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# **National Capacity Self-Assessment: Report and Action Plan**

**National Capacity Self-Assessment for Global Environmental Management  
(NCSA)  
SUDAN**

**Higher Council for Environment and Natural Resources  
Ministry of Environment and Physical Development**

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## Foreword

The signing of the comprehensive peace agreement in January 2005 ended the civil war which lasted for more than two decades and left serious impact on the environment and development of the country. During the decade of the 1990(s) and following the Earth Summit, Sudan ratified several global environmental conventions and through funding availed from the Global Environmental Fund (GEF), Sudan formulated and adopted several strategies and action plans such as: National Action Plan to Combat Desertification, Sudan first National Communication under the United Nations Framework Convention on the Climate Change and National Biodiversity Strategy and Action Plan. However, due to lack of resources during the civil war era, the country was not able to assign resources for the implementation of these environmental strategies and action plans.

It is now widely accepted that environmental issues should be integrated in the recovery and rehabilitation process. There is a vicious circle linking environmental degradation, poverty and conflicts. One of the dimensions of Darfur crisis related to conflicts over national resources, exacerbated by climate change severity of drought and land degradation.

The Sudan National Capacity Self-Assessment (NCSA) Project is a UNDP-Sudan Government Project implemented by the Higher Council for Environmental and Natural Resources from Sept. 2005 to Sept. 2007. The NCSA project objectives are to identify national capacity constraints and priorities to meet the obligations included in the three Rio Conventions (Biodiversity Conservation, Climate Change and Desertification). The NCSA project managed through intensive consultative process to come up with stocktaking report, conduct thematic and cross-cutting analysis and succeeded in producing capacity development action plan which is meant to solicit commitment to implement priority actions.

The NCSA process is to complement other national action plans such as Sudan Post-Conflict Environmental Assessment (PCEA) which was carried out by UNEP and launched by the Ministry of Environment and Physical Development (MEPD) on July 2007. The National Plan for Environmental Management (NPEM) in post-conflict Sudan sponsored by UNEP, EU and Nile TEAP and carried out by (HCENR) of (MEPD) and the Sudan Strategic Plan for the coming 25 years which is based on vision to build of united, safe, peaceful and developed Sudan Nation emphasizing justice, freedom, consultation and participation, unity, decent life of dignity and honor, and democracy.

The Sudan Strategic Plan includes a Five Year Action Plan aims at achieving balanced development, reducing poverty, make progress towards achieving Millennium Development Goals MDGs, stressing public accountability, good governance and environment conservation. The Sudan strategic plan identified weaknesses included limited civil services institutional capacity and the need for institutional reform and capacity building and needs for strengthening partnership with private sector and civil society.

The serious need to address to environmental issues is reflected in the concurrent environmental actions and processes that are addressed by the country. The NCSA Action Plan is produced in the right time to be integrated with related ongoing initiatives in Sudan. All stakeholders are encouraged to facilitate the implementation of this action plan as a constructive step towards peace and sustainable development.

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## ACRONYMS

ACES	Advisory Commission for Environment and Safety
ADS	Area Development Scheme
AIACC	Assessment and Adaptation to Climate Change
CBO	Community Based Organization
CCF	Country Cooperation Framework
CHM	Clearing House Mechanism
CO	Carbon Monoxide
COP	Conference of Parties
CPA	Comprehensive Peace Agreement
DADCSC	Desertification and Desert Cultivation Studies Center
DECARP	Desert Encroachment Control And Rehabilitation Programme
DPA	Darfur Peace Agreement
ERI	Energy Research Institute
EU	European Union
ESPA	East Peace Agreement
ESD	Education for Sustainable Development.
FAO	Food and Agricultural Organization of the United Nations
FNC	Forests National Corporation
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHGs	Greenhouse Gases
GIS	Geographic Information System
GONU	Government of National Unity
GOSS	Government of South Sudan
HCENR	Higher Council For Environment And Natural Resources
ICD	Individual Capacity Development
ICT	Information and Communication Technology
IENR	Institute of Environment Research and Natural Resources
IES	Institute of Environmental Studies
INC	Initial National Communications
INCD	Institutional Capacity Development
IPCC	Intergovernmental Panel on Climate Change
JAM	Joint Assessment Mission
IT	Information Technology
LPG	Liquid Petroleum Gas
MEAs	Multilateral Environmental Agreements
MST	Ministry of Science and Technology

MHESR	Ministry of Higher Education and Scientific Research.
MEAs	Multilateral Environmental Agreements
MEPD	Ministry of Environment and Physical Development.
MAF	Ministry of Agriculture and Forestry
MOIRW	Ministry of Irrigation and Water Resources.
NAP	National Action Plan
NAPA	National Adaptation Program of Action
NBSAP	National Biodiversity Strategy and Action Plan.
NCCD	National Committee for Combating Desertification
NCR	National Council For Research
NCS	National Comprehensive Strategy
NCSA	National Capacity Self Assessment
NDDCU	National Drought and Desertification Control Unit
NEA	National Energy Affairs
NEAP	National Environmental Action Plan
NEPAD	New Partnership for Africa Development
NGO	Non Governmental Organization
NNGOs	National Non-Governmental Organizations
RSA	Remote Sensing Authority
SCD	Systemic Capacity Development
SECS	Sudanese Environmental Conservation Society
SEC	State Environmental Councils
SNC	Second National Communications
SSO	Sahara and Sahel Observatory
TOT	Training of Trainers
U of K	University of Khartoum
UIS	UNESCO Institute of Statistics.
UNCBD	United Nation Convention for Biodiversity.
UNCCD	United Nation Convention to combat Desertification.
UNFCCC	United Nations Framework Convention on Climate Change.
IUCN	World Conservation Union
UNDAF	United Nations Development Assistant Framework.
IGAD	Intergovernmental Authority on Drought.
UNICEF	United Nations Children Fund
WHO	World Health Organization
WSSD	World Summit on Sustainable Development

## EXECUTIVE SUMMARY

### A. Introduction

The goal of the Sudan National Capacity Self-Assessment (NCSA) was to determine priority needs and establish a plan of action for developing Sudan's capacity to meet its commitments to national and global environmental management. The NCSA was a highly participatory and consultative process that resulted in the production of several technical reports over a two-year period. These describe Sudan's capacity needs related to the "Rio Conventions" on biodiversity conservation, climate change, and desertification/land degradation<sup>1</sup> in the context of the National Plan for Environmental Management (NPEM) in post-conflict Sudan. This Action Plan for Environmental Capacity Development in Sudan is the final product of the NCSA.

The NCSA was initiated by the Higher Council for Environment and Natural Resources (HCENR), the coordination body for all environmental and natural resource management related matters in the Sudan, in Sept. 2005. The process was supervised by a Steering Committee representing major stakeholders and hosted by the HCENR. The process included identification of key stakeholders; extensive stakeholder consultations and workshops; a stocktaking to summarize work already done on these topics; four Thematic Assessments (for each convention plus one on "Tertiary Education and Research Related to Rio Conventions"); and a cross-cutting analysis to identify capacity development needs that are common to all three conventions.

Sudan has made efforts to improve its environmental governance system over time and has taken important steps towards meeting its country obligations under the Rio Conventions. The country has introduced various natural resources-related laws since 1902, participated in the Stockholm Conference on Environment and Human Development in 1972 and the UN Conference on Desertification in 1976, established the first government Environmental Committee in 1977, and participated in the Earth Summit in 1992 and Johannesburg Summit in 2002.

The HCENR was established in 1992 as the central government agency coordinating government efforts for sustainable development. At that time, the HCENR was chaired by the Prime Minister and eight ministers sat as members. In 1995 the Ministry of Environment was created and in 2006 membership of HCENR was broadened to include 26 ministries, a representative for environmental NGOs and two representatives of universities. The Minister of Environment became the chairperson.

Sudan has ratified numerous Multilateral Environmental Agreements (MEAs), including those on climate change, biodiversity, desertification and persistent organic pollutants (POPs). Sudan (with GEF support) has also developed national strategies and action plans related to these MEAs. HCENR is the focal point for MEAs, with the exception of the UNCCD, which is the responsibility of the Ministry of Agriculture and Forest (MAF).

The NCSA identified national capacity constraints and priorities for capacity development to meet commitments related to the Rio Conventions. The following priorities emerged:

**a. Desertification** priorities include actions to speed up implementation of the National Action Plan (NAP), establish the Higher Council for Coordinating Drought and Desertification Programme (HCCDDP) and upgrade the National Drought and Desertification Control Unit

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<sup>1</sup> United Nations Convention on Biodiversity - CBD, United Nations Convention to Combat Desertification - CCD and United Nations Framework Convention on Climate Change - UNFCCC

(NDDCU). Other priorities are: promotion of public awareness, enhancement of scientific research to address technical/field problems and introduction of environmental education at all levels. Other key areas requiring interventions are: environmental law and policy; land use and rural development; extension programs; integration of indigenous knowledge; and the use of intermediate technologies and renewable energy. Key institutions to be involved in the action plan include the Remote Sensing Authority (RSA), Sudanese Environment Conservation Society (SECS), Desertification and Desert Cultivation Centre (DADCSS) and Natural Resources Research Institute (NRRI).

**b. Biodiversity** conservation capacity building priorities include: the need for a lead authority on biodiversity; increased awareness of decision-makers and stakeholders/the public; revised policies, institutional structures and affiliations; improved institutional capacity; and a biodiversity information centre. The development of national land use planning to better control land use and development patterns is also urgent.

**c. Climate Change** priorities include the need for revised policies, structures, and affiliations of institutions related to climate change and accelerated implementation of the National Adaptation Program of Action (NAPA). NAPA was developed in participatory manner, involving five states. It analyses impacts of climate change on food security, agriculture, water resources and health and recommends policy reform, institutional integration and capacity building as key tools to address climate change. NAPA also recommends upgrading institutional capacities to address climate change and enhanced capacity of universities, research centres and civil society to contribute. It supports an increased coordination role of HCENR; establishment of a climate change unit within HCENR; a climate change information and database; and national Greenhouse Gases (GHGs) inventory. Specific recommended activities include awareness programs, shelter belt establishment and adoption of alternative energy sources.

## **B. Cross-cutting analysis**

The cross-cutting analysis identified five strategic objectives that provide the framework for the Environmental Capacity Development Action Plan, which aims to improve global and national environmental management in Sudan. Those objectives cover the following capacity functions:

1. *Policy, legal and institutional reform*, with an emphasis on inter-ministerial coordination, planning and law enforcement; an enhanced role for HCENR as a coordinating body; increased institutional capacity; environmental information database; and greater government commitment and funding.
2. *Changes to land use policy and planning frameworks*, with emphasis on preventing conflicts over natural resources and ecosystem services, as well as protection and rehabilitation of shelter belts.
3. *Support to community-based natural resource management*.
4. *Promotion of environmental education and research* to support environmental management.
5. *Civil society engagement and awareness-raising* among policy analysts and decision-makers as well as key stakeholders and sectors of the wider public.

Implementation of the Comprehensive Peace Agreement (CPA), Darfur Peace Agreement (DPA) and East Peace Agreement (ESPA); the prevailing peace in most regions of the country; and the increased international assistance to the country provide good and timely opportunities for improved MEA implementation. The *Sudan National Strategy Plan* provides a framework for

coordinating the nation's peace and development efforts over the next five years. It is the first part of 25-year Strategy whose vision is to build a united, safe, peaceful and developed Sudanese nation. It is founded on the values of justice, good governance, rule of law, consultation, democracy, unity and equal rights of citizens.

The following main strategic directions for Sudan's overall development are also key in improving the country's environmental management capacity:

- Promotion of sustainable economic development;
- Sustaining peace and stability through implementation of CPA, DPA and ESPA;
- Reducing poverty and make progress towards achieving the MDGs;
- Strengthening public accountability, good governance and the rule of law; and
- Building the capacity of public institutions and civil society.

### **C. Implementation Strategy**

HCENR was identified as the appropriate institution to coordinate the policy formulation process, develop consultation mechanisms and link with international agencies. As the agency responsible for the NAP (desertification), the Ministry of Agriculture and Forests (MAF) should also be involved, and cooperation between MAF and HCENR should be promoted.

The NCSA recommendations are in agreement with conclusions reached in other recent and related processes such as: the 25-Year Strategy, the 5-Year Action Plan, UNEP-Sudan PCEA, the National Plan for Environmental Management (NPEM), NIP and NAPA.

Natural resources based conflicts were identified as one of the major causes for Darfur and Eastern Sudan conflicts and were partly behind the civil war in Southern Sudan. It is widely accepted that sustainable peace requires sustainable environmental management. The CPA, DPA and ESPA, prevailing peace in most regions of the country, increased country revenue from petroleum export, and increased international assistance to the country are providing good timing for MEA implementation.

### **D. Key Results and Proposed Actions**

Based on the NCSA component reports, especially the Thematic Assessments, the project team proposed the following five strategic priorities, which were then discussed and endorsed at Steering Committee and stakeholder meetings:

1. Develop capacity for land use policy and planning in Sudan at federal and state levels.
2. Improve legislative and institutional arrangements for environmental management.
3. Strengthen capacity to implement community-based natural resource management.
4. Expand capacity for tertiary education and research to create a sustainable knowledge base in support of environmental management.
5. Raise the awareness of policy and decision-makers and key sectors of the public about the role of MEAs in environmental management an sustainable development in Sudan.

# **1. NATIONAL CAPACITY SELF-ASSESSMENT IN SUDAN**

## **1.1 Background to the NCSA**

This document, the Sudan Action Plan for Environmental Capacity Development is based on the National Capacity Self-Assessment (NCSA), conducted over 2005-7. The NCSA identified, through a country-driven consultative process, priorities for capacity development to enhance national efforts for global environmental management. The Action Plan should be read along with “Thematic Assessments” for biodiversity conservation, climate change and land degradation, which are summarized in Annexes 1-3. The Plan describes the current situation regarding global and national environmental management in Sudan, including strengths, constraints and capacity needs. It also includes a report on environment-related tertiary education, which is seen as key to sustaining the country’s environmental management capacity.

The report is organized as follows. The rest of Chapter 1 describes the NCSA process and provides background on Sudan’s environmental and sustainable development activities related to the “Rio Conventions”.<sup>2</sup> Chapter 2 describes the results of the NCSA, including the thematic and cross-cutting assessments. Chapter 3 outlines the Action Plan for Environmental Capacity Development resulting from the NCSA. This includes proposed strategic objectives, implementation arrangements and linkages with other environmental and sustainable initiatives in Sudan. Table 1 presents the Action Plan in a matrix format, organized around five core objectives, with key results (outcomes and outputs); indicators of success; an indicative timeframe; estimated costs; target stakeholders and responsible parties.

## **1.2 Foundation of the Sudan NCSA**

The NCSA was an assessment and planning exercise, funded by the GEF through its implementing agency the United Nations Development Program (UNDP), and driven by country-based participants. Sudan is part of over 150 developing countries to undertake an NCSA. The goal of an NCSA is to determine national priorities for capacity development to better address global environmental issues. The process analyzes a country’s capacity strengths, constraints and needs, and recommends capacity development actions to address them. The NCSA focuses on a country’s capacity to implement the three Rio Conventions and related Multilateral Environmental Agreements (MEAs). A key goal is to identify capacity needs that are “cross-cutting”, i.e., common to all three conventions, with the idea that addressing them will promote synergies in MEA implementation.

The country-driven approach enables a country to integrate its plans for environmental capacity development into other national sustainable development goals and programs. This should help to secure follow-up to the NCSA and ensure that the process leads to measurable improvements in environmental management at national and global scales.

The Sudan NCSA closely followed the core NCSA concepts and principles provided in the GEF-UNDP guidance for NCSAs as presented in Boxes 1, 2 and 3.

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<sup>2</sup> United Nations Convention on Biodiversity - CBD, United Nations Convention to Combat Desertification - CCD and United Nations Framework Convention on Climate Change - UNFCCC

### **Box 1. Definition of Capacity Development**

*Capacity development* is the process by which individuals, organizations, institutions and societies develop abilities [individually and collectively] to perform functions, solve problems and set and achieve objectives (UNDP, 2002). Capacity development occurs at three interconnected levels:

At the *individual level*, capacity development refers to the process of changing attitudes and behaviours, most frequently through imparting knowledge and developing skills through training. However it also involves learning by doing, participation, ownership, and processes associated with increasing performance through changes in management, motivation, morale, and levels of accountability and responsibility.

At the *organizational level*, capacity development focuses on overall performance and functioning capabilities, such as developing mandates, tools, guidelines and information management systems for the ability of the organization to adapt to change. It aims to develop its constituent individuals and groups, as well as its relationship to the outside.

At the *systemic level*, capacity building is concerned with the creation of “enabling environments”, i.e. the overall policy, economic, regulatory, and accountability frameworks within which institutions and individuals operate. Relationships and processes between institutions, both formal and informal, as well as their mandates, are important.

### **Box 2. Guiding Principles for Capacity Development (GEF-UNDP 2006)**

- Ensuring national ownership and leadership, and the use of national or regional experts
- Using existing coordinating structures and mechanisms
- Paying due attention to provisions and decisions of the three Conventions, as they relate to capacity building
- Ensuring multi - stakeholder participation, consultation and decision making, through appropriate institutional arrangements
- Building on ongoing/existing work relevant to NCSAs, for instance through GEF-supported enabling activities, and national reports to the Conventions
- Adopting a holistic approach to capacity building that addresses capacity needs at the systemic, institutional and individual levels while integrating such capacity building into wider sustainable development efforts
- Adopting a long-term approach to capacity building within the broader context of sustainable development

The following criteria are to be used to identify priority capacity development actions:

- *Effectiveness*: the degree to which the system achieves its objectives;
- *Efficiency*: the degree to which it generates its products using minimum inputs;
- *Relevance*: the degree to which the system’s objectives and activities reflect the needs and priorities of key stakeholders; and
- *Financial sustainability*: the conditions to make a system financially viable.

**Box 3: Core capacities needed for effective environmental management (UNDP/GEF 2006)**

*Capacity to conceptualize and formulate policies, legislations, strategies, and programs*

This includes analyzing global conditions that may affect country needs and performance in a given area, developing a vision, long-term strategizing, and setting of objectives. It also includes conceptualizing broader sectoral and cross-sectoral policy, legislative and regulatory frameworks, including synergies between global environmental conventions. It further contains prioritization, planning and formulation of programs and projects.

*Capacity to implement policies, legislations, strategies, and programs.*

This includes process management capacities that are essential in the implementation of any type of policy, legislation, strategy and program. It also includes execution aspects of program and project implementation. It includes mobilizing and managing human, material and financial resources, and selection of technologies and procurement of equipment.

*Capacity to engage and build consensus among all stakeholders.*

This includes issues such as mobilization and motivation of stakeholders, creation of partnerships, awareness-raising and developing an enabling environment for civil society and the private sector, stakeholder identification and involvement, managing of large group process and discussion, including mediation of divergent interests, as well as the establishment of collaborative mechanisms.

*Capacity to mobilize information and knowledge.*

This pertains to the mobilization, access and use of information and knowledge. It includes issues such as effectively gathering, analyzing and synthesizing information, identifying problems and potential solutions, as well as consulting experts and peers. It further covers specific technical skills that are related specifically to the requirements of the SPs and associated Conventions, including the capacity to carry out scientific and technical assessments in the areas relevant to GEF focal areas and related Conventions.

*Capacity to monitor evaluates report and learn.*

This category pertains to the monitoring of progress, measuring of results, codification of lessons, learning and feedback, and ensuring accountability to ultimate beneficiaries and partners. It also covers aspects such as reporting to donors and global conventions. It naturally links back to policy dialogue, planning and improved management of implementation.

### **1.3 Methodology for the Sudan NCSA**

The Sudan NCSA was initiated with the signing of the project document “Self Assessment of National Capacity Building Needs in Sudan to Manage Global Environmental Issues” (NCSA) by UNDP (on behalf of the GEF), the Ministry of International Cooperation (MIC) and the HCENR on 24 November 2004. GEF provided US\$ 200.000 in funding and the Sudanese government provided US\$ 50.000 (in kind). Project implementation began in Sept. 2005 with the recruitment of Project Management Unit (PMU) and Steering Committee (SC) meetings and ran over two years.

Stakeholders relevant to the three MEAs were involved in project implementation from the beginning to ensure a thorough and participatory process. An inception workshop was held in November 2005, attended by 90 key stakeholders, followed by a stakeholder workshop in December. The NCSA received good coverage in the popular media, including the four major daily newspapers.

Three consultants prepared the Stocktaking Reports, completed in June 2006. They designed and distributed questionnaires among stakeholders, with excellent response rates and effective data collection. Three additional workshops for the desertification, biodiversity and climate change thematic reports involved relevant stakeholders. A fourth consultant (academic) carried out a stocktaking related to training and research in tertiary education, as related to the Rio conventions, and a consultation workshop on that topic was held in June 2006.

A representative from the Government of Southern Sudan (GOSS) was nominated to join the Steering Committee. A second SC meeting reviewed NCSA progress. A third meeting reviewed the stocktaking reports, approved a work plan for the thematic assessments, and reviewed reports on the Stockholm Convention on Persistent Organic Pollutants and the Higher Council for Environment and Natural Resources. In November, the NCSA project manager made a presentation to GOSS institutions and stakeholders and encouraged participation in the NCSA.

Two of the four consultants who prepared the stocktaking reports also conducted the thematic assessments for the three conventions (UNCCD, UNCBD and UNFCCC), while tertiary education and research were addressed separately. These were all completed by Feb. 2007.

This final NCSA Report and Action Plan is based on the above component reports, stakeholder consultations and information from other reports/programs, including:

- *Sudan Post-Conflict Environmental Assessment Report* (PCEA), a key product from a national initiative managed by UNEP and the Ministry of Environment and Physical Development (MEPD) over 2005-7.
- *National Plan For Environmental Management* (NPEM) in post-conflict Sudan: produced by MEPD, in collaboration with GOSS and supported by the European Commission.
- *National Adaptation Plan of Action* (NAPA 2007), which addresses climate change, produced by HCENR and funded by GEF and UNEP.
- *National Implementation Plan for the Stockholm Convention on POPs* (NIP, 2007), produced by HCENR and sponsored by GEF and UNEP.

The reports also drew on the results of workshops organized by the National Assembly on desertification, protected areas and environmental management (2006-2007), and on federalism and land use related issues and legislation (May 2007).

#### **1.4 Global Environmental Management in Sudan**

The proposed UNEP country program 2007-2009 emphasizes environmental governance, with a focus on legislation development; technical assistance and capacity building; awareness raising and advocacy; assessment and practical action. UNEP proposes to take the lead in coordinating environmental initiatives undertaken by international organizations in Sudan. UNEP estimated a total cost of US\$ 120 million over 3-5 years for the program, with US\$ 70 million from GONU, US\$ 37.3 million from GOSS and US\$ 12.5 million from the international community. UNEP

proposed that international donors provide technical assistance and capacity building rather than just funding. UNDP programming in Sudan is undergoing changes to respond to the evolving political context in the country, as summarized in Box 4.

#### **Box 4. Changing Context for Environmental Management in Sudan**

Following the signing of the Comprehensive Peace Agreement (CPA), a joint Assessment Mission (JAM) led to a framework for sustained peace, development and poverty eradication. This will be implemented through domestic efforts and resources as well as development partners, with the aim of addressing underlying structural causes of conflict and underdevelopment in Sudan.

The strategy within the Bridging Program 2007-2008, adopted by UNDP and the Government of National Unity (GONU) as the Country Cooperation Framework (CCF), was no longer considered relevant due to new objectives and priorities arising from the signing of the CPA, DPA and ESPA. The UN and GONU will prepare a UNDAF for period 2009-2012.

The goal for UNDP's Country Development Assistance Framework (CDAF) for 2007-2008 is:  
*to promote sustainable peace and development by providing strategic support to implementation of the CPA, DPA and ESPA, guided by the Millennium Development Goals (MDGs), and in partnership with the parties to peace agreements, civil society and development partners.*

Expected outcomes are to promote human security and recover democratic governance and rule of law, reduce poverty and make progress towards the MDGs. Capacity building of institutions at all levels is considered a cross-cutting issue.

