CAPACITY DEVELOPMENT INITIATIVE

Scientific and Technical Capacity Development

Needs and Priorities

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GEF – UNDP Strategic Partnership

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INTRODUCTION

1. There is a growing recognition that science and technology play a major role in addressing global environmental problems associated with the loss of biological diversity, climate change and land degradation. This recognition is deposited in such international regimes as the United Nations Agenda 21 and related conventions on biological diversity, climate change and desertification. For example, Agenda 21 contains explicit reference to the role of science and technology in managing such problems as land degradation, climate change and loss of ecosystems and species.

2. There are many institutions that have focused their activities on harnessing and applying science and technology to address environmental degradation. They exist at all levels of governance: local, national, regional and international levels. There are many science networks that are working on various environmental issues. These networks can play an important role in the creation and/or enlargement of developing countries' capacities to harness and utilize science and technology to identify and solve climate change, loss of biological diversity and land degradation problems. Their efforts should however be informed by or based on a clear assessment and an understanding of the specific capacity needs of the countries.

3. This report is an attempt to assess scientific and technical capacity needs of developing countries to address environmental problems of climate change, loss of biological diversity and land degradation. It also identifies specific roles that science networks can play in the development of that capacity. The report is prepared to assist the Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF) to develop strategic approaches to utilizing science networks. It also suggests ways and means through which the networks can assist governments in building scientific and technical capacity for global environmental management.

4. The first section of the report deals with conceptual and methodological issues. It defines concepts of capacity, scientific and technical capacity, and capacity building. The section also describes methodology for the assessment of scientific and technical capacity.

5. The second section examines the extent to which scientific and technical issues have been addressed by global environmental agreements and related programmes. It is an overview of the science and technology content of the conventions on biological diversity, land degradation and climate change. The section also identifies the different scientific and technical bodies that are responsible for global environmental management.

6. The third section is an overview of developing countries' scientific and technical capacity needs. It focuses on needs in the areas of biological diversity management, climate change impact assessment and adaptation, and stemming land degradation. Emphasis is placed on the scientific and technical capacity needs common to most developing country regions of Africa, Asia, Latin America and the Caribbean, Eastern Europe, and the Small Island Developing States (SIDS).

7. The fourth section discusses roles that science networks (particularly regional and international ones) can play to build or develop the scientific and technical capacities of the countries. It places emphasis on those activities that would enlarge opportunities of these countries to implement the conventions. The last section suggests ways and means through which STAP can utilize the networks to contribute to capacity development.

1. CONCEPTUAL AND METHODOLOGICAL ISSUES

1.1 Concepts Defined

8. The concept of 'capacity' and that of 'capacity development' have acquired such wide and general usage that their precise meanings are taken for granted. Often the terms are used so generally that they are subject to misuse. Sometimes people talk of capacity when actually they are referring to skills. Some simply make reference to finances and institutions. At international intergovernmental forums some of the delegations make generalized statements on capacity building without articulating specific components or elements of capacity that they require built.

9. In our view capacity is *the ability (of an individual, institution, or society as whole) to identify and solve a problem or problems.* It is not the mere existence of potential. Capacity is capacity only if the potential is harnessed and utilized to identify and solve a specific problem that confronts society or an individual. Capacity has at least three elements or components. The first is the skills/expertise required to identify and solve a problem or problems. These are embodied in human beings. Indeed human beings are the carriers of skills/expertise. The second element or component of capacity is institution (both rule-based and role-based). It is institutions (be they clans, women groups, formal government agencies, corporate aggregates, and their norms, values and rituals) that create, mobilize and often utilize skills/expertise embodied in persons. Institutions also create other necessary resources (informational, finance, social, etc.) that persons require to identify and solve a problem. It is not the mere existence of agencies or organizations that constitute the institutional component of capacity but how each of the agencies or organizations are configured to create the necessary space for the creation, mobilization and utilization of the skills and other resources. Intra-institutional or agency articulation is thus an important factor to consider in the assessment of capacity.

10. The third component of capacity is the context in which institutions and skills/expertise evolve, grow (and after sometimes die), and are mobilized and utilized. The context comprises of the overall economic, political, socio-cultural, general infrastructure, inter-institutional/ organizational articulate (how and whether institutions or agencies in a country communicate), the nature (including adequacy) of policies, laws and administrative measures and how and whether these are implemented or enforced on the basis of agreed upon or set benchmarks.

11. Having identified constituent elements of capacity it should be relatively easy to define what 'capacity development' or 'capacity building' means. Capacity development is, in general terms, the processes of creating, mobilizing, utilizing, enhancing or upgrading, and converting skills/expertise, institutions and contexts. It is thus achieved through the following interrelated clusters of activities:

(a) Skills/expertise creation, mobilization, enhancement (and where necessary conversion) and utilization;

(b) Institution/agency creation, enhancement and utilization;

(c) Context creation, enhancement and/or sustenance.

12. Capacities exist at three general levels: individual (a person who possesses and uses (his/her) intellect, skills, money, information, infrastructure, values and norms, and social relations to identify and solve problem(s)), institution (agency or organization with skilled persons, money, programmes, values and norms, relations with other agencies, equipment/infrastructure, authority and autonomy, and purpose to identify and solve problems), and country (a country with a government, skilled persons, with linked and equipped institutions, policies, rules and laws, functioning and/or growing economy, a reasonable measure of political stability, overall general infrastructure, dynamic and good relations with other countries, etc.).

13. It is important to note that the individual, institutional and country/system capacities are *constantly changing both qualitatively and quantitatively*. And thus capacity is time dependent. At one time a person may have skills relevant to the identification and solution of a problem and later those skills become obsolete or irrelevant to society and its problems. National capacity is the *cumulative composition* of the skills, institutions and context but not the sum of these components. It is not the sum of scientists, institutions and policies as well as laws that constitute national capacity but how these are configured and reconfigured over time to address specific situations and challenges.

14. The development or building of capacity is not an event or project but a knowledge-intensive process. Paradoxically, you must have capacity to create capacity. The process entails the generation, retention and use of information to manage change. It also requires varying degrees of social organization and re-organization. Social organization and reorganization are essentially about institutional development. Capacity development cannot therefore be pursued independent of the development of the relevant institutions.

1.2 Typology of Scientific and Technical Capacity

15. There is also wide and often misplaced usage of the phrase ‘scientific and technical capacity’. Scientific and technical capacity means different things to different people. For some it is all about equipment and infrastructure and for others it is the mass of scientists. Even for some it is the mere existence of scientific and technical agencies.

