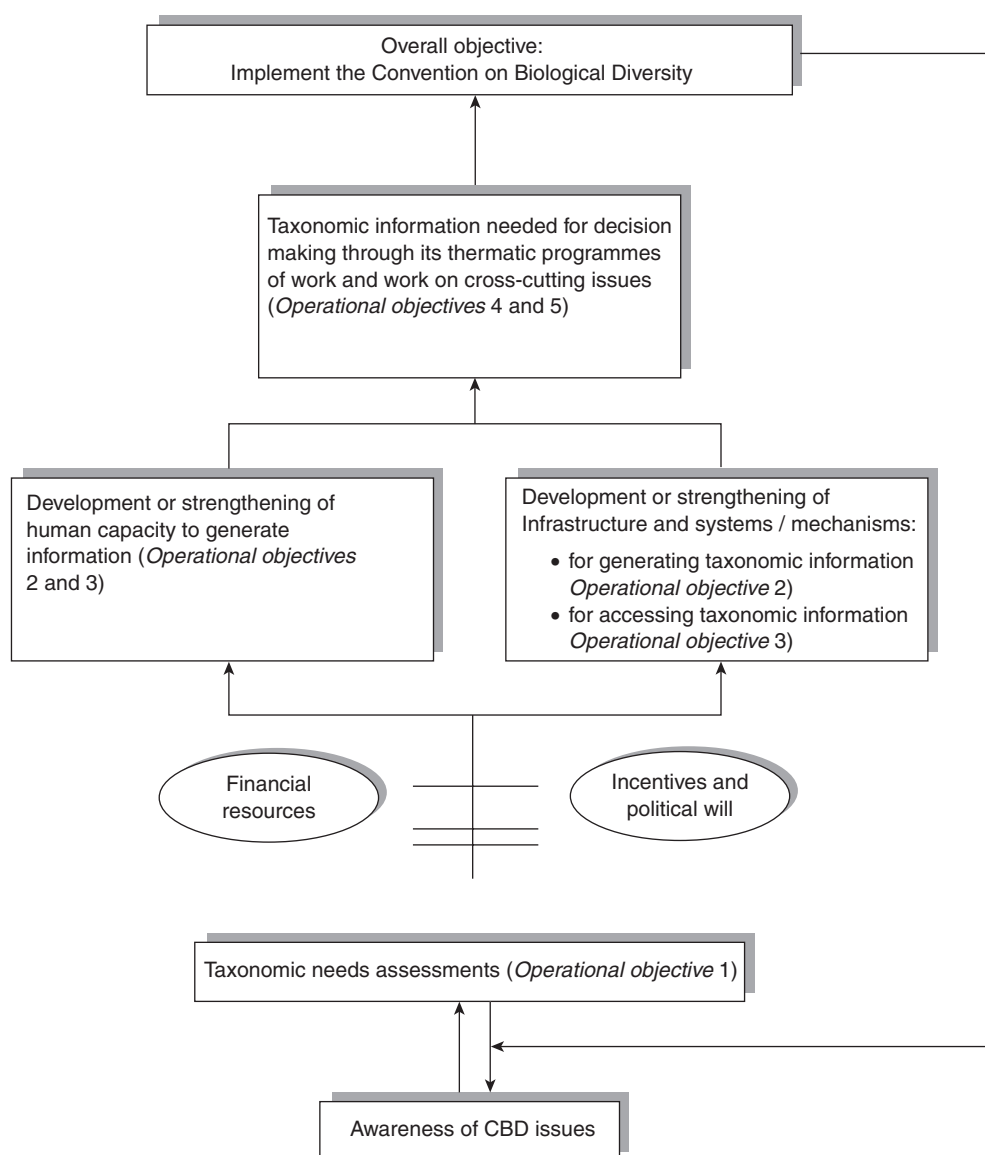


Diagram 1. Rationale and linkages between the five operational objectives of the programme of work

national, regional and global levels, with emphasis on facilitating and fostering both South-South and South-North partnerships and information exchange. Bilateral, multi-national and regional cooperation and networking will be of importance in implementing the programme of work.

B. Taxonomic needs assessments at the national, regional and global levels

1. Operational objective 1 - Assess taxonomic needs and capacities at national, regional and global levels for the implementation of the Convention

1.1. Planned activity 1: Country-based taxonomic needs assessments and identification of priorities

i. Rationale

In its decision IV/1 D, the Conference of the Parties recognized the need for each country to conduct a national taxonomic needs assessment. Furthermore, in decision V/9, the Conference of the Parties urged Parties, Governments and relevant organizations to undertake as a priority activity, assessments of national taxonomic capacity to identify and, where possible, quantify national and regional-level taxonomic impediments and needs. Assessments should be undertaken within the framework of undertaking the necessary planning to produce or update national biodiversity strategies and action plans under the Convention. To this end, the needs assessments will be required to clearly articulate how the lack of taxonomic information and/or capacity is an impediment to the implementation of national biodiversity strategies and action plans.

The Global Environment Facility (GEF) has been requested to support developing countries in undertaking the necessary needs assessments upon which to base action. (Decision III/5 provides additional

guidance to the GEF to provide financial resources to developing countries for country-driven activities and programmes, targeting capacity-building, including taxonomy, to enable developing countries to develop and carry out an initial assessment for designing, implementing and monitoring programmes. Decision V/9 urges eligible Parties and consortia of eligible Parties to seek resources for the agreed priority actions, including needs assessments, through the financial mechanism.)

ii. Outputs

Each country would provide through their national biodiversity strategies and action plans, as well as through national reports to the Conference of the Parties, a report on their taxonomic capacity and priority needs, which would then be disseminated through the Convention's clearing-house mechanism.

iii. Timing

In its decision V/9, the Conference of the Parties urged Parties, Governments and relevant organizations to undertake this priority activity and, while not setting a specific timeframe, requested Parties to report on their actions to the Conference of the Parties at its sixth meeting (April 2002). As this is a fundamental part of the process of clearly identifying solutions to current lack of capacity it is very important for all countries to complete their needs assessment as soon as possible. Full or preliminary needs assessments should have been reported to the Executive Secretary by December 2001 for report to the Conference of the Parties at its sixth meeting, and final assessments by December 2002.

iv. Actors

National Governments, with the support of national and international organizations and institutions as needed, would take primary carriage of this activity. The Executive

Secretary would compile completed assessments into an information paper for the seventh meeting of the Conference of the Parties.

v. Mechanisms

The GEF was requested to provide funds for countries to undertake their needs assessments as part of a broader biodiversity information requirements process. An approach for the development of a standardized framework and instruments will facilitate compilation and comparison of information for baseline assessments and ongoing monitoring. As initial advice, a list of issues to be addressed has been developed by DIVERSITAS, and was provided to SBSTTA at its fourth meeting¹⁷⁶.

vi. Financial, human resources and other capacity requirements

National Governments will be required to fund this activity, potentially with additional support from donors.

vii. Pilot projects

The development of guidelines for the preparation of country-based taxonomic needs assessments, with specific advice on the integration within the overall implementation of national biodiversity strategies and action plans, is proposed as a pilot project to be undertaken by a relevant international organization or consortium of organizations.

1.2. *Planned activity 2: Regional taxonomic needs assessments and identification of priorities*

i. Rationale

Ideally, country-level needs assessments provide the core input into the development of an assessment of regional capacity, the gaps in capacity across the region, and finally the setting of priority actions to fill the gaps. In many regions of the world it will be advantageous to pool resources and

to act cooperatively in building taxonomic capacity to support conservation and decision-making. Regional activities in taxonomy have been supported by the Conference of the Parties in decisions III/10, IV/1 D and V/9, which all identify regional level activities as a major activity for the GTI. Decision III/10 endorsed recommendation II/2 of the SBSTTA, which sought to prioritize strengthening of regional and subregional networks for taxonomy, regional collaboration and regional and subregional training programmes. Decision IV/1 D stressed the urgent need for the further implementation of recommendation II/2 of the SBSTTA concerning capacity-building in all fields of taxonomy to assist in the implementation of the Convention, through the incorporation of targeted actions in its work plan, including promoting regional activities to set regional agendas. Decision V/9 also called for the identification of national and regional priority taxonomic information requirements. Furthermore, decision V/9 called for short-term activities, including regional meetings of scientists, managers and policy-makers to prioritize the most urgent global taxonomic needs and facilitate the formulation of specific regional and national projects to meet the needs identified.

ii. Outputs

Combined with best available information on national taxonomic needs (if possible national taxonomic needs assessments), regionally agreed plans of action, that provide identified priorities, will provide a clear focus for activities under the GTI. To develop such plans of action regional workshops will be held, under the general guidance of the Executive Secretary and the GTI Coordination Mechanism. The challenge of

¹⁷⁶ UNEP/CBD/SBSTTA/4/INF/7

the workshops will be to blend academic advice and perspective with country needs to fulfil its obligations under the Convention.

iii. Timing

Two regional workshops, one in Africa and one in Central America, have taken place in 2001. Planning for a workshop in Asia, which will be held in 2002, has begun. Other meetings, including in South America, North America, Europe and a second one in Africa, are being discussed.