Sudan is a signatory to 16 Multilateral Environmental Agreements (MEAs), most of which provide funding to assist developing countries with compliance (See summary in Box 5). Over the period 2002-2006, Sudan benefited from 11 national projects (USD 4.76 million) as well as several regional environmental programs.<sup>3</sup>

#### **Box 5. MEAs and Related Agreements Signed by Sudan**

##### **A. Conventions and agreements issued before Stockholm Conference**

- Convention concerning the use of white lead in painting, Geneva, (1921).
- London convention on the preservation of Fauna and Flora in their natural state (1933). Ratified 1935.
- Paris International convention for protection of birds (1950).
- International convention on conservation of plants, Rome (1951). Ratified 1971.
- Treaty banning nuclear weapons tests in the atmosphere, in the outer space and under water, Moscow (1963). Ratified 1966.
- Treaty on the prohibition on the emplacement of the nuclear weapons of Mass destruction on the sea bed and the ocean floor, Washington (1961).
- Agreement for the establishment of commission for controlling the locust in the Near

<sup>3</sup> Examples of the latter include: Strategic Action Program for the Red Sea and Gulf of Adan (PERSGA); Nile Basin Initiative (NBI); Nile TEAP Land UNEP (NTEAP); Formulation of Action Program for Integrated Management of Shared Nubia Aquifer; Elimination of POPs; and Mainstreaming Conservation of Migratory Soaring Birds into key productive sectors along the Rift Valley /Red Sea flyway.

East, Rome (1965). Ratified 1967.

- African convention on conservation of natural resources, Algiers (1968). Ratified 1973.
- Convention on wetland of international importance especially as waterfowl habitat, Ramsar- Iran, 1971. Ratified 2005.

#### **B. Conventions and agreements issued after the Stockholm Conference**

- Protection of world culture and natural heritage, Paris (1972). Sudan membership 1973.
- Convention on international trade in endangered species of wild fauna and flora (CITES), Washington, 1973. Ratified 1982.
- Convention on the conservation of migratory wild animals, Bonn, 1979, ratified 2002.
- United Nation Convention of the Law of the Sea, Jamaica, 1982, Ratified 1985.
- Regional convention for the conservation of the Red Sea and Gulf of Eden, Jeddah, 1982. Sudan joined 1985.
- Protocol concerning regional cooperation in combating pollution by oil and other harmful substances in the Red Sea, Jeddah, 1982, Sudan membership 1985.
- Vienna convention for the protection of Ozone layer, Vienna, 1985. Ratified 1995.
- Convention on early notification of nuclear accidents, Vienna, 1986. Ratified 1986.
- Montreal protocol on substances that deplete Ozone layer, Montreal, 1987. Ratified 1993.
- Basel convention on the control of the trans-boundary movement of hazardous wastes, Basel, 1989. Ratified 2006.
- Bamako convention on ban of import into Africa and the control of the trans-boundary movement and management of the hazardous wastes, Bamako, 1991. Ratified 1993.
- Nile Basin Initiative, Tanzania, 1999.

#### **C. Rio Conventions (1992) and related agreements**

- United Nations Framework Convention on Climate Change (UNFCCC), Rio de Janeiro (1992). Ratified 1993.
- International Convention on Biodiversity CBD, Rio De Janeiro, 1992. Ratified 1995.
- International Convention to Combat Desertification (UNCCD) in countries experiencing serious drought and/or desertification particularly in Africa, Paris, 1994. Ratified 1995.
- Kyoto Protocol, Kyoto- Japan, 1997. Ratified 2005.
- Internationally legally binding instrument for the application of prior informed consent procedure for certain hazardous chemicals and pesticides in international trade, Rotterdam, 1998. Ratified 2004.
- Cartagena Protocol on Bio-safety to the convention on biological diversity, Montreal, 2000. Ratified 2005.
- Stockholm convention on persistent organic pollutants, Stockholm, 2001. Ratified 2006.

Through its Environmental Focal Point (HCENR), Sudan has also implemented the following programs as part of MEA implementation.

#### ***a) Stockholm Convention on Persistent Organic Pollutants: National Implementation Program (NIP)***

Sudan ratified this convention in 2006, thus committing to manage and phase out POPs. The NIP was developed in 2004 – 2006. It provides the background and current POPs situation, including nine substances (Aldrin, Chlordane, Dieldrin, Endrin, Heptachlore, HCB, Mirex, Toxaphene and DDT); estimates emissions into the environment and their impacts; and outlines how Sudan will meet its convention obligations. The country proposed combined measures to meet its obligations, including government involvement (regulatory reforms and law enforcement)

supportive local actions; market instruments (subsidies and tax breaks); and international cooperation, including co-funding.

Sudan has also set national priorities regarding POPs management and phase-out. The first is to tackle the stocks of obsolete POPs, including pesticides and contaminated containers and soils around the pesticide stores. The second is to address uncontrolled waste burning and related waste management activities in order to reduce dioxins and furans in densely populated areas. The third is to reduce and eliminate risks related to PCBs in electrical equipment. DDT use for malaria and vector control is to be prevented through regional cooperation with WHO.

Proposed actions include one institutional project at HCENR, planned for a period of five years at a cost of US\$ 300.000, and based on the encouraging experience of developing the NIP. Further proposed actions include four pesticide-related projects, nine PCB-related projects and ten dioxin and furan-related projects. The elimination of DDT use in malaria and disease vector control will be addressed through four action plans (“project profiles”).

### ***b) National Adaptation Program of Action (NAPA)***

The goal of the NAPA in Sudan is to identify priority activities to address climate variability and climate change within the context of economic development priorities. Efforts are focused on three sectors: agriculture, water resources and public health. The objectives of the NAPA were:

- To ensure widespread representation of local stakeholders in the consultation process;
- To identify a comprehensive set of adaptation strategies, projects and programs;
- To develop country-driven criteria to evaluate and prioritize adaptation measures;
- To characterize a set of urgent and immediate adaptation initiatives; and
- To recommend a set of broad adaptation activities, including capacity-building, policy reforms and institutional integration.

The NAPA made the following recommendations for the water, agriculture and health sectors:

- Rehabilitation of current water facilities and establishment of new ones;
- Consideration of environmental health and quality issues, in particular measures that ensure separation of human and animal water outlets;
- Establishment of monitoring and early warning systems;
- Activation and/or establishment of State Councils for Environment and Natural Resources for coordination of related work;
- Revision of land use policies;
- Amendment of land use laws in order to be consistent with customary laws;
- Introduction of climate change in education through schools, universities, mosques, etc;
- Coordination among institutions working on environment-related areas;
- Adoption of long term plans that consider the impacts of climate change;
- Consideration of health laws and policies during formulation and implementation of developmental projects;
- Amendment and/or development of funding policies to suit conditions of the poor;
- Encouragement of celebration of important environmental occasions, e.g. trees festival;
- Effective participation of woman in projects that target climate change adaptation; and
- Encouragement and support for civil society organizations working in the field of environment.

## 1.5 National Environmental Management in Sudan

Sudan has recognized the importance of natural resources management since the beginning of the 20<sup>th</sup> century. Legislation in forest and wildlife was enacted in 1902. The Sudan Government participated in Stockholm Conference on Environment and Human Development (1972) and the UN Conference on Desertification (1976). It established the first Government Environmental Committee in 1977 and attended the Earth Summit in 1992 and Johannesburg Summit in 2002.

In 1992, the Higher Council for Environment and Natural Resources (HCENR) was established as the central government agency to coordinate sustainable development efforts. In 1995, the government created the Ministry of Environment and Tourism, now Ministry of Environment and Physical Development (MEPD) to oversee environmental management. Other ministries with major responsibilities for natural resources management, land use planning and socio-economic development are also members of the board of HCENR, including the Ministries of Agriculture and Forest; Irrigation and Water Resources; Industry and Commerce; Energy and Mining; Justice; Health; Culture and Information; and Education and Higher Education.

In June 1993, the HCENR, then chaired by the President, reviewed its structure and mandate. The Council of Ministers Decree 316, 2006 revised the HCENR membership to designate the MEPD as president of the council and add the following members:

- Ministry of Agriculture and Forest; Minister of Irrigation; Khartoum State Governor; Minister of Environment of GOSS; State Ministers of the Ministries Of Finance and National Economy; Health; Energy; Science and Technology; and Animal Resources;
- Under-Secretaries of the Ministries of Wildlife And Tourism; and Information and Culture; Director-General of Sudanese Corporation for specifications;
- Directors of the Institutes of Urban and Environmental Studies of the University of Khartoum; and
- Representatives of the private sector and NGOs.

The Government of Sudan has adopted national strategies, legislation and programs to strengthen biodiversity conservation and natural resources management, such as the Wildlife And Nature Reserves Conservation Act 1986, Forestry Act 2002, Environmental Protection Act 2001 and the 10-year National Comprehensive Strategy (NCS, 1992-2002). It also participates in international agreements on biodiversity conservation and sustainable development, including World Heritage; Man and Biosphere Reserves (MAB); Convention on Wetland of International Importance (Ramsar); Convention in Trade of Threatened and Endangered Species (CITES); and Protection of the Red Sea and Gulf of Adan (PERSGA).

In November 1995, Sudan became the 16<sup>th</sup> party to ratify the UNCCD. The National Drought and Desertification Control Unit (NDDCU) of the Ministry of Agriculture and Forests (MAF) was designated as the National Focal Point. As part of convention commitments, a National Action Plan (NAP, 2002) was prepared.

In 1995, the Government of Sudan became a party to the CBD. With GEF support and technical assistance from the World Conservation Union (IUCN), it developed its first National Biodiversity Strategy and Action Plan (NBSAP, 2000) and a country study on Biological Diversity (2001). The NBSAP outlines strategies, priorities and actions for biodiversity conservation and protection of natural ecosystems. A GEF/UNDP add-on project (initiated 2002) aimed to assess capacity needs for biodiversity management and conservation, with a focus on

the NBSAP. Several biodiversity projects are underway, including GEF-supported projects on Conservation of Dinder National Park, Nile Transboundary Environmental Action Project, Strategic Action Program for the Red Sea and Gulf of Aden (PERSGA) and several capacity building activities.

In 1992-1993, the Government of Sudan signed and ratified the UNFCCC. HCENR also implemented a GEF/UNDP-funded enabling activity that included training, a GHGs inventory, an analysis of vulnerability and adaptation assessment and mitigation and an awareness programme. Sudan completed its first National Communication in February 2003. To fill the gaps in the vulnerability and adaptation assessment, a two-year project was developed under the “Assessment of Impacts and Adaptation to Climate Change” program (AIACC - GEF/UNEP). It aimed to enhance scientific and technical information, assess climate change impacts and design cost-effective response measures. The GEF also supported a project to remove barriers to photovoltaic (PV) market penetration in semi-urban Sudan and another one on Community-based Rangeland Rehabilitation for Carbon Sequestration, to promote land use and range management master plans in regions where drought and overgrazing have had drastic effects.

## **2. RESULTS OF THE NATIONAL CAPACITY SELF-ASSESSMENT**

### **2.1 Key Capacity Gaps and Constraints related to Desertification**

#### ***2.1.1 Constraints and Needs***

Previous national strategies to address environment, natural resources conservation and sustainable development have been largely sectoral and lacking an integrated and holistic approach; for example:

- Programs, activities and interests of various national, international and NGO organizations involved in combating desertification are diverse and poorly coordinated;
- Relevant research is very limited and where it exists, is not well planned or financed;
- Financial resources to implement NAP are not allocated within the national budget, which is often constrained; and
- There are few national efforts to sustain results and/or continue projects initiated by donors, such as IGAD or UN, due to the limited resources for the National Focal Point.

#### ***2.1.2 Requirements and Priorities***

The Council of Ministries issued Resolution No. 81 for 2006 on 21 March 2006 outlining priority actions to be taken. These including a national campaign to combat desertification, with educational programs, media as well as enforcement of laws and regulations to make it obligatory to plant trees in 5% of areas in mechanized farming and 10% of areas in rain-fed agricultural schemes. It also called for increased enforcement of laws limiting felling of trees, and directed the Ministry of Environment to work with building research institutes to find alternative building materials to replace the current practice of using burned bricks, which has led to deforestation. Finally, the resolution instructed the ministries of environment, agriculture and forestry, science and technology and information to coordinate NAP implementation activities.

The NAP identified the establishment of the Higher Council for Coordinating Drought and Desertification Program (HCCDDP) as a high priority. The National Drought and Desertification Control Unit (NDDCU) is to be upgraded as a technical secretariat for the HCCDDP. The

following are priority actions for human resources development:

- Build capacities to strengthen environmental public awareness;
- Enhance scientific research to address practical environmental problems; and
- Introduce environmental education programs in curricula at various levels.

Other capacity building priorities related to desertification are: improved environmental policies; increased extension, public awareness and community mobilization; and promotion of indigenous knowledge, intermediate technologies, renewable energy sources, rural development and poverty alleviation. Finally, institutional capacity should be built for the Remote Sensing Authority (RSA), Environmental and Natural Resources Research Institute (ENRRI), national NGOs committee to combat desertification (NNCCD) and the early warning unit with the Relief And Humanitarian Agency.

## **2.2 Key Capacity Gaps and Constraints related to Biodiversity Conservation**

### ***2.2.1 Constraints and Needs***

Critical capacity constraints to implementing the biodiversity convention include the following:

- Gaps in national legislation.
- Weakness of strategic planning and the need for national and state land use planning.
- Need for a lead authority to coordinate management and conservation of Sudan genetic resources. Responsibilities for various aspects of natural resource management are scattered among sectors and institutions. In addition, inadequate affiliations and frequent organizational changes have negatively affected institutional capacity.
- Poor infrastructure of institutions and limited coordination among them.
- Lack of job satisfaction and training (within government) as well as wrongful dismissal.
- Security constraints make several areas of the country inaccessible.
- Low awareness of biodiversity and its values.
- Threats to plant and animal systematics from the scarcity of taxonomists, taxonomy, the limited number of herbaria, botanical gardens and zoos, and the lack of databases.
- Pteridophytes; Montane vegetation; desert vegetation; and mangroves and marine ecosystems are priority areas requiring further study.

### ***2.2.2 Requirements and Priorities***

- Redefinition of roles of various government institutions working in conservation and sustainable use of resources at both national and state levels. This should occur within existing mandates of different ministries, with the addition of new terms of reference.
- Creation of official channels of communication among all natural resources units and with HCENR as the coordinating body.
- Creation of an information centre for biodiversity data.
- Inventory of human resources: Due to the lack of official statistics, it would be useful to inventory the number and types of biodiversity-related professionals in different institutions and classify them by discipline and geographical area.
- Identification of partnership opportunities for research and project implementation.
- Enhancement of the coordinating role of HCENR.

### ***2.2.3 Legislative and Institutional Gaps***

- Lack of effective land use policy: Land use policies are not backed by legislation. Anticipated legal reforms include revision of sectoral laws, enactment of legislation to manage land use, rangeland and pastures, genetic resources and biodiversity.
- Weak institutions at state levels: The country's constitution divided land, forest and other natural resources in accordance with federal state boundaries and structures, preventing the holistic approach needed for biodiversity conservation. This has resulted in diverse policies, incoherent legislation and by-laws, and institutional weaknesses.
- Need to improve and update legislation such as the Wildlife and Fisheries Acts and to reform wildlife management beyond its mono-disciplinary outlook and traditions.

## **2.3 Key Capacity Gaps and Constraints related to Climate Change**

### ***2.3.1 Constraints and Needs***

The National Adaptation Program of Action (NAPA) was completed in a participatory manner in March 2007 and was approved and commended by the council of Ministers. It developed criteria for evaluation and priorities for implementation of adaptation initiatives and NAPA recommendations for capacity building, policy reforms and institutional integration. Despite this effort, the following constraints prevail:

- Climate change and UNFCCC concepts are not well integrated in the national policy and planning systems. This is partly because of limitations of the national management and data processing system.
- There have been limited efforts to foster awareness and understanding of climate change issues. Since the structures and affiliations of government institutions related to climate change are subject to frequent changes resulting from political instability, policies and strategies do not effectively incorporate MEAs such as UNFCCC.
- In key sectors such as agriculture and energy, there are few specific climate change measures, although some national plans call for the establishment of shelterbelts in agricultural schemes, promotion of renewable energy and periodic vehicle emissions inspection.
- In most cases, good laws and regulations are poorly enforced.
- At the institutional level, lack of awareness and limited capacity to monitor and evaluate hinder implementation of adaptation strategies and environmental management plans.
- Capacity building is needed in the areas of information technology, networking, and use of laboratory and field equipment for monitoring and evaluation.
- There is no assessment of environmental and socio-economic impacts of climate change.
- The number and qualifications of staff involved in climate change are inadequate. There is a need to recruit qualified staff and conduct intensive training.
- Upgrading institutional capacities to deal with climate change requires increasing awareness of policy-makers about climate change issues, introducing appropriate policies and regulations and revising institutional structures.
- Universities and research centers need support to include climate change issues in their programs.
- The role of civil society organizations should be enhanced through training, capacity building and networking, as well as government creation of an enabling environment for greater involvement of civil society.

### ***2.3.2 Requirements and Priorities***

The following priorities were based on an analysis of capacity weaknesses and strengths during the stocktaking and thematic assessment and a ranking of issues by stakeholders:

- Strengthen the national legal and coordination power to meet the demands of integrating of climate change issues into policy formulation process.
- Strengthen HCENR as the proper institution to coordinate policy formulation and develop a national GHG inventory, mitigation measures and adaptation plans. A coordination unit is to be established, properly equipped and staffed with competent professionals.
- Build capacities of appropriate sectors and institutions to carry out inventories, undertake vulnerability and adaptation assessments and develop mitigation initiatives.
- Establish a climate change information database centre.
- Conduct an intensive training program to include data collection; monitoring and evaluation; risk assessment in the field of GHGs and relevant scenarios of climate change; vulnerability and adaptation modelling; and information technologies.
- Raise awareness among key stockholders on relevant aspects of climate change, with emphasis on socio-economic and health benefits of mitigation and adaptation.

## **2.4 Key Capacity Gaps and Constraints related to Tertiary Education and Research**

### ***2.4.1 Constraints and Needs***

The following are priority constraints/needs:

- The root causes of all constraints are the lack of proper financing and the absence of a common vision and strong policies on MEAs in tertiary education and research.
- There is little information on MEAs and sustainable development in tertiary education.
- Linkages between tertiary education and MEAs; related awareness, training and research are not well established.
- Higher education policies are not adapted to requirements of MEAs and do not address sustainable development issues.
- Research is structurally weak, being narrow instead of trans-disciplinary.
- Physical infrastructure is weak, lacking advanced facilities and equipment to cope with emerging issues.
- The lack of Information & Communications Technologies has hindered innovation in teaching and research.
- Human resources lack appropriate training.

### ***2.4.2 Requirements and Priorities***

Policies should be adopted to overcome the above constraints. Priorities include the following:

- Universities and research centers should produce educational and research packages that address convention themes in a cross-cutting and integrated program.
- Institutions should promote integration of disciplines leading to multi-disciplinary programs. Advanced courses in environmental management should be developed on the topics of monitoring biodiversity conservation, desertification, POPs, natural resources conservation and climate change impacts and mitigation.
- Scientific and technical education should incorporate indigenous knowledge and traditional practices.
- Research should be directed towards implementing sustainable development, and should

include pilot projects to link researchers to communities and create partnerships with the private sector.

- Capacities related to infrastructure and communication should be strengthened.
- Awareness campaigns should be conducted.
- Training should be developed for key stakeholders on issues relevant to the conventions.

## **2.5 Synergies and Cross-cutting issues**

The lack of resources during the civil war era can be seen as justification for not including MEAs among national priorities for funding in the past. However, this situation should not continue after the CPA and the discovery of oil in the Sudan. The CPA (DPA and ESPA) officially brought to an end a long period during which there was enormous loss of life and considerable depletion of the country's resources. These agreements aim to bring a peace that can only be sustained through sustainable development. Implementation of the conventions can contribute to this process. Effective management of MEA-related issues is also integral to meeting the MDGs, implementing peace agreements, and alleviating poverty.

### ***2.4.3 Cross-cutting Institutional and Legal Issues***

Under the above agreements, Sudan is adopting a federal system of political governance. There are several levels within this system, which is designed to distribute, share and delegate authority, supported by the INC. Institutional reform and capacity-building is needed at all levels to strengthen governance in general and environmental governance in particular. The following are priority cross-cutting capacity needs at the institutional and legal level:

- *Improved MEA implementation* requires restructuring of national institutions, formulation and implementation of national programs, and increased coordination among MEA national focal points. (HCENR is the focal point for UNFCCC, CBD and POPs, while the NDDCU in MAF is the focal point for the UNCCD.)
- *Strategic planning is needed as a basis for institutional reform*, with the aim of improving structures, functions and relationships within and among environmental and natural resource agencies. Currently, affiliations among ministries and administrations are subject to frequent changes that are not always guided by a clear, systematic approach (e.g. the Wildlife Administration and NDDCU have experienced frequent changes).
- *Environmental and natural resources legislation* requires updating and improvement, with special attention to integrating MEA-related concerns. This should include a review of institutional mandates and the laws and regulations that set out their responsibilities.
- *The adoption of EIA regulations* is a priority action that would address multiple convention-related issues.
- *Both focal point units require extensive strengthening* at the institutional and individual levels. Their activities also need to be better integrated into decision-making at the systemic level, i.e., government policy and decision-making.
- There is limited awareness among policy and decision-makers of the importance of addressing MEA-related topics as part of Sudan's development. There is a need for *environmental awareness programs that integrate convention-related topics*. Key target groups include National Assembly members, senior managers (policy and decision-makers), NGOs, media, rural communities, students, women and the general public.
- Sudan's institutions need to enhance their *capacity to better manage, coordinate and follow up on international aid activities and projects*. Recent reports shows that broader

international aid programs significantly affect environmental management in the country. The *UNEP-Sudan Post-Conflict Environmental Assessment* (PCEA) identified several unintended negative environmental impacts of aid programs, mostly related to agriculture substitution by food aid; lack of integration of aid into UN country programs; and limited attention to environment impacts of projects. This critique can also be applied to UN MEA-related programs, which are often poorly integrated into UN country programs. Project effectiveness and sustainability is further undermined when the government fails to provide its approved contribution to a project (local component) and/or doesn't follow-up to ensure that results are sustained after project termination.

### ***2.5.2 Cross-cutting MEA / Convention Management Issues***

There are many common operational obligations under the Rio Conventions where Focal Points could increase collaboration and synergies. The NCSA as identified three areas for cooperation:

- *Coordination of convention implementation activities* that are common to all conventions, such as: reporting, public awareness, information and knowledge management (including national information exchange), research, environmental education and training, and institutional and individual capacity-building.
- *Establishment of information centers* for data related to MEA implementation as well as technical aspects of MEA issues is a shared interest that could be addressed by HCENR, NDDCU, other line ministries and NGOs.
- *Increased partnerships* among government with private sector, NGOs and civil society organizations involved with MEA-related issues.

### ***2.5.3 Cross-cutting Technical Issues***

- *Capacity building to address land use issues* is a need identified for all conventions. Land use planning and management was identified a priority tool for conservation of biodiversity, combating land degradation and addressing climate change adaptation.
- The *strengthening of community-based natural resources management*, and related activities such as establishment and conservation of vegetation cover (including shelterbelts), is seen as a practical tool for implementing all MEAs at the ground level.
- The *promotion of alternative energy sources* such as solar energy and LPG can simultaneously contribute to reducing the felling of trees, land degradation and carbon emissions. Capacity building for key stakeholders should focus increasing the knowledge and skills they need to employ appropriate technologies.
- *Integration of MEAs into tertiary education and research* is best addressed jointly for the three conventions (see recommendations in the Tertiary Education Thematic Report). Priority topics in research and training include: remote sensing GIS, information technology, disaster management and community mobilization.
- *Capacity development for educational and research institutions* can contribute to more effective convention implementation. On-the-job training is the proposed technique.

### 3. ACTION PLAN FOR ENVIRONMENTAL CAPACITY DEVELOPMENT

#### 3.1 Scope of the Action Plan

The goal of the Sudan NCSA was to determine the priority needs and establish an Action Plan for developing Sudan's capacity to meet its commitments to national and global environmental management. The Action Plan identified common obstacles that are hindering implementation of all three conventions in the country and priority capacity building actions to address them.