16. To define the notion of ‘scientific and technical capacity’ it is important first to ‘un-package’ it. That is to say, ‘scientific and technical capacity’ is better defined by first defining the concepts of science and technology—What is science? What is technology? Science can be defined as the inquiry into the

nature of things. It is the systematic generation of new knowledge and information about natural and/or physical phenomena. Technology is, on the other hand, the application of science to solve a particular problem or generate goods and services. It is either tacit (software)—that is technique or process involving the application of scientific information—or hardware (for example tools, machines, etc.).

17. We define, drawing from above, scientific and technical capacity as the ability to generate, procure and apply science and technology to identify and solve a problem or problems. It is about the generation and use of new knowledge and information as well as techniques to solve problems. The scientific and technical capacity comprises of:

(a) Skills in specific sciences and technologies—these are essentially in persons who have acquired expertise to generate new knowledge and apply it to the solution of problems;

(b) Institutions whose role to conduct science, and to develop and apply technologies—These include agencies that are dedicated to science, those dedicated to technology development, and even those responsible for science and technology policy research and formulation.

(c) Overall science and technology context—This includes the scientific infrastructure of a country, national science and technology policies as well as laws, configuration of science and technology agencies, existence of a science and technology culture, etc.

18. Scientific and technical capacity is not the mere existence of any one of the components. It is how the skills, institutions and overall context are configured and used to generate and apply science and technology in the solution of problems. The creation, enhancement, mobilization and utilization of skills require prior existing capacity in the form of expertise, institutions and appropriate national policies.

1.3 Building Scientific and Technical Capacity[1]

19. Developing countries differ in their level or status of scientific and technical capacity to engaged in environmental management. They have differentiated abilities to deploy both science and technology to deal with specific problems of environmental degradation. They also differ in their capabilities to

1 This section draws heavily from ACTS, 1993. *Technology and Sustainable development: Strategic Medium Term Plan*; and Mugabe, J. 1994. *Technological Capability for Environmental Management: The Case of Biodiversity Conservation in Kenya*. PhD Thesis, University of Amsterdam.

engage in environmental science research. That a country has accumulated scientific and technical capabilities for environmental management means that it has acquired the abilities for search, acquisition and deployment of specific techno-scientific knowledge and information to effectively undertake specific conservation activities and deal with specific ecological problems. It also means that it has the competence to introduce incremental innovations in the technological systems of environmental management.

20. There are a variety of interrelated activities and processes of developing scientific and technical capacity. These largely include:

(a) *Mobilization of existing scientific and technical potential*—There are many jurisdictional, organizational and informational obstacles to the process of mobilizing and utilizing existing scientific and technical potential (human, equipment and institutional). In the first case, existing capacity components may not be utilized because they do not reside in the institution that is charged with the respective responsibility. In the second case, which we consider to be the most critical, scientific skills, equipment and information is not utilized because of organizational deficiencies.

21. In many cases, existing potential may not be fully utilized because of the lack of information on the existence of such scientific and technical potential. The common response to this problem has been to develop databases on scientific expertise. But such databases will not be useful unless they are accompanied by additional measures that provide capacity intelligence, which includes information on factors such as effectiveness, reliability, availability and competence. The mobilization of scientific and technical capacity thus should go beyond the mere listing of the nature of expertise to include creation of institutional arrangements to test the effectiveness, reliability, availability and competence of the experts.

(b) *Capacity enhancement*—Capacity enhancement involves measures aimed at dealing with obsolescence by providing short-term courses, workshops, seminars and other training services. It is also provided in a subtle way through the continuous utilization of existing capacity, which is associated with the accumulation of experience. Benefiting from capacity enhancement requires a certain degree of institutional stability, which is often lacking in developing countries. Frequent change in jobs, for example, may have the effect of eroding the acquired scientific and technical capacity. In other cases, however, such changes may lead to the acquisition of complementary skills that raise the competence of a particular individual.

(c) *Scientific and technical capacity conversion*—As new environmental problems emerge, so does society needs to apply the existing scientific and technical capacity to find solutions to those problems. The conscious adjustment of existing capacity to deal with the new problems can be seen as a form of capacity conversion. Not all skills, information and equipment are adapted to this kind of drift into capacity. In research, for example, it is not uncommon to find people who have been trained in one discipline applying their skills in other fields.

(d) *Creation of scientific and technical capacity*—This largely involves formal training programmes. It is also the most expensive and involves long periods of preparation. However, it is a critical base upon which other forms of capacity development can be based. "Higher levels" of capacity creation are often associated with university education.

22. Institutions are the loci in which scientific and technical capacity is mobilized, enhanced, converted and created. Institutions' abilities to develop capacity often depend on their organizational structures, management strategies, the economic structure and policies of the country in which they are located or operating, their initial human, financial and infrastructure capabilities.

23. It should be emphasized that the development of scientific and technical capacity is largely a learning process. The process of learning proceeds at a certain pace and requires innovative strategies as well as flexibility. It is essentially institutions that are supposed to provide space for that learning. Moreover, the process of learning in order to accumulate capacity involves organizing different domains of knowledge in sequences that specifically relate to the institutional structure and mandates.

24. Much of the literature and discussion of capacity development tend to assume that the process is costless and quick. Indeed the literature on capacity development tends to adopt this assumption: of costless and quick technological learning, mastery and deployment of science and technology to address environmental problems. Some of the discussions implicitly assume that once the relevant technologies are transferred to developing countries and/or training has been provided, it is easy and costless to deploy science and technology for environmental management. The development of scientific and technical capacity requires the institutionalization of specific long-term activities. It also requires the creation of a sound institutional base for information search, acquisition, management and assimilation. It is incremental as well.

25. Successful deployment of scientific and technical capacity for environmental management in any one country depends more on factors of institutional change and management than on mere accumulation of human capital, funds and equipment. On the whole, institutions are essentially the social organisms that facilitate the generation or acquisition, assimilation and storage of capacity. Their ability of institutions to successfully engage in environmental management is dependent to a large extent on the nature and level of scientific knowledge, of different arts, accumulated they have accumulated. Continued accumulation of knowledge is such areas enables the institutions to improve their scientific and technical abilities to address environmental problems.