Ideally the GTI should endeavour to hold all regional workshops by the end of 2003, preferably by December 2003 as input to discussions at the seventh meeting of the Conference of the Parties.

iv. Actors

National governments, taxonomic institutions and global, regional and bilateral funding agencies are the main actors in the development of regional taxonomic needs assessments and priorities.

v. Mechanisms

Existing or proposed regional biodiversity projects, as well as national biodiversity strategies and action plans, will provide a key mechanism for identification of the most urgent taxonomic information requirements at the regional level. The development of regional taxonomic needs assessments and priorities is best facilitated through regional workshops supported by prior research into country level capacity, compiled into regional syntheses. Active regional networks of taxonomists would be best placed to facilitate the compilation of national needs assessments into cohesive regional syntheses.

vi. Financial, human resources and other capacity requirements

The Government of Sweden, through the Swedish International Development Cooperation Agency (SIDA), has funded two regional workshops in 2001. Japan has agreed to partially fund the Asian workshop,

but no sources of funding have been agreed at this stage for additional workshops.

vii. Pilot projects

Existing or proposed activities (or elements of activities) in some regions could be considered as pilot studies in the preparation of regional based taxonomic needs assessments, such as SABONET and SAFRINET in southern Africa, and BOZONET in Eastern Africa. However these existing activities need to be broadened to include all taxa, as well as input from the full range of biodiversity stakeholders needing taxonomic information. It is intended that the outputs from each regional workshop will be shared with all future workshops in order to facilitate clear and unambiguous, readily achievable pilot projects.

1.3. *Planned activity 3: Global taxonomic needs assessment*

i. Rationale

Given the nature of taxonomic activity, and the lack of knowledge of key groups of organisms with global distributions of importance to humankind and biodiversity concerns, a global dimension is critical. It is widely recognized that generally there is very little data available on global diversity and distribution patterns, and where it does exist it is usually in non-standardized formats that may restrict its usefulness. Agreed global cooperation to finalize taxonomic work on globally important groups should involve both developed and developing countries, and will provide a major input into development of capacity-building initiatives. The global taxonomic needs assessment can result from a compilation of the regional taxonomic needs assessments, with activity to provide some agreed priority actions that can be undertaken at the global level.

ii. Outputs

A concise global plan of action using the outputs from the regional workshops, with the

advice and support of international organizations and the GTI Coordination Mechanism.

iii. Timing

Progress towards production of a draft global plan of action on priority groups for study was reported to the Executive Secretary by December 2001, as input to discussions at the sixth meeting of the Conference of the Parties. A draft plan should be finalized by December 2002.

iv. Actors

National Governments, taxonomic institutions and global, regional and bilateral funding agencies are the main actors in the development of global taxonomic needs assessments and priorities. At the global level organisations such as, but not limited to, FAO, IUCN, UNEP-WCMC, UNESCO, the Ecosystem Conservation Group (ECG), and programmes such as BioNET-INTERNATIONAL, DIVERSITAS, the Global Biodiversity Information Facility (GBIF), Species 2000, and Systematics Agenda 2000 International among others, will also have key roles to play.

v. Mechanisms

A workshop focusing on global level taxonomic priorities should be organized, perhaps through the Ecosystem Conservation Group and GBIF. The taxonomic requirements of the Millennium Ecosystem Assessment should be a significant focus of setting global priorities. Such a workshop could be held in a developing country to highlight their special needs.

vi. Financial, human resources and other capacity requirements

Funding should be sought for this activity from Parties and key intergovernmental and non-governmental science based institutions interested in this activity.

vii. Pilot projects

Some pilot projects already exist that address some elements of this activity, such

as ECOPORT, Species 2000, and the developing GBIF projects.

1.4. *Planned activity 4: Public awareness and education*

i. Rationale

The need to raise awareness and to educate on the importance of taxonomy to underpin the Convention is critical to the success of the Global Taxonomy Initiative, and, within the programme of work, it is necessary to identify and target those groups who would benefit from increased awareness and education. This will include those working in and associated with work in areas of high biodiversity. In developing a public awareness and education package it will be necessary to balance the needs for formal education against the need for wider public awareness-raising. This activity will best be developed in conjunction with the activity under way following decision V/17 on education and public awareness, being carried out jointly by the Secretariat of the Convention on Biological Diversity and UNESCO. This joint activity will provide the focus for public awareness and education on taxonomy within the Convention through the development of a specific module on taxonomy. The module would test out techniques to develop regionally appropriate public awareness tools to help remove the taxonomic impediment, which would be refined in the later stages of the education and public awareness activity under the Convention, and should focus on educational materials for training to facilitate implementation of the Convention.

ii. Outputs

A package of materials and activities aimed at broadening public understanding of the importance of taxonomy in achieving the objectives of the Convention. Examples could include a brochure on the GTI, enhancement of Web pages, tutorials for education managers, popular scientific films, etc.

A special focus on using the public awareness activity to acquire new levels of taxonomic information, through, *inter alia*, public involvement in parataxonomic activity, should form part of these initiatives.

iii. Timing

Activities will be planned in 2002, and further developed as appropriate.

iv. Actors

At the global level this activity could be jointly executed by the Convention Secretariat and UNESCO, but with prime carriage for this project by regional networks in conjunction with key taxonomic institutions that already have considerable experience in public-awareness programmes, and have indicated a willingness to participate in GTI activities.

v. Mechanisms

Toolkits addressing particular taxonomic issues will be developed by the lead agencies for trial in selected regions of developing and developed countries. A key mechanism will involve participatory activity by local communities to strengthen the training and awareness raising for parataxonomists.

vi. Financial, human resources and other capacity requirements

This work element will be undertaken under the Global Initiative on Biodiversity Education and Public Awareness being elaborated by the Convention Secretariat and UNESCO, as called for in decision V/17 of the fifth meeting of the Conference of the Parties

vii. Pilot projects

Pilot projects should be developed within the joint public-awareness activity of the Convention Secretariat and UNESCO. The recent activities of Systematics Agenda 2000 International and BioNET-INTERNATIONAL in this area could also be expanded into pilot projects under the GTI.

C. Targeted actions

2. Operational objective 2 - Provide focus to help build and maintain the systems and infrastructure needed to obtain, collate and curate the biological specimens that are the basis for taxonomic knowledge.

2.1 Planned activity 5: Global and regional capacity-building to support access to and generation of taxonomic information

i. Rationale

A significant impediment to greatly increasing the world's taxonomic base for the implementation of the Convention, and indeed more effectively utilizing the current taxonomic knowledge, lies in the limited capacity in many nations, and the decreasing taxonomic capacity world-wide. A key objective of the GTI should thus be to address the global and regional capacity-building needs, particularly of developing countries. There are two main areas of concern that need to be addressed simultaneously:

- a. Human capacity-building; and
- b. Infrastructure capacity-building.

Human capacity-building requires major increases in training programmes for taxonomists and parataxonomists throughout the world, for it is now well established that the "taxasphere", the world's global taxonomic expertise, is currently shrinking just at the time when we need it to advance our knowledge base rapidly. In addition to training, new employment opportunities should be created.

Maintaining and improving the existing taxonomic infrastructure can be achieved only through adequate funding, and new strategies are required to make optimal use of our past investments, while minimizing the costs and maximizing the benefits of future investments. In its decisions IV/1 D and V/9, the Conference of the Parties has urged countries to establish or consolidate regional and national taxonomic reference centres. There is a need to explore globally how the best

possible outcomes for improving taxonomic capacity can be achieved. The GTI should address at the global and regional levels the coordination of collections infrastructure within countries and regions leading to improvements of long-term infrastructure regionally. Furthermore, such strategic planning should therefore encourage the creation or strengthening of national and regional taxonomic reference centres.

ii. Outputs

Increased human and institutional taxonomic capacity directed at meeting the needs of implementing the Convention.

iii. Timing

Activities need to begin immediately and be included in all work elements throughout the programme of work, with priority in covering the major upcoming work areas of the Convention in a timely manner, such that increases in capacity are achieved prior to the major element of work being undertaken.

iv. Actors

All Governments, international and national funding agencies, biosystematic institutions and taxonomic organizations have a role to play. Expert institutions in developed and developing countries and their professional staff with expertise in taxonomic groups around the world have much to offer in terms of capacity-building. Within planned activities 1 and 2 above, the development of national and regional taxonomic priorities, detailed regional priorities for capacity-building, both human and institutional, should be addressed.

v. Mechanisms

In its decision III/10, the Conference of the Parties endorsed SBSTTA recommendation II/2, concerning capacity-building for taxonomy, in which the GEF was requested to provide funds for training programmes, strengthening reference collections, making information housed in collections available

to countries of origin, producing and distributing taxonomic guides, strengthening infrastructure and disseminating taxonomic information through, *inter alia*, the clearing-house mechanism.

vi. Financial, human resources and other capacity requirements

The financial and human resources requirements of this activity are substantial. Funding needs may extend beyond possible contributions from individual Parties. However, through national and regional priority-setting, it will be possible to take a staged approach to undertaking the work required.

vii. Pilot projects

Consortia of major institutions should participate in the development of pilot projects to identify priority activities including capacity-building and development of information, through facilitating regional conferences to document existing holdings and by designating lead agencies in a collegiate process to maximize taxonomic effort across all groups.

SABONET and BioNET-INTERNATIONAL are two existing examples of projects that could be considered pilots of a regional and global approach respectively, that could be strengthened to provide greater capacity-building activities. The Smithsonian Institution has submitted a potential pilot project on neo-tropical moths that could also be considered for regional capacity-building.

2.2. *Planned activity 6: Strengthening of existing networks for regional cooperation in taxonomy*

i. Rationale

To facilitate the development of cooperative programmes that increase taxonomic capacity in developing countries through fostering North-South and South-South collaboration.