A Draft Action Plan was prepared by the NCSA project manager and deputy, based on the NCSA component reports. It was then reviewed by the NCSA Steering Committee and underwent intensive discussion and revision by the main stakeholders. Upon completion, the NCSA Report and Action Plan was officially endorsed by the Steering Committee, HCENR, and will be submitted for final endorsement by the Council of Ministers.

#### 3.2 Proposed Implementation Strategies

Consistent with the objectives of the Government of Sudan, the project team proposes that the following bodies have the key roles and responsibilities for implementing the Environmental Capacity Development Action Plan.

*HCENR*: the body responsible for multi-agency coordination and consultative planning in the fields of environment and natural resource management should have ultimate responsibility for plan oversight.

*MEPD*: currently the key executive body in charge of environmental management.

*MAF*: currently hosting the Unit for National Drought And Desertification Control.

The involvement of these agencies should enhance their in-house institutional capacities as well as improve the enabling environment for environmental management in Sudan. The NCSA project team noted that even where good national frameworks and plans are available to address Sudan's key environmental issues, they are rarely implemented. Therefore, the team proposes that practical measures be adopted to implement the Plan and that novel and flexible approaches be used, employing the implementation tools that are most effective to address each objective.

The NCSA team also noted that the recommendations of the NCSA Action Plan are consistent with other environmental action plans underway in Sudan and emphasized that the NCSA should be implemented in a complementary and synergistic fashion with those plans. The common messages that have emerged from these initiatives provide a good starting point for capacity development:

- NIP, NAPA, NPEM, PCEA and NCSA all emphasized the need for a strengthened coordination role for HCENR and an improved legal and administrative framework to facilitate coordinated implementation of the various environmental action plans.
- NPEM included specific suggestions to reform the HCENR, guided by these principles:
  - Enhance HCENR role in cross sectoral coordination,
  - Build political support for environmental strategies and policies,
  - Harmonize sectoral strategies and policies, and
  - Improve capacity to enforce national environmental policies, laws and standards.
- NPEM suggested actions for institutional support to HCENR and capacity-building for

- key organizations at the state, locality and community levels.
- NCSA and NPEM recommended improved land use planning as a core element for better environmental management (also recommended in NAP and NAPA).
  - NAP, NPEM, NAPA and NCSA all support increased use of community-based natural resources management models.
  - All plans call for capacity development for tertiary education and research on environment and sustainable development topics.
  - All plans called for increased environmental awareness among policy and decision-makers and the public.

### **3.3 Strategic Objectives**

NCSA stakeholders identified the following priority strategic objectives for environmental capacity development in Sudan:

1. To develop capacity for land use policy development and planning at federal and state levels.
2. To improve legislative and institutional arrangements for environmental management.
3. To strengthen capacity to implement community-based natural resource management.
4. To expand capacity for tertiary education and research to create a sustainable knowledge base in support of environmental management.
5. To raise the awareness of policy and decision-makers and key sectors of the public about the role of MEAs in environmental management in Sudan.

### **3.4 Expected Results and Proposed Activities**

To achieve the above strategic objectives, the following outcomes and activities are proposed:

***Strategic objective 1: To develop capacity for land use policy development and planning at federal and state levels***

#### **Outcome 1.1**

Land use policy is revised to harmonize customary and federal legislation with the guiding principle of conflict prevention (in contrast with the current conflict mitigation approach).

*Rationale: Land tenure systems in Sudan are complicated and consequently their role in promoting optimum utilization of natural resources is confused and ineffective.*

Proposed Activities:

- Recommendations in the CPA to revise and harmonize customary and federal legislation related to land use are implemented.
- Present laws at the localities (Mahallia), state (Wilaya) or national levels are revised and harmonized, based on a legal and regulatory review.
- Consultative and collaborative activities are undertaken to involve communities in sustainable use of natural resources and involve tribal leaders in conflict transformation.

#### **Outcome 1.2**

The mandate and institutional functions of the Land Commission and other institutions are clarified and their capacities are developed to achieve consistent land policies at federal and state levels.

*Rationale: A Land Commission is presently established, but not yet functioning. Its role, as outlined in the CPA, is restricted to conflict mitigation; however, pressing land use and land management issues require adoption of land use policies and plans to address broader issues.*

Proposed Activities:

- Recommendations in the CPA to establish a Land Commission are implemented.
- Additional functions and roles for the Land Use Commission are defined and appropriate capacity building is provided for Commission members and staff.
- A National Land Use Forum is established to identify key issues, clarify policies, suggest solutions and help to implement them.
- HCENR leads efforts to establish a land use network that includes the Soil Department, Remote Sensing Authority, state authorities, pastoralists and farmers unions.
- The land use management capacity of HCENR and State Environmental Councils (SEC) are strengthened through training on related topics.

***Strategic Objective 2: To improve legislative and institutional arrangements for environmental management in Sudan***

### **Outcome 2.1**

The HCENR administers and coordinates participatory environmental planning and management functions, with the aim of better integrating environmental considerations into national socio-economic planning and development.

*Rationale: The HCENR, chaired by the MENR and including 28 ministries/administrations and representatives of NGOs, universities and the private sector, is the coordinating body for environmental management. It is well-positioned to perform its role as the cornerstone for effective environmental governance in Sudan. This includes acting as the focal point for most MEAs and the operational focal point for GEF. However, the HCENR met only once in 1993 and the HCENR Secretariat, the technical arm of the council, continues to be understaffed and poorly equipped and trained to perform its duties.*

Proposed Activities:

- The HCENR Secretariat is strengthened through sustainable provision of resources.
- The HCENR Secretariat improves its ability to use strategic planning, project management and stakeholder consultation mechanisms to perform its coordination role.
- State Environmental Councils build their capacity to implement local environmental management activities (using the same tools as for the HCENR above, if appropriate).

### **Outcome 2.2**

The capacity of the NDDCU to implement the NAP and better address desertification is strengthened.

Proposed Activities:

- The NDDCU is strengthened through sustainable provision of resources.
- The NDDCU improves its ability to use strategic planning, project management and stakeholder consultation mechanisms to perform its coordination role.
- A practical strategy is developed to implement priority actions in the NAP.

### **Outcome 2.3**

Legislative and regulatory frameworks are revised to better operationalize the Rio Conventions and other MEAs.

*Rationale: The Environmental Protection Act of 2001 is an umbrella law that requires by-laws and enforcement mechanisms to make it more effective. There are about 150 Acts and regulations dealing with environmental issues and their enforcement are entrusted to 17 ministries and 81 government institutions. Implementation is fragmented and enforcement is uneven. Although EIA is required for all major developments, it is often not conducted or is inadequate.*

Proposed Activities:

- As required in the CPA and Interim Constitution 2005, environmental laws and regulations are revised to adapt to CPA and constitutional changes (required for all laws).
- Legal review and reform includes the development of subsidiary laws and regulations to better integrate MEAs, as needed.
- EIA requirements and practices are strengthened, implemented and monitored.

### **Outcome 2.4**

The institutional capacity of key MEA executing bodies such as MEPD and MAF is developed to better implement MEA provisions and enforce environmental laws as part of sustainable development.

Proposed Activities:

- A legal department is established at HCENR to coordinate among ministries and government institutions entrusted with environmental legislation.
- Consultation meetings and workshops to identify priorities for legal reform are held, involving the Ministry of Justice, MEPD, HCENR, legal advisers from relevant ministries, faculties of laws and NGOs.
- The HCENR legal department plays a lead role in reforming environmental legal instruments and establishing new ones, as needed.

### **Outcome 2.5**

Capacity for environmental monitoring and information management is improved through introducing integrated information and data management systems and strengthening institutional and human capacity to collect, manage and use information.

*Rationale: HCENR has successfully coordinated several surveys and monitoring activities as part of implementing MEAs for biodiversity, climate change and POPs; however, it has limited ability to follow up on these activities due to lack of capacity and resources.*

Proposed Activities:

- An integrated information and data management system is established at HCENR to track progress on implementation of national environmental plans and strategies, including convention-related activities.
- HCENR's ability to use environmental information for environmental management is enhanced through institutional and individual capacity-building, including training and improved labs and equipment, as needed.
- The above capacity building on environmental monitoring and information management

is extended to relevant line ministries and NGOs.

### **Outcome 2.6**

Individual capacity of key technical personnel in relevant institutions is enhanced through systematic formal (e.g., workshops, courses, and informal, e.g., on-the-job), with a focus on practical knowledge and skills.

Proposed Activities:

- Core staff of the HCENR Secretariat are trained in policy and planning aspects of environmental management, such as legislation and policy; program/project management and monitoring; land use planning, and information management (as noted under 2.4).
- Relevant staff of HCENR are trained on technical aspects of environmental management, including taxonomy, GIS, information technology and community mobilization and awareness. (Training is organized locally, where possible, e.g., Institute of Environmental Studies, Remote Sensing Authority RSA, and abroad as needed, e.g., post-graduate studies on taxonomy.)
- Some of the above training is extended to appropriate line ministries and NGOs.

***Strategic Objective 3: To strengthen capacity to implement community based natural resource management (CBNRM)***

### **Outcome 3.1**

Legislative frameworks and institutional arrangements are in place to promote the use of community-based natural resources management practices (CBNRM) to manage shared resources.

*Rationale: The implementation of the CPA and 2005 Constitution are providing good opportunities for expanding the use of CBNRM. The Forests National Corporation (FNC) already acknowledges the right of communities to forestland and resources; these legal rights are being extended to pastoralists through their inclusion in the rangeland law (in draft).*

Proposed Activities:

- Legislative frameworks and institutional arrangements are developed to promote expanded use of CBNRM.

### **Outcome 3.2**

The role of social capital and community relations in environmental management and sustainable development is strengthened through expanded use of CBNRM.

*Rationale: Capacity building is needed at the local/regional level to support the use of CBNRM as a practical tool for community participation in environmental management and sustainable development.*

- Consultations (workshops, meetings, training) are organized to build the knowledge and skills needed by farmers and pastoralists (through their unions), local institutions and NGOs to develop and implement CBNRM models.
- Pilot projects are developed in a participatory manner to test and demonstrate the practical use of CBNRM as a way to use social capital and community relations.

***Strategic Objective 4: To develop capacity for tertiary education and research to provide a sustainable knowledge base in support of environmental management***

**Outcome 4.1**

Higher education policies and practices are revised to promote programs related to implementation of MEAs through improved national and global environmental management.

*Rationale: Linkages between tertiary education, research and MEAs are not well established. Higher education activities do not incorporate MEAs and other sustainable development issues.*

Proposed Activities:

- Involve leading universities in the revision of environmental courses to integrate MEAs.
- Produce awareness-raising and teaching materials for faculty, students and researchers.

**Outcome 4.2**

Research is undertaken to support implementation and integration of MEAs into national environmental management frameworks in Sudan.

Proposed Activities:

- HCENR invites research institutions to participate in research related to environmental management, including community-based natural resources management.
- Support is provided for applied research that supports MEAs implementation.

***Strategic Objective 5: To raise the awareness of policy and decision-makers and key sectors of the public about the role of MEA-related topics in environmental management and sustainable development***

**Outcome 5.1**

Proposed Activities:

- MEA-related awareness and information packages and activities are developed for policy and decision-makers and key sectors of the public, using diverse techniques and involving media professionals from radio and TV, as well as artists and drama specialists.
- Newspaper articles, videos and drama shows are delivered to defined target groups within the public, e.g., private sector, community organizations.

**Table 1. ACTION PLAN**

Outcomes	Indicators	Baseline	Outputs & Activities	Target stakeholders	Responsible stakeholders	Time frame	Cost
<b><i>Strategic objective 1. To develop capacity for land use policy and planning at federal and state levels</i></b>							
1.1 Revision and harmonization of land use policies	<ol style="list-style-type: none"> <li>1. National land use policies and laws revised and harmonized</li> <li>2. Local and state land use policy and laws revised and harmonized</li> <li>3. Fewer reported cases of land use conflict</li> </ol>	<p>Contradictory policies</p> <p>Unclear mandates</p> <p>Rules aren't clear</p> <p>Conflicts among land uses</p>	<p>Studies</p> <p>Workshops</p> <p>Decision-maker meetings</p>	<p>Land Commission</p> <p>Community groups</p> <p>SEC</p>	<p>SEC</p> <p>HCENR</p> <p>Land Commission</p> <p>MAF</p>	12 months	300.000 US\$
1.2 Clarified mandate and institutional functions for Land Commission & related agencies	<ol style="list-style-type: none"> <li>1. Land Commission established and functioning</li> <li>2. Land Use Forum established and functioning</li> <li>3. Land Use network established</li> <li>4. Land Commission staff trained</li> </ol>	<p>The CPA called for establishment of a Land Commission</p> <p>Terms of Reference of Land Commission are not clarified</p>	<p>Studies</p> <p>Workshops</p> <p>Decision-maker meetings</p>	<p>Policy-makers</p> <p>Land Commission</p> <p>NGOs &amp; community groups</p>	<p>HCENR</p> <p>Land Commission</p> <p>National Assembly</p>	6 months	150.000 US\$
<b><i>Strategic objective 2. To improve legislative and institutional arrangements for environmental management in Sudan</i></b>							
2.1 Strengthened institutional capacity of HCENR for environmental management	<ol style="list-style-type: none"> <li>1. HCENR and SEC resourced and holding regulator meetings</li> <li>2. HCENR and SEC Secretariats use strategic planning, project management and stakeholder consultation for environmental management</li> </ol>	<p>HCENR held one meeting since 1993</p> <p>SEC not established in some states and weak in others</p> <p>HCENR has limited personnel &amp; facilities</p>	<p>Meetings</p> <p>Facilitation</p> <p>Capacity building for SEC</p>	<p>HCENR</p> <p>SEC</p>	<p>HCENR</p> <p>MEPD</p>	6 months	100.000 US\$
2.2 Strengthened capacity of NDDCU to implement NAP	<ol style="list-style-type: none"> <li>1. HCCDDP is holding regular meetings</li> <li>2. NDDCU is effectively supervising NAP</li> </ol>	<p>NDDCU has very weak capacity</p> <p>NAP isn't implemented</p>	<p>Training</p> <p>Equipment</p>	<p>NDDCU staff</p> <p>HCCDDP members</p>	<p>MAF</p>	6 months	100.000 US\$

	implementation						
2.3 Improved environmental legislative and regulatory framework	<ol style="list-style-type: none"> <li>1. Environmental Protection Act of 2001 is amended</li> <li>2. MEAs integrated into laws and regulations</li> <li>3. EIA conducted regularly for development projects</li> </ol>	<p>Environmental Protection Act 2001 out of date</p> <p>Sectoral legislation needs revision</p> <p>EIAs are not conducted regularly</p>	<p>Legal Task Force</p> <p>Workshops</p>		<p>HCENR</p> <p>MAF</p> <p>MEPD</p> <p>Ministry of Justice</p> <p>Faculty of Law</p>	1 year	50.000 US\$
2.4 Improved institutional capacity of MEA executing bodies (MEPD, MAF)	<ol style="list-style-type: none"> <li>1. Legal unit establishment within HCENR</li> <li>2. Consultations with law-related stakeholders conducted</li> <li>3. Legal instruments for MEAs are developed and used</li> </ol>	<p>Law enforcement capacity is limited</p> <p>Law enforcement process is not effective</p> <p>MEAs aren't well understood</p>	<p>Training programs</p> <p>Awareness raising programs</p>	<p>MEPD</p> <p>MAF</p>	HCENR	1 year	50.000 US\$
2.5 Improved environmental monitoring and information management	<ol style="list-style-type: none"> <li>1. Integrated information system established</li> <li>2. Training for HCENR, line agencies, NGOs</li> <li>3. Necessary labs and equipment provided</li> </ol>	<p>HCENR cannot follow up the implementation of Rio conventions and other MEAs</p>	<p>Recruitment of professionals</p> <p>Enhancement of HCENR capacity</p>	<p>Technical groups of environmental departments in different ministries</p>	HCENR	1 year	1.000.000 US\$
2.6 Systematic formal and on-the-job training and skills development	<ol style="list-style-type: none"> <li>1. Staff at HCENR Secretariat are trained in policy/planning and technical aspects of their work (locally and international programs)</li> <li>2. Training extended to line agencies and NGOs</li> </ol>	<p>Limited training opportunities for HCENR staff</p> <p>Specific courses on priority topics</p>	<p>Training programs in different areas</p>	<p>HCENR staff</p> <p>Line ministries</p>	<p>HCENR</p> <p>NGOs</p> <p>Universities</p> <p>Institutes</p>	2 years	1.000.000 US\$
<b>Objective 3. To strengthen capacity to implement community based natural resource management (CBNRM)</b>							
3.1 Legislative framework & institutional	<ol style="list-style-type: none"> <li>1. Community based natural resources management (CBNRM) is more</li> </ol>	<p>Limited participation by pastoralists and traditional farmers in</p>	<p>Consultation workshops</p> <p>Training</p>	<ol style="list-style-type: none"> <li>1. Pastoralists</li> <li>2. Farmers</li> </ol>	<p>HCENR</p> <p>NGOs</p>	6 months	100.000 US\$

arrangements promote community based natural resources management	widespread, as shown by number of states and communities involved 2. CBNRM is more effective, as shown by successful examples	official natural resources management activities	workshops				
3.2 Capacities built to strengthen social capital & community relations	1. NGOs and local institutions such as the farmers and pastoralist union are involved 2. Pilot projects using CBNRM for sustainable environmental management are established	Limited use of CBNRM NGOs and local institutions Traditional farmers and pastoralists not well organized	Training support for pilot projects	Farmers Pastoralists	HCENR NGOs	1 year	200.000 US\$
<b><i>Objective 4: To develop capacity for tertiary education and research to provide a sustainable knowledge base for environmental management</i></b>							
4.1 Higher education policies/practices address MEAs	1. Leading universities integrate MEAs into curricula 2. Awareness-raising and teaching materials for faculty, students and researchers	MEAs not well integrated in the universities curricula	Training programs for university staff & researchers	Universities Ministry of Higher Education	HCENR	1 year	100.000 US\$
4.2 Support for research related to MEA-related topics	1. A network of organizations related to MEAs, including universities and line ministries, is established 2. MEA-related research done	Limited research are conducted to support implementation of MEAs	Individual and institutional capacity building	University and research institutes' staff	HCENR		
<b><i>Objective 5. To raise the awareness of policy and decision-makers and key sectors of the public about the role of MEA-related topics in environmental management and sustainable development</i></b>							
5.1 Develop MEAs awareness packages to address policy and decision makers	1. MEA-related awareness/information packages developed 2. Increased awareness of MEAs among policy and decision-makers and public	Lack of awareness about MEAs issues among policy and decision-makers and their publics	Capacity building for mass media professionals	Policy and decision makers Public	HCENR Mass media:- professionals	1 year	100.000 US\$

## **ANNEX 1: THEMATIC ASSESSMENT OF UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION (UNCCD)**

### **1.0 Introduction**

Sudan is one of the Sudano-Sahelian countries that have been seriously affected by drought and Desertification since the late sixties to the present. This has its lasting imprints on natural habitats, means of livelihood and socio-economic fabric of the societies. The magnitude of desertification in Sudan was assessed by assimilating the existing information through the use of Geographical Information System. Sudan with its large area and diversified ecosystems reflects different types of land use. The intensive use of the available resources has led to the appearance of the problem of desertification.

In Sudan, desertification is regarded as the first environmental threat that poses a real constraint to achieving sustainable agricultural development. Climate with its great variation and intensity is the second causal agent of desertification the first being anthropogenic factors. Desertification is a human made problem through misuse and mal-practices of natural resources. Humans are thus the main agents of desertification as well as its victims.

Land degradation is invariably accompanied by degradation of human well being and social prospects. The desert affected areas in Sudan are confined to different ecological zones which fall between latitude 10<sup>o</sup>-18<sup>o</sup> N. The frequent severe drought that struck Sudan from 1967-73 and 1982-84, in addition to lesser severe drought in late eighties with their great impact on the natural resource led to famine and human displacement.

The objective of this thematic assessment is to identify priority capacity needs and opportunities for capacity development under the United Nations Convention to Combat Desertification (UNCCD).The analysis depended mainly on a Stocktaking Stage and wide stakeholder consultation. The Stocktaking methodology (including a questionnaire and a workshop), findings and conclusions are summarized in the Stocktaking Reports.

### **2.0 Causes and Extent of Desertification in Sudan**

#### ***a. Overgrazing***

Overgrazing is the most prevalent cause of desertification almost all over Sudan. This is especially so around water points and where water table is often lowered after increased or excessive use of water. Sudan with its rich livestock is vulnerable to desertification through overgrazing. This has led to the disappearance of some palatable species and replacement by non-palatable types in some rangelands in Western Sudan. The carrying capacity of most of the rangeland areas in Kordofan, Darfur and Butana can hardly support the large number of livestock in the area.

#### ***b. Deforestation***

Felling of trees for different reasons and the use of fuel wood energy are the causes of deforestation leading to desertification in forest areas. Alternative energy sources (solar, wind, biogas...etc) must be thought of if desertification due to deforestation is to be controlled. The use of butane gas as a substitute to biomass as a source of domestic energy has significantly improved the situation in this respect. The recently launched FNC Scheme (Ghabat gas) has proved to be useful.

### ***c. Over-cultivation***

The over-cultivation and cultivation of marginal land especially in low rainfall areas, is a serious cause of desertification in Sudan. Cultivation of marginal lands combined with irrational use of heavy machinery contribute directly to desertification. This often causes: a) loss of soil fertility b) soil impermeability and c) loss of nutrients and slow down biological activities.

### ***d. Bush removal and unplanned burning***

Uprooting of bushes for wood and burning of grass and forest shrubs for crop cultivation can lead to desertification. This is practiced in some areas in central Sudan. Fires destroy the soil cover leaving it bare and hence vulnerable to erosion and desertification.

## **3.0 Impacts of Drought and Desertification**

The major impacts of desertification on natural resources in Sudan are as follows:

- Socio-economic.
- Decline of land productivity.
- Food production shortage.
- Resource Based Conflict
- Decline in environmental quality.
- Decline of rangelands and pastoral resources.
- Shifting of sand dunes.

## **4.0 Overall Approach to Implementing the UNCCD**

In the middle of 70's, the Rural Development Administration implemented several agricultural development projects in Sudan over a wide range of climatic and soil conditions. The Desert Encroachment Control and Rehabilitation Program (DECARP, 1976) was planned then to deal with problems triggered by human and livestock activities such as overgrazing, deforestation for production of fuel wood, encroachment of mechanized farming in forest and range land, cultivation of marginal areas, and irrational use of water resources. Implemented projects were planned to control overgrazing, marginal cultivation, deforestation, and burning of grasslands.

On its preparatory arrangement for implementing the UNCCD, the NDDCU received a technical support from the European Economic Community for strengthening its capacity. The support was devoted to training, purchase of 2 vehicles and a Geographic Information System (GIS) unit. Using available information and applying the GIS, the state of desertification in the affected areas has been classified.

NDDU has a data bank of information from the affected States. The data collected are on vegetative cover, soil, surface and groundwater, distribution of rainfall and human population. The indicators used were: geomorphology and soils, rainfall distribution, water resources, land use and population distribution. Table 2 shows the degree of desertification and depicts the desertified areas and the degree of desertification as shown in the table 1 below.

The UNCCD was adopted in Paris on June 17<sup>th</sup> 1994 and entered into force on December 26, 1996 ninety days after the fiftieth ratification was received. Sudan became the 16<sup>th</sup> party to ratify the UNCCD on November 1995. Ministry of Agriculture and Forests (MAF) is the focal point. UNCCD is the only internationally recognized legally binding instrument that addresses the

problem of land degradation in dry land rural areas. The UNCCD places human beings at the centre of its effort to combat desertification and mitigate the effects of drought.

**Table 2: Degree of Desertification, using GIS - in km<sup>2</sup> and % in Relation to Total Country Area**

Degree of Desertification		Area Km <sup>2</sup>	% in Relation to Total Country Area
1	Desert	593366	23.8
2	Very severe	109599	4.4
3	Severe	72674	2.4
4	Moderate	82822	3.3
5	Slight	96038	3.9
6	Very slight	305243	12.2
Total		1259743	50.0

Source: NDDCU Files (1997)

## 5.0 Steps and Achievements towards Implementing the UNCCD

### 5.1 Past and On-Going Projects to Combat Desertification

The *Restocking of Gum Arabic Belt Project* in Kordofan was planned to promote individual and community involvement. Activities included establishment of extension centers to mobilize the communities in restocking of the gum belt.