26. It is important to stress that the effects of scientific knowledge accumulation in institutions for environmental management should be analyzed within the context of factors such as the diffusion of such knowledge among the personnel of the institutions, and the rate of assimilation and deployment of new knowledge in conservation practices. The diffusion of knowledge within a particular institution is largely determined by the nature of the organizational structure of the institution. It is crucial to note that institutions may also loose knowledge and memory as a result of staff turnover or mobility, declining funding, declining infrastructure, and lack of proper information storage facilities and capacities.

27. National scientific and technical capacity is not simply the aggregate sum of the capacities or capabilities of the institutions within the country. Because of institutional inter-linkages and externalities, national capacity results from the synergy of institutional abilities. In other words, institutional scientific and technical capacities interact in synergy to produce the overall national capability.

2. SCIENCE AND TECHNICAL ISSUES IN GLOBAL ENVIRONMENTALISM

28. The evolution and growth of global environmentalism—largely the emergence and spread of awareness of threats to the natural environment and subsequent institutionalization of norms and rules to address these threats—have their origins in scientific inquiry. It is the scientific enterprise that brought to the fore reality of the destruction of the earth's systems—ecological and physical. Science was instrumental in attracting public attention to problems of pollution, and the destruction of forests and fisheries. Such works as *Silent Spring* by Rachel Carson (1962) gave a vivid scientific picture of some of the environmental problems that confront society. They found institutional expression in the programmes of such agencies as the World Conservation Union (IUCN), before called the International Union for the Protection of Nature. These agencies gave institutional backing to the scientific efforts.

29. The initiatives of the United Nations in organizing the United Nations Scientific Conference on the Conservation and Utilization of Resources in 1949 gave environmental science—inquiry into the nature and extent of environmental change—international legitimacy and helped move concerns to the policy and political arenas. The conference, held at Lake Success in New York, was organized on the premise that the world's heritage of fauna and flora was increasingly being threatened, towards extinction, by man's socioeconomic activities. It noted that the IUCN had largely ignored plants, small mammals, reptiles and insects in its activities and focused mostly on charismatic animals such as elephants.[2] These concerns were later articulated in the 1970s at the United Nations Conference on the Human Environment and in such scientific publications as *The Sinking Ark* by Norman Myers. Myers in his seminal work demonstrated through scientific data that the world's species of plants and animals were disappearing at alarming rates.[3]

30. Environmental science formed the basis for the search of technical sources to the problems. It become increasingly clear that many of the environmental threats required technical sources. This was despite the growing perception among environmental activists that technological progress was the main source of environmental degradation. The works of Commoner and Schumacher in the 1970s promoted systematic thinking that it was not technology to blame for environmental degradation but mankind or society for failing to establish institutional systems to guide the generation and application of appropriate technologies, provided the activists with new perceptions on technological progress.[4] There is now increasing recognition that technological change is important for environmental management. This is demonstrated by increasing integration of technological issues in environmental concerns.

[2]McCormick, J. 1989, *The Global Environmental Movement: Reclaiming Paradise*. Belhaven Press, London. p. 37-40.
[3]Myers, N. 1979, *The Sinking Ark: A new look at the problem of disappearing species*. Pergamon Press, Oxford.
[4]See for example Commoner, B. 1971.

31. The recognition that technological change is important for environmental management is reflected in recent international agendas and conventions on environmental issues. For example, Agenda 21 adopted by the world's nations during the United Nations Conference on Environment and Development (UNCED) at Rio de Janeiro in 1992 explicitly recognizes that technological change is vital for environmental management. Most of the chapters in Agenda 21 articulate this recognition. For example, chapter 15 on conservation of biodiversity, chapter 16 on environmentally-sound management of biotechnology and chapter 34 on transfer of environmentally-sound technology, cooperation and capacity building address technological imperatives in relation to environmental management. International conventions such as the 1992 Framework Convention on Climate Change, the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and the Convention on Biological Diversity address technological issues in environmental concerns.

32. Chapter 16 of Agenda 21 provides that biotechnology "promises to make a significant contribution in enabling the .... support for sustainable methods of afforestation and reforestation." It further observes that "[b]iotechnology can assist in the conservation of ... resources through, for example, *ex situ* techniques."[5] Chapter 34 takes a systematic definition of technologies that are environmentally-sound. It provides that "[e]nvironmentally sound technologies are not just individual technologies, but total systems which include know-how, procedures, goods and services, and equipment as well as organizational and managerial procedures."[6] It further provides that "when discussing transfer of technologies, the human resource development and local capacity-building aspects of technology choices, including gender-relevant aspects, should also be addressed. The chapter in this way addresses issues of technological capability building.

33. Chapter 34 also notes that environmentally-sound technologies should be "compatible with nationally determined socio-economic, cultural, and environmental priorities."[7] It proposes that technological capabilities for environmental management should be created through human resource development, institutional capacity building, bilateral cooperation and institutional partnerships.

[5]Agenda 21, Chapter 16: 'Environmentally-sound Management of Biotechnology'. Para. 16.1

[6]Agenda 21, Chapter 34: "Transfer of Environmentally-sound Technology, Cooperation and Capacity building" para. 34.3

[7]ibid.

3. SCIENTIFIC AND TECHNICAL CAPACITY NEEDS

3.1 Biological Diversity

34. Developing country Contracting Parties to the Convention on Biological Diversity have incurred obligations to undertake various activities—at domestic and international levels—to promote or ensure the conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of benefits arising from the utilization of genetic resources. Meeting these objectives of the Convention will require scientific and technical capacity in developing countries. Indeed developing countries will require capacity to harness and effectively apply science and technology to meet the objectives of the Convention.

35. There are a number of priorities for the countries in their efforts at implementing the Convention. These priorities have been set by the countries themselves and are articulated in their first national reports (under Article 26 of the Convention) to the Conference of Parties. They include:

(a) Preparation and implementation of national biodiversity strategies and action plans (Article 6);

(b) Conducting inventory, assessment and monitoring of the status of and trends in ecosystems, species and habitats (Article 7);

(c) Establishment of domestic measures to control the release and spread (as well as negative impacts) of alien species (Article 8g);

(d) Formulation and enforcement of measures to assess and manage risks from modern biotechnology (Article 19);

(e) Review and expansion of protected areas systems (Article 8);

(f) Formulation of measures to regulate access to genetic resources and promote benefit-sharing (Article 15);

(g) Establishment of measures to promote access to and transfer of technologies, including biotechnology, to developing countries (Article 19); and

(h) Establishment of national clearing-house mechanisms to promote scientific and technical cooperation (Article 18)

36. The implementation of the above largely depends on the existence of endogenous scientific and

technical capacity in the developing countries. These countries require skills, institutions and appropriate policies to mobilize science and technology to undertake various tasks associated with the above responsibilities and priorities. For example, they require technological infrastructure with working telephones and electricity to effective develop, manage and utilize clearing-house mechanisms. They require scientific skills in such areas as taxonomy to be able to effective conduct inventory and assessment of status of ecosystems and species. They require specialized skills in risk assessment as well as well equipped laboratories to be able to conduct such assessment.