Taxonomic capacity in terms of both human and institutional capacity varies widely between countries and regions. Although many developed countries have relatively comprehensive reference collections and a number of experts, no single country has a complete taxonomic inventory of national biodiversity, nor experts in all relevant taxonomic groups. In many cases, developing countries have very little or no physical reference collections of local biodiversity, nor trained personnel. Much of the existing reference material from developing countries resides in the expert institutions of the developed world, as do the experts in particular taxonomic groups. However, even in developed countries taxonomy has been under-resourced for many years, leading to a general decline in infrastructure, and a dearth of younger professionals.

In order to facilitate taxonomic capacity-building to underpin the Convention on Biological Diversity, cooperative programmes need to be established and/or strengthened between the countries with the expertise and reference materials and those without. A number of regional networks that facilitate cooperation between countries in building taxonomic capacity in certain taxonomic groups currently exist, e.g., SABONET, a cooperative network between 10 countries in southern Africa focused on flowering plants. The most comprehensive network currently in existence is that fostered by BioNET-INTERNATIONAL, the Global Network for Taxonomy. This initiative currently has seven extant subregional networks covering some 120 countries, with another four under development, and a further five planned. It is envisaged that these 16 networks will provide a global coverage of collaborative North-South and South-South networks for taxonomic capacity-building. The Global Network for Taxonomy is a

donor-funded programme and the rate of network establishment is dependent on adequate continued funding. In establishing sub-regional cooperative networks, BioNET-INTERNATIONAL works through official governmental endorsement and comprehensive needs assessment activities to establish regional and national priorities.

ii. Outputs

A global network, ideally comprised of increasingly self-sufficient subregional networks, that covers all taxa. While the actual capacity-building initiatives should have a finite project-based life, ideally the networks themselves would remain in perpetuity once established and underpinned by member country Governments.

iii. Timing

Given that the lack of taxonomic capacity is a severe impediment to the abilities of countries to meet their obligations under the Convention on Biological Diversity, and that most taxonomic capacity can readily be shared and utilized across institutional and national boundaries, it follows that building of taxonomic capacity can best be facilitated by subregional cooperative networks and global partnerships. Therefore plans for strengthening and/or building of regional networks should at least be in place by December 2002, particularly ensuring that existing relevant networks become fully operational across the full spectrum of taxonomic groups. Strategies should be in place to complete the global coverage by December 2002. In addition, over the next five years, taxonomic institutions should look for opportunities to build capacity-development partnerships, particularly between institutions in developed and developing countries.

iv. Actors

Existing regional and subregional networks, with assistance from organizations

such as BioNet-INTERNATIONAL and UNESCO, and with regional and extra-regional partner organizations and networks, could be utilized to build a more complete coverage. These networks should play the role of implementing mechanisms, such that the GTI has access to, and interaction with all relevant taxonomic institutions within a subregion.

To facilitate this development the expert institutions of the developed world that house the relevant subregional taxonomic reference materials and information, and the professional staff with expertise in taxonomic groups from these subregions, should be actively involved.

v. Mechanisms

An agreed strategy on strengthening and building networks to ensure global coverage both geographically and by taxon group is a huge undertaking. Different countries and regions have different levels of capacity, and different taxonomic needs and priorities. Existing subregional networks can serve as implementing mechanisms for improving taxonomic capacity in developing countries. These existing networks need to be broadened in scope, and the establishment of the remaining networks currently under development or in the planning stages needs to be undertaken as soon as possible. This will require completion of needs assessments and priority setting for each network, where these do not exist or need updating and/or expansion. Regional taxonomic reference centres that house network reference materials and host the network's Information and Communications System provide a useful mechanism to prevent duplication of infrastructure, but they require sound means of communication to provide all countries involved with equal access to the information. As part of this, improved access by taxonomists of all Parties to the taxonomic

reference material itself, particularly type specimens and material presently held outside countries of origin, is important in developing work within the GTI.

vi. Financial, human resources and other capacity requirements

Funding will be required to support the work programmes of the individual networks, but the countries themselves need to endorse the operations and specifically the human resource and institutional costs of maintaining, operating and developing such collaborative networks. These costs will depend on the status of each country's capacity and the scope of the work programmes. Such collaborative networks can be cost-saving mechanisms in certain taxonomic groups/areas because of the 'economies of scale' produced by the sharing of taxonomic capacity, and reduce the need for each country to attempt to build the needed capacity individually.

Ideally the networks should have a dedicated full-time secretariat, but depending on needs, they can be operated on a part-time basis by staff already employed within relevant institutions.

Capacity-building in taxonomy necessarily includes the infrastructure capacity to house reference material, together with all of the reference material and equipment to enable identifications.

vii. Pilot projects

Three pilot projects can be proposed. The first pilot project could work with one of the existing BioNET-INTERNATIONAL networks and evaluate the current structure, mechanisms and operations of the network to assess its ability to expand to fully meet the objectives of the GTI in underpinning the Convention on Biological Diversity. Currently, many of the existing BioNET-INTERNATIONAL networks are focused on micro-organisms and invertebrates, often

with an agricultural orientation, and as such would need to be expanded to include all taxon groups and relevant institutions. The second pilot project could be undertaken in partnership with BioNET-INTERNATIONAL in the establishment of new networks designed to meet the requirements of the Convention. The third project is currently under formulation under the name BOZONET and is an eastern African taxonomic capacity-building project for botany and zoology.

3. Operational objective 3 -Facilitate an improved and effective infrastructure/system for access to taxonomic information; with priority on ensuring that countries of origin gain access to information concerning elements of their biodiversity

3.1. Planned activity 7: Develop a coordinated global taxonomy information system

i. Rationale

Existing taxonomic information is widely scattered and not centrally available. This activity will firstly identify the current status of major taxonomic information systems in particular their major foci, and plan a coordinated approach to the development of a global taxonomic information infrastructure, as the major element of the GTI under the Convention's clearing-house mechanism.

ii. Outputs

An agreed strategy to develop information services that optimizes access to taxonomic information systems world-wide, in appropriate formats. This strategy would also include common standards for exchange of data and consideration of intellectual property rights.

iii. Timing

Work took place in 2001 and information was provided as an input to discussions by the sixth meeting of the Conference of the Parties; the activity will be further developed

within a five-year framework and reports provided to SBSTTA as appropriate.

iv. Actors

Actors will include ECOPORT, GBIF, Species 2000, the Integrated Taxonomic Information System (ITIS), Tree of Life, NABIN, ISIS, BIN21, BCIS, BioNET-INTERNATIONAL, as well as large-scale biosystematics research institutions and other stakeholders of taxonomic information, in collaboration with the clearing-house mechanism of the Convention on Biological Diversity.

v. Mechanisms

Assessment of the objectives of each system, and their prospective target audience, as a means to evaluate the fulfilment of the needs of Parties in accessing taxonomic information required under the Convention on Biological Diversity. The existing International Plant Names Index (IPNI) and the Global Plant Checklist (IOPI) among others could provide useful models for developing a global strategy.

vi. Financial, human resources and other capacity requirements

Sources of funding need to be identified.

vii. Pilot projects

As a precursor to developing pilot projects it is proposed to hold a workshop that brings together stakeholders of all the existing global and major regional biodiversity information systems to identify overlaps, synergies, and gaps in order to develop a coordinated global strategy for harmonizing the existing systems.

Several pilot projects are already under way including SABONET and Species Analyst, and several potential projects have been put forward in recent international taxonomic meetings, and submitted to the GTI as potential pilot projects, such as GLOBIS, a butterfly information system for the world, and the World Termite Database.

4. Operational objective 4 - Within the major thematic work programmes of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components

It is recognized that taxonomy is fundamental to the thematic areas of the Convention on Biological Diversity through discovery, identification, and documentation of biological diversity. Because there are inadequate global taxonomic resources to meet all demands, it is important to indicate taxonomic priorities within each of the thematic areas of the Convention on Biological Diversity. Such priorities should recognize indigenous knowledge systems where appropriate permission has been obtained. Within existing thematic work programmes, workshops should be conducted in appropriate regions, involving taxonomic experts to identify key taxa for inventory and monitoring programmes. Sufficient flexibility should be maintained in order to respond to possible future modifications of priorities.

4.1. Planned activity 8: Forest biological diversity

i. Rationale

In the annex to decision IV/7, on forest biological diversity, containing the work programme on forest biological diversity, under programme element 3 on criteria and indicators for forest biological diversity, the following activity is identified: Taxonomic studies and inventories at the national level, which provide for a basic assessment of forest biological diversity.

ii. Outputs

An increased knowledge of the species composition of forests, through national taxonomic studies and inventories. Using this increased knowledge base facilitates selection of criteria and indicators for forest

biological diversity and may guide in the selection of sites to be protected and in the valuation of resources.

iii. Timing

As this activity is carried out at the national level there will be variable timetables globally. The second round of national reports for the implementation of the Convention was due in May 2001 and provided an opportunity for countries to report on taxonomic studies and inventories carried out at the national level that provide for a basic assessment of forest biological diversity.

iv. Actors

National governments and institutions will have the main responsibility, with possible advice from a collaborative partnership of forest members on methodologies for the development of appropriate criteria and indicators. The active involvement of international organizations such as the Center for International Forestry Research (CIFOR), the International Centre for Research in Agroforestry (ICRAF), and the United Nations Forum on Forests (UNFF) will provide useful links between existing initiatives.

v. Mechanisms

In decision IV/7, the Conference of the Parties agreed that countries would review specific indicators of forest biological diversity derived by the major international processes related to sustainable forest management. Depending on the selection of the criteria and indicators chosen, additional taxonomic studies and inventories will then be required.

vi. Financial, human resources and other capacity requirements

These requirements will be country-dependent, and resource requirements and sources will vary.

vii. Pilot projects

To facilitate the implementation of one element of the programme of work on forest

biological diversity, a pilot project is proposed in the selection of indicators for below-ground diversity in forests in each of the three forest biomes: tropical, temperate, boreal. While there is a need to continue developing knowledge in many components of forest ecosystems, the least known, and highest priority, is the below-ground biological diversity. It is understood that it plays a major role in contributing to the development and the health of the above-ground biological diversity by, for instance, processing nutrients or minerals that are then made available to, and assimilated by, plant biodiversity.