The *Integrated Resource Management for Desertification Control Project* in Al Odaya in Kordofan state was planned to establish institutional structure to promote individual and community involvement for the proper management of natural resources.

The *Western Savanna Development Project (WSDP)* emphasized poverty alleviation and involvement of women. This project was planned as an integrated agriculture and rural development in Southern Darfur. Objectives included increasing small farmers incomes, arresting the ongoing degradation, rehabilitate water supply facilities, extension of new technologies and conservation of rangelands.

Activities under WSDP included adoption of operational research and establishment of four controlled settlements with secure tenure. In addition, the project established range enclosures; developed grazing systems and coordinated water development activities with other natural resources use activities. The project included several capacity building inputs such as:

- Establishing nursery techniques and restocking of Gum Arabic “Gardens”;
- Adoption of rest-rotation grazing system;
- Models for community natural resources management;
- Integrated approach involving several disciplines and sectors; and
- Effective assessment and monitoring and evaluation system.

Other projects were designed to conserve the forest resources by promoting rational use and providing alternative energy resources for household energy and services. These include: the project of briquette blocks of groundnut shells and improved strata dissemination at Al Nuhoud, and the project of charcoal production from cotton stalks in agriculture schemes of Al Rahad and Gezira, biogas plants in Darfur, solar energy (Photo-voltaic cells) in several states and promotion of use of LPG in several states in the Sudan.

Several NGOs and governmental projects aimed for fixation of mobile or shifting sand dunes which cause blockage of watercourses and burying productive land, rail, roads and buildings. A notable successful project for sand dunes fixation was implemented near Al Bashiri village, 18 km northwest of Bara (Lat. 14° n). The method included community mobilization in fencing, establishment of chessboard designed fence using local bush and planting of drought resistant plants such as: *Panicum turgidum*, and *Leptadenia pyrotechnica*.

## **5.2 National Action Program (NAP)**

The Sudan National Assembly held a workshop on December 2005 where the NAP was presented, discussed and endorsed by the agricultural committee. The NAP was then endorsed by the Council of Ministers in its resolution No. 81 for 2006 on 12 March 2006.

The resolution stated that a national campaign to combat desertification should be started, including educational programs and media. It also recommended the following:

- Directing more attention to enforcement of laws and regulations, for example, making it obligatory to plant trees in areas of 10% to 20% of agricultural schemes.
- Enforcement of laws limiting felling of trees;
- Directing the Ministry of Environment to work with building research institutes to find alternative building materials, since current practices of using burned bricks utilized large amounts of fuel wood;
- Instructing ministries of environment, agriculture and forestry, science and technology, higher education, and information to coordinate activities related to NAP implementation.
- Establishment of the Higher Council for Coordinating Drought and Desertification Control Program should be expedited (HCCDDCP).
- Capacity building to support NAP implementation, with emphasis on community based natural resources management and transformation of natural resources based conflicts.
- The CPA and the transitional national constitution for 2006 stated that it is necessary to activate states and regional environmental councils and revise policies at the state level.

Summary of recommendations suggested in the 2005 workshop:

- Support regular short training courses abroad according to specific needs within each category;
- Revisited the curricula stated by some colleges to meet some of key demands stated by stakeholders;
- Provide essential equipments to the laboratories for relevant categories; and,
- Achieve coordination among all relevant stakeholders to secure successful implementation of the UNCCD.

## **5.3 National Action Plan of Research on Desertification**

*UNESCO Chair of Desertification, and Desert Cultivation Studies Institute, University of Khartoum January 2006.*

Mindful of the concept of desertification in Sudan, the UNESCO Chair of Desertification and Desert Cultivation Studies Center (DACSC) organized a National Forum of scientific research on desertification 16-18 March 2004 to initiate a national dialogue on research undertaken on the various sectors operating in the area of combating desertification. The papers of the forum were

organized in three focal areas, namely, strategy and methodology of research, plans of action of research of the affected States and institutions, policies, finance, management and networking.

One of the main recommendations of this forum is to form a task force to formulate a National Action Plan of Desertification Research (NAPODR). The present administrative boundaries of the States were considered to be the main unit areas for NAPODR, not only for division of labor but also for practical considerations for successful implementation of each state plan. Accordingly, each member was asked to prepare the first draft of a State plan, which was then subjected to thorough discussions and amendments by the task force members. All the plans, with exception of that of southern Sudan, were based on the plans which were prepared and presented in the National Forum. The task force held ten meetings to reach consensus on the State plans.

## **6.0 Capacity Needs Assessment**

### **6.1 Institutions**

The NAP document (2006) identified four main programs related to institutional building for coordination and monitoring and evaluation, capacity building and human resource development, identifying priority program areas at state levels, and other priorities related to the implementation of UNCCD and pilot projects.

Recommendations were made as to how capacity should be built for implementing the NAP to enable combating desertification. They included the following:

- A Higher Council for Coordinating Drought and Desertification Control Programs (HCCDDCP) needs to be established.
- The NDDCU is to be upgraded to a general secretariat for the proposed HCCDDCP. The NDDCU is to build operating capacities in the field of desertification monitoring, integrated information systems on environment and desertification, policy analysis, capacity building, partnership promotion, resource mobilization and funding.

### **6.2 Human Resources**

The following recommendations were made in relation to human resources development:

- Revise and coordinate policies at national and state level.
- Enhance scientific research to address practical environmental field problems.
- Introduce environmental education programs in curricula at various levels.
- Promote environmental public awareness.

The objectives of the above programs are to build national capacities in various fields such as:

- Environmental policies.
- Extension and public awareness on environmental issues.
- Environmental education.
- Intermediate technologies.
- Renewable energy sources.

In relation to priority programs, the following areas were identified:

- Community based natural resources management to emphasize sustainability and conflict transformation.
- Demographic density and population distribution.

- Contribution to rural employment and rural development.
- Degree of complementation with any other former or ongoing development activities.
- Local socio-geographic balance and equity.
- Extending and promote the utilization of appropriate technologies.
- Promote and develop alternative renewable energy sources.

### **6.3 Institutions Involved in Desertification Issues**

#### **6.3.1 Remote Sensing Authority (RSA)**

##### *a. Background*

The application of satellite remote sensing began in Sudan in early seventies (1973); with training of several professionals in various disciplines at South Dakota State University (U.S.A), forming the nucleus of remote sensing specialists in the country. Subsequently many Government Departments started to introduce remote sensing in their fields. The importance of remote sensing and the urgency to coordinate the activity of remote sensing and to liaise between local, regional and international organizations led the Council of Ministers in 1977 to issue a decree to the effect of establishing:

- National Remote Sensing Center (NRSC), and
- National Committee for Remote Sensing.

In 1979 the National Remote Sensing Center was housed at the premises of the Faculty of Engineering, University of Khartoum and was affiliated to the National Center for Research. In 1996 the NRSC was renamed: (Technical Authority for Remote Sensing); however, the mandate and objectives remained the same: as follows

##### *b. Mandate*

- To formulate the general policy for the conduct of research and the application of remote sensing technology and determine the ways and means for its realization.
- To coordinate the efforts and activities on remote sensing technology and make use of local and international experience.
- To formulate the general policy for training at national and international levels in remote sensing.
- To Support technically and scientifically the remote sensing units in the Ministries and other Governments Departments wherever possible.
- To provide satellite data to the various users in different disciplines; and
- To assess earthquakes hazards in Sudan.

#### **6.3.2 Environment and Natural Resources Research Institute (ENRRI)**

##### *a. Research Activities*

This institute is also affiliated to the National Centre for Research. Its major research activities are as follows:

- Reclamation of desertified soils and their use for animal and plant production.
- Use of biological nitrogen fixation for increasing land fertility and researching the possibility of using other natural fertilizers.
- Use of plant extracts for control of pests. This is in addition to other techniques (e.g. biological control, introducing pest-resistant varieties, improving of husbandry practices). The objective is to establish integrated pest management for economically

important food and cash crops.

- Improving animal productivity through the use of agricultural by-products and other inexpensive materials for feeding.
- Monitor and follow-up of environmental pollution and investigation into other environmental problems.

### ***6.3.3 National Drought and Desertification Central Unit (NDDCU)***

Subsequent to the ratification of the convention, a ministerial resolution authorizing and recognizing the NDDU as the sole focal point and coordinating body for the UNCCD was issued. A steering committee chaired by the Under-Secretary of the Ministry of Agriculture was then constituted for the unit. The Unit's coordinator is a rapporteur to the steering committee.

The committee includes members from the Ministry of Agriculture and Forestry, UNDP, the Ministries of Social Planning, International Co-operation and Investment, External Relations and the Higher Council for Environment and Natural Resources. Legal measures are now under-way to authorize the existing desertification control coordinating council. A technical committee has been constituted for the unit, with members from the HCENR, NGOs, UNDP and the Desertification and Desert Cultivation Studies Centre (DADCSC). A Coordinator was assigned to the technical committee, with responsibility to work with the states to organize state and specialized workshops and a national forum. The UNDP also assigned a National Volunteer from the UN Voluntary Action Program for African Countries to assist the unit.

Coordination has been maintained in the process of implementing the UN Conventions on desertification, climate change and biodiversity. That was manifested by appointment of the national coordinator for climate change, the principal consultant and the information consultant to the project for strengthening the strategic planning, in the NDDCU technical committee. The NDDCU is also represented on the technical committee for climate change. At the States' level three States, Gezira, Northern, and Sennar have taken the initiative and formed their coordinating councils. Similar links were established with the biodiversity programme.

### ***6.3.4 National NGOs Coordinating Committee on Combating Desertification (NCCD)***

As for the voluntary sector, in 1994 all NGOs involved with combating desertification and accredited by the UNCCD COP united under the name Rescau International and ONG sur la Desertification (The International Network on Desertification and Drought) RIOD's Focal point in the Sudan is the NCCD (National NGOs Coordinating Committee on Combating Desertification membership open to all relevant NGOs and CBOs.) They have now reached 12 member organizations.

The NCCD has a strong communications with the NDDU, the sub-regional and World Organizations. It is the Sudan Focal Point of the World NGOs Network, which is working for combating desertification. It takes serious initiatives in social animation, awareness and participation in combating desertification. Its work is being supervised by a temporary steering committee from a temporary office of a member organization. Work is governed by the Sudan Council on Voluntary Action (SCOVA) and supervised by the humanitarian aid agency. The organization has formed the Group of Women and Desertification in 1997. The Group collaborates the Women Activities Coordinating Committee in the Ministry of Social Planning, in addition the World Women Group.

*Legal Status:* The NDDCU is institutionally under the land use and Desertification Control Administration which comes under the Federal Ministry of Agriculture and Forestry. There was talk of upgrading it to a national council with subsidiary branches in affected states. Recently the national forum suggested two options that are still being investigated:

- Establish an organization, accountable to the presidency and mandated with all aspects of the environment, including desertification.
- Establish an organization, directly responsible to the Federal Minister of Agriculture and Forestry and concerned with the control of desertification.

Existing legislative acts on the use and conservation of natural resources have been in place since the colonial era and are periodically reviewed and strengthened. They include the Wildlife and National Parks Act 1986, the Sudan Forestry Policy (2006) and the Forests and Renewable Natural Resources Act, 2002. Measures are now underway to pass legislation for protecting the grazing resources.

#### **6.4 Key Achievements Since Ratification of the UNCCD, 1995**

*Preparation of the National Plan on the Environment (1996):* The document has recognized desertification as the main environmental problem in the Sudan. It was jointly prepared by the relevant government departments and the National and International NGOs under the umbrella of the formerly named Ministry of Environment and Tourism (currently Ministry of Environment and Physical Development) MEPD.

*National Forum for Preparation of the National Action Program (1998):* The Forum put forward a set of priorities that vary from state to state, to address state-specific characteristics. The recommendations are a direct feedback from state workshops and seminars that have raised the awareness of stakeholders. Also the forum has gained consensus on some national recommendations, including such as the National Desertification Fund (National Desertification Fund) as a financial mechanism, the identify of the Focal Point, and coordination and partnership.

#### **6.5 Priority Requirements for the UNCCD**

##### ***6.5.1 Convention Management***

###### *a. Institutional Framework for Program Administration*

Pursuant to UNCCD it is recommended that the country should constitute a national coordinating council for combating desertification and mitigating the effect of drought, from relevant institutes and organizations. The council is to be lawfully and politically empowered and have subsidiary branches in the states affected by desertification.

###### *b. Financial Resources*

Pursuant to articles 20 and 21, it is recommended that financial mechanism i.e. a national desertification fund for combating desertification be established and the government to be the main contributor in establishing this funding mechanism. Furthermore, the government is to shoulder responsibility of approaching and urging potential financiers e.g. government organizations, private sector, CBOs, national and international organizations and agencies to participate in establishing and administering the proposed funding mechanism.

###### *c. Programs Priorities, Administration and Coordination*

It is recommended that methodologies of project preparation under the national action program be unified to comply with the UNCCD concept and directives. Pursuant to article 16, Sudan is to open channels for cooperation with country parties to prepare and implement regional and sub-regional programs and to coordinate information collection and exchange.

The country is to adopt a unified system of policies, decisions and regulations regarding control of desertification and mitigating the effects of drought. This should include consultations among the Federal Government, States' Governments and local communities. It is also recommended that a bank of information on environmental, constitutional and economic issues pertaining to drought and desertification be established for exchange of information among the Federal Government, State Governments and other organizations. The bottom-up approach is to be used in planning, execution, follow-up and decision-making.

### ***6.5.2 Capacity Building and Human Resource Development***

Recommendations include:

- Training of local leaders and raising their capacities in management, perception and application of environmental rules.
- Strengthening the role of women, youth organizations, NGOs, pastoralists' and farmers' groups through awareness raising and encouragement of their activities and innovations.
- Application of suitable intermediate technology.
- Approaching the private and expertise organizations to support application of new technology and research findings in combating desertification.
- Training and capacity building of those who are involved with combating desertification at the Federal and State's level.
- Directing research work and all institutions involved with desertification to be responsive to the needs of the local communities.
- Making use of the intermediate technology and traditional knowledge.
- Special consideration for training the subordinate cadre.
- Taking advantage of international co-operation for provision of expertise and equipment.
- Incorporating desertification control programs in national education curricula and use of all communication means (information media, clubs, and mosques) in training programs for raising environmental awareness in affected states.

### ***6.5.3 Indigenous Knowledge, Science and Technology***

Recommendations include:

- Establish a national mechanism for collection, classification, and authentication of indigenous knowledge that is connected with concepts, beliefs and practices for coping with drought and desertification.
- Do research work based on indigenous knowledge, for combating desertification and mitigating the effect of drought.
- Arrange for coordination and follow-up to ensure application of research findings.
- Incorporate all sustainability factors into feasibility studies of development and investment projects. Create and apply environmental laws to safeguard environmental sustainability of these projects.
- Establish a mechanism to follow-up and evaluate implementation of projects to combat desertification and mitigate the effects of drought, in harmony with the central government and the States.

#### ***6.5.4 Contribution of National NGOs and World Community***

Through a networking structure, national NGOs have worked in close association with concerned government institutions. Their participation in raising awareness and implementing the UNCCD is acknowledged and should be encouraged. An on-going role for NGOs and Research Institutes in implementing the IGAD Sub-regional Program of UNCCD is a priority.

Cooperation of Sudan with the International Community in combating desertification has been going on for a long time and should continue in order to implement the NAP successfully. In addition to Government contributions to running costs and staff salaries, support from UNDP and United Nations office to Combat Desertification and Drought (UNSO) is needed for the NAP. In addition, there are still projects in reforestation and the improvement and development of pasture which need funding from the government and an international helping hand.

Support to implement the NAP is pending establishment of the financial mechanism "National Desertification Fund". Guidelines for this will be made through government consultation with UNDP and UNSO. Financial support priorities are as follows:

- Training in the various fields of natural resources;
- Provision of transportation and communication means for NAP implementation in all affected states;
- Support for scientific and research institutes; and
- Support for national NGOs.

#### ***6.5.5 Monitoring and Early Warning Systems***

A consensus has been reached on the nature of priority projects in each state. The presence of an early warning system within the Relief and Humanitarian Agency will help in environmental monitoring. Methods for monitoring environmental change are lacking. The only information obtained on an annual basis is on meteorology, forestry, range and pasture and wildlife. The availability of information to evaluate change depends on annual surveys which are usually untimely and are not sustainable. Some available information can be used by applying GIS.

In the area of using research findings to combat desertification and promote sustainable development, a technological package for soil reclamation and breeding of drought-resistant crops was developed. A similar package in alternative energy is being introduced. However, most of these findings still need support to be sustained.

Indigenous knowledge for combating desertification and coping with drought furnishes an additional early warning method. However, the main constraint is the inaccessibility and lack of communication methods to gathering the information. The degree of desertification in each state has been interpreted through the use of GIS; however, field checking to verify and update information remains a cornerstone. Finally, the States' experience from projects to combat desertification shows, that stakeholders, i.e. rural people, should participate in monitoring and evaluation of impacts.

## **ANNEX 2: THEMATIC ASSESSMENT OF THE UNITED NATIONS CONVENTION ON BIOLOGICAL DIVERSITY (UNCBD)**

### **1.0 Background**

The United Nations Conference on Environment and Development (UNCED), also known as the “Earth Summit” was held June 3-14, 1992, in Rio de Janeiro, Brazil, after years of negotiations by Preparatory Committees. Five major agreements on global environmental issues were signed, including **the Framework Convention on Climate Change** and **the Convention on Biological Diversity** and the Convention to Combat Desertification, which are formal treaties with binding provisions on the parties. Other UNCED agreements including three non-binding statements on the relationship between sustainable environmental practices and the pursuit of social and socioeconomic development. **Agenda 21** sets out goals for improving environment and development results in key sectors of society. **The Rio Declaration** summarizes consensus principles for sustainable development. The **Statement on Forest Principles** pledges parties to more sustainable use of forest resources.

The CBD was opened for signature in Rio de Janeiro in June 1992. It entered into force on Dec. 29, 1993 and currently has 188 Parties. The Government of Sudan was amongst the first governments to sign the CBD, signing on June 22, 1993 ratifyin in October 1995.

### **2.0 Progress on Meeting the Priority Requirements for the CBD**

#### **2.1 Background on Biodiversity Enabling Activities**

Lack of awareness about the importance of biodiversity, lack of planning and inadequate institutional mechanisms for integrated biodiversity management have aggravated the situation of biodiversity in Sudan. The result has been the unsustainable use of biological resources and the degradation of aquatic, marine and terrestrial ecosystems, putting under threat important species of flora and fauna and their habitats. The CBD;s financial tools made it possible for countries like Sudan to pay attention to its biodiversity and take the opportunity to save it.

#### **2.2 The Planning Phase**

Following the ratification of the CBD in October 1995, the Government of Sudan received GEF support (through its implementing agency UNDP) for the development of NBSAP. GEF also approved a funding request under the Clearing House Mechanism (CHM). Implementation of this initial enabling activity in meeting its obligation under the convention was through a project implemented under the umbrella of the (HCENR), with technical support from the World Conservation Union, East Africa Regional Office (IUCN-EARO).

The project started in early 1999 as a unit within HCENR that was to be transformed into a permanent biodiversity coordination unit. A steering committee provided guidance on project implementation. Following project completion, the committee hoped to be restructured into a permanent National Biodiversity Committee to provide continued policy guidance and advice to the Government of Sudan on biodiversity management and conservation, including implementation of CBD and related conventions.

### 2.3 Development of NBSAP (Enabling Activity – Project)

**NBSAP Strategy:** The NBSAP project steering committee formulated a task force of seven national experts to develop the BSAP. The first draft was prepared over November-December 1999. It was reviewed by IUCN Eastern Africa Regional Office (EARO). As part of stakeholder involvement and consensus building, the draft was distributed to ministries, institutes, agencies and departments of relevance for comments. To widen the circle of participation, five regional workshops were held in different parts of the country. The BSAP was also presented in a final national workshop April 17-18, 2000. There was additional discussion and written comments were also received from expert individuals. The participants agreed to adopt the BSAP provided that useful comments that emerged during the discussion were incorporated and it was amended.

**Vision:** The vision of the Biodiversity Strategy is: “Conservation of diversity and related indigenous knowledge for sustainable national development of Sudan”.

**Guiding principles:-** The following principles were followed in developing the NBSAP:

- Protection of the natural environment and its constituent biological, ethnic and cultural diversity, and the development and good use thereof is an authentic aspect of fulfilling man’s role as vicegerent on earth. Conversely, the destruction of environment is a mischievous sort of corruption. Thus, furnishing a healthy social environment, and its improvement and development is an essential demand in responding to the principle of sustaining the dignity of mankind;
- Every Sudanese citizen has a constitutional right to a healthy environment that secures health, abundance and prosperity;
- Stakeholders at the local, state and national level should have an equitable share of benefits accruing from biological and other dimensions of diversity; and
- The formulation of BSAP and implementation action plan require the voluntary and democratic participation of the society at large. Some aspects of the natural environment and its constituent biological, ethnic and cultural diversity recognize no political or geographical boundaries within or between countries which necessitate sub-regional, regional and international cooperation for protection of the environment and development in the context of international conventions and agreements.

**Overall objective:** “To conserve and enhance biological diversity for the prosperity and development of the Sudan”. This encompasses the following specific objectives:

- a. **Conservation of biodiversity** (CBD articles 12 and 17): ensure conservation of the biological heritage for present and future generations through:
  - i. *Strengthening research and monitoring and assessment activities:* by improving inventories, database and documentation. This includes indigenous knowledge of the flora, fauna and microorganisms. Collaborative efforts from home and abroad will be necessary for the benefits of all concerned;
  - ii. *In-situ conservation* (CBD article 8): Conservation of representative samples of ecosystems including terrestrial, marine and fresh water ecosystems through nature reserves, national parks, on-farm conservation, forest reserves and restorative procedures;
  - iii. *Ex-situ conservation* (CBD article 9):
    - Establishment of arboreta, botanic gardens, herbaria and zoological gardens at national and state levels; and

Establishment of gene banks for the important species.

**b. Promoting sustainable use of biodiversity products (CBD article 10) through:**

- i. Reducing, halting and ultimately reversing the over-exploitation of biological resources through appropriate land use, especially the horizontal expansion in crops on marginal lands of fragile ecosystems, overgrazing and deforestation, and by promoting efficient farming techniques and multiple use of the resources to realize their inherent potential;
- ii. Creating alternative products and sources of alternative income; and controlling the formal introduction of germplasm especially noxious species in forests and food crops and in livestock.

**c. Promoting awareness on biodiversity conservation (CBD article 13) through:**

- i. Informing the public and decision-makers by providing adequate information through the media, improved extension service and networks;
- ii. Assigning real economic and other values to biodiversity products, so as to formulate sound policies for stakeholders through incentives in conservation activities. Initiatives from NGOs (national and foreign) and the private sector should be encouraged. This includes promotion of environment friendly activities like ecotourism, wildlife ranching and upfront preventive activities like environmental impact assessment.

**d. Creating an enabling environment for biodiversity conservation by:**

- Promoting political goodwill for the cause of biodiversity and availing incentives to stakeholders;
- Strengthening the institutional technical capacity by improving the technical infrastructure and strengthening the manpower base through training to carry out the tasks;
- Enacting a comprehensive and effective biodiversity conservation policy and practice that addresses, among other things, issues such as land allocation, land tenure and possible conflicts;
- Adopting economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biodiversity (CBD article 11); and
- Undertaking and considering financial resources and financial mechanisms as stated in articles 20 and 21 of the CBD.

**e. Complying with and benefiting from regional and international agreements and mechanisms (CBD article 22 and COP decisions)**

Through signature and/or ratification, Sudan is a party to a number of arrangements and mechanisms, legally binding and non-legally binding, which contain substantive elements, addressing different biodiversity and environmental aspects. Sudan should honour its commitments and benefit, to the maximum from ratified arrangements.