37. The Convention recognizes the need to build scientific and technical capacity of developing countries to meet their obligations. The Convention also notes that the conservation of biodiversity by nations largely depends on national scientific and technical capacity. Specific articles of the Convention that relate to the issue of scientific and technical capacity are: Article 12 on research and training, Article 17 on exchange of information, and Article 18 on technical and scientific cooperation.[8] Article 12 provides that the "Contracting Parties shall:

(a) Establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity and its components and provide support for such education and training for specific needs of developing countries; and

(b) Promote and encourage research which contribute to the conservation and sustainable use of biological diversity, particularly in developing countries, ..."

38. Article 18 explicitly calls for establishing and strengthening scientific and technical capacities for research and conservation in developing nations through international cooperation. Paragraph 2 of Article 18 provides that: "[e]ach Contracting Party shall promote technical and scientific cooperation with other Contracting Parties, in particular developing countries, ... In promoting such cooperation, special attention should be given to the development and strengthening of national capabilities, by means of human resource development and institution building."

39. The role of technical and scientific cooperation in capacity building for biodiversity conservation is also articulated in Agenda 21. Chapter 15 para 15.7 c recommends that governments should:

> *Promote technical and scientific cooperation in the field of conservation of biological diversity and the sustainable use of biological and genetic resources. Special attention should be given to the development and strengthening of national capabilities by means of human resource development and institution-building, including the transfer of technology and/or development of research and management facilities, such as herbaria, museums, gene banks, and laboratories, related to the conservation of biodiversity.*

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[8] UNEP (1992), op. cit.

40. Chapter 15 of Agenda 21 recognizes the need to build capacity for the mobilization and utilization of science and technology for conservation and sustainable use of biodiversity.

41. Agenda 21 also recommends a number of measures for building and utilizing national scientific and technical capacities for biodiversity conservation. In chapter 15 paragraph 15.8 it recommends that governments should:

> *"(a) Increase the number and/or make more efficient use of trained personnel in scientific and technological fields relevant to the conservation of biological diversity and the sustainable use of biological resources;*
>
> *(b) Maintain or establish programmes for scientific and technical education and training of managers and professionals, especially in developing countries, on measures for the identification, conservation of biological diversity and the sustainable use of biological resources;"*

42. It also recommends that governments should "strengthen existing institutions and/or establish new ones responsible for the conservation of biological diversity and to consider the development of mechanisms such as national biodiversity institutes or centers". (Ch. 15 para. 15.11a).

43. On the whole, the Convention and Agenda 21 have set basic guidelines and measures for applying technology in the conservation of biodiversity. They have also stressed the importance of building national technological capabilities for undertaking research on biodiversity and promoting conservation. Furthermore, the two documents have noted the two main technological systems for biodiversity conservation. In the preamble the Convention notes that "the fundamental requirement for the conservation of biological diversity is the *in situ* conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings." It goes further to recognize "that *ex situ* measures, preferably in the country of origin, also have an important role to play." It deals further with *in situ* and *ex situ* conservation in Articles 8 and 9 respectively. The rest of this section provides a general indicative assessment of scientific and technical capacity needs of developing countries.

44. A review of four regional and 7 national capacity needs assessment reports prepared under the CDI shows that most developing countries face constraints in generating, harnessing and applying science and technology to conserve biological diversity and sustainably use its components. The constraints can be grouped in four categories as follows:

> (a) *Shortage of scientists* with skills and experience in such areas as taxonomy. All the four regional reports identified taxonomy as a major science discipline in which there are few experts. The training or creation of more taxonomists has been recognized by the Conference of Parties to the Convention on Biological Diversity as priority in ensuring effective conservation and sustainable use of biodiversity. Parties to the Convention have recognized the urgency to address 'taxonomic impediment'—"gaps of knowledge

in our taxonomic system (including knowledge gaps associated with genetic systems), the shortage of trained taxonomists and curators, and the impact these deficiencies have on our ability to manage and use our biological diversity."[9] Other areas for which h specialized scientific and technical skills are in great demand include

(b) *Absence of up-to-date information* on ecosystems and species, their nature (structure and capacity) and usefulness, is a major constraint to national efforts at conserving and sustainably using biodiversity and its components. There is scanty information on the structure and functioning of many of the major ecosystems of developing countries.

(c) *Poor institutional linkages* between conservation science bodies and national biodiversity management agencies—In many developing countries there is a disjunction between agencies responsible for and/or engaged in conservation science research and those mandated with practical aspects of managing ecosystems, species and habitats. Management agencies are not linked to and drawing from science research institutions.

(d) *Poor or inadequate scientific infrastructure,* including such infrastructure as for information and data acquisition and management, gene banking, biotechnology risk assessment, and monitoring of ecosystem and species status and trends, is one of the main scientific and technical capacity needs of developing countries. Institutions such museums and herbaria whose mission is to collect, document and safely store biological collections are poorly equipped and under-funded in many developing countries. "Despite the importance of these collections, both in developed and developing countries, we today are witnessing the deterioration of collection standards. The museums and herbaria which have been established to provide safe storage of specimens and the infrastructure for research and information retrieval now have inadequate resources even to maintain their collections in an active accessible form, let alone expand and develop their potential to contribute to the aims of the CBD and to national, regional and local objectives. There is therefore an urgent need for substantial funding to be made available to museums, herbaria, and relevant living collections to secure their future."[10]

(e) *Inadequate science and technology policies*—Most national science and technology policies only provide general reference to the need to harness and apply science and technology to manage biodiversity. They generally focus on industrial development and pay little attention to the need to create and/or strengthen scientific and technical capacity for the conservation and sustainable use of biodiversity. There are also no deliberate policies for the mobilization and utilization of scientific and technical capacity to address environmental challenges such as those associated with land degradation, climate change and loss of biodiversity.