4.2. *Planned activity 9: Marine and coastal biological diversity*

i. Rationale

Two major elements of taxonomic work within marine and coastal ecosystems can be considered as high priority for achieving the Convention's objectives in marine and coastal systems, namely ballast water organisms, and key organisms for monitoring the health of mangrove systems through their invertebrate fauna. The ballast water organisms sub-element will require, *inter alia*, a focus on pelagic juvenile stages of benthic organisms. The second element focuses on mangroves, which are among the world's most rapidly changing systems. Within the marine and coastal biodiversity programme of work there is a need to develop taxonomic support for baseline monitoring of invertebrate fauna in mangrove systems.

ii. Outputs

Identification aids for quarantine and other officials to identify and monitor the introduction of novel marine organisms.

Taxonomic guides to key invertebrate organisms in mangrove systems to aid management of the continuum from natural to disturbed mangrove ecosystems. Taxonomic data will also assist in selecting sites for protected areas and for resource valuation.

iii. Timing

Within the timeframe of the GloBallast programme, produce basic guides for the identification of major organism groups found in ballast water at major sources.

Within the next three years, develop taxonomic guides to the identification of mangrove invertebrate fauna that can be used as indicators of habitat change.

iv. Actors

The International Maritime Organization (IMO) should take the lead role in the taxonomic work in ballast water, under their GloBallast work programme, which would then be integrated with the activities foreseen under the invasive alien species work of the Convention on Biological Diversity, and the GTI programme of work.

International conventions, in particular the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, and taxonomic institutions with expertise in coastal invertebrates should play a key role in conjunction with national institutions from Parties with significant extent of mangrove ecosystems under threat, in the implementation of the necessary taxonomic work.

v. Mechanisms

The IMO GloBallast work programme could include a taxonomic component for the identification of marine pelagic taxa, including those with adult benthic forms, which will form a key element of the GTI in the marine environment. The International Society for Mangrove Ecology (ISME) could facilitate the development of the work element on mangrove invertebrate fauna, including training workshops of key personnel from taxonomic institutions in tropical areas. Three workshops, one in Africa, one in the neotropics and one in Asia have been suggested and are in preparation for 2001 with support from UNESCO. The International

Coral Reef Initiative (ICRI) and its network can assist with regard to coral reefs.

vi. Financial, human resources and other capacity requirements

The IMO GloBallast programme could provide the appropriate resources for a pilot project involving six developing countries.

Funding support is required for the three capacity-building workshops as well as appropriate infrastructure support for the mangrove invertebrate taxonomy and production of guides and ICRI work.

vii. Pilot projects

The GloBallast programme is a pilot project under the IMO, with direct relevance to the invasive alien species and GTI programmes of work.

A pilot project focused in south-east Asia on mangrove invertebrates, particularly involving Malaysia, Indonesia and Philippines, could be developed in conjunction with the International Center for Living Aquatic Resources Management (ICLARM) and ISME.

4.3 Planned activity 10: Dry and sub-humid lands biodiversity

i. Rationale

Decision V/23 on consideration of options for conservation and sustainable use of biological diversity in dryland, Mediterranean, arid, semi-arid, grassland and savannah ecosystems establishes a programme of work, including, *inter alia*, assessment of the status and trends, identification of specific areas within dry and sub-humid lands of particular value for biological diversity and/or under particular threat, and the further development of indicators. Under each of these activities targeted actions on furthering the knowledge base on the organisms that maintain the crucial soil crust should be developed at national and regional levels, as well as the need for greater knowledge of the

micro-organisms in nutrient cycling, and increased taxonomic information of pests and diseases.

Correct identification of indicator taxa, such as crust-forming lichens, often requires special identification aids and techniques, and the development of such tools is necessary for increasing the capacity of rangeland managers to understand their function in maintaining dryland ecosystems. In many parts of the world, there is a need to increase taxonomic capacity to identify the lichens, and to then develop identification tools. It is important that such identification tools be designed in such a way that they can be used by rangeland managers to help in identification of key organisms.

ii. Outputs

Enhanced understanding among agricultural and rangeland managers of lichens as key indicators warning of the advance of soil degradation. This will usually take the form of loss of particular species from the system. Taxonomic work will need to develop easy-to-use identikits for key soil lichens, algae, soil invertebrates, pest insects and other herbivores, and other taxa that will be the harbingers of change.

iii. Timing

By the seventh meeting of the Conference of the Parties, have developed identification aids in consultation with appropriate national taxonomy and management agencies.

iv. Actors

The Convention to Combat Desertification (CCD) and other environmental conventions and their relevant collaborators, international agencies (including International Agriculture Research Centres (IARCs)), rangeland managers and national Governments.

v. Mechanisms

Cooperation with the CCD and other key players among international organizations

vi. Financial, human resources and other capacity requirements

To facilitate global and regional cooperation and synergy in this work, a project which could attract funding from the IARCs, in conjunction with FAO, can be proposed.

vii. Pilot projects

A pilot project could be developed among CCD, FAO and UNEP to assess different biological and biochemical indicators of land degradation. This project would require input from a range of taxonomic experts, including algologists and lichenologists. Input would also be required from soil scientists, who can link abiotic information with the taxonomic information obtained. Results can be distilled to a simple identikit system that will allow local managers to identify key species and determine the health of their arid/semi-arid system.

4.4 *Planned activity 11: Inland waters biological diversity*

i. Rationale

As in all other major ecosystems the current status of taxonomic knowledge in inland waters is varied both geographically, and according to the major taxon groups. For the purposes of the GTI targeted activities in rapidly increasing worldwide knowledge of freshwater fish and invertebrates are proposed as high priority.

ii. Outputs

A series of regional guides to freshwater fish and invertebrates (including adult terrestrial forms where appropriate) as an input to ecosystem monitoring for river and lake health.

iii. Timing

Produce field-usable regional guides within two years for both professional and public use.

iv. Actors

National agencies and taxonomic institutions, especially museums, should play a

principal role in the implementation of this activity. International support and coordination could be provided through the UNESCO key science activity "Water and Ecosystems". Parataxonomists, in the form of interested members of the public and school students in a number of countries, have been using the technique to monitor aquatic health. This is an area that could be built upon, and maybe also linked to planned activity 11.

v. Mechanisms

Changes in the species compositions and abundance of macro-invertebrates in freshwater systems are now being studied worldwide as part of approaches to monitoring of ecosystem health. A number of key potential partners are possible for this activity, including from developed and developing country perspectives. The Scientific and Technical Review Panel of the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat should also be involved in this project to provide specialist expertise, and a focus on the concept of using taxonomy to help understand ecological change.

vi. Financial, human resources and other capacity requirements

There is opportunity to build on existing projects here, or assist regional collaboration between existing projects, which would contribute to the implementation of the GTI while simultaneously improving monitoring of ecosystem health.

4.5 *Planned activity 12: Agricultural biological diversity*

i. Rationale

Within the programme of work on agricultural biological diversity, several areas require taxonomic capacity in order to deliver fully on their objectives. The need for taxonomy ranges from classical taxonomy of the species living in agricultural ecosystems, to the taxonomy of wild

relatives of agriculturally important species, to access to existing taxonomic information including basic knowledge on the functional relationships between organisms often recorded by taxonomists.

The value of training and knowledge-sharing among researchers, extension workers, farmers and indigenous peoples is highlighted in decision V/5 of the Conference of the Parties to the Convention on Biological Diversity. Within the agricultural biodiversity work programme specific taxonomy-related activities are envisaged in the following subject areas: pollinators; soil and other below-ground biodiversity, to support agricultural production systems, especially in nutrient cycling; and natural enemies of pests and diseases.

As the agricultural biological diversity work programme develops, significant taxonomic activities will need to be integrated within the proposals for work.

ii. Outputs

Outputs would include: easy-to-use keys to families, genera and species of pollinators; automated identification systems for pollinators; development of standard methods for identification of soil biodiversity to different taxonomic levels; increased knowledge of soil biodiversity to aid in the identification of indicators of the "health" of below-ground biological diversity; and taxonomic training for farmers and ecosystem managers.

iii. Timing

Within the agricultural biodiversity work programme the taxonomy related activities are part of the timeframe for the development of the overall activity. Current timeframes are as follows:

- a. Pollinators - In order to initiate the process of implementation of the International Initiative for the Conservation and Sustainable Use of Pollinators a planning meeting

took place at the FAO in late 2000. A plan of action was adopted at the sixth meeting of the Conference of the Parties;

- b. Soil biota - Ongoing efforts by Governments and relevant organizations will develop projects with appropriate timing;
- c. Pest and disease regulation organisms - Proposals for activities may be developed by countries and relevant organizations as determined in the programme of work on agrobiodiversity.

iv. Actors

FAO has been invited by the Conference of the Parties in decision V/5 to lead the International Pollinators Initiative (IPI), and will prepare a proposal for the development of the IPI for the seventh meeting of SBSTTA.