**f. Legislative aspects (CBD article 14, 15, 16 and 17)**

- Promote appropriate institutional, legislative, technical or other arrangements to ensure that the environmental consequences of sectoral programs and activities that are likely to have impacts on biological diversity are taken into account, mitigated or reduced;
- Promote appropriate conditions and measures for legal access to genetic resources and techniques deemed important for agriculture, forestry, animal husbandry and safety;

- Emphasize biosafety and social considerations in the development and application of biotechnology; and
- Build capacity and promote legal capabilities to safeguard the national interests and rights of the Sudan and Sudanese people over their intellectual property rights pertaining to biodiversity resources, indigenous knowledge and national heritage.

## **2.4 NBSAP Recommendations**

Below are suggested general and specific actions recommended in the NBSAP Action Plan:

### ***a. General Actions***

- Develop the CNS 1992-2002 into a new CNS 2002 – 2012 and develop a national action plan, which is a priority;
- Promote institutional, legislative, technical or other arrangements to ensure that the environmental consequences of sectoral programs and activities that have or are likely to have impacts on biological diversity are taken into account, neutralized or reduced;
- Promote appropriate conditions and measures for legal access to genetic resources, indigenous knowledge and techniques deemed important for agriculture, forestry, animal husbandry and safety;
- Emphasize biosafety and social considerations development and application of biotechnology;
- The legislation in relation to establishment of the 26 states should be revised to cater for neglected ecological concerns e.g. dividing the states of Kordofan and Darfur into northern and southern states causes further stress on their deteriorated resources;
- Undertake revisions of laws dividing power and revenues in relation to natural resources between the central government and state government to come up with the best situation that emphasizes conservation and sustainable use;
- Subject existing institutional set-up related to biodiversity conservation to critical evaluation and restructuring, in order to dictate lines of coordination and integration;
- Build capacity in the area of genetic resources protection and biosafety and establish necessary legislation;
- Evaluate and suggest improved measures related to land use tenure, legislation and practices, including regulations that require sustainable use;
- Facilitate popular participation in biodiversity conservation programs and capacity building programs for NGOs and CBOs; and
- Consolidate the role of the HCENR as the national focal point and coordination body in relation to biodiversity and other environmental issues.

### ***b. Specific Priority Actions***

Strategies and actions should be directed to alleviate poverty. A participatory approach to development should be adopted. Awareness-raising is needed and decision-makers should be won to the cause of environmental conservation. Many actions are common among various biodiversity components and should be coordinated. Priority actions are as follows:

### ***c. In-situ conservation***

- Systematic surveying and inventorying of plant and animal genetic resources;
- In-situ conservation of wild relatives of field and horticultural crops, endemic and indigenous herbaceous and woody species. Species and areas need to be determined, e.g.

pearl millet in the west, okra in the center, watermelon in the north and medicinal in their locations;

- On-farm conservation of farmers' varieties: improvement of cultural practices for better yields by traditional varieties, e.g. sorghum in Nuba Mountains, southern Blue Nile, southern Sudan and River Atbara; watermelon in western Sudan, date palm in northern Sudan and Darfur;
- Restoration of traditional varieties in war or disaster-affected areas, e.g. sorghum for the south and Nuba Mountains; and millet for Darfur.
- Mitigation measures to reduce the negative impacts of natural and man-made factors upon in-situ conserved crops, e.g. floods, drought, riverbank erosion and fires; and
- Developing monitoring and early warning system for loss of genetic resources.

**d. *Ex-situ conservation***

- Priorities should be set for collecting plant and animal genetic resources throughout the country to rescue material that may soon disappear in the field or be subjected to catastrophes such as war, epidemics or drought;
- These genetic resources need to be collected through a national campaign that involves governmental and non-governmental institutions. Research centers, universities, agricultural departments, farmers, national societies, women, etc. could participate;
- For such task of short- and long-term ex-situ conservation there is a need to strengthen the present PGR Unit at ARC to accommodate new collections that include natural vegetation species. New establishment for animal embryo and tissue culture is to conserve plant, domestic animals and wildlife genetic resources;
- Establishment of in-vitro conservation facility and field gene banks for the conservation of vegetatively propagated crops;
- Current field genebanks of fruit trees need to be maintained;
- Regeneration program is to be executed for the current collections in the PGR Unit/ARC;
- Establishment of program of surveys and research to generate and collect information-related to biotechnology;
- Establishment of gene banks to preserve microbial cultures of importance;
- Promotion of the effective use of plant tissue culture methods for conservation and propagation of endangered species.
- Proposal of projects that aim to provide base data of micro-flora collections in Sudan.
- Retrieval of Sudanese germplasm conserved abroad;
- Creation of capable full-time collection team.

**e. *Utilization***

- Conservation and utilization are inextricably linked, because utilization provides the principal purpose for conservation. Utilization of genetic resources involves the following:-
- Multiplication and characterization of collected materials in the regions where they are collected;
- Evaluation of local germplasm for the desirable characters;
- Participation between genebank, breeder and farmers in the utilization of the local germplasm or breed;
- Use of molecular evaluation techniques to develop core collections, and to avoid duplications;

- Purification of local diversified germplasm to produce varieties for commercial use;
- Production of multi-line varieties;
- Promotion of under-utilized, local varieties;
- Promotion of seed production systems both at local and national levels.

***f. Documentation***

- Many plant and animal breeders are deterred from using collections because of a lack of information and documentation. Documentation should include the following activities:
- Documenting while collecting or characterizing;
- Documenting of plant and animal genetic resources using a computerized system;
- Documentation of indigenous knowledge, practices and technologies;
- Establishment of information network between plant and animal genetic resources units and users in research centers and universities; and
- Publication of germplasm or breed catalogues.

***g. Training, Education and Extension***

- Recruitment and training of staff for the National Plant Genetic Resources Center and regional units, including postgraduate education for researchers, and long and short-term training courses for researchers and technicians in technical, managerial and policy areas;
- Training staff of research centers, universities and agricultural departments to participate in the collection operations;
- Development of syllabi on plant and animal genetic resources in the curricula of universities and colleges;
- Training in the areas of taxonomy (both plant and animal);
- Strengthening extension and extension facilities to develop a feedback mechanism to help researchers to scientifically approach field problems; and
- Inclusion of biodiversity issues in the curricula of schools.

***h. Institutional arrangements***

- Establishment of centrally coordinated program for plant genetic resources under the umbrella of the ARC for conservation of local germplasm of current and potential agricultural crops;
- PGR Unit/ARC is to be expanded into a national plant genetic resources center (in Khartoum or Wad Madani) where the base collection of crop germplasm in Sudan is maintained;
- The objectives of the national center include planning for collection, evaluating and use of the crop genetic resources as a coordinating body with the regional units. It will be responsible for the distribution of germplasm as regulated by legislation;
- The base collection is to be deposited in the national center while the active collections are to be held by the regional units;
- Some central facilities are to be attached to the national center for the conservation and evaluation of the collected germplasm. Examples of these are molecular biology laboratory and in-vitro conservation facility;
- Five regional plant genetic resources units are to be established in the north, west, south, east and center where active collections of materials collected from those regions are maintained;
- Objectives of establishing regional units include collecting inside the regions, and evaluation of such materials collected in these regions;

- Consolidation of cooperation among relevant regional and international organizations; and
- Strengthening institutional capacities by determining the proper affiliations. For example, RPA should be affiliated to other natural resources administrations. The WCGA affiliations should be revised and its linkages with natural resources agencies strengthened. The relationship between the WCGA and WRC are to be formalized.

## **2.5 Implementation Modality for the NBSAP**

### ***2.5.1 How the NBSAP Should be Implemented***

The Sudan NBSAP is a useful guide to implement the CBD. Accordingly, it should be:

- Presented by the former Ministry of Environment and Tourism (MET), currently Ministry of Environment and Physical Development (MEPD), to the Council of Ministers for Government approval, and then passed by Parliament and endorsed by the President of the Republic to secure government ownership and commitment to implementation.
- Publicized widely to secure stakeholder and public ownership and understanding, including making it user-friendly through abridged versions for different stakeholders;
- Made available as a planning tool by the National Council for Planning and other levels of government to integrate biodiversity in national development and sectoral planning;
- Made ready to be used by the MFNE as reference in budgeting and allocation of government resources;
- Made to be used as a useful tool for fundraising and co-ordination of donor support to biodiversity conservation and implementation of CBD, UNFCCC, UNCCD, CITES, Ramsar, Forest Principles and other related conventions, including facilitating synergy among the conventions. It is suggested that an environment/biodiversity donor liaison committee be formed immediately to harmonize funding strategy for implementation of the NBSAP and biodiversity related activities;
- Meant to be a guiding tool for the HCENR as a Government agency responsible for the CBD. The NBSAP will greatly assist implementation of Sudan's obligation to the CBD. In line ministries, the desk officers responsible for conventions will find it a useful tool for coordinating implementation of CBD and related conventions;
- Ready to be used as a guiding tool for assisting states to integrate biodiversity in their states development planning, policies and laws;
- Made to be a useful source of information for the National Information data bank(s), research institutions and sectoral agencies (e.g. Agriculture, Forestry, RPA, Livestock, Fisheries, Wildlife, etc.), and identifying information gaps and research priorities for sectoral agencies;
- Used as a guide to the development agencies/partners that would identify programs for support to biodiversity conservation and sustainable development; and
- Used as a guide to Government of the Republic of the Sudan in implementing regional and international conventions and agreements as well as the Horn of Africa and other regional frameworks.

### ***2.5.2 Prioritization of NBSAP Activities***

The proposed projects were to be implemented in the order they appear in Table 3 below, over a period of six years, 2001-2007. However, no funds were secured to do so.

**Table 3: Summary of Projects Proposed in the NBSAP**

<b>Project Title</b>	<b>Estimated Costs (US \$)</b>
Organizational set-up for conservation of biodiversity	1,000,000
Raising awareness of all stakeholders at all levels of biodiversity and its importance	1,000,000
Strategic planning for conservation of natural resources	3,000,000
Exploration and documentation of flora and fauna of Darfur, central clay plains, River Nile, Northern, Equatoria, Bahr El Ghazal and Upper Nile regions	2,000,000
Conservation of representative areas of various ecosystems	11,000,000
Rangelands conservation	1,000,000
Ex-situ conservation	41,000,000
Capacity building in systematics	1,500,000
Conservation of local races of livestock	1,500,000
Conservation and sustainable utilization of agro-biodiversity	14,800,000
Establishment of national Center for biotechnology	280,000
Reducing impact on biodiversity from civil strife	40,000,000
Estimated Total Cost	118,800,000

## **2.6 Monitoring, Evaluation and Reporting for NBSAP**

The implementation of NBSAP will require monitoring and evaluation of the progress as well as the assessment of biodiversity status and trends to follow up on the impact of implementation. HCENR is the overall responsible agency for monitoring of biodiversity and NBSAP implementation. Through a participatory process, the council will identify areas for monitoring and develop a comprehensive monitoring program. Among other areas the program will include:

- Monitoring implementation of the NBSAP;
- Monitoring the state of biodiversity; and
- Monitoring reporting on biodiversity.
- The council will also guide and build capacity of all participating institutions for their contribution in implementing the monitoring program.

## **2.7 Financing Implementation of NBSAP**

Implementation of the proposed projects under NBSAP will be financed through public, donor and private sector resources. Public sector sources will include:

- Allocation and reallocation of existing government funds;
- Improved and new methods of public revenue regeneration and allocation;
- Cost-saving through more efficient budgeting and use of funds.

Private sector financing and cost-sharing will be encouraged through the dismantling of existing barriers to investment in biodiversity and the setting in place of positive incentives such as:

- Establishment and improvement of biodiversity prices and markets;
- Appropriate property rights;
- Increased devolution of responsibilities and opportunities for biodiversity management

and utilization for profit and for non-profit purposes, through private, joint and collaborative management arrangements; and

- use of appropriate fiscal instruments (such as differential taxes) and financial inducements (such as credit, funds and trusts).

Donor and international funding sources will include:

- Conventional grants, loans and development assistance;
- Innovative donor funding arrangements such as debt-for-nature swaps, trusts and compacts; and
- Innovative international financial flows such as offsets, transferable development rights, biodiversity sales.

### **3.0 Implementation Phase (the Achievements)**

Generally, the pace of implementing the NBSAP has been slow and relatively little has been done, due to many constraints. Major achievements and gaps are listed below.

#### **3.1 National Biodiversity Strategy and Action Plan (NBSAP)**

*Project Partners: UNDP, IUCN-EARO and HCENR*

##### ***3.1.1 Major Components***

###### ***a) Biodiversity Assessment***

Through a participatory process, a countrywide biodiversity assessment was undertaken by fifty national experts from academic and research institutions, resulting in 14 individual assessment reports, which addressed the following topics:

- Agrobiodiversity;
- Freshwater (inland) Ecosystem;
- Forest Ecosystem;
- Insect Life;
- Marine and Coastal Habitats;
- Rangelands Ecosystem;
- Wildlife Ecosystem; and
- Biotechnology and Biosafety.

It also examined cross-cutting issues such as: Biodiversity Economics and Legal and Institutional policy frameworks.

###### ***b) Sudan Country Study on Biological Diversity***

This publication constituted a comprehensive document on the status of biodiversity in the country. It was compiled from the 14 reports based on sectoral and regional assessments. In addition to the data presented, the document included analyses and synthesis of the national situation regarding conservation and management of biodiversity.

###### ***c) National Biodiversity Strategy and Action Plan (NBSAP)***

Development of NBSAP was undertaken by a Task Force of seven national experts but it has involved meticulous consultations among a great number of stakeholders including representatives of the civil society at both federal and state levels. Ten awareness, training and consultation workshops were held. Besides its demonstration of the state of affairs in

biodiversity, the NBSAP has identified the need for strengthening of organizational set up for conservation and management of biological resources as important activity that needs immediate attention for implementation.

The Final National Biodiversity Workshop that took place in April 2000 provided a participatory and useful forum in confirming the findings of biodiversity assessment reports and in identifying priority areas for actions including scientific and management capacity building. The NBSAP was finalized mid May 2000. The NBSAP has been approved in August 2001 by the Council of Ministers. The plan envisages future sustainable development plans to take into consideration the conservation of the natural environment and its constituent biological, ethnic and cultural diversity.

NBSAP is presented in two parts: Part I which encompasses the strategy and, Part II which highlights basic background information and the synthesis of the results of biodiversity assessment, specially conducted for the purpose of developing the strategy. In Part I the strategy aspire to attain a number of set objectives. The latter are based on several guiding principles which emanate from current political, socio-economic and constitutional happenings. The objectives cover aspects pertaining to biodiversity such as conservation, promotion of awareness, creation of enabling environment for and effecting sustainable utilization, complying with and benefiting from regional and other conventions/agreements to which Sudan is party, together with essential legislative actions.

A number of opportunities conducive to the realization of the strategy and possible impediment constraints are enumerated. Twelve projects are proposed to achieve the objectives of the strategy. Funding for the projects is envisaged from Sudan Government with substantial contribution from the donor, development partners and international community. An implementation modality and a time frame together with monitoring and evaluation schedules are proposed at the end of the strategy.

Part II of the NBSAP includes a background and a synthesis of the results of the biodiversity assessment, status and trends, threats and necessary actions. It stresses the need to build a critical mass of effort to contribute to the safe and equitable application of biotechnology with emphasis on development and conservation of biodiversity.

#### ***d) Awareness Program***

Ten national and state-based awareness, training and consultation workshops were held during the life span of this enabling activity. These workshops helped in widening the circle of involvement and participation of the stakeholders. The attendance and participation of these workshops was intensive and noteworthy.

#### ***e) Other Documents and Reports***

In addition to the publications noted above, the following documents were produced:

- First National Country Report to the CBD (COP),
- Proceedings of 10 workshops during this phase of the project, and
- Seven Biodiversity Series booklets.

### ***3.1.2 Gaps identified in the NBSAP***

Although the Sudan is rich in its diversity of ecosystems, habitats, species and genetic resources, few comprehensive surveys or assessments have done. Most biodiversity surveys and studies

have been fragmented and tailored for limited academic, research and scientific purposes. Thus, although the NBSAP involved wide consultation, it still has the following gaps and weaknesses:

- Biodiversity assessments did not cover the southern part of the country due to inaccessibility from the civil war that was waging on those areas. All assessments for the southern region were carried out as desk work. This was unfortunate because the southern part of the country is the most biodiversity-rich part in the country. Most significant is the largest swampy wetland area of the “sudd” which harbors diverse flora and fauna. In the deep south of Sudan, there are also dense forests and numerous wildlife species.
- For Sudan, it is essential to see biodiversity protection and conservation in the context of sustainable development. However, the NBSAP put most of the emphasis on conservation, with little attention to issues of sustainable use and benefit-sharing.
- Poverty has not been addressed in the NBSAP and/or linked to biodiversity even though these topics are intricately interconnected. The degradation of **ecosystem services** is one of the principal factors that cause **poverty**.
- There was no attention to the association between food security and other goods and services provided by ecosystems and biodiversity components.
- There was no clear mention of synergies between biodiversity, climate change and desertification.
- There was no clear vision or explanation of how to mainstream the NBSAP into other national strategies and plans.

These gaps could be attributed to the fact that at the time of preparing the NBSAP some of the above-mentioned issues had not emerged globally. Furthermore, there were no agreed upon contents or standard format to follow in preparing NBSAPs, at least not within the region and NBSAP documents were not exchanged between countries in the region.

### ***3.1.3 SWOT Analysis of Biodiversity Implementation***

#### ***Strengths***

- Awareness of the value and importance of biodiversity has been generally growing rapidly and in particular among academicians, university level students and professionals.
- Involvement of many national experts in the different stages and processes of the biodiversity enabling activities will assist in the process of monitoring and evaluation of biodiversity in the country.
- Experts from the different subject matter specialists are available in the country.

#### ***Weaknesses***

- Lack of consistency and continuity of data collection and information gathering in consequence to lack of monitoring.
- Dominance of conventional and sectoral vision in some institutions a factor that hampers the adoption of integrated approaches to data collection.
- Lack of standard quantitative and mechanistic data collection and monitoring systems among institutions and sectors of similar mandate.
- Inadequate coordination and communication and therefore lack of exchange of biodiversity information between relevant institutions or departments.

#### ***Opportunities***

- Facilities and helping equipment such as computers, internet websites and GIS tools are

becoming increasingly available in many institutions.

- Increased regional and global initiatives on biodiversity components and the associated technical and financial assistance being made ready for interested countries.
- The launching of the Peace Agreement between northern and southern Sudan. This will pave the road for carrying out up-to-date assessments of biodiversity ecosystems in areas that once were battlefields.

### ***Threats***

- Rapid transformation of the economy into an open market economy and liberalization.
- Oil and mining activities are dominating the Government policies priority activities.

## **3.2 Assessment of Capacity Needs and Country-Specific Priorities in Biodiversity Management and Conservation Project**

*Project partners: UNDP, HCENR and MIC*

The NBSAP team and IUCN-EARO technical advisors prepared proposals for funding to identify priority areas for further capacity needs assessment and development of capacity enhancement to support NBSAP implementation. These focused on the following priorities:

- Implementation of conservation activities for representative ecosystem and species, including integration of the Biodiversity Action Plan at sectoral and state levels;
- Further awareness raising on NBSAP proposals and their integration into sectors at Federal and state levels;
- Taxonomy, including assessment and monitoring;
- Biosafety;
- Mechanisms for access to genetic resources, benefit sharing and promoting the use of and safeguarding traditional knowledge;
- Biodiversity economics and incentive measures for biodiversity management and conservation; and
- Data management for CHM.

These priorities were confirmed and approved during the Tripartite Review (TPR) meeting held with project partners in June 2000. The proposal resulted in a GEF/UNDP 10-month Add-On Project on biodiversity, initiated in October 2002. The project including the following assessments of the capacity needed to implement the NBSAP:

- National capacities in implementation of general measures of *in-situ* and *ex-situ* conservation and sustainable use, including national plans, strategies and legislation;
- National capacity building in biodiversity monitoring programs including taxonomy; and
- National capacity building needs related to managing access to genetic resources and benefit sharing.

The assessments were undertaken by three working groups, each with ten experts from universities, research institutions and government departments from different sectors. The assessments identified the key issues as: lack of appropriate and adequate skills; inappropriate infrastructure; and inadequate institutional and legal frameworks to address emerging biodiversity issues. The Add-on Project held four national consultation workshops, three on the above issues, and one to gain endorsement of the recommendations, resulting in completion of three comprehensive documents.

Sudan also acceded to the Cartagena Biosafety Protocol and developed the NBF. Biosafety was handled in a separate project that aimed at developing a National Biosafety Framework (NBF), financed by GEF/UNEP.

### ***3.2.1 Institutional Setting***

#### **Relevant Ministries and Affiliated National Institutions**

The involvement of the ministries at the federal level should be coordinated. Each ministry has traditionally managed its own affairs in almost total isolation of others. Federal ministries which have a stake in environmental issues include:

- **Ministry of Agriculture and Forestry:** includes Range and Pasture Administration, Drought and Desertification Unit, Administration of Soils and Land Use;
- **Ministry of Irrigation and Water Resources:** responsible for the Nile water resources and the underground resources;
- **Ministry of Health;**
- **Ministry of the Interior:** incorporates the Wildlife Forces General Administration administrative aspects personnel recruitment and promotion;
- **Ministry of Tourism and Wildlife (Technical aspects of wildlife management)**
- **Ministry of Animal Resources:** incorporates livestock and fisheries;
- **Ministry of Higher Education:** supports the university system and higher education institutes;
- **Ministry of Science and Technology:** harbours all research centers and institutions including the Agricultural Research Corporation (ARC), with its network of research stations serving different agricultural environments; the Animal Resources Research Corporation (ARRC), with its network of research centers; and the National Centre for Research (NCR).
- **Ministry of Environment and Physical Development:** incorporates the Higher Council for Environment and Natural Resources (HCENR).

Other stakeholders with environmental concerns include national and international non-governmental organizations. Many international NGOs are now taking an active interest in environmental issues. Donors are requiring them to do so, but they have also come to realize that the root causes of some of the programs or projects they are handling in the areas of humanitarian assistance are in some respects environmentally driven.

There also many national NGOs and civil society groups involved in fighting poverty and working to spread a culture of peace after decades of conflict. All of these groups realize that their objectives are also related to environmental protection and conservation.

### ***3.2.2 National Institutions and Mandates***

#### *Higher Council for Environment and Natural Resources (HCENR)*

The Higher Council for Environment and Natural Resources (HCENR) was established in 1992. Its establishment came in response to the many calls by the academic community for a body to shoulder the co-ordination of efforts needed to tackle the many and complex issues of environmental degradation.

The formation of the council was the culmination of various organizational efforts has begun by a memorandum from the Sudan delegation to the Stockholm Conference of 1972, which recommended the formation of a permanent council on man and the environment within the

ministry of higher education. A committee on man, the environment and development was formed in 1972 within the National Council for Research, chaired by the secretary general of the council who had ministerial status. The assistant secretary general became secretary of the committee. The committee functioned until 1978 when it was expanded to become the National Committee on the Environment, and its scope of work was expanded to include the Red Sea coastal and marine environment. One of the major achievements of the national committee was the drafting of law on environmental policies. Foreign assistance was solicited for this purpose.

Following the drought year of 1984 and its aftermath, a Commission on Relief and Rehabilitation was established. It was intended to relieve the national committee from the humanitarian problems that were associated with the drought and displacement. The decision was to maintain the national committee on the environment as research body since it is part of an institution charged principally with a research mandate.

HCNER came into being in 1992 and all the functions of the committee were transferred to it. The Prime Minister originally chaired the council and its members included the concerned ministers of health, agriculture and irrigation. This arrangement soon proved impractical and in reality, the council never functioned and remained dormant. The creation in 1995 and for the first time in Sudan, the Ministry of Environment and Tourism amalgamated the council into the new ministry, which simplified the organizational set up and allowed the council to function more effectively under a minister rather than the Prime Minister.

The council is now under the auspices of the minister of environment and physical development. Its primary role is to act as the technical arm of the new ministry. The functions of HCNER at the present are the long term planning and co-ordination on the national level. The HCNER has responsibility for drawing and coordinating national policies and plans as well as proposing legislation for environmental protection and conservation of natural resources. It has a secretariat which functions in an advisory and liaison capacity to the ministry of Environment and Physical Planning under whose auspices it falls at the present. The secretariat also acts as Sudan focal point for regional and international environmental concerns.