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9 The Darwin Declaration, 1998. See http://www.anbg.gov.au/abrs/flora/webpubl./darwinw.htm

10 The Darwin Declaration, 1998. See http://www.anbg.gov.au/abrs/flora/webpubl./darwinw.htm

3.2 Climate Change

45. The UNFCC creates a variety on obligations on developing countries. These countries have also established their priorities and articulated these in their national communications to the Conference of Parties to the Convention. There are at least three clusters of priorities. The first pertains to assessing impacts of climate change and associated global warming. Many of the developing countries have identified activities associated with *impact assessment* as priority in the implementation of their obligations under the Convention. They place emphasis on impacts on such ecosystems as coastline and forests and economic sectors as agriculture and fishing.

46. The second priority pertains to *assessing national vulnerability* and searching for appropriate climate change *adaptation measures*. In a good number of developing countries there has been assessment of national vulnerability to climate change. Vulnerability to climate change is defined as "a nation's ability to cope with the consequences of the range of impacts of climate changes that may follow from increasing concentrations of GHGs in the atmosphere."[11] Our understanding of how vulnerable ecological and economic systems are to climate change is still meager. Having clear national vulnerability statements would form the basis for establishing adaptation strategies and actions with high levels of confidence.

47. The third set of priorities relates establishing *energy efficient systems* in such areas as industry, agriculture and transport. Associated with this is the *acquisition of relevant technologies*. These relate to the acquisition of energy efficient technologies on preferential terms, for example under relatively cheap licenses or relaxed intellectual property protection law. Discussions on transfer and acquisition or procurement of related technologies need to be focus on such considerations as endogenous scientific and technical capacity to absorb and efficiently utilize technology, need to build mechanisms for technology forecasting and assessment, and issues of intellectual property protection that are of concern to technology sources—the private sector. While there is scanty empirical data on the individual developing country scientific and technical capacity to acquire, absorb and utilize environmentally sound technologies the general view is that many of them lack such capabilities. Secondly, most of the countries have not established technology forecasting and assessment facilities.

48. Other priorities relate conducting *national inventories of anthropogenic emissions*. Contracting Parties to the UNFCC are required to establish the status of and trends in their emissions. Such information is to be communicated to Conference of Parties through their national communication reports.

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[11] Fuglestvedt, J. *et. al.* 1994. *A Review of Country Case Studies on Climate Cha*nge. GEF Working Paper No. 7. Global Environment Facility (GEF), Washington DC.

49. The implementation of activities and tasks to meet the above priorities will require specialized skills or expertise and scientific institutions with the necessary equipment and scientific information. Some of the tasks that developing countries have to undertake include:

(a) Establishing science-informed plans to manage sinks and reservoirs of GHGs;

(b) Integrating climate change considerations into their social, economic and environmental policies;

(c) Establish programmes that promote practices and processes that reduce and control emission of GHGs;

(d) Assessment of impacts and vulnerability status; and

(e) Identification and establishment of adaptation measures.

50. Some of the scientific skills that are crucial to the conduct of the above activities include: chemistry, biochemistry, meteorology, mathematics to develop models for establishing national scenarios of future emissions or to guide national R&D priorities, and climatology among many others. Scientific and technical capacity to undertake any of the above tasks is really a convergence of skills drawn from these and other disciplines. The developing countries also require scientific institutions with the necessary equipment and related overall technological infrastructure (electricity, telephone, etc) to be able to effectively undertake the tasks.

51. A general review of scientific and technical capacity needs of the countries shows that in many countries there is scanty information on the nature and quantity of skills that are present. From the regional and national reports prepared for the CDI as well as responses to questions sent out to various institutions and networks, there is no clear indication that it is the absence of scientific skills in the certain disciplines. In many cases there responses indicate that the skills are there or in some case in short supply. Two areas in which *skills shortage was identified are meteorology and climatology*.

52. Other scientific and technical capacity needs for climate change research and management include the following:

(a) *Scanty or absence of information on technologies* that are being generated from R&D laboratories in the industrialized countries. Information from these laboratories is difficult to obtain mainly because it is considered proprietary or simply because it published in journals that are not accessed by developing countries' science research agencies. The absence of such information undermines efforts of countries to engage effectively in technology search and assessment.

(b) *Inadequate, and in many cases no, equipment* for systematic collection of long-term instrumental observation of climate system variables (including hydrological cycles, energy balances, etc.) for purposes of model testing and assessment of variability.

(c) *Absence of bodies or agencies dedicated to climate science research*—In many developing countries there are no agencies dedicated to conducting scientific research on climate change. Where some research is taking place it often in meteorological departments in the form of short-term projects. Few, if any, developing countries have established reputable climate science programmes. There is a tendency in many countries to add-on climate change issues to broad environmental agendas of ministries of the environment. Such efforts are not based on adequate science on the climate system and its changes. However, some of the countries are relying on the scientific assessments being undertaken through the Intergovernmental Panel on Climate Change (IPCC). There is little if any country research and modeling of climate process to enable policy-makers to make predictions and adopt appropriate actions. Most of such activities are undertaken in industrialized countries' institutions.

(d) In many countries, particularly those of Africa, science and technology policies do not contain specific and explicit provisions on climate change and its management. They do not promote scientific research on climate change.

3.3 Land Degradation

53. One of the major environmental problems that confront many developing countries is land degradation. It is often in the form of erosion and loss of soil quality and quantity, and is associated with such processes as salination and deforestation. Although there is a lack of reliable data on the status of land degradation some estimate that 1,900 million hectares of land worldwide is affected by soil degradation.[12] More 500 million hectares of Asia's land and about the same acreage of Africa has been affected by soil degradation. Land degradation greatly affects agricultural economies of the developing world. It is recognition of this problem that the international community negotiated and adopted the United Nations Convention to Combat Desertification. The Convention has 159 countries as Contracting Parties. Its main objective is to "combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels…"[13]

54. The Convention contains explicit recognition of the role that science and technology play in management of land in general and control of desertification and associated drought. This is reflected in Articles 9(3), 12, 16, 17, 18 and 19. For example, Article 18 which focuses on transfer, acquisition, adaptation and development of technology provides in paragraph 2 that "Parties shall, according to their respective capabilities, and subject to their respective national legislation and/or policies, protect, promote and use in particular relevant traditional and local technology, knowledge, know-how and practices and, to that end, they undertake to …encourage and actively support the improvement and dissemination of such technology, knowledge, know-how and practices or of the development of new technology based on them."