Parties should make contributions on soil biota and organisms involved in pest and disease regulation. In addition, the tropical soil biology and fertility (TSBF) programme hosted by UNESCO in Nairobi is the proposed implementing agency for a full-sized GEF project, which includes major taxonomic components for assessing below-ground biodiversity. Also, the Global Integrated Pest Management (IPM) Facility, based in Rome, which is a programme co-sponsored by FAO, UNEP, UNDP and the World Bank, may contribute as an organisation involved in pest and disease regulation.

v. Mechanisms

The International Pollinators Initiative (IPI) will contain a major taxonomic component, and the project is currently under development.

A major taxonomic element needs to be built into all current and proposed projects dealing with the sustainable use or conservation of agricultural and non-agricultural

lands, if we are to advance our knowledge base on the functional aspects of maintaining ecosystem processes.

As concerns organisms involved in pest and disease regulation, a scoping exercise should be undertaken to determine where the limitations exist in terms of taxonomic information, from basic alpha-taxonomy of pests and natural enemies, to how the information is presented and distributed. This work can be carried out by farmers' networks and research institutions, including the IARC system.

vi. Financial, human resources and other capacity requirements

All three elements require resources to be identified within existing and new projects, as well as additional resources to be made available to increase technical capacity in most countries of the world.

vii. Pilot projects

A major UNEP project entitled "Conservation and sustainable management of below-ground biodiversity" in seven countries is currently under assessment by UNEP. A Canadian report "Soil biodiversity: issues for Canadian agriculture" is being prepared and may be a suitable pilot. A pilot project on termites submitted by the Smithsonian Institution could also be considered.

4.6 *Planned activity 13: Mountain biological diversity*

Development of this activity will be undertaken following discussion of this thematic work area at the seventh meeting of the Conference of the Parties. The GTI Coordination Mechanism could play an important role in proactively defining taxonomic needs related to this planned thematic activity.

5. Operational objective 5 - Within the work on cross-cutting issues of the Convention include key taxonomic

objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

5.1. Planned activity 14: Access and benefit-sharing

i. Rationale

The Conference of the Parties, in its decision V/26, identified "Assessment and inventory of biological resources as well as information management" as key capacity-building needs with respect to access and benefit-sharing arrangements. Indeed, the inventory of biological resources could provide useful information in view of the elaboration of measures regarding access to genetic resources and the equitable sharing of benefits arising from their exploitation. In order to carry out this inventory, increased capacity is often needed at the country level. The primary goal of the GTI is to assist countries in carrying out this inventory in a timely and efficient manner. A major element in increasing capacity to properly inventory and access biological resource information is effective information management. Therefore a key element of the GTI must be the development of appropriate information-technology tools to allow access to existing data, as well as to provide efficient entry of new information generated from any increased knowledge.

The more each country can develop its capacity to properly inventory, collect, classify, and then commercialize its biological resources, the greater will be the return of benefits to that country. These four elements (inventory, collection, classification, commercialization) can be seen as a hierarchy of increasing capacity. The GTI will concentrate on developing capacity in the collection and classification of biodiversity. The GTI should include projects designed to develop capacity in collecting and maintaining

biological collections, as well as the proper classification and knowledge of the biological resources. Taxonomic information, in particular at the genetic level, will be critical in tracing the origin of resources and living modified organisms (LMOs).

Increasing access by countries of origin to existing information on biological resources held elsewhere has also been highlighted as a major element of the Global Taxonomy Initiative. In decision V/26, the Conference of the Parties urged countries to adopt measures that are supportive of efforts to facilitate access to genetic resources for scientific, commercial and other uses, and associated knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant to the conservation and sustainable use of biological diversity.

The first step in facilitating access is provision of information, and the Parties have agreed in decision IV/1 D to a series of actions that would increase access to information world-wide. Operational objective 3 of the present programme of work sets out a plan to begin to address this issue.

ii. Outputs

Interactive catalogues of material available, linked to taxonomic collections in herbaria and museums. Taxonomic support, including at the molecular level, to provide clear identification of specimens in the *ex situ* collections, especially in developing countries, is needed.

A series of country-driven projects could be carried out, combining the development of basic taxonomic capacity and an improved information base on biological resources.

These would assist in developing better linkages between existing initiatives that provide information electronically on genetic resources, as well as new projects to improve the access to, and range of, publicly

available taxonomic information. In turn, a basis for the commercialization of components of that biological diversity would be provided.

iii. Timing

Progress in global networking between countries and taxonomic institutions holding significant *ex situ* collections should be accelerated within a five-year timeframe.

Development of pilot projects should occur as soon as possible.

iv. Actors

National (and international) culture collections, including microbial collections. The IARC system, especially the Consultative Group on International Agricultural Research (CGIAR), should be involved to select priorities for needed taxonomic effort.

Taxonomic institutions in many countries contain significant holdings of *ex situ* materials from other countries, and in particular from developing countries. Botanical gardens hold both dead and live material that may be of considerable interest to the country of origin of that material, and may also develop new or improved conservation techniques that could aid countries of origin in their conservation and sustainable use efforts.

The FAO Commission on Genetic Resources for Food and Agriculture could play a key partnership role.

The Global Biodiversity Information Facility (GBIF) may be usefully involved in this activity.

v. Mechanisms

One of the first most important measures any country can take to encourage the sustainable use of its resources and ensure proper sharing of benefits derived from their exploitation is through developing knowledge regarding their own biodiversity, and in particular full cataloguing of its diversity. Through acknowledging the

importance of developing taxonomic capacity and adopting a series of suggested actions and priority activities (in its decisions IV/1 D and V/9), the Conference of the Parties has clearly indicated to Parties, Governments and relevant organizations the major work that needs to be undertaken to build taxonomic capacity within countries.

The basic mechanism for undertaking these actions and activities is through country-driven projects at the national, regional and subregional levels, which are to be implemented with the assistance of developed and developing country institutions that house *ex situ* collections (i.e. herbaria, botanical gardens, museums and zoos), and the financial mechanism. These country-driven projects need to be developed to show clearly how the development of basic taxonomic capacity leads to an improved knowledge base and understanding of the biological resources held by the country, which can then be used to attract the necessary investment in the full range of commercial uses of components of that biological diversity.

Achieving tangible results in the short term will require the promotion of a series of projects that have existing support from within both developing and developed world institutions and that clearly lead to a conservation or sustainable use outcome. A major action plan should be developed with FAO, IARCs (especially CGIAR) and BioNET-INTERNATIONAL as the key intergovernmental organizations and non-governmental organizations, among others.

vi. Financial, human resources and other capacity requirements

Capacity-building of taxonomic institutions is a costly and ongoing matter, and strategic input to help conservation and

sustainable use efforts significantly must be based on those areas where useful outcomes can be demonstrated in the short to medium term. It is to be hoped that demonstrating benefit may then lead to further investment in infrastructure support and development.

New resources are needed to initiate activities, although existing resources within key organizations may be able to be mobilized for the development of an action plan.

5.2 *Planned activity 15: Invasive alien species*

Development of this activity will be undertaken based on priorities identified through GISP phase I, the review of the status of invasive alien species and of ongoing measures addressing invasive alien species under way within the Convention on Biological Diversity, and the contents of the decisions taken by the sixth meeting of the Conference of the Parties to the Convention on Biological Diversity regarding invasive alien species¹⁷⁷.

5.3 *Planned activity 16: Support in implementation of Article 8(j)*

i. Rationale

The Conference of the Parties has acknowledged that traditional biodiversity-related knowledge (TBRK) has the potential to inform the activities of the Convention on Biological Diversity. Before it can do so, indigenous and local communities require protection of their intellectual property in any collaborative efforts aimed at meshing traditional knowledge and science. Given that the GTI has the potential to make traditional biodiversity-related knowledge more accessible to a wide range of users, due regard must be given to the concerns raised by indigenous and local communities regarding the right to preserve, protect and manage traditional biodiversity-related

¹⁷⁷ See decision VI/23

knowledge, particularly traditional taxonomic knowledge.

In its decision V/16, the Conference of the Parties endorsed a programme of work to implement Article 8(j) based on a number of principles, including full and effective participation of indigenous and local communities, the valuing of traditional knowledge, acknowledgment of spiritual and cultural values and the requirement for prior informed consent from traditional knowledge holders.

Paragraph 17 of that decision requests the Parties to support the development of registers of traditional knowledge, innovations and practices of indigenous and local communities through participatory programmes and consultations with indigenous and local communities, taking into account strengthening legislation, customary practices and traditional systems of resources management, such as the protection of traditional knowledge against unauthorized use.

A number of tasks in the programme of work for the implementation of Article 8(j) have a direct bearing on the proposed activities of the GTI, in particular tasks 1, 2 and 7 in phase 1 and tasks 6, 10, 13, and 16 in phase 2 (decision V/16).