State branches of HCENR, composed of the concerned state ministries, have been established. The branch councils are charged with the follow up of national policies, compilation of resource assessment data and co-ordination of programs implemented in the state.

The Environmental Policy Act has been signed into law in March 2000. What remains is the issuance of the necessary by-laws to facilitate the enforcement of the provisions of the act.

The strong mono-disciplinary tradition is still strong. Some of the federal ministries above have semi-autonomous corporate bodies with an environmental concerns or mandates. These are:

- **Agricultural Research Corporation (ARC):** The corporation's mandate is adaptive research in the different agro- ecological environments in field, horticultural crops and other primary commodities. It also houses the Forestry Research Centre and the network of Western Sudan agricultural research. The network has a special mandate of promotion of agriculture production of the traditional rain fed farming systems. The corporation also houses the genetic resources and tissue culture research unit;
- **Forests National Corporation (FNC),** whose mandate is the production, reservation, protection and the maintenance of natural and planted forests;
- **Animal Resources Research Corporation (ARRC):** Primary mandate is animal health

research. It is also responsible for fisheries and wildlife research;

- **National Centre for Research (NCR):** Has one of its several components an Institute for Natural Resources and Environmental Science.

Other national institutions with interest in the environment are the university and institutes of higher education system. Of these the University of Khartoum is the oldest and has the most research experience. Here the Institute for Environmental Studies and the Departments of Botany and Zoology of the Faculty of Science, Faculties of Agriculture, Veterinary, Animal Production and Forestry are all promoting biodiversity education and research.

Other universities such as Juba, Upper Nile, Bahr al ghazal, Ahleia, Neelain, Sennar, Red Sea, Kordufan and Darfur universities are also involved in biodiversity programme.

### ***3.2.3 State Institutions***

The state ministry with the most involvement in the environment is the ministry of agriculture. It is charged with responsibility for agriculture, livestock, wildlife, forestry, pasture, fisheries or marine resources. The relationship between the federal and state level in the management of resources has not as yet been finalized. In this connection it is to be mentioned that that state authorities do exercise powers of land allocation for investment and development. The right of land disposition has been an exclusive right of the national ministries. This right has been slowly relaxed with the introduction of federalism. No firm policy of division of rights of land allocation has yet emerged. There are both national and state allocation rights.

All the units of the agricultural and animal research are federal institutions. The states have no control on them. There is also one university in each state. Being about ten years old, most of the state universities are young and have modest human capacity and material resources.

One major concern has emerged from the federal division of the country into twenty-five states and the sources of their revenue. The Kordofan and Darfur regions have been divided into northern and southern states. This division has resulted in limiting the opportunities of the northern populations of North Kordofan and North Darfur states. The result is more pressure on already depleted resources of ecologically fragile ecosystems.

### ***3.2.4 Research Infrastructure***

Both the agricultural and animal research corporations have excellent basic facilities in terms of physical plant, laboratories, experimental plots, and libraries. Unfortunately the ailing Sudan economy has been unable over the last two decades to afford their upkeep, renewal and maintenance. At the present it may be safely said that funds for logistics and other research services in these institutions have almost dried up. The same can be said of other national research institutions. The little research that takes place is funded from outside sources, mostly bilateral assistance to Sudan government.

Without pumping new blood into these institutions it is unlikely that they can make a significant contribution to the new challenges posed by conservation and sustainable use of resources.

### ***4.2.5 Human Resources***

Sudan has invested heavily in education and training immediately after independence. All professions received equal attention, whether in the civil service, research or higher education. The trained manpower in agriculture and agricultural research for example has been up to the mid 1970s second only to Egypt in the East Africa region. Since then agricultural research lost

almost 75% of its personnel. Furthermore national training funds have considerably shrunk since 1983. Training abroad became limited to opportunities provided by bilateral sources. These are limited in number and scope, as they have been part of the various development assistance packages. More recently all assistance came to be limited to humanitarian assistance only and nearly forms of development assistance dried out.

A massive drain of Sudan professional manpower has taken place in the last two decades. Professionals were lured by lucrative employment in the oil countries, regional and international bodies. Recently national and international non-governmental organizations have also attracted substantial numbers.

No figures are available on the extent of losses of manpower. The general consensus is that Sudan lost a very substantial numbers of the highly trained and experienced manpower in nearly all disciplines of biological science, engineering, medicine, economics and social science.

#### **4.0 Capacity Assessment related to Biodiversity Conservation**

The capacities of the different institutions to undertake activities pertaining to *in-situ* and *ex-situ* conservation are limited by numerous constraints, including the following critical ones:

##### ***a. Absence of strategic planning***

Lack of sustainable economic planning has had far-reaching repercussions on biodiversity conservation. Removal of plant cover due to urbanization, agricultural expansion, oil exploration and mining are common practices. In addition, the absence of a general land use policy, which integrates various land uses, results in conflicts among the various stakeholders.

##### ***b. Affiliations***

There is no lead authority to observe the overall management and conservation of Sudan genetic resources. The different components of the natural resources are scattered among different sectors and institutions. Improper affiliation and impending and continuous changes in affiliation may have a direct negative impact on the performance and administrative stability of these institutions. Change in leadership may entail change in policies and plans and may affect the relationship and linkage with other related institutions. This is mainly due to the whims and attitude of the leader himself.

##### ***c. Job Satisfaction***

Due to lack of job satisfaction and training as well as wrongful dismissal, many professionals working in the field of biodiversity conservation had given up their jobs while others were forced to do so. The remaining professionals lack enthusiasm and oftentimes are depressed.

##### ***d. Security constraints***

Southern and Western Sudan, which are rich in biodiversity are suffering from civil strife and armed robbery. This has resulted in the following:

- Their vegetation is not fully explored and documented;
- There is indiscriminate removal of trees for road construction, security purposes, petroleum prospecting and transport, and for use as fuel wood; and
- Movement of heavy military machinery may destroy the vegetation and compact the soil. This is further augmented by removal of vegetation due to oil exploration activities. This is indeed, a good manifestation of lack of strategic planning.

***e. Logistics and infrastructure***

Most institutions working on issues related to biodiversity conservation are lacking, appropriate and functional buildings, logistics, and continuous supply of power, up-to-date sophisticated scientific equipment, chemicals and needed technologies.

***f. Coordination***

The institutions working on biodiversity conservation suffer from lack of coordination and synchronization, resulting in the following:

- Scientific endeavours and initiatives are scattered, fragmented and rarely lead to meaningful results.
- Duplication of work and redundancies.
- Loss of mutual and reciprocal benefits.
- It is deplorable to mention that research activities related to medicinal and aromatic plants have been treated just like other horticultural and field crops whose infrastructures are well established. Since 1998 due to lack of annual budget and financial allocations, inventory and documentation were stopped. Activities such as scientific expeditions, maintenance, procurement of logistics and training suffered a serious setback.

***g. Legislative arrangements***

There are gaps in the national legislation that constrain the implementation of the CBD in certain areas. The present legislation does not have neither regularity nor effective penalty and they are sector-based. Their improvement depends on strengthening and restructuring individual institutions. Weakness in the legislation and relaxation in its implementation may lead to serious impacts such as illegal introduction of plants and animal species, degradation of forest and rangelands, absence of prompt and effective penalties on pollution, and smuggling of genetic resources due to poor quarantine measures. Other key gaps include:

- National legislation to regulate access to biological resources including both crop and animal genetic resources;
- Legislation to protect local communities, farmers and pastoralist rights to biological resources and their indigenous knowledge, practices and technologies;
- National legislation to safeguard and protect breeders rights;
- National legislation to regulate the movement of germplasm and breeds into and out of the country;
- Rangeland legislation to address land use in rangelands, integration of animal production and crop production; establishment of range reserves (unfenced, but based on public participation), and development of land tenure system that recognizes rangeland use as a major land use type;
- Enforcement of maritime, marine and coastal legislation;
- Laws to regulate introduction of exotic biological specimens (Pathogenic);
- Risk assessment laws to endorse and implement Biosafety;
- Laws that protect patents of intellectual property rights endorsement and implementation are not existing;
- Laws that prohibit Bio-piracy are not enacted; and
- Plans to adopt and/or promote understanding of bioethics with emphasis on manipulation of human genome and gene transfer, are not in place.

#### ***h. Taxonomy***

Plant and animal systematics are seriously threatened by the following constraints:

- *Scarcity of plant taxonomists*: Sudanese plant taxonomists are already scarce, yet they are subject to heavy drain by the Gulf States.
- *Publications*: Lack of publication is one of the major constraints that limit teaching, training and authentication of plant taxonomy.
- *Education and Training*: The limited weight allotted for the teaching of plant taxonomy coupled with the scarcity of plant taxonomists have greatly handicapped taxonomy education and training – opportunities for national or international training are limited and depend on donations from joint research projects or bilateral cooperation between educational institutions and governmental agencies or international NGOs.
- *Herbaria*: Currently there are only four herbaria in the Sudan namely: University of Khartoum Herbarium located at the Botany Department, Faculty of Science; Forest Research Centre Herbarium at Soba; Herbarium of the Range and Pasture Administration in Khartoum and the Herbarium of the Medicinal and Aromatic Plants Research Institute, Khartoum. Such a limited number of herbaria coupled with the lack of equipment, laboratories, trained and qualified personnel rendered these herbaria mere collection centres.
- *Botanic Gardens*: There is only one botanical garden in Khartoum, which is used as a focal point for plant identification and conservation of genetic resources. The number of species is limited and in deterioration and so is the staff. It has now become a nursery of ornamental plants.
- *Lack of Databases*: The lack of databases on plant distribution, habitat characteristics, uses, plant pests and diseases, is a major constraint that hinders documentation and authentication of taxonomic information.
- *Study of Special Ecosystems*: Most of the current taxonomic work centers on flowering plants. There is a pressing need for studying lower plants, especially Bryophytes and Pteridophytes. Similarly, there are unique ecosystems that deserve taxonomic studies such as the Montane vegetation, the oasis (desert) vegetation and expanses of range vegetation such as: the Butana and Elbaga areas. Special study should be carried on the unique Gizzu (desert) succulent vegetation, which support large number of nomads' livestock (Camels and Sheep) during winter months.

#### ***i. Genetic Resources***

The institutions dealing with conservation and management of genetic resources are by and large public corporations. The finance of these institutions usually comes from the following sources:

- General government budget;
- Development budget;
- Donations from local and foreign organizations; and
- Self-generated income.

It is sad to mention that both development budgets and donations have come to a halt since 1996. There is now complete dependence on the general budget, which is either inadequate, precarious, or does not come in time. Self-Dependant Corporation such as the FNC suffers from budget cuts because the income levied by this corporation is shared between the FNC and the States. Shortage in financial allocations may lead to freezing or complete abandoning

of activities such as surveys, inventories, and afforestation programs. Lack of adequate funds is also hampering the activities of the National Botanic Gardens, such as collection of endangered plant species. The rehabilitation program of 1992 was executed with the collaboration of the related institutions so as to collect and restore endangered and extinct plant species.

Capacity building needs for managing genetic resources include:

- Developing an integrated national natural resources use and biodiversity resource protection, policy and strategy.
- Developing research programs in biodiversity management and monitoring.
- Linking scientific research and indigenous knowledge and practices in biodiversity management and protection.
- Developing well-targeted natural resource and biodiversity, protection, polices, laws and legislation.
- Creating ecological awareness with regard to resources and biodiversity, protection, management and earning grassroots support and participation.
- Creating an environmental concern and awareness with regard to genetic resources and biodiversity safeguarding as central to policy and sustainable development. .
- Benefit sharing and Intellectual Property Rights protection in genetic resources and indigenous knowledge.
- Inventory, data collection and documentation of genetic resources.
- Surveying and mapping of national genetic resources.
- Identifying new genetic resources via surveys and expeditions and monitoring and evaluating changes in genetic resources.
- Developing technical know how and capacity building in identifying and managing access to genetic resources.
- Preparation of national environmental action plan including capacity building in biodiversity, management, monitoring and protection.

## **5.0 Rebuilding Capacity**

The current capacity of Sudan requires two basic inputs, infusion of material support to institutions to increase their current production, and identification, training and redistribution of human resources between research and implementation to maximize returns. The Sudanese economy at its present rate of growth is unlikely in the short and mid term to meet the required infusion of funds to rebuild institutional infrastructure. Due to the limited funding currently available from government, what is more feasible for slowly rebuilding Sudan capacity at the national level may be achieved by:

- Redefinition of the roles of various government and the semi-autonomous bodies in conservation and sustainable use of resources, including revising existing mandates of the different ministries, and adding new terms of reference, as necessary;
- Creation of official channels of communication among all environmental units, with the Higher Council as the coordinating institution; and
- Designation of a single official source for information-gathering and dissemination of environmental data.

Regarding human resources, in the absence of official statistics, it would be prudent to:

- Assess by complete census the number of professionals in the different ministries and the semi-autonomous research and the higher education institutions;
- Classify numbers into disciplinary areas and identify weak or missing areas;
- Establish geographical distribution at the national and state levels; and
- Identify partnership opportunities for research and project implementation.

At the state level it is necessary to conduct a similar census of institutions and the range of their mandates, personnel and official lines of communication with the federal ministry and HCENR.

Experience with the Biodiversity Project demonstrated that lines of communications among various environmental bodies are possible, despite long and cherished mono-disciplinary traditions. Experience also shows that communication may be short-lived and tend to die out or become blurred after project completion. The HCENR Council could keep these lines open by:

- Regular consultative meetings and workshops with the national and state bodies;
- Invitation of academics and research workers to make presentations of their research results or their visions of pressing problems as a prelude to project formulation of project proposals;
- Invitation of communities to make presentations of their needs and outlooks in the presence of professionals and civil servants to further increase levels of awareness and establish direct lines of communication with the ultimate beneficiaries;
- Publication of updated statistical environmental data to federal ministries, states, provinces rural councils and the academic community; and
- Publications of lessons learned from project implementation and the results obtained and from consultant evaluation reports.

## **6.0 Legal and Institutional Frameworks**

### **6.1 The Federal System**

Until 1970 Sudan government structure was a highly centralized mechanism. The legislative branch was a national assembly and the executive branch was composed of central ministries. The Sudan Judiciary has been and still is an independent body. Within this system, a limited form of local government existed; a 1951 law enacted powers for municipalities in the big cities and later in selected rural areas. In 1971 the Peoples' Local Government Act expanded the existing local government system by the creation of more Provinces, Districts within the provinces and urban and rural councils within the districts.

Further development took place in 1980 with the promulgation of the Regional Government Act. Sudan was divided into regions, each with a legislative body and a regional government. More devolution of the central government powers took place in 1992 with the launching of the Federal Government Act. The country was divided into twenty-six States, which were later reduced to twenty five states, each with legislature and government. Each State was also divided into Provinces, which were further subdivided into localities. The prime objective of the federal system and philosophy rests on the sharing of power and resources.

Legislation on environmental matters was incorporated as part of the responsibilities and terms of reference of the central departments, which were responsible for implementation throughout the country. The gradual processes of devolution had little impact on this basic set up and sector-based legislation continues to be a legacy of history.

The central government departments were charged, from the outset of their establishment in 1900, with very specific responsibilities. Each department had its own organizational structure and supportive legislation. Thus the agricultural, veterinary, medical, forestry and land use departments, each had its own laws and regulations. Examples are the animal diseases act 1901, locust destruction act 1907, plant diseases act 1913, agricultural pests control act 1919, land settlement and registration act 1925 and fresh water fisheries act 1954.

The most important of these early laws was the 1925 land settlement and registration ordinance. This act had been preceded by many acts starting in 1908. The purpose of these acts, which culminated in 1925, was to pave the way for the irrigated development of agriculture in the Gezira clay plain for the commercial production of long-staple cotton. The main provision of this ordinance was that all land which was not legally proved to be privately owned was deemed to be government land.

The land ordinance upheld the existing communal land use system, which had been established in Sudan through the successive waves of Arab migration in to Sudan hinterland since the six century. The law preserved the customary rights of the population in the extensive clay plains in the centre and the south east, and in the sands and Goz lands of western Sudan. These included such rights as the right of cultivation, woodcutting, grazing and settlement. The law had vested the rights of use of land to the people. Land as a resource is treated as a trust owned by the government but used by the people. The ordinance also guarded against speculation in land and the creation of a landed-class of entrepreneurs.

More sector-based legislation was made as demand dictated or as update of existing ones. Examples are the forestry act 1989, crop control act 1972, food protection act 1973, pesticides act 1974, environmental health act 1975, wildlife and national reserves conservation act 1986, the seeds act 1990 and the land disposition and construction planning act 1994.

The basic feature of Sudan legislation pertaining to environmental issues is that it is sector-based, with a focus on agriculture, forestry, fisheries, public health and animal resources. The notable exception is the pasture and range departmental sector, which has no similar central legislation regulating the use of this important resource. The only reference to pasture and grazing resources is found in the land tenure ordinance referred to above. Recently remedies to this situation have been made in the form of state legislation and local government orders related to grazing routes and fire lines.

Key line ministries with direct mandates for aspects of the environment and natural resources, including biodiversity as defined in the CBD, are agriculture and forests, animal resources, internal affairs, energy and mining, irrigation and water resources, health and industry. It is estimated that there are a total of 90 institutions, including ministerial units or para-statal public corporations, with direct or indirect jurisdiction over biodiversity. Their functions range from planning and management to training and extension to research and data-gathering.

A recent questionnaire showed that 50% of these institutions have their environmental mandate backed by laws. The law usually assigns responsibility to the minister or to a corporate body, while by-laws and regulations then detail terms of reference in accordance with the organizational structure within each ministerial body. There are also dual affiliations. For example the department of wildlife is affiliated to both the ministry of internal affairs and the ministry of environment and tourism. Law governs the first relationship, while the second is prescribed in the warrant establishing the ministry of environment and tourism.

The current legislation and institutional practices and traditions continue to carry the sector flavour. There is no co-ordination or interactive mechanisms to bring these bodies together over a joint issues. The ministries of agriculture and forests, environment and tourism, and irrigation and water resources all play a role in preventing water pollution. Coordination is also lacking among the departments of fisheries, pasture and wildlife; and among the forestry, pasture and soil conservation and wildlife departments.

After the launching of the federal system of government, environmental matters at the state level became divided between the portfolios of the state ministries for agriculture and animal resources, health and engineering affairs. The ministry of agriculture has responsibility over agriculture, forests, the environment and animal resources. The mandate of the ministry of engineering affairs includes overseeing land and surveys, construction and housing, roads and public waters, transportation and communication, water resources and energy and electricity. The ministry of health is responsible for preventive and curative medicine.

Again there is apparent dualism of functions between ministries at the state level, which arises from fact that the state ministries were founded on the capacities of the former regional ministries under the regional government system established in 1980. The regional government in many ways had not matured before it was transformed into a federal system. The autonomy of the state ministries is awaiting finalization of the process of power division and revenue-sharing.

## **6.2 Current Legal Constraints**

The biodiversity assessment identified the following legal and institutional constraints:

- The forestry sector has weak institutional capacity at the state levels;
- There is no legal provision for reserved forests or the establishment of shelterbelts;
- The absence of a land use policy creates conflicts between different stakeholders;
- Traditions and practices of forestry are still strongly mono-disciplinary;
- The schedules annexed to the 1986 wildlife conservation act do not cover all wildlife species which are found;
- There is blurred jurisdiction of wildlife in the 1998 Sudan constitution;
- The definition of reserved areas and sanctuaries is not very clear;
- The act needs updating to be in line with international and regional wildlife agreements;
- The wildlife departmental set-up continues to suffer dualism of affiliation;
- In the case of fisheries, the 1954 act needs to be updated to accommodate the federal system of government. The states lay emphasis on revenue only. Legislation is needed to cater to such aspects as handling and transporting fish, management of inland waters and the inclusion of fisheries resources in revenue sharing between the federal government and the states.

## **7.3 Priority Capacity Building Requirements and Opportunities**

The prioritization of the requirements, as listed below, is based on an analysis of the main weaknesses and strengths identified during the stocktaking stage. Their ranking is based on scores for levels of concern, reflected during the stakeholders' workshop.

### ***7.3.1 Creation of an Enabling Environment***

In order to integrate the UNCBD main concepts in the national policy process, it is imperative to strengthen the systemic level by convergence of all the threads to a fully mandated focal point. This enabling environment will harmonize the diffused policies and trim the irregularities among

the 25 states' laws. In fact, creation of an enabling environment for biodiversity conservation in Sudan, is one of the specific objectives of NBSAP. Such an initiative will need an Information Bank for biodiversity or a Technical Advisory Committee to HCENR to help coordinate matters on the institutional levels and provide networking on the individual level.

The enabling environment will be effective in regulation of the implementation and fight illegal introduction of plants and animal species, degradation of forest and rangelands and enforce effective penalties on pollution and smuggling of genetic resources.

### ***7.3.2 Legal Needs***

Despite the multiplicity of legislation relating to conservation of species, legislation primarily falls in the protection phase only. This is indeed a first step in the development of an environmental law. Sector-oriented legislation has resulted in a large number of agencies and administrations charged with implementation and enforcement of sectoral laws. With the launching of the federal system of government, 25 states and their various organisations became implementers of this existing multiplicity of legislation. This situation calls for urgent review and updating of all legislation. There is also the prudent desire to incorporate the ecosystem approach in the conservation legislation in lieu of administrative boundaries.

The country's constitution has divided land, forests and other natural resources in accordance with federal state boundaries and structure. This division overlooked the holistic approach, which is more appropriate. The lack of such an approach is resulting in diffused policies, incoherent legislation and by-laws and institutional incompetence. In addition, the constitutional provisions on the environment have been formulated only as very broad objectives and directives.

Land use policy is not yet backed by legislation. Anticipated legal reform includes revision of sector legislation, enactment of land use legislation, enactment of a range and pasture ordinance and introduction of legislation for the protection of genetic resources, patents and bio-safety. Reform is also required for forestry and wildlife to move them away from mono-disciplinary outlook and traditions. Finally, better measures for legal access to genetic resources, indigenous knowledge and techniques are important for agriculture, forestry, animal husbandry and safety.

### ***7.3.3 Strengthening Institutional Infrastructure and Training***

An important requirement arises from the poor infrastructure and lack of logistics among all relevant institutions. There is no clear policy for capacity building in these institutions. In particular, the area of Taxonomy requires a well-articulated training policy leading to:

- Promotion of scientific and technical co-operation with relevant parties (National, Regional and International) through database updating and internet connections.
- Encouragement of teaching taxonomy subject in schools and undergraduate curricula.
- Provision of scholarships and fellowships to encourage research on taxonomy and expose trainees to modern techniques.
- Involvement of Sudanese scientists in checklist preparation and/or updating.
- Capacity building of relevant departments and research institutes that would lead to:
  - Qualifying taxonomists.
  - Promotion of skills in taxonomy.
  - Arrangement for publications, handouts, awareness programs.
- Establishment of:
  - (i) A technical advisory committee to the Higher Council for Environment and Natural Resources in matters related to systematics.

(ii) Ex-situ biodiversity conservation sites, such as:

- Arboreta and botanic gardens.
- Herbaria.
- Genebanks.
- Marine Aquaria and Museums.
- Zoological Gardens.
- Showrooms at National Parks, Game Reserves and proposed Protected Areas.

There is also a need for capacity building on the topic of Access and Benefit Sharing of Genetic Resources, including raising awareness of the role of safeguarding genetic resources and biodiversity in sustainable development. Such capacity building should address Benefit Sharing and Intellectual Property Rights protection in genetic resources and indigenous knowledge.

#### ***7.3.4 Awareness and Education***

Awareness and knowledge of the strategic importance and the biological values of genetic resources in the country leave much to be desired apart, from fragmented and poorly concluded media initiatives. The efforts of some NGOs such as the Sudanese Environment Conservation Society (SECS) should be recognized and encouraged.

There is a virtual absence of syllabi related to conservation and protection of biodiversity in the general education curricula and little, if any, in the higher education curricula. Most institutions and corporations are suffering seriously from lack of adequate qualified scientists (including taxonomists), technicians, and skilled support staff. It is regrettable that there are only a few taxonomists in the FNC, RPA, NBG, IES and the Faculty of Science of University of Khartoum.