55. There are several specific science and technology areas and/or issues that have been identified by developing countries as priorities in their efforts at meeting the objective of the Convention—mainly to stem land degradation. These include:

(a) *Assessment of the status of and trends in land degradation*—In most countries there is scanty information on the nature and extent of land degradation. Many countries have recognized this as a major limitation to national and regional efforts at combating desertification. There is inadequate information on soil types and structures to enable countries to formulate land use and management strategies that are responsive to such concerns as soil erosion.

(b) *Establishment of monitoring and early warning systems*—Most developing countries have identified the establishment of infrastructure (including such facilities as

[12] UNEP, 1999. Global Environment Outlook, GEO-2000. United Nations Environment Programme, Nairobi.

[13] UNCCD, 1994. United Nations Convention to Combat Desertification, Article 2.

Geographic Information System GIS) to monitor changes in soil and land patterns and structures, and to institute strategic responses.

(c) *Establishing preventative measures* for lands that are not yet degraded or which are slightly degraded.

(d) Enhancing national climatological, meterological and hydrological capabilities.

56. To meet the above priorities countries require scientific and technical capacities compromising of skills in such areas as GIS, information and data management, and well-equipped agencies. Drawing from regional and national assessments already undertaken under the CDI as well as on the basis of interviews with at least 4 members of STAP, the main scientific and technical capacity needs of developing countries include:

(a) *Shortage of soil scientists* with adequate knowledge in issues related soil structure and chemistry.

(b) *Shortage of climatologists* in many developing countries, particularly those of Africa.

(c) *Shortage of* expertise in the application of GIS and information management for early warning.

(d) *Poorly equipped* remote sensing agencies and other bodies responsible for scientific and technical activities for land management. From the regional assessments it is clear that many of the developing countries do not possess GIS equipment and satellite as well as overall infrastructure for their effective utilization.

(e) *Poor articulation of scientific and technical issues in land use regimes*. Many of the countries' land use policies, where they exist, put emphasis on regulation of use but not on science and technology-led measures to enhance land quality.

(f) *Inadequate scientific information on soil and land*—There is scanty and inadequate scientific information on such land resources as soils, microorganisms, plants in drylands and various factors that interact to cause land degradation. This has made it difficult for many developing countries to address the root causes of land degradation.

(g) *Absence of or existence of weak science bodies* dedicated to the study of land issues, with emphasis on drought and desertification—In many developing countries there are no scientific institutions engaged in research on such issues as drought and desertification. Where such agencies exist as in Zambia, Kenya and Namibia in Africa they faced constraints associated with lack of equipment and technological infrastructure.

3.4 Synthesis of Scientific and Technical Capacity Needs

57. From the above assessment there are generally four common areas in the three environmental domains where many of developing countries face scientific and technical capacity limitations. These areas are:

(a) *Assessment* of the nature and status of the environmental problems—e.g. land degradation, climate change and biodiversity—and the *generation (as well as management) of scientific information* and knowledge on which to base responses, including anticipating degradation of the environment and establishing early warning mechanisms. For example, most countries have to conduct inventories and assessment of the status of biodiversity, assessment of climate change impacts and their vulnerability to these impacts, and assessment of status of and trends in land degradation.

(b) Integration of environmental considerations into national science and technology policies or formulation of science and technology policies that are deliberately aimed at addressing environmental problems.

(c) Creation and/or strengthening of science research bodies to focus more explicitly on the conduct of science for the solution of environmental problems in the three areas of land degradation, climate change and biodiversity.

58. For the first category of priority responsibilities associated with assessment and information management, developing countries will require specialized skills in such areas as taxonomy (for biodiversity), climatology (for climate change), and soil chemistry (for land degradation). In each of the domains they will require a variety of specialized skills well configured to undertake the assessments and information management. They require specialized skills in information and data generation using such technologies as GIS and satellite. In addition to the specialized skills countries require agencies with financial resources and appropriate technological infrastructure including computer-related ones to be able to effectively undertake the assessments and information management.

59. To integrate environmental considerations into science and technology policies or formulate new policies countries will require skills in policy analysis. Such skills would be in science and technology policy, and environmental policy. But on the whole the task requires a convergence of skills from both natural sciences and the social ones.

60. The creation and/or strengthening of bodies dedicate to environmental science in the areas of biodiversity, climate change and drought as well as desertification will requires specialized skills, finances, appropriate equipment, specific policies and laws, and a general infrastructure for science and technology development.

4. CAPACITY DEVELOPMENT: THE ROLE OF SCIENCE NETWORKS

4.1 The nature of science networks

61. There are more than 500 national, regional and international science networks around the world that would make different important contributions to the development of developing countries' scientific and technical capacities to address problems of land degradation, climate change and loss of biodiversity. These networks take different forms. Some are specialized around a particular issue while other take a broad focus on science. For example, such networks as the Third World Academy of Sciences (TWAS), the Third World Network of Scientific Organizations (TWNSO), Indian Academy of Sciences, the African Academy of Sciences (AAS), the UK Royal Society (founded in 1660 as the UK national academy of science), Euroscience, the European Science Foundation (ESF), the International Council for Science (ICSU), the Global Network for Environmental Science and Technology (GNEST) and the American Academy of Science focus on a variety of disciplines. They tend to be multidisciplinary in their membership and coverage. Other networks such as the Association of Systematic Collections (ASC), the International Astronautical Federation (IAF), the Southern Africa Botanical Diversity Network (SABONET), and Botanical Society of America have fairly specialized mandates and focus on a few areas. These networks can also be categorized on the basis of their functions. Some have explicit mandate to undertake research while others are purely responsible for information exchange.

62. For the three thematic areas of biodiversity, climate change and land degradation there are also networks that are responsible for various activities. SABONET is, for example, responsible for undertaking taxonomic studies and promoting exchange of botanical information among institutions and countries of Southern Africa.

4.2 Roles for Networks

63. Science networks have various roles to play in the development of scientific and technical capacities of developing countries. These roles include mobilization of scientific skills, provision of scientific and technical information to relevant government bodies, training of scientists in specific aspects of environmental management, and participation in project development and implementation. For each of the thematic areas networks have specific roles to play to contribute to the development of capacities.