Traditional knowledge systems include taxonomic information, which if used in combination with Linnaean taxonomies could support the GTI. Access to and use of traditional knowledge must have the prior informed consent of the holders of that knowledge and be based on mutually agreed terms. When this has occurred, comparison of indigenous taxonomies and Linnaean taxonomies in different regions could be made to provide general principles to assist in the conservation and sustainable use of elements of biodiversity in different ecosystems.

ii. Outputs

Regional and subregional guides based on ethical research practices and developed

with full and effective participation of indigenous and local communities. These guides could highlight the similarities and differences between the two taxonomies and may be in the form of catalogues and species lists, or be more targeted resource material that provides interpretation information for a wide variety of environmental managers, in particular protected area and conservation managers.

iii. Timing

Preparation of guides to be completed as part of implementation activities under Article 8(j).

iv. Actors

National and subnational governments, indigenous and local groups, indigenous research centres and indigenous non-governmental organizations should take the lead in this work element. Potentially the GBIF could play a lead role in providing a global role in information distribution. Some international and national institutions already hold significant information and have active programs in compiling indigenous and local taxonomies. These institutions, with the full and effective participation of indigenous and local communities, should be encouraged through additional “catalytic” funding to ensure that their research practices are based on agreement between parties and the principle of prior informed assent.

v. Mechanisms

The Convention on Biological Diversity, UNESCO, the International Social Science Council (ISSC) and the International Council of Scientific Unions (ICSU) offer the appropriate platform to develop with the full and effective participation of indigenous and local communities suitable plans of work leading to project development. The Ad Hoc Open-ended Working Group on Article 8(j) should play a key role in advising on the development of projects.

vi. Financial, human resources and other capacity requirements

New resources are required to initiate this activity.

5.4 Planned activity 17: Support for ecosystem approach and work under the Convention on Biological Diversity on assessment including impact assessments, monitoring and indicators

i. Rationale

Under the ecosystem approach, a key activity will be the Millennium Ecosystem Assessment. The Millennium Ecosystem Assessment will require considerable scientific effort for the characterization of ecosystems, including better data on key species that comprise ecosystems and their role in maintaining ecosystem processes. In many regions taxonomic knowledge needed to fulfil these efforts is not available, which will therefore require specific activities to be undertaken (created under the GTI). The Millennium Ecosystem Assessment seeks policy-relevant information; the GTI is a policy response to a recognized impediment, or knowledge block, in our system of biodiversity understanding. The GTI seeks to facilitate gathering of the pertinent species information that would be used to characterize ecosystems, including those that help to illustrate the value of goods and services flowing from ecosystems.

The Millennium Ecosystem Assessment will be required to report on issues such as patterns of species and ecosystem diversity - the activities of the GTI in facilitating better knowledge of the species and their distribution will help provide this information. All information fed into the Millennium Ecosystem Assessment will need appropriate geo-referencing - which is a key plank for all activities envisaged under the GTI. The GTI will also be focusing on taxonomic activity in areas of relevance to the

Convention, especially the key ecosystem themes. Thus the products of the GTI can complement the Millennium Ecosystem Assessment activity in thematic ecosystems, which in turn may illustrate the extent of removal of the taxonomic impediment - providing a positive feedback process.

The GTI also has relevance to the suite of environmental conventions associated with the Convention on Biological Diversity (e.g., the Convention on the Conservation of Migratory Species of Wild Animals, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Convention on Desertification), and to the Commission on Sustainable Development, all of which have a direct interest in the outcomes of the Millennium Ecosystem Assessment. There is scope for linking envisaged work programmes under the Millennium Ecosystem Assessment with the key action areas under the GTI.

ii. Outputs

Production of taxonomic overviews to help guide the Millennium Ecosystem Assessment to focus on key areas and issues of importance. These overviews can be compiled from work under the other operational objectives, but may need special focus for the global ecosystem context of the Millennium Ecosystem Assessment.

iii. Timing

To be linked with the Millennium Ecosystem Assessment development and programme.

iv. Actors

The Millennium Ecosystem Assessment advisory mechanisms, and the UNEP World Conservation Monitoring Centre (WCMC) and UNESCO as key synthesizers.

v. Mechanisms

The Convention's cross-cutting issue of assessments and the programme of work on

indicators of biological diversity include a number of programme elements where input from the GTI would be required, including the development of a menu of indicators in thematic areas and development of methodology sheets, guidelines and training for supporting the development of national monitoring and indicator programmes. Specific input required from the GTI would be in the identification, development and testing of suitable indicators, and priority taxonomic information required as input to scientific assessments.

vi. Financial, human resources and other capacity requirements

The development of financial and human resource requirements will need to be undertaken within the development of specific Millennium Ecosystem Assessment project proposals, as well as through agreed activities in indicator development.

5.5. Planned activity 18: Protected areas
Development of this activity will be undertaken following discussion of this cross-cutting work area. The GTI Coordination Mechanism could play an important role in proactively defining taxonomic needs related to this planned activity for the ninth meeting of SBSTTA, prior to the seventh meeting of the Conference of the Parties.

ANNEX 12.

COP DECISION VII/9: GLOBAL TAXONOMY INITIATIVE

The Conference of the Parties,

1. *Notes* the progress and commitment being made in implementing the programme of work for the Global Taxonomy Initiative;

2. *Invites* Parties, other Governments, regional and international organizations to take full account of the importance of taxonomic capacities in achieving the goals of the Convention, to support taxonomic activities to attain the 2010 target, and to provide all necessary support to national, and where appropriate regional, taxonomic centres of research and expertise; and *urges* Parties, other Governments and relevant funding organizations to provide adequate and timely support to developing countries to assist in the implementation of the Global Taxonomy Initiative, and for integrating taxonomic capacity-building activities into thematic and cross-cutting programmes, including supporting activities and projects, such as, where appropriate, stand alone capacity-building projects;

3. *Invites* Parties to appoint National Focal Points for the Global Taxonomy Initiative as called for in decision V/9, and *urges* all Parties to ensure that those focal points work with their taxonomic communities taking into account the programme of work for the Global Taxonomy Initiative;

4. *Requests* Parties to appropriately include and give full support to the taxonomic work needed to accomplish the thematic and cross-cutting programmes of work and activities under the Convention;

5. *Invites* developed country Parties to provide technical and financial support for the operations of the Coordination

Mechanism of the Global Taxonomy Initiative;

6. *Requests* Parties to report on the status of implementation of the programme of work for the Global Taxonomy Initiative and further *invites* national and international, taxonomic institutions, funding organizations, financial agencies, and the financial mechanism of the Convention to contribute information on their relevant activities to the review of the Global Taxonomy Initiative for consideration by the Conference of the Parties at its eighth meeting;

7. *Requests* the Executive Secretary, in collaboration with the Coordination Mechanism for the Global Taxonomy Initiative to:

- (a) Ensure that appropriate taxonomic expertise with balanced regional representation is included in inter-sessional meetings and expert groups convened by the Secretariat as appropriate;
- (b) Develop the process and guidelines for the in-depth review, including mechanisms for monitoring progress in the implementation of the programme of work for the Global Taxonomy Initiative, to be finalized during the tenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice for consideration at the eleventh meeting of the Subsidiary Body; and
- (c) Undertake an analysis of the existing thematic programmes of work and cross-cutting issues with

respect to taxonomic components, in order to more effectively build taxonomy into the work programmes and to develop an understanding of the taxonomic capacity necessary to accomplish the targets of these programmes of work.

- (d) Undertake a gap analysis of missing elements of the existing programme of work for the Global Taxonomy Initiative in the light of the decisions at the sixth and seventh meetings of the Conference of the Parties, considering also the result of the regional workshops held after the adoption of the programme of work.
- (e) Further facilitate the synergistic collaboration between existing

initiatives, including the clearing-house mechanism, the Global Biodiversity Information Facility, and regional and sub-regional taxonomic networks in order to develop more accessible information sources for countries on their biodiversity;

- (f) Ensure that there are linkages between Articles 15 and 8(j) of the Convention, decisions VII/19 A-F of the Conference of the Parties, on access and benefit-sharing, and taxonomy;

8. *Welcomes* the contribution offered by the Government of Belgium through the Directorate-General for Development Cooperation for training in taxonomy and collection management for developing countries.

ANNEX 13.

**COP DECISION VIII/3: GLOBAL TAXONOMY INITIATIVE: IN-DEPTH
REVIEW OF THE IMPLEMENTATION OF THE PROGRAMME OF
WORK FOR THE GLOBAL TAXONOMY INITIATIVE**

The Conference of the Parties

1. *Welcomes* the progress made in the implementation of the programme of work for the Global Taxonomy Initiative, as reported in the note by the Executive Secretary (UNEP/CBD/SBSTTA/11/5) on the in-depth review of the implementation of the programme of work for the Global Taxonomy Initiative;

2. *Notes with appreciation* the contributions to the Global Taxonomy Initiative made by BioNET-INTERNATIONAL the Global Biodiversity Information Facility, CABI International, the Integrated Taxonomic Information System (ITIS) and Species 2000 and *encourages* these organizations and initiatives to continue contributing to the implementation of the Convention;

3. *Notes* that some Parties and other Governments have made significant progress in implementing activities pursuant to the programme of work for the Global Taxonomy Initiative;

4. *Notes* that the taxonomic impediment is particularly serious in countries with mega-diversity;

5. *Emphasizes* the need to build and retain capacity to address the taxonomic impediment, and in this context, explore options to ensure the long-term sustainability of the necessary financial support, and *invites* BioNET-INTERNATIONAL and other relevant organizations, in consultation with the Coordination Mechanism for the Global Taxonomy Initiative, to establish a special fund for the Global Taxonomy Initiative, and to report on progress to the Conference of the Parties at its ninth meeting;

6. *Recalling* target 1 of the Global Strategy for Plant Conservation (“A widely accessible working list of known plant species, as a step towards a complete world flora”), *welcomes* the progress made by Species 2000, the Royal Botanic Gardens, Kew, and collaborating partners towards the achievement of this target;