The sharp decline in the number of technicians and supporting technical staff (lab assistants and skilled laborers) should be addressed. The turn of the last decade of the last century witnessed virtual cessation of cultural and academic protocols. Arranged visits and training programs should be structured and sustained.

There is a need to strengthening research, assessment and monitoring by improving inventories, database and documentation, including indigenous knowledge of the flora, fauna and micro-organisms. Collaborative efforts at home and abroad will be necessary due to financial constraints and political challenges.

## **ANNEX 3: THEMATIC ASSESSMENT: UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)**

### **Executive Summary**

A thematic analysis related to climate change was carried out in partial fulfilment of the process of Self-Assessment of National Capacity Building Needs in Sudan to manage Global Environmental Issues (NCSA). The objective of this exercise is to identify priority capacity needs and opportunities for capacity development under the United Nations Framework Convention on Climate Change (UNFCCC). The aim is to provide the basis for the next step of cross-cutting analysis and possible synergies in implementation.

The thematic area is researched on the background of the vulnerability of Sudan's ecological, economical and social situations, the institutional frameworks and their legislation. The threats facing the environment and their impacts are pointed out and related to the effects of climate change phenomenon.

The ultimate objective of UNFCCC and its requirements were summarized as: Preparing inventories and national communications; and developing and implementing national programs, adaptation plans and measures. Other requirements include assessing vulnerability and adaptations, mitigation options and transfer of technology. The convention requires systematic observation of climate change functions by education, training, awareness and information management. For least developed countries-like Sudan- institutional capacity-building, raising awareness and financial support are prioritized.

Progress towards meeting these priority requirements in Sudan is surveyed. The national inventory of the total emissions of GHG for 1995 was 25752 Gg, and the main gas emitted is CO<sub>2</sub>, followed by CO, CH<sub>4</sub> and others. Land-use change and forestry (including biomass) was found to be the main emitter of CO<sub>2</sub>. The energy sector emits the major share of CO and non-methane volatile organic compounds.

Vulnerability and adaptation assessment were tested in Kordofan states to reveal that even modest changes in temperature and precipitation may hit hard the agriculture and forestry sector. The results also indicated critical decline in soil moisture compared to historical baseline and acute water stress could be experienced by the year 2060. Changes in temperature and precipitation anticipated under climate change were also shown to be adversely altering the current distribution and intensity of malaria incidence.

The institutional frameworks and approach to implementation were identified on the background of overall physical structure, the economic framework, and the overall approach to environment protection. The key stakeholders related to UNFCCC were grouped in respect to their sensitivity to the impacts of climate change. These are governmental ministries and institutions, universities and research institutes and non-governmental organizations. Permanent observation units were established within relevant sectors and institutions for future updating of Sudan's GHG inventory. These units were hosted in the ministries of Energy, Industry and Agriculture, Forest National Corporation, Khartoum University and the Meteorological Authority.

The general capacity, strength and weakness of the policies and legislative process are surveyed at the systemic, institutional and individual levels. The root cause of the weakness of the general capacity is the lack of understanding that climate change is a 90% man-activity (UN Conference-Paris-Feb.2007). Thus the main constraints are the lack of political commitment, effective

training, awareness and mainstreaming of the teaching and research to support convention requirements. Priority requirements under the convention, based on past and on-going studies, were identified as:

- Formulation of enforced policy and legislation-pertaining to the requirements- in the Comprehensive National Strategy and creation of a Coordination Unit to implement these policies in the respective focal units in the different institutions.
- Strengthening institutional infrastructure, by supporting effective focal units in the different institutions and promoting Sudan's adaptive capacity and limiting the increase of GHG emissions from the different sources.
- Acquisition of knowledge and mutual dissemination of information can only be properly achieved from a national climate change data that points out data gaps and required research. The creation of a web-based database is imperative to this requirement.
- A strategic training program to develop the capacity of implementing, monitoring, evaluating and reporting is needed for the respective stakeholders. The areas of training opportunities needed include -inter alia- methodologies, analyses, modeling and the application of information technologies.
- A continuous process of awareness among stakeholders will illustrate the anticipated effects of GHG emission reduction and the economic benefits. This should cover all spectra of stakeholders, with a structured and well designed program for each sector.

## **1.0 Background**

Soon after the Earth Summit in Brazil had adopted the UNFCCC, Sudan signed and ratified the convention on the 19th November 1993 and committed itself to active cooperation with the global community to address the problem of climate change. Sudan has been an active participant in negotiations at the Conference of Parties.

This commitment ensured that Sudan will carry out certain tasks required by the convention. However, recognizing the respective capabilities of different nations, the UNFCCC agreed on the principles of common but differentiated responsibilities. Accordingly developed countries are committed to take measures to reduce their levels of Greenhouse Gases (GHG) emissions, while developing countries are encouraged to undertake a development path that limits the growth of GHG emissions.

Among other commitments, every party to the Convention has an obligation to submit regularly a national inventory of GHG emissions, by source and sink. This will enable the international community to systematically quantify all present day and expected anthropogenic emissions, employing comparable methods to assess the global impacts of such emissions. Despite the fact that Sudan contributes an extremely small amount of greenhouse gases to the atmosphere compared to the rest of the world, the impacts of climate change in this country are likely to be disproportionately large.

This thematic assessment part of the National Capacity Self-Assessment (NCSA) project is aimed at analyzing the country's obligations and opportunities from the UNFCCC and the country's performance and achievements to date, including strength and constraints in implementing the convention as well as priority capacity needs.

The methodology adopted in this assessment is mostly desk work, consulting documents, strategies, action plans and consulting available literature. Communicating with stakeholders and referring to Stocktaking productions were also useful.

## **2.0 Summary of Priority Requirements under the Convention**

Sudan is facing significant challenges related to reducing its annual level of GHG emissions. Of these, recurrent droughts, chronic food security problems and regional instability have contributed to population displacement and an ongoing refugee crisis. Expanding desertification is threatening agricultural production and biodiversity. At the same time, the energy use is dominated by consumption of firewood and charcoal resources. Thus, the impact of global warming on Sudan's fragile ecosystem is expected to be disproportionately much larger.

To face this situation, several priority requirements are expected to be included in the national priorities for development. A number of priority actions listed in the Comprehensive National Strategy (GOS, 1991), are related, directly or indirectly, to climate change. These include protection and development of the rural environment for sustainable development, rehabilitation/preservation of ecosystems for sustainable and renewable energy resources, and enhancement of environmental awareness among concerned groups. However, certain priority requirements under the UNFCCC are to be emphasized in an action plan which builds on the results of the inventory, vulnerability assessment and mitigation analysis. The objectives of this strategy include:

- To improve scientific knowledge and understanding of climate change and its impacts.
- To build an enabling environment to integrate climate change issues and concerns into national development.
- To raise stakeholders awareness.
- To identify and build synergies with other conventions and agreements.
- To develop a national climate change adaptation program.
- To develop a national GHG mitigation program.

To reach these objectives, the following priority capacity building actions were identified:

### ***a) Establish a climate change coordination unit***

The unit would supervise and coordinate the implementation of the national strategy and all climate change activities both nationally and abroad.

### ***b) Strengthen institutional infrastructure***

By establishing focal units in the related sectors with clear role and obligation, supported by political commitment and capacity to coordinate, insuring their effectiveness, and sustainability.

### ***c) Create a climate change information and database center***

By creating and maintaining a well-designed web-based database it will facilitate access to climate change data and information to relevant institutions. Beside data collection and analysis, it identifies research areas to fill data gaps.

### ***d) Implement a strategic training program***

A training program will increase the capacity for conducting analyses of climate change data by courses, workshops and seminars. Raising awareness among different sectors and building

national consensus for climate change action plan is also recommended, with special emphasis on industry and NGOs.

### **3.0 Progress in Meeting Priority Convention Requirements**

Sudan is only at the beginning of approaching the first step to meet these requirements. It has signed the UNFCCC in 1992, ratified it in 1993 and ratified the Koyoto Protocol in 2005. During 1998 – 2001, 50 governmental and non – governmental institution members have participated in a capacity building project to prepare the Sudan Initial National Communication Under the UNFCCC (Climate Change Report). Equipped with the full understanding and the required professionalism, Sudan has produced the initial communication containing the first GHG inventory and a preliminary Vulnerability and Adaptation Assessment.

The results of Sudan’s national inventory indicated that the total emissions of GHG, for 1995 amount to 25,752 Gg. The main gas emitted is CO<sub>2</sub> (75%) followed by CO, CH<sub>4</sub>. Land-use change and forestry (including biomass estimates) was found to be the main emitter of CO<sub>2</sub>. The energy sector emits the major share of carbon monoxide and non-methane volatile organic compounds (NMVOC). The results may contain a large degree of uncertainty due to data problems, methodological problems and technical problems which need to be addressed.

Kordofan state was chosen for the focus of the vulnerability and adaptation assessment because of its vulnerability to climate change effects. The results suggested that the Agriculture and Forestry sector may be hard hit by even modest changes in temperature and precipitation. Nevertheless, changes in temperature and precipitation anticipated under climate change were shown to be adversely altering the current distribution and intensity of malaria in Kordofan state and Sudan at large. The results also indicated critical decline in soil moisture, compared to the historic baseline and acute water stress could be experienced in the year 2060. .

However, permanent observation units were established within relevant sectors and institutions, for future updating of Sudan’s GHG Inventory. These include the Ministries of Energy, Industry and Agriculture, Forest National Corporation, Khartoum University, and Meteorological Authority.

The climate change studies in Sudan are projecting that in the coming 30 years many changes can be expected. These include the shifting of the agro-climatic zone to the south reducing the productivity of sorghum and millet crops up to 50% in certain areas and Gum Arabic to 20-30%. The increased temperature and low rainfall will affect available water resources and may increase the incidence and geographical range of malaria.

GEF and UNEP have sponsored the Sudan AIACC-AF – 14 Project (2001-2005) which included development of mitigation strategies in arid and semi-arid areas in relation to national resources management and disaster mitigation. That was a very useful experience in identifying tools and practical adaptation options for vulnerable communities.

The National Adaptation Plan of Action (NAPA, 2007) is a step towards developing a national strategy for adaptation to climate change by identifying practical adaptation options. During this process , Sudan has participated in the Global Assessment of Impacts and Adaptation to climate change in Multiple Sectors and Regions which is an umbrella project consisting of 24 regional studies on impacts, vulnerability and adaptation. This NCSA project (2005-2007) is an important self-assessing step in relation to MEA’s.

## **4.0 Enabling Environment**

### **4.1 Economic framework**

Despite outstanding potentialities, Sudan is considered one of the least developed countries with annual per capita income of less than US \$ 400. The Sudan abolished the Dinar and adopted the Ginaiih or Pound equivalent to 100 Dinars in 2007. The country is known for its agricultural capacity and livestock wealth as a leading wealthy African country. However, the economic performance since independence in 1956 suffered structural imbalances between production and consumption, imports and exports and revenue and expenditure. This situation has resulted in inflationary pressures and continuous external debt.

It is only in the late 1990s, after the extraction of oil, that economic performance improved gradually. The government has taken measures to liberalize prices and encourage privatization, being supported by new petroleum revenue. The growth rate of 1.2% for the Gross Domestic Product (GDP) during the 1980s has changed in the 1990s to 7.8%. This improvement is attributed to the developments in the agricultural sector. It is estimated that during 1995 – 1996, agriculture provided 90% of the raw material for local industries, 80% of export earnings, and income and employment for more than 80% of the population. The economy of Sudan has no safe path but agriculture.

This is not to undermine the contribution of the industrial and mining sectors to the economy. These sectors contribution to the GDP was 14.5% in 1996 and 15% in 1998 with growth rates of 7.2% and 10.2% respectively. The industrial sector is a valuable source of employment and income to the population and at least one third of the manufacturing value added product comes from traditional small scale industry.

The services sector is relatively large but its contribution to GDP is declining. It dropped to 37% in 1997 with a negative growth rate of – 1.1%, when it was at 50% of the GDP in the 1980s, in 1998 the growth rate had increased to 2.0% although its contribution to GDP has decreased to 36.3 due in part to the increase in the growth of government services, and decreasing inflation.

Most of the time, inflation was high, exceeding 120% in 1996, which affected the purchasing power of the Dinar. In 1990, a reform program mobilized both internal and external resources to decrease the rate to 17% in 1998. Until 1998 the exchange rate against other currencies was very high and in 1990 the official rate of the Dinar was at US \$ 0.45 and (1.13) for parallel rate. Since mid-1999 the Dinar-Dollar exchange remained around the 260 marks but as from 2007, the exchange rate dropped to 200 Dinars (equivalent to 2 Sudanese pounds).

Almost 90% of the Sudanese live below the poverty line (Strategic Studies 1998) and the country is fifth from bottom of the UN List of Medium Human Development Indicators that include 87 countries (UNDP 2005).

### **4.2 Sectors Sensitive to Climate Change In Sudan**

#### ***a. Agriculture***

Although agriculture is the backbone of the Sudan economy, this sector is characterized by a vast agricultural landscape of relatively low productivity. Thus this sector needs a long-term strategy for increasing the productivity of the cropland. Farming is practiced under three systems: irrigated sector, mechanized rain fed sector and traditional rain fed sector. The success of these depends on the climatic conditions in the first place.

### ***b. Forestry***

The forest cover in Sudan decreased from 36-43% of the total area (1958) to 19% in 1990. Sudan's Comprehensive National

Strategy (1992-2002) directs that 25% of the country's area is to be reserved as forests, rangeland and wildlife reserves. To reduce deforestation the Forest National Corporation (FNC) is planning to put all natural reserved forests under management for sustained production, this necessitates promotion of alternative energies and introduction of energy conservation techniques. By so doing, the building and fuel wood production will be limited and the stabilization of climate by forest will be attained.

### ***c. Energy***

Biomass is the major source of energy in Sudan. It contributed 78.5% of the energy supply in 1995 of which 70.5% was in the form of woody fuel. Petroleum products contribute 19.4% of the total energy and hydroelectricity only 2.1%. However Sudan became an oil producing and exporting country since the beginning of this century with the concomitant effects of pipelines, refineries and oil terminals.

### ***d. Industry***

The industrial sector is divided into four main subsections shown below with their contribution to the total contribution of industry to GDP:

- Manufacturing: 56%
- Construction: 30%
- Electricity and petroleum refining: 15%
- Mining and extraction: 1%

Yet the total contribution of the industrial sector is small e.g. in 1999 it was 14.9 with growth rate reaching 4.3%. Industries are classified according to the International Standard Categories (ISO) and the electricity consumption by the industrial sector was estimated to be 468.8 GWh in the year 1997. However, the decline in industrial sector activity witnessed afterwards is attributed to the shortage of electricity, raw materials, spare parts, limited financial resources and skilled manpower.

### ***e. Transportation***

The transportation sector can be divided into the five standard modes; air, rail, river/ sea, road and pipeline. Sudan Airways transported about 575 million passenger-km in 1993 and about 28 ton-km cargo. Although Sudan has the longest railways net in Africa (6000 km), the energy intensity indicators for passenger and freight indicate that trains were more efficient in 1993 compared to recent years. The reasons for this are related to inadequate maintenance and lower passengers and freight transport levels. Road transport is responsible for 70% of all transportation activities in Sudan. It is estimated that 9.9 million tones-km were transported in 1998 and 11.3 passenger-km in the same year.

There are two navigable water lines in the River Nile. They are connecting Kosti-Juba (1436 km) and Karima-Dongola (287 km). On the Red Sea there are four main seaports, PortSudan, Bashair, Oseef and Osman Digna. 80% of the Ocean transport passes through PortSudan harbor.

There are two main pipelines for the transportation of oil products. These are: Khartoum to Port Sudan, 815 km long with a capacity of one million metric tons per year, and the second is Heglig to Bashair, 1600 km long and a mean capacity of 400,000 barrels per day.

***f. Buildings***

Three groups of buildings are found in Sudan. A) Those made of clay and unbaked bricks, B) Those made of red bricks and C) Buildings made of reinforced concrete cement. During the hotter months, energy utilization in the third group is very high because of the usage of fans and air conditioning units.

***g. Waste***

In Sudan, all solid waste disposal sites are unmanaged and in most cases it is disposed through land filling and open burning. Domestic and commercial wastewater is disposed in open pit latrines or in septic tanks. Sewer systems exist only in Khartoum for 0.5% of the population. Most industries dispose their waste water in open ponds and treatment of industrial and municipal wastes can produce emission of important GHGs.

**4.3 Overall Approach to Environment Protection**

Sudan has a unique federal governance system of 25 states; 10 of which form the separate South of Sudan government, yet the federal government is responsible for the national interest. Each state carries out functions and provides services to its regional level armed with legislative powers. States in turn are divided into localities governed by local councils. These councils include representatives of ‘people committees’ linking grassroots governance to the federal level.

Environmental protection legislation was embodied in various sectoral legislation of the Sudan government. By 1992, there were 19 laws dealing with land tenure and land use planning, 10 on soil conservation, 4 on forestry, 9 on wildlife and protected areas, 16 on water resources, 5 dealing with marine resources and coastal management, 5 on livestock, 6 on hazardous substances, 4 on energy and mining, 10 on environmental health and one on antiquities.

To overcome the problems of such conflicting and overlapping situations, the HCENR was established in 1992. The Council was able to advocate the necessity for collaborative, holistic approach towards sustainable use of resources. The result was the formation of the Environmental Protection Act (EPA) declared in the year 2001. The act asks for protection of environment and its natural balance and the conservation of its components and its social and cultural elements in order to achieve sustainable development. It empowers HCENR to coordinate the work of State Council for Environment and Natural Resources (SEC), draw long term policies and to promote research and raise awareness.

The act also requires an Environmental Impact Assessment study for every project that is likely to have a negative impact on the environment or natural resources (Article 18). Thus the act calls for all institutions concerned to observe maintaining the quality of air, food, soil and plant cover and their prevention from pollution and deterioration. It also outlines penalties for violating these standards. HCENR in coordination with other authorities concerned with standards and metrology shall issue standards and methods of pollution levels and ways to reduce it in the different areas and the advertisement of these standards.

## **5.0 Overall Approach to Implementing the Convention**

Sudan understands very well the need for the cooperation of all countries, developed or developing, to address the threats facing the planet. The vulnerable ecosystem of Sudan, suffering from recurrent droughts, overuse of marginal lands and dominance of biomass use for energy, make Sudan one of the most vulnerable countries from the climate change phenomenon. That is why Sudan has ratified the UNFCCC signifying its commitment to the global environment and principals of sustainable development. Not only that, Sudan has been an active participant in negotiations at the conference of parties.

Since 1996, Sudan has started compiling its first inventory of GHG through the climate change enabling project. This was to prepare Sudan for compliance with its obligation under the UNFCCC. This will help Sudan in formulating climate sensitive development goals and informed mitigation and adaptation policies.

A team of national experts - drawn from sectors identified as sources and sinks for GHGs, was formed and trained for one week on GHG inventory methodology by United Nations Institute for Training and Research (UNITAR). Then the national inventory of GHGs in Sudan was conducted using the standardized IPCC/OECD methodology. Following this methodology, GHG emissions have been calculated for most of the source/sink categories identified in the waste management, and land-use change and forestry.

By 2003, the Sudan's First National Communications was submitted. However, additional work had been suggested in different areas using the findings of at study as a platform. Similar studies on agriculture and forestry in Darfur and Kassala regions, vector-borne diseases modeling, vulnerability of water resources, and most importantly adaptation assessment to identify possible adaptation options, should be undertaken.

The impacts of climate change and the impact of social and environmental baseline processes, occurring in the absence of climate change, may serve to compound one another. Thus, a more in-depth look at these relationships is needed in the future. To meet these requirements, Sudan lacks a clear and systematic integration of the UNFCCC main concepts in the national policy formulation process.

## **6.0 Capacity Assessment**

### **6.1 General Capacity**

Climate change and UNFCCC concepts are not well integrated in the national policy and planning system. This is partly because of the lack of a national knowledge management and data processing system. The major constraining factor for the general capacity is the weak national awareness about the climate change phenomenon. The root cause of the weakness of the general capacity is the lack of understanding that climate change is a 90% man-made activity (UN Conference-Paris-Feb.2007).There was no effort fostering general awareness and better understanding of the issues. At the same time, Sudan has a poor capacity development for energy efficiency and renewable energy options. The general capacity will be tackled here- according to the grouping of stakeholders- at the systemic, institutional and individual levels.

## **6.2 Government Institutions**

### ***6.2.1 Overview***

The structures of these institutions are subject to frequent changes resulting from political instability. The policy makers' capacity to conceptualize and formulate policies, legislations, strategies and programs is very weak out of mere ignorance or suppressed motivation. Adopted policies of these institutions give no serious consideration to Multilateral Environmental Agreements such as UNFCCC. There is neither specific act, nor specific strategy in force for Climate Change and secondary legislation for UNFCCC does not exist. These factors reduced the effectiveness of these institutions and minimized coordination among them and the only interaction is through workshops, meetings and mainly through individual levels.

The laws concerning the Agricultural sector do not include specific measures concerning climate change requirements, although some national plans in this sector address climate change issues. In the energy sector, the laws concerning the efficient use of energy are not enforced, Apart from periodical inspection of vehicle quality; the transport sector does not apply any regulation concerning the UNFCCC. The forestry laws and regulations are well in line with the requirements of the convention, had it not been crippled by lack of finance.

The weakness of these institutions is reflected in the low capacity of implementing the policies- if any- or stakeholder engagement or mobilizing information and knowledge. Awareness and information are only disseminated among the focal point personnel in the different institutions who very seldom change or leave the post. No wonder that the capacity to monitor, evaluate, report and learn from these institutions is at the base.

At the institutional level, the same lack of awareness among the tops of administration of each institution is an obstacle that limits the capacity to implement policies, monitor or evaluate any issue related to climate change. As there is limited understanding of the impacts of climate change, there are neither suitable environmental management plan, nor systematic environmental impact assessment for most projects of the different sectors of these institutions. Added to this mismanagement attitude, there is no assessment of the environmental, economic and socio-economic impact due to the negative impact of climate change.

The number and qualification of the staff involved in activities related to climate change in most of these institutions are less than enough to meet the obligations under UNFCCC. Qualified staff may quit their jobs due to the very low salaries and very high frustration. Another root cause of this situation is the widespread negligence of capacity building of staff by training. In fact, there are no trainers to train on climate change issues. At this individual level, the capacity to implement, engage in consensus, and mobilize information or to monitor, evaluate and report is minimal.

### ***6.2.2 Needs and Constraints***

Policy makers' awareness of the importance of climate change issues, needs to be raised to the level that they adopt these understandings in formulating policies, regulations and rules. Not only must this, but a political commitment to implement these regulations be emphasized. This necessitates focal units with stronger mandate to be established at relevant government institutions, supporting effective coordination and mutual links with HCENR Climate Change Coordination Unit.

The know-how in the field of climate change is very limited in Sudan. The existing personnel working on climate change areas need training for effective capacity building and ensuring national ownership and leadership.

The main constraint in achieving these needs is the lack of the trainers and instructors able to undertake the training opportunities. This is a vital necessity to face the increasing demand for soft and hardware systems technology and to mitigate the suffering from high turnover of staff. The limited poor working infrastructure and equipment in all the government institutions is a clear reflection of the limited allocated financial support and lack of effective mechanism for its utilization.

### **6.3 Universities and Research Institutions**

#### ***6.3.1 Overview***

Several universities in Sudan teach climate change as a separate subject, while many touch on climate change issues within other related subjects. However, this is not a statute policy of higher education and it only came from the general aims of education for sustainable development and environment protection. There is no sign of adopting climate change issues in most – if not all – curricula. Even in the continuous curriculum development processes, only few universities are planning to include climate change in their syllabi. In addition, the low number of teaching staff specialized in this field is another limiting factor.

Research related to climate change in universities and research institutions is minimal. However, M. Sc. and diploma programs in some universities are directly related to climate change. The Diploma / M. Sc program in Meteorology at the Institute of Environmental Studies of University of Khartoum and the research in the faculty of Engineering in renewable energy are good examples. The interactions between these institutions rely on personal initiatives and there is no effective cooperation.