4.2.1 Biological Diversity

64. Science and technical networks have a variety of functions in building developing countries' scientific and technical capacity for biodiversity management. The first function pertains to the generation and provision of science and technical information. As the assessment in section 3 showed, assessment and inventories of biodiversity and its components constitute priority of many developing countries in their efforts to implement the Convention on Biological Diversity. Such networks as SABONET, SCOPE, and the World Conservation Union's (IUCN) specialized commissions are important avenues of mobilizing and directing scientific skills in taxonomy and data management for the conduct of biodiversity assessments and inventories.

65. As observed earlier, the management of biodiversity is science and technology intensive. It is requires the generation, use and management of scientific information. Effective conservation and sustainable use of biodiversity also require the acquisition, development and application of the different techniques. These tasks cannot be undertaken without a critical mass of experts in such areas as taxonomy, information technology, zoology, botany, and basic technological equipment such as computers and GIS. As we have severally stated many developing countries do not possess the skills and equipment and many lack the necessary general scientific and technological infrastructure. These countries' information technology infrastructure is poor and many of the national R&D agencies do not possess the necessary equipment and human resources to search, store and manage scientific information.

66. Existing science or scientific networks such as SABONET, TWAS, AAS, Indian Academy of Sciences, the Association of Systematics Collections (ASC), the International Union of Biological Sciences, DIVERSITAS, the Scientific Committee on Problems of the Environment (SCOPE), the International Union of Microbiological Societies (IUMS), the International Council for Science (ICSU), and the International Geosphere-Biosphere Programme (IGBP) can or already play important roles in the development of scientific and technical capacity of developing countries to undertake assessment of status of and trends in biodiversity and to effectively manage information or data on various ecosystem and species. For example, DIVERSITAS, which is a network of scientific bodies and associations[14], is playing a major role in strengthening of national scientific and technical capacities for biodiversity data generation and management. It has focused its programmatic activities on generating and promoting exchange of scientific information on biodiversity. DIVERSITAS has placed emphasis on information on the origins, maintenance and change of biodiversity, on systematics and inventorying and classification, and monitoring of biodiversity to contribute to the understanding of ecosystem functioning. It activities

[14]Network and sponsors of DIVERSITAS include the International Union of Biological Sciences (IUBS), the Scientific Committee on Problems of the Environment (SCOPE), the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the International Union of Microbiological Societies (IUMS), the International Council for Science (ICSU), and the International Geosphere-Biosphere Programme (IGBP).

contribute to the strengthening of national scientific and technical capacity to undertake systematics research and documentation of the components of biodiversity, and identification of patterns of diversity and endemism.

67. The National Commission for the Knowledge and Use of Biodiversity (CONABIO) is an inter-ministerial commission presided by the Constitutional President of Mexico, Dr. Ernesto Zedillo Ponce de León. It is a network of public ministries and scientific research bodies in Mexico. Its mission is to co-ordinate conservation and research efforts designed to preserve biological resources. CONABIO promotes and develops scientifically-based activities whose aim is to explore, study, protect or find a sustainable use for biological resources. The intention of these activities is to conserve the nation's resources and to generate criteria for sustainable development. CONABIO has developed a National Biological Inventory Programme (NBIP) and a National Biodiversity Information System (NBIS). It conducting inventories of plants, micro-organisms and animals found in Mexico.

68. IUCN has several specialized commissions with more than 5,000 scientists from a diverse range of scientific and technical disciplines. For example the World Commission on Protected Areas (WCPA) has at least 1,200 scientists in areas associated with the creation and management of protected areas. The Commission is the largest network of protected area managers around the world.

69. SABONET is a capacity development network of herbaria and botanic gardens. Its objectives are to create and enhance local botanic expertise for ten participating countries of Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. It aims at developing a core group of botanists, taxonomists, horticulturalists and plant diversity specialists for the countries. The network's activities will assist these countries to conduct inventories and assessment of botanical diversity in response to Article 7 of the Convention on Biological Diversity. The activities include training courses at postgraduate level, workshops, collaborative collecting expeditions in various under-collected areas of the region, and computerization of plant specimens in herbaria and living collections in botanic gardens. Through such a network African scientists, particularly botanists and taxonomists, can contribute to training and exchange information.

70. On the whole, science networks could contribute to the development of scientific and technical capacity for biodiversity assessment and data management by:

(a) Mobilizing existing skills of taxonomists, curators and information managers and directing these to training of more taxonomists and para-taxonomists; and

(b) Developing and promoting scientific guidelines for assessing biodiversity and inventorying of its components as well as for managing data on species and ecosystems;

71. There are of course other functions that networks should play in the development of national scientific and technical capacity for biodiversity management. These include providing to governments scientific data on status of biodiversity and promoting the integration of conservation and sustainable use

considerations into national science and technology policies. Networks such as the Indian Academy of Sciences and the AAS would contribute to this by participating review of the existing policies and recommending specific biodiversity considerations that should be integrated into policy regimes. These networks are also best suited to assist countries to undertake technology assessment and identification of specific techniques for conservation and sustainable use.

4.2.2 Climate Change

72. Climate change management is a science and technology intensive process requiring a considerable body of scientific information and technologies. As we have stated before, the ability of developing to meet their obligations from the UNFCC largely depends on the nature and level of scientific and technical capacity that they acquire and utilize. There are three specific priority areas in which science networks can contribute to the development of scientific and technical capacities. These are:

(a) Assessment of impacts of climate change and formulation of adaptation strategies;

(b) Conduct of national inventories of GHGs; and

(c) Establishment of technology assessment and procurement facilities.

73. The assessment of impacts of climate change requires a diverse range of skills or expertise in chemistry, modeling, environmental economics, risk assessment, etc. Many of the developing country governments do not have institutional mechanisms to mobilize and direct the utilization of the skills. Science networks such as the TWAS, AAS, Indian Academy of Sciences and the Third World Network of Scientific Organizations (TWNSO) as well as many other national, regional and international networks can play a major role in skills mobilization. For example, the AAS has developed a databank and profile of African scientists in such areas as chemistry and mathematics. It could provide governmental agencies responsible for impact assessment with profiles of scientists and support the mobilization of these scientists for impact assessment exercises. AAS would also develop a specific databank of African scientists with skills and experience relevant to climate change impact assessment. Such a databank would be available to relevant governmental bodies in hard copies and electronic versions. The TWAS could work with the UNFCCC Secretariat to establish a global databank of experts in impact assessment. This would be made accessible to UNFCCC Contracting Parties in published form as well as electronic through websites.