7. *Adopts* as a target under operational objective 3 of the programme of work for the Global Taxonomy Initiative “A widely accessible checklist of known species, as a step towards a global register of plants, animals, microorganisms and other organisms”, bearing in mind the urgent need for timely provision of scientific names of organisms to support implementation of work under the Convention on Biological Diversity;

8. *Adopts* the planned activities to support implementation of the programmes of work on mountain biological diversity, invasive alien species, protected areas, and island biological diversity contained in the annex to this recommendation as complementary to the programme of work contained in the annex to decision VI/8;

9. *Urges* Parties and other Governments that have not done so to:

- a. Establish National Focal Points for the Global Taxonomy Initiative so that they can contribute to implementation of the programme of work at national level;
- b. Undertake or complete or update, as a matter of priority, national taxonomic needs assessments, including related technical, technological and capacity needs, and establish

- priorities for taxonomic work that take into account country-specific circumstances. These assessments should take into account ongoing national biodiversity strategies and action plans as well as regional strategies and initiatives under development, with particular regard to user needs and priorities;
- c. Contribute, as appropriate, to regional and global taxonomic needs assessments;
 - d. Contribute, where possible, to the implementation of the planned activities contained in the programme of work for the Global Taxonomy Initiative;
 - e. Contribute, as appropriate, to initiatives facilitating the digitization of information on specimens of natural history collections, noting the importance of accessible data to support actions under the Convention;
10. *Invites* Parties, other Governments, and relevant organizations and institutions to:
- a. Use and support existing mechanisms for strengthening collaboration and communication among government agencies, the scientific community, research institutions, universities, collection holders, the private sector and stakeholders in order to improve the response to taxonomic needs for decision-making;
 - b. Promote taxonomy and taxonomic products and related research as a cornerstone for inventory and monitoring of biological diversity in the framework of the implementation of the Convention and to achieve its objectives;
 - c. Develop and implement strategies to support the taxonomic research necessary to implement the Convention;
 - d. Collect and disseminate information on the availability of taxonomic resources with a view to maximising the use of relevant existing resources for the effective implementation of the Global Taxonomy Initiative;
 - e. Develop and implement capacity-building activities related to the Global Taxonomy Initiative, such as training in the areas of identification of taxa, information exchange and database management, taking into account national and region-specific needs;
 - f. Mobilize financial and technical resources to assist developing countries, in particular least developed and small island developing States, and countries with economies in transition, including those with high levels of biodiversity, to build and maintain systems and significant institutional infrastructure in order to adequately obtain, collate and curate biological specimens as well as to facilitate information exchange, including repatriation of information, on their biodiversity;
 - g. Promote cooperation and networking at national, regional, sub regional and global levels in support of capacity-building activities related to the Global Taxonomy Initiative, in accordance with Articles 18 and 15 of the Convention, by, *inter alia*, making information available through the clearing-house mechanism and other means;
 - h. Provide, within the framework of the terms of reference contained in decision V/9, clear guidance to

National Focal Points for the Global Taxonomy Initiative on duties and specific tasks to better communicate and promote the objectives of the Initiative, working in collaboration with other stakeholders and in accordance with country needs;

- i. Facilitate, as appropriate, the integration of taxonomic information on nationally held collections in regional and global databases and information systems;
11. *Requests* the Executive Secretary to:
 - a. Consult with relevant organizations and funding agencies regarding the global taxonomic needs assessment called for in planned activity 3 of the programme of work for Global Taxonomy Initiative, in order to consider, *inter alia*, the scope of the assessment, options for methodology, and potential implementing agencies, with a view to completing the assessment as soon as possible, taking into account users' needs;
 - b. Continue collaborating with relevant conventions, organizations and institutions, and to foster synergies between relevant processes and programmes, in order to make available taxonomic information, expertise and relevant technologies needed to achieve the objectives of the Convention on Biological Diversity, noting in particular, taxonomic priorities at national, regional and global levels;
 - c. Continue collaborating with existing initiatives, including the Global Biodiversity Information Facility, the Integrated Taxonomic information System and Species 2000, to develop the Electronic Catalogue of

Names of Known Organisms and the Catalogue of Life;

- d. Continue collaborating with existing initiatives, including those of BioNET-INTERNATIONAL, the Global Biodiversity Information Facility, IUCN, and CAB International, to develop the human capacities, tools and infrastructure needed to support implementation of the programme of work on the Global Taxonomy Initiative;
- e. Undertake, as part of the Global Initiative on Communication, Education and Public Awareness programme and in collaboration with relevant partners, activities demonstrating the importance of taxonomy for the general public, including information on products, lessons learned, and accomplishments of taxonomy-related projects, and activities encouraging public participation, recognizing the importance of volunteer naturalists and local and indigenous people as a source of expertise;
- f. Develop, in consultation with the Coordination Mechanism of the Global Taxonomy Initiative, other relevant consultative bodies, stakeholders and organizations, for each of the planned activities of the programme of work on the Global Taxonomy Initiative, specific taxonomic, outcome oriented deliverables to be considered as additions under "(ii) Outputs" with a timeline for possible consideration by the Conference of the Parties at its ninth meeting;
- g. Report to the ninth meeting of the Conference of the Parties on

progress made towards the target for the programme of work as specified in paragraph 7 above;

- h. Include the Global Taxonomy Initiative in the joint work plan between the secretariats of the Convention on Biological Diversity and the International Plant Protection Convention, with a view to exploring synergies in the work under the two conventions, with particular regard to invasive alien species;
- i. Facilitate networking and collaboration among National Focal Points for the Global Taxonomy Initiative through, *inter alia*, the Global Taxonomy Initiative portal;
- j. Complete and publish the Guide to the Global Taxonomy Initiative;

12. *Requests* the Global Environment Facility to continue to support the implementation of the planned activities contained in the programme of work on the Global Taxonomy Initiative, including taxonomic needs assessments, projects with a taxonomic focus or clearly identified taxonomic components, and regional activities on taxonomic capacity development and access to technology;

13. *Further requests* the Global Environment Facility to provide financial resources to developing countries, in particular the small island developing States among them, and countries with economies in transition, for projects which help to establish and operationalize their national focal points for the Global Taxonomy Initiative, as well as financial resources to support capacity-building activities such as, *inter alia*, taxonomic training related to specific taxa and information technologies;

14. *Requests* the secretariats of the Convention and the Global Environment

Facility to conduct a joint analysis of funded GTI-related projects and relevant project information contained in national reports, including analysis of the resources directed specifically to capacity-building, with a view to extracting best practices and sharing information and experience in promoting financial support for the Initiative;

15. *Requests* the Executive Secretary to convene, with support from relevant organizations and donors, a project development seminar aimed primarily for those countries that have already identified taxonomic needs or that have submitted proposals for pilot projects under the Global Taxonomy Initiative, to promote formulation of country-driven projects based on identified taxonomic needs and to explore potential benefits of developing new, and enhancing existing, regional or global projects to address common taxonomic needs that have already been identified.

Annex

ADDITIONAL PLANNED ACTIVITIES

I. PLANNED ACTIVITY: MOUNTAIN BIOLOGICAL DIVERSITY

(i) Rationale

1. The taxonomic composition of mountain biodiversity varies with the biogeographic region, the latitude and the altitude of the mountain as well as with the relief. In some cases, mountains provide a necessary seasonal resource for organisms at other times found in lowland biomes. Furthermore most groups of organisms have representatives in the lowland as well as in montane region, and so a vast range of groups of organisms is encountered rather than a few taxonomic groups. Consequently, montane regions are often hot spots of biodiversity, which renders their

full taxonomic treatment a challenge and requires many actors and experts for different organisms.

2. As most mountain ranges extend over considerable length and area, a regional approach to mountain biodiversity is of paramount importance, and relevant information is available in many different databases and inventories. Therefore, the Global Taxonomy Initiative can contribute to the mountain biodiversity programme of work in several ways, including collating relevant information and expertise.

(ii) Outputs

3. An increased knowledge of the species composition of mountains through national taxonomic studies and inventories. The Global Taxonomy Initiative could aid the programme of work on mountain biological diversity through:

- (a) *Working lists of organisms* - assembling working lists of organisms occurring in montane areas including their vernacular names, with reference to altitude and relief;
- (b) *Working identification keys* - producing identification keys in printed and electronic form useful for the conservation, monitoring and sustainable use of organisms in montane areas;
- (c) *Dissemination of data* - distributing the working lists and keys as widely as possible to increase their usefulness;
- (d) *Human resources* - address and support taxonomic experts to encourage their participation in relevant training programmes, and supporting the establishment of local reference and data collections of montane biota;
- (e) *Hot spots and protected areas* - providing relevant taxonomic

information, infrastructure and human resources to identify hot spots of mountain biodiversity and to establish and monitor protected areas.

(iii) Timing

4. As current knowledge of mountain biodiversity is still inadequate, the Global Taxonomy Initiative will make an ongoing effort to develop and improve working lists and working identification keys for montane organisms. Within the next three years, it will attempt to develop taxonomic guides, computerized lists of montane organisms, and identification keys in consultation with appropriate national taxonomy and management agencies.

(iv) Actors

5. The mountain biodiversity programme of work identified many relevant actors, such as Global Mountain Biodiversity Assessment (GMBA) of DIVERSITAS, Mountain Partnership, Mountain Forum, BioNET-INTERNATIONAL (to organize regional LOOPs), the FAO for agricultural aspects, the clearing house mechanism of the Convention and the Global Biodiversity Information Facility (GBIF), the Global Environment Facility (GEF) and national funding bodies for financial support, the Global Strategy for Plant Conservation (GSPC) (for plants), national organizations, nature conservation agencies and programmes including relevant non-governmental organizations, local communities, and many others.

6. The scientific community with past and current research programmes on mountain biodiversity and the natural history museums with specimens collected over decades hold a key role in providing the expertise and relevant information and should actively be included.

(v) Mechanisms

7. Existing mechanisms, such as the clearing house mechanism and Coordination Mechanism of the Global Taxonomy Initiative, Mountain Partnership, and Mountain Forum, and GBIF could be used to coordinate and promote the efforts.

(vi) Financial, human resources and other capacity requirements

8. Financial, human resource and capacity building require funds to be identified within existing and new projects, as well as additional resources to be made available to increase technical capacity in developing countries.

(vii) Pilot projects

9. Pilot projects could be built on information for a number of montane regions of the world, such as the Alps, the Andes, the Himalayas, the Eastern Arc to produce the outputs in short term and to evaluate their usefulness. The Global Taxonomy Initiative could address, *inter alia*, the needs of local and regional capacity building by coordinating workshops in collaboration with mountain partnership, Mountain Forum and DIVERSITAS, focussing on mountain biodiversity conservation and monitoring.

II. PLANNED ACTIVITY: INVASIVE ALIEN SPECIES

(i) Rationale

10. Prevention and mitigation of the impacts of invasive alien species often relies on timely access to taxonomic expertise, and to taxonomic resources such as identification tools, information on species names, and biological reference collections. For many pathways of introductions for invasive alien species, effective prevention and mitigation may depend on detection and monitoring activities that are undertaken at subregional, regional or even global levels.

Consequently, taxonomic capacities and information need to be accessible to all countries in order to support effective prevention and mitigation of potential impacts of invasive alien species. Better characterization of species through research can be key to prediction, early detection and monitoring of invasions. Better baseline taxonomic information on biological diversity in areas that are exposed or vulnerable to key invasion pathways (e.g., marine ports) can facilitate early detection of changes in species composition that may result from invasive alien species. In addition, taxonomic expertise can be important in the development of biological control measures which may be considered by decision-makers for addressing invasive alien species in particular cases.

(ii) Outputs

11. Outputs should comprise:

- (a) Databases of invasive alien species and occurrences of invasions, developed and/or expanded, and made widely available;
- (b) Working identification keys for known invasive alien species associated with key invasion pathways produced and disseminated;
- (c) Working lists of organisms in areas that are exposed or susceptible to key invasion pathways produced and utilized by local monitoring authorities.

(iii) Timing

12. Databases further developed and/or expanded and made widely available within two years. Working identification keys for known invasive alien species produced and disseminated within three years. Working lists of organisms in areas that are exposed or susceptible to key invasion pathways produced and utilized within three years.

(iv) Actors

13. Database development – IUCN Species Survival Commission (SSC) Invasive Species Specialist Group, Global Invasive Species Information Network, clearing-house mechanism of the Convention, ITIS, IABIN, GBIF, Species 2000, BioNET-INTERNATIONAL. Identification keys – scientific community, national Governments, natural history museums and programmes. Working lists of organisms in areas that are exposed or susceptible to key invasion pathways – national governments, national and regional organizations including non-governmental organizations.

(v) Mechanisms

14. Coordinated efforts at the national and global levels by the actors identified above will be an important mechanism. In addition, existing mechanisms, such as the clearing-house mechanism of the Convention and the GBIF can function as information portals.

(vi) Financial and human resources and other capacity requirements

15. Financial, human-resource and capacity building require resources to be identified within existing and new projects, as well as additional resources to be made available to increase technical capacity in developing countries. GEF and national funding organizations would be important sources of financial support.

III. PLANNED ACTIVITY: PROTECTED AREAS

(i) Rationale

16. Taxonomic expertise and information constitute key requirements for conservation planning and sustainable natural resource management. This is especially true in the case of protected areas, which are

established with the goal to conserve a significant part of natural biodiversity, but usually based on limited knowledge or available information about the biodiversity they actually contain. With no complete species inventory currently available for any existing or planned larger protected area and relevant taxonomic, distributional and biological information about many taxa with high conservation value still missing, it will be difficult to achieve meaningful conservation planning. The objective of the programme of work on protected areas is to support the establishment of ecologically representative and effectively managed national and regional systems of protected areas. Activity 1.1.2 of the programme of work specifically calls for establishing protected areas in any large, intact or highly irreplaceable natural areas, as well as areas securing the most threatened species, and activity 1.1.5 requests that gap analyses at national and regional levels of the representativeness of the protected area system be undertaken (by 2006). The Global Taxonomy Initiative could play an important role particularly for the identification, establishment and management of protected areas (decision VII/28, annex, programme element 1) through focusing on biodiversity inventories and gap analysis of existing inventories, and in the development of standards for managing and monitoring protected areas (decision VII/28, annex, programme element 4) through facilitating assessments and comparisons of different taxonomic components of biodiversity covered and sustained through the existing network of protected areas. In light of threats to protected areas through climate change and invasive alien species, it is important to understand current constraints on species and populations, and how these would determine distribution under changing

conditions. Access to accurate information on current distributions and ability to model these is important for appropriate management and policy development.

(ii) Outputs

17. Improved and augmented biodiversity inventories of protected areas of all kinds, also to be expanded into monitoring efforts to record changes of species and populations over time. Taxonomic guides for key invertebrate organisms, lower plants and microorganisms, economically important and threatened species. Information on current distribution and occurrence of important species in protected areas, including population trends. Identification of habitats and priority setting for establishing new protected areas, through plotting distributions of species at local, national and regional levels. Mobilization and augmentation of specimen and observational-level data pertaining to species to allow modelling of current distributions and distributions under different models of climate change and of other biotic and a biotic changes (e.g. land-use change, invasive species).

(iii) Timing

18. The target date for activity 1.1.5, on conducting gap analysis is 2006. The target date for goal 4.3 (to assess and monitor protected area status and trends) and goal 4.4 (to ensure that scientific knowledge contributes to the establishment and effectiveness of protected areas) of the programme of work is 2010. Hence, outputs need to be produced within the next four years, but efforts will need to be ongoing.

(iv) Actors

19. National agencies and local authorities concerned with protected area administration and management in concert with taxonomic institutions, especially natural history museums, biosystematics units at universities and other research institutions,

botanic gardens and culture collections, and the IUCN Species Survival Commission, together with nature conservation agencies including international non-governmental organizations such as Conservation International, BirdLife International, Flora and Fauna International, WWF, the World Resources Institute (WRI), and local communities. Parataxonomists could also play an important role. Other actors include the clearing-house mechanism of the Convention and GBIF (as data portals), GEF and national funding organizations for financial support, and BioNET-INTERNATIONAL (to organize regional LOOPS). Other biodiversity conventions, including the Ramsar Convention on Wetlands, the World Heritage Convention, the Convention on Migratory Species, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the UNESCO Man and the Biosphere (MAB) biosphere reserve programme could also play an important role. Direct linkages to relevant ongoing or planned taxonomy-related, capacity building projects should also be implemented, e.g., the International Pollinator Initiative (IPI), the Census of Marine Life (CoML), the Botanical/Zoological Network for Eastern Africa, the Partnerships of Enhancing Expertise in Taxonomy (PEET), and the recently proposed European Distributed Institute for Taxonomy (EDIT).

(v) Mechanisms

20. Coordinated effort at national and global levels by the actors identified above will be an important mechanism. Mobilization of extant data and their presentation in an appropriate manner, with the development of the analytical tools, is required. The need for identification keys, inventories and primary data must be communicated effectively to the key agencies

and funding bodies, with an indication of priority.

(vi) *Financial, human resources and other capacity requirements*

21. Insofar as the requirements need a focus cutting across traditional work processes and patterns of the data providers, funding will be required that is focussed at meeting the identified needs.

(vii) *Pilot projects*

22. Stimulate and undertake efforts to carry out All-Taxon Biodiversity Inventories (ATBIs) in existing or planned protected areas. Gap analyses of representative taxa found in protected areas, in the context of the distribution and presence of those taxa at other sites nationally and regionally, demonstrating the development and use of such analyses in protected area selection and management. Mobilization of primary occurrence data of species in a protected area, provision of these data to country of origin, and analysis of distributions using a niche modelling system.

IV. ISLAND BIOLOGICAL DIVERSITY

23. As noted in SBSTTA recommendation X/1, paragraph 6, islands incorporate all the thematic areas (coastal and marine biological diversity, forest biological diversity, inland water biological diversity, dry

and sub humid land biological diversity, mountain biological diversity and agricultural biological diversity) considered under the Convention. Thus, the planned activities already identified under operational objectives 4 (on thematic programmes of work) and 5 (relating to work on cross cutting issues) in the GTI programme of work (decision VI/8, annex, planned activities 8-18) already identified for thematic and cross-cutting programmes of work could also be considered to generate taxonomic information needed for the conservation of island biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising from its use.

24. However, recognizing the current alarming rate of loss of island biological diversity in both biodiversity 'hot' and 'cool' spots; that due to their isolation, island environments are witnessing a unique evolution of often endemic and characteristic flora and fauna; that islands are microcosms of their continental counterparts; that vulnerability of small islands require not only special but urgent attention, special support is needed to islands, in particular small islands, to implement, as a matter of urgency, the planned activities 8 to 18 of the GTI programme of work. In addition, for small islands in particular, regional approaches to meeting taxonomic needs and building capacity should be emphasized.