74. The TWAS and several other networks provide fellowships in chemistry and other sciences related to climate change. These fellowships are important in enhancing skills in climate change science generally and in promoting exchange of information relevant to impact assessment. Already some of the recipients of TWAS grants have worked on chemistry issues associated with climate change.

75. Another role that some of the science networks could play in the development of national scientific and technical capacity for impact assessment relates to the procurement of relevant equipment. Impact assessment exercises require specialized computer software and models (normally referred to Global Scenario Models—GSMs) that many developing country public agencies do not have. The TWAS and other networks could mobilize skills to develop and make available such software to developing countries. The TWAS has already a variety of activities that aim at equipping developing countries' institutions. It already provides small grants for the purchase or acquisition of scientific equipment: Two specific grants have been established for this purpose. The first is the TWAS Research Grants. This involves provision of up US$ 10,000 each to scientists from developing countries for research in biology, chemistry, mathematics and physics. The grants are supposed to cover costs of specialized scientific and technical equipment and literature. The second is a grant totaling US$ 1,000 each to Third World institutions to cover costs of small items of spare parts for scientific equipment. Such grants could deliberately target support to scientists and institutions to acquire some of the equipment and software for impact assessment.

76. The Indian National Science Academy (INSA) is one of the national science academies that are instrumental in generating new scientific information on climate change. Recent work of the Earth Sciences Committee of the Academy has focused on enlarging scientific understanding of climate change.

4.2.3 Land Degradation

77. Existing regional and international science and technical networks have major roles to pay in the development of capacity for land management in general and the implementation of the United Nations Convention to Combat Desertification. There are at least four roles or functions for the networks. These are:

(a) Mobilization and enhancement of scientific skills in areas such as soil chemistry, microbiology, land economics, etc.

(b) Research on the status of land degradation and identification of scientific measures for re-vegetation;

(c) Provision of information on best practices of land management to government agencies, NGOs and the general public; and

(d) Identification and documentation of technologies for combating desertification and drought.

78. In Africa the AAS is already engaged in various initiatives that mobilize and build expertise in issues of land management with emphasis on drought and desertification. It has a programme on soil and water management—the Soil and Water Management Programme (SWMP)—whose overall objective is to develop centres of excellence in water and soil research in Africa. SWMP's activities include provision of financial support to African universities to train students at M.SC. degree level. Targeting universities in 15 African countries the programme has also been instrumental in promoting scientific research on issues of soil and water management by providing some grants to university researchers. It also promotes publication of soil and water science research findings in academic scientific journals.

79. AAS has another programme that also contributes to the enhancement of scientific and technical capacity for land management. The Capacity Building in Forest Research (CBFR) is a competitive grants awarding scheme for young and senior African scientists. Since its inception in 1991 the programme has awarded more than 100 grants to African scientists to conduct research on forests.

80. The International Arid Lands Consortium (IALC) is a network of several institutions—the University of Arizona, Desert Research Institute based in Nevada, Higher Council for Science and Technology-Jordan, University of Illinois, New Mexico State University, South Dakota State University, Texas A&M University-Kingsville—that work on issues of drought, desertification and land management. It has organized technical training courses in a variety of areas and issues associated with land degradation. For example, in May to June 1999, it organized a training course on consequences of natural climatic variability in planning for water resource management; sustainable agroforestry practices; pastoral issues, including forage production, grazing systems, and range improvement techniques in Amman, Jordan, and Tel Aviv, Israel, for trainees from Jordan, the Palestinian Environmental Authority, and Israel. Operating largely as a network, the IALC contributes to the strengthening of national scientific and technical capacity by providing scientific information on the status of drought and desertification.

5. STRATEGIC CONSIDERATIONS AND RECOMMENDATIONS

81. The above exploration has shown that science networks have a variety of functions to play in the development of scientific and technical capacities of developing countries. The roles include mobilization of existing scientific skills/expertise, generation and provision of scientific information to policy-makers and agencies such as the GEF, provision of small grants to scientists and/or scientific bodies to purchase equipment, organizing and offering specialized training courses, participation in project conception and development with governmental agencies (particularly GEF focal points), and support to project review, monitoring and evaluation. There are a number of specific recommendations that the GEF and STAP may wish to consider in order to tap the potential of science networks to play the roles outlined above. *First* is the need for a GEF meeting or workshop for science networks—the GEF may wish to organize a workshop that would bring together science networks to discuss their potential roles and contributions to the development of scientific and technical capacity for global environmental management. Such a workshop would also explore ways and means of building synergy between STAP and activities of the networks.

82. *Second*, the potential that the science networks offer in creating and/or enhancing scientific and technical capacity of developing countries can also be tapped by the GEF through special funding to consortia of science networks. The GEF could allocate special funds to capacity development projects to implemented through and/or by science networks and would encourage competitive proposals from consortia either on regional or international basis.

83. *Third,* science networks should be encouraged to provide the GEF and convention secretariats with reports on their capacity building activities that support the implementation of the conventions. The GEF Council and respective conference of parties to the conventions may wish to adopt resolutions or decisions calling upon the science networks to periodically furnish the secretariats with reports or documentation on their capacity development activities. Such reports would be made available to governments as information documents at GEF Council, COPs and related environmental meetings.

84. *Fourth*, some of the networks hold considerable scientific information on environmental issues and for the solution of problems associated with land degradation, loss of biodiversity and climate change. For example in the area of biodiversity, CONABIO is a growing source of information and data on Mexico's biodiversity. It is a good example of a national network of public science bodies and ministries that are making a major effort at mobilizing scientific expertise to conduct inventory and generate information on the status of the country's biodiversity. The GEF should assist countries to establish and manage such institutional arrangements as CONABIO for purposes of mobilizing expertise and undertaking activities aimed at developing national capacity in taxonomy and biodiversity data management. Similar national networks should be established in the areas of climate change and land degradation.

6. CONCLUSIONS

85. This report has provided an indicative assessment of scientific and technical capacity needs of developing countries to address global environmental problems associated with land degradation, climate change and loss of biodiversity. It has identified specific areas in which scientific and technical capacity should be developed. The report has also suggested roles that some of the existing science networks can play to contribute to global capacity development initiatives. Emphasis has been placed on the role of the GEF and STAP sources of inspirational and financial support to mobilize and direct science networks to specific capacity development courses. The report has recommended that STAP should organize a meeting to bring together science networks to discuss, in more detail, their role in capacity development for global environmental management and to identify the nature of support that the GEF may provide to them.

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