Despite the low number of teaching staff and researchers in the field of climate change, there is always the problem of staff and researchers turnover due to their very low salaries and lack of appreciation. Few lecturers and researchers are involved in offering consultancies and raising the awareness among the policy makers and the public.

#### ***6.3.2 Needs and Constrains***

Universities and research institutions are the developing tools of know-how and technology transfer, besides conducting studies, offering consultancies and raising awareness. In order to play these roles effectively, they need to build capacities in various areas, including:

- Understanding the importance of the role of these institutions in the formulation of plans of sustainable development;
- Advanced training in Information Technology;
- Mutual networking between these institutions; and
- Infrastructure and laboratory equipment to monitor parameters related to climate change.

These activities are hindered mainly by the lack of optimum financial support.

## **6.4 Non-Governmental Organizations**

### ***6.4.1 Overview***

The main activities of these civil societies are directed towards promoting conservation awareness and proper community-based management of natural resources. In some instances, they could be powerful policy-directing bodies. In their endeavors, they raise awareness about MEAs and implement interventions to address climate change impacts.

The relationship between civil societies and the government is somewhat critical. This is mainly because the Establishment sees civil societies as another prime opponent to its policy rather than a complementary safeguard. However, recently a regulating act was raised to Parliament in an effort to legalize and arrange for this relationship.

Membership of these societies is increasing, with about 50% usually being women. They are governed by general assemblies and dedicated executive committees. The work is well-organized, identified projects are well executed and team spirit is usually high. However, the young members, though full of enthusiasm, have limited capacity in the perception of emerging issues like climate change and Information Technology. The lack of institutions providing appropriate training and orientation and/or financing for such efforts have obliged some members to leave or de-accelerate their efforts.

### ***6.4.2 Needs and Constraints***

The vital role of civil societies must be acknowledged by the Establishment. Due consideration must be given to the “eye” of the public and a clear policy of coordination and transparency between them must be attained. Links with other institutions and logistical supports need to be erected. Sustainable training needs must be identified and met with. And finally, the limited funding attainable towards climate change issues is rather a problem.

## **7.0 Capacity Priority Requirements and Opportunities**

The prioritization of requirements is based on the analysis of the main weaknesses and strengths, undertaken during the Stocktaking stage. Their ranking is based on the scores for levels of concern identified during stakeholder workshops.

### **7.1 Strengthening national legal and structural capacity and coordination to integrate climate change issues into policy formulation**

*Climate Change Coordination Unit:* In order to integrate the main UNFCCC concepts into the national policy process, build capacities for developing national GHG inventory, mitigation measures and adaptation plans, a central body (Coordination Unit) is essentially needed. The HCENR is the proper candidate to house this unit, embracing the present secretariat, the focal units in the different relevant institutions and the observation units. A National Climate Change Committee can be formed from representatives of all relevant bodies for effective coordination and supervising of the implementation of the national strategy and all climate change activities in Sudan. The main objectives for this unit are:

- To build an enabling environment.
- To raise awareness of stakeholders.
- To identify and build synergies with other conventions.
- To develop a national climate change adaptation program.
- To develop a national GHG mitigation program.

The professionalism and technological expertise in the unit will enable it to formulate policies, strategies and programs and suggest legislative alterations if needed. It will be able to issue directives for implementation to the focal units in the different institutions. The unit will also coordinate sub-regional, regional and international participation of Sudan in various climate change events. The effectiveness of the unit depends on the power of the HCENR which is presumably to be enforced. Adequate resources, technical and institutional capacities should be provided to enable the unit to perform its duties.

The National Climate Change Committee will prepare an Action Plan that focuses on climate change issues. It will build on the results of the studies already completed in inventory development, vulnerability assessment and mitigation analysis, and integrating mitigation options into national planning. The unit will consider two main groups of mitigation options in the Non-Energy Sector:

- Afforestation and rehabilitation options where the national demand for forestry products, required food for livestock and sustainable land use management is achieved. Such achievements are prime priority for sustaining carbon storing.
- Management options where the need to revise and update the current policies and legislation to improve forests and rangeland management. Thus management strategies should include rehabilitation, reforestation and sustainable utilization measures.

In the Energy Sector, the unit will carry on from the identified set of appropriate options that can reduce emissions of GHGs, and the major energy-consuming sectors will be researched. These include the electricity supply sector, household sector, commercial sector, transportation sector and industrial sector. The opportunities to use energy more efficiently or to use lower or zero-emitting fuels include:

***Household and commercial sectors:*** Use of LPG in the place of inefficient woodstoves and charcoal stoves in rural and urban areas. This is in addition to the use of solar cookers. Encouraging the use of fluorescent lamps (CFL) and introducing more efficient air conditioning units and evaporative coolers in urban areas are other options.

***Industrial sector:*** Electricity improvement by using higher efficiency motors and efficient boilers.

***Transport sector:*** Introduce fleet vehicles and private sector taxis.

***Electricity sector:***

- Use of solar resource, which is available all over Sudan.
- Use of wind resource, especially in the north and east of Sudan.
- Use of biogas, if possible.
- Enhance the usage of hydropower resources.

***Agriculture sector:*** possible opportunities and mitigation options remain to be identified and fully researched by the concerned focal units.

It is within this context that the unit will coordinate efforts across concerned institutions and turn these opportunities into reality. Beside carbon sequestration, environmental benefits and socio-economic rewards, these carbon credits – obtainable from these activities- may provide opportunities for finance, joint investment and economic incentives.

One of the best opportunities is that the unit would seek links with other similar units of MEAs (e.g. Biodiversity, Desertification) and joint efforts in projects of cross-cutting issues, developing synergies and mutual benefits. Mutually supportive technologies like renewable energy, agriculture efficiency and ecosystem preservation are effective from a technological perspective for these common elements.

## **7.2 Providing Units in Different Sectors to Undertake Inventories, Vulnerability and Adaptation Assessments And Mitigation Initiatives**

This theme is complementary to priority requirement 1, above. The findings of the First Communication should be the base for future studies and a platform for interaction between these units. Similar studies could be extended in Darfor and Kassala regions. Developing local values for malaria and vector-borne disease vulnerability assessment needs to be identified. More detailed research is needed in the area of vulnerability of water resources in large parts of Sudan. Identification of adaptation options in the different sectors is the challenge, giving consideration to indigenous knowledge and traditions.

*Strengthening Institutional Infrastructure:* This can be achieved by supporting the focal units in the concerned governmental institutions, universities and research institutions and non-governmental organizations. Each focal unit will work on promoting Sudan's adaptive capacity and limits its growth in GHG emissions from the different sources. The roles and obligation of these units should be clearly defined and political commitment and government support for these structures should be obtained. The units are expected to:

- Integrate climate change management considerations into social, economic and environmental policies and programs.
- Keep levels of their emissions under check by periodically or as required providing national inventories of anthropogenic emissions and removal by sinks.
- Promote the sustainable management of sinks and reservoirs of GHG.
- Promote and/or conduct relevant research and cooperate in exchange of information.

Hence, adequate technical and institutional capacity is needed to be built within these units. More effectively, a clear coordination mechanism must be established to link these focal units with the HCENR Coordination Unit through regular reporting, meetings and web-based networks.

The prime activities of these focal units are to undertake systematic management plans and environmental impact studies for agriculture, energy, and industrial sectors and to assess the socio-economic and environmental impacts due to the negative impact of climate change. These activities necessitate a strong support from the general budget in order to carry out mitigation measures and enhance technical capacity and energy efficiency. Moreover, the research projects run by these focal units are projects that mitigate impacts of climate change and establish vulnerability indices, the nature of which dictates a well organized institutional capacity of human resource, laboratories, equipment and a wide range of logistics.

Close collaboration with the Energy Research Institute (ERI) will be established to carry out basic and applied research in energy in general and renewable energy in particular. Thus strengthening the infrastructure of institutions such as the ERI will promote appropriate technology development, adaptation and indigenization of alternative renewable energy from

solar, wind and waves. It is only after strengthening the institutional infrastructure that these units will be able to engage with all stakeholders and be capable to monitor and evaluate.

### **7.3 Acquisition of Knowledge and Mutual Dissemination and Exchange of Information**

*Climate Change Information and Database Center:* The major problem in the poorest countries is the lack of proper mobilization of information in order to understand the ecosystem dynamics. Information always demands identification of the required data and the useful sources, followed by establishing mechanisms for data collection and reporting. A strong national capacity is thus needed to develop a knowledge management and networking system that facilitate acquisition, processing and dissemination of technical knowledge on climate change issues across institutions and individuals.

The concerned sectors in Sudan are no exception in the need for such a capacity. Each sector's data would be integrated in a national climate change data that points out any data gaps which need filling or further research. The sector data should be a flagship- entity that promotes awareness among stakeholders and sells economic opportunities to the industrial network.

The creation of a web-based database will facilitate access to climate change data and information dissemination. Open-ended flow channels with the focal units will enable information in all disciplines concerned and strengthen the link with the National Documentation and Information Center.

### **7.4 Strategic Training Program to Implement Convention Requirements and Develop Capacity for Monitoring, Evaluation and Reporting**

Training in the field of climate change is a corner stone requirement for trainees, trainers and educators, in order to deepen national capacity and consensus among key stakeholders and non-governmental organizations. The gaps in the training process for the individual are as varied as:

- Training in data collection, processing and analysis relating to climate change;
- Monitoring, evaluation, risk assessment in the field of GHG's and the relevant scenarios of climate change;
- Impact models and methodologies of assessment in GHG's inventories and vulnerability and adaptations;
- Training in models adoption and modification to suit current situation for the different sectors in Sudan; and
- Application of information technologies.

The training strategy should incorporate acquisition of technical knowledge and technology transfer. The strategy will cover all concerned areas of specializations and consider the expected turn over through time. Key stakeholders must be subjected to the theoretical science of GHG's, impacts and mitigations as well as information technologies.

Several opportunities could be grasped in this endeavor by attending and participating in regional and international activities, workshops, conferences and training opportunities. There are many relevant enabling activities run by UN agencies and regional initiatives that are directly related to capacity building in the field of climate change (e.g., Nile Basin, IGAD, NEPAD).

Most institutions in Sudan lack the technical and practical knowledge for resource mobilization to implement their projects, which is another area of capacity development need at the

institutional and individual levels. One of the areas of funding mechanism of the Global Environment Facility (GEF) is “Mitigation of and adaptation to climate change”.

## 7.5 Raising Awareness Among Stakeholders

Raising awareness of the intricate issues of climate change and its impacts is required as a continuous process of knowledge and understanding of the dynamic climate change phenomenon. It has to cover the broad spectrum of stakeholders from governmental and non-governmental organizations and the public at large. Structured campaigns, each targeting certain groups, would be effective in addressing the different levels of climate change science, impacts and scope of mitigations and adaptations.

The anticipated effects of climate change on development and economics are to be explained to politicians and administrators so as to help them in formulating policies and legislations. The campaigns will strengthen the capacity for regional and international cooperation and open gates to technology transfer as well as renewable energy alternatives.

Practitioners in the field of climate change need to be provided with the emerging issues and the new technology pertaining to these issues. The different sectors should be aware of the economic incentives and opportunities of GHG emissions reductions projects.

Simply illustrating topics on the role of climate change on our future can be portrayed to primary schools classes, while demonstrable topics would be included in secondary school classes of geography, sciences and other courses. In the tertiary level of education, climate change courses have become a necessity and should be statutory in the curricula with innovations that mainstream with sustainable development.

The socio-economic and health benefits of mitigations and adaptations would be demonstrated to the concerned communities and the wider public. The NGOs will lead campaigns encouraging voluntary actions to reduce GHG emissions and implementing energy-efficiency pilot projects.

**Table 4: Current Capacity to Address Climate Change**

Institution	Individual Capacity				Institutional Capacity	
	Ph.D.	M Sc.	B Sc.	Tech	Vehicles	Computers
Energy Sector *	11	38	65	65		
Ministry of Industry	1	1	1	-	17	5
Federal Ministry of Agriculture			2	5		
Forest National Corporation	3	40	218	112		
Sudanese Environment Conservation Society		8	12	1	3	10

\* Energy sector includes: National Energy Institute and the Ministry of Energy (Advisory Commission Environmental And Safety + National Energy Affairs)

## **ANNEX 4: THEMATIC ASSESSMENT ON TERTIARY EDUCATION AND RESEARCH RELATED TO RIO CONVENTIONS**

### **Executive Summary**

A thematic analysis related to tertiary education and research was carried out in partial fulfillment of the process of the Self-Assessment of National Capacity Building Needs in Sudan to Manage Global Environmental Issues (NCSA). The objectives of this assessment are to develop a clear understanding of the requirements, the strength of the capacity, available opportunities and to identify priority capacity needs.

After adopting Agenda 21 in 1992, Sudan has declared the Higher Council for Environment and Natural Resources (HCENR) as the national focal point for Agenda 21. One of the duties of HCENR is providing teaching and research and inclusion of environment conservation in educational programs in schools and universities and other institutes.

Environmental Education (EE) in higher education is burdened by the responsibility for meeting the requirements of the three Multilateral Environmental Agreements (MEAs); namely conventions on Biodiversity (UNCBD), Desertification (UNCCD) and Climate Change (UNFCCC). The priority convention requirements regarding tertiary education are identified as:

- Providing scientific and technical education and training.
- Identification and monitoring parameters pertaining to UNCBD, UNCCD and UNFCCC.
- Harmonization of curricula, adopting common syllabi and methodology.
- Enhancing the capabilities of teaching and research.
- Advanced research and common projects and mutual communication.
- Creating an enabling environment for long-term programs of awareness of multidisciplinary nature.
- Managing information and establishing networking.

The following are the results of the Capacity Assessment for tertiary education and research:

- The overall capacity of higher education is analyzed on the bases of its preparedness to meet the requirements.
- The higher education policies have to adapt to these requirements by vision and political commitment to sustainable development. New syllabi are to be injected in curriculum development mainstreaming EE to sustainability.
- Research is structurally weak and needs to be trans-disciplinary.
- The physical structures are poor, weak and lack advanced facilities to cope with the newly emerging issues. The lack of proper ICTs has hindered innovations in teaching and research.
- Constraints are many and very often intricate. The root cause of these constraints is the lack of proper finance. Other constraints include: absence of common vision and strong policy towards the MEAs, untrained human resource and lack of reliable information system on the conventions.
- Several opportunities are to be grasped, including local partnerships with other sectors, participation in regional initiatives programs such as Universities of Africa, Nile Basin and NEPAD.
- New areas of teaching and research are now opened in Biosafety, Genetic Resources and Benefit-Sharing, Development of Renewable Energies, Appropriate Technologies and

Intellectual Property Rights.

- Training is the corner stone for achieving the requirements of the three conventions, especially training of trainers and training of curriculum developers.
- Raising understanding and awareness by a long-term multi-disciplinary program is imperative and expected to be led by the HCENR. The target groups include university leaders, curriculum developers, faculties concerned, students unions and non-governmental organizations NGOs) in the education sectors.

## **1.0 The Role of Tertiary Education and Research**

Understanding the importance of international collaboration to address global environmental problems, Sudan has committed itself to meet the requirements under the Multilateral Environmental Agreements (MEAs). These agreements include the United Nations Convention to Combat Desertification (UNCCD), The United Nations Convention on Biodiversity (UNCBD) and the United Nations Framework Convention on Climate Change (UNFCCC).

Through the NCSA, Sudan assessed its priority national capacity to meet the requirements of these conventions. This process involved Inception, Stocktaking and Thematic stages complemented by a fourth component of Tertiary Education and Research obligations. This thematic component was devoted to the identification of capacity priorities under the three conventions and the optimal interventions required from tertiary education. The analysis cover the country situation and general capacity at the systemic, institutional and individual levels. Identified priority requirements are addressed, based on country performance and possible opportunities.

Since the United Nations Conference on Environment and Development (UNCED) in Brazil in 1992, more than 178 governments have adopted Agenda 21, a comprehensive plan of action. According to Agenda 21, education is critical for achieving environmental and ethical awareness, establishing values and attitudes, developing skills and behavior consistent with sustainable development and for effective public participation in decision-making. In 1992 Sudan has created the Higher Council for Environment and Natural Resources (HCENR) which acted as the national focal point for Agenda 21 besides bringing together the divergent institutional interests. In the year 2001 a presidential decree was issued declaring the Environmental Protection Act. The Act defines the duties of HCENR -inter alia- as:

- Co-ordination of Sudan affiliation to international agreements dealing with the environment and the identification of institutions to be charged with implementation.
- Making federal plans for raising environmental awareness and the sustainable use of natural resources, their protection and the attempts to include these objectives in educational curricula in co-operation with the concerned bodies.
- Inclusion of environmental conservation in the educational programs in schools and universities and other educational institutes.
- Promoting and supporting research in all areas of the environment and natural resources in co-operation with the National Center for Research.
- Periodic revision of environmental legislation.

Tertiary education is based on four pillars:

- Teaching and learning; leading to education for sustainable development.
- Research; including analyses, assessment and resolutions.

- Community engagement, by participation, contribution and shaping society's future.
- Regional and international interactions; including multi-disciplinary and inter-disciplinary dialogue (e. g. North-South dialogue).

Tertiary education provides the country with thinkers, experts equipped with knowledge, techniques and society values that enable them to carry out studies and to implement programs. The objectives of Environmental Education at the tertiary level can be identified as:

- Promote the knowledge on environment and the ability to solve problems facing it.
- Develop research on environment and management.
- Raise awareness for environment protection.

This mission has burdened tertiary education to carry out certain tasks required under the three conventions (UNCCD, UNCBD and UNFCCC). These requirements-inter alia-are for:

***A. Biodiversity:***

- Identifying and monitoring biodiversity and its conservation.
- Managing information, notably through clearing house mechanisms.
- Providing scientific and technical education and training.
- Raising understanding and awareness.

***B. Climate Change:***

- Research and systematic observation of climate and other functions.
- Developing and transferring technology.
- Information and networking, including databases.
- Education, training, and public awareness raising.

***C. Land Degradation / Desertification:***

- Systems for research and development.
- Technical and scientific co-operation.
- Joint research programs for the development of appropriate technologies.
- Systems to collect analyze and exchange information.
- Training for collection and analysis of data for disseminating and using early warning information system, covering drought and food production.
- Education and public awareness.

The assignments stemming from these requirements are summarized by UNESCO ([www.unesco.org/education/desd](http://www.unesco.org/education/desd)):

- Giving sustainable development a place in all university curricula and educational and research programs.
- Playing an important role as local knowledge centers for sustainable development in order to help society meet the challenge at the local level.
- Making sustainable development a leading principle in their own logistics and managerial processes.

Teaching is informed by research. That is why most of the requirements dictated by the three conventions imply an articulate process of studying environmental parameters and monitoring their effects. Moreover, research provides a problem-based mode of production of knowledge. Joint research programs are more effective in solving complex problems and cover the cross-

cutting issues and their synergies under the three conventions. Thus teaching and research require the integration of a number of disciplines which were previously regarded as separate and distinct, leading to holistic and multidisciplinary approaches. Measures and opportunities must be taken to streamline the research in order to cope with the requirements of Articles (12, 18, and 19 in particular) of UNCCD, UNCBD, UNFCCC and other related MEAs. Nevertheless, teaching and research are far from achieving their mission, unless they are followed by sound information management and advanced communication technologies.

## **2.0 Requirements under the Conventions**

The requirements dictated by the three conventions to tertiary education can be summarized as:

- Identification and monitoring biodiversity, climate change impacts and land degradation issues, by providing relevant syllabi and increased practical working hours.
- Harmonizing of curricula in universities; adopting standard terminologies and methodologies while periodically updating the curricula in a participatory approach.
- Providing scientific and technical education and training, incorporating indigenous knowledge and traditional practices.
- Enhancing the capacity of teaching and training by carrying out high level ‘Training of Trainers’ and ‘Educate the Educators’ courses.
- Advanced research and common projects needed to enhance mutual communication, and tackling emerging issues of poverty and peace.
- Creating an enabling environment for long-term programs of awareness of multi-disciplinary nature, relating socio-economic factors and rural development.
- Managing information and established networking.

## **3.0 Capacity Assessment**

### **3.1 Overall Capacity**

Higher education in Sudan falls under the jurisdiction of the Ministry of Higher Education and Scientific Research (MHESR) since 1970. The act which provides this legislation was introduced in 1990 and amended in 1993 and 1995. The ministry is responsible for policy formulation and plans for each sub-sector under a National Council for Higher Education and Scientific Research (NCHESR) which is headed by the chancellor (Head of State). The membership of the Council includes chairpersons of councils and vice-chancellors of government universities while 9 members represent private universities (Article 5 and 6).

At present (2007), there are 77 institutions under the ministry: 28 government universities, 44 private providers of tertiary education (4 universities, 35 colleges, 3 institutes, and 2 academies), and 5 technical colleges. Out of the 28 universities, 8 are in Khartoum, 2 each in River Nile and White Nile states, and the rest include one in each of 16 states (however, 3 are located in Khartoum for logistical reasons).

Although all universities are serving the same aims of higher education (Article 12), some universities – like Gezira and Juba – were established to serve the needs of their rural areas. Their original programs and academic structure were reflecting these objectives had it not been hindered by many constraints mainly of financial nature. Two other universities are assigned for Islamic religion goals: Omdurman Islamic University and University of Al Koran Al Karim and Islamic Sciences.

The minimum requirement for admission to higher education is a pass in the Sudan School Certificate (SSC) Examination or its equivalent. The student has to pass in 4 compulsory subjects: Arabic, English languages, religious education and mathematics. Faculties concerned will accept students passing the 4 subjects together with 3 subjects specified by them. There are exceptions to this merits-based criterion of admission, based on different considerations.

In the year 2005, 122824 students have qualified for admission to higher education, forming 58.3% of those who passed the SSC. At the same time, students from Khartoum and Gezira states constituted a high percentage (33%) of the admitted students. Although regional disparities are visible in the gender percentage of admitted students to higher education, yet- as El Tom (2006) computed-the gender gap (Male/Female) is closing from 9.1 in 1967 to 0.9 in 2002.

The student enrolment in public universities grew at an average annual rate of 9.8% during the period 1975- 2000 while the corresponding growth rates for full-time faculty and Ph D faculty, were 5.5% and 4.9%, respectively. In private higher institutions the rates were 5.0% for students, 6.5% and 5.7% for full-time faculty and Ph D, respectively.

In 2000/2001, public universities had a total of 4495 academic staff of which 1856 (41.3%) were Ph D holders and 2555 (56.8%) had master degrees. From the private institutions 910 full-time faculty, 321 (35.3%) were Ph D holders and 526 (57.8) had a master degree (ElTom 2006). The student/ full-time faculty ratio ranges between 10 (Upper Nile) and 112 (AlKoran Al Karim). In the case of student/Ph D holders only, the ratio varies from 33 (Khartoum) and 551 (Gadarif). The ratio of student/faculty for the world and the least developed countries during 1980-1995 was 14 and never exceeded 21.

### **3.2 Teaching**

In 2005/2006 public universities offered 725 undergraduate programs, 358 of them are in two subject areas of Natural and Mathematical Sciences (60) and Engineering and Technology (298). They offered 107 programs in Arts and Humanities and 204 in Social Sciences. Programs in education alone (150), represent 73.5% of the social sciences programs and nearly 21% of all programs offered (ElTom 2006). In 35 private institutions, 143 bachelor degree programs were offered in 2005/2006. But only 3 universities offered more than 9 programs; Ahlia (16), Ahfad (12) and Technology (12). Ahlia University is the only one which has programs covering all 5 broad subject areas.

### **3.3 Environmental Education**

Most universities started only recently to give attention to the environment after directives from the ministry to incorporate courses on “Principles of Environmental Studies”. However, older universities like universities of Khartoum, Juba, Gazira, Ahlia and Ahfad for Girls have had environmental concerns in their courses. Some have established faculties for the study of natural resources and some incorporate environmental dimensions into different disciplines. Faculties of Education in different universities began to deliver more Environmental Education (EE) courses.

It would be useful to classify the universities according to their involvement in EE:

- Universities with faculties for natural resources e.g. Juba, Kordofan, ElFashir and Malakal.
- Universities with faculties offering degrees in Environmental Studies e.g. Khartoum, Ahlia and Gazira.

- Universities with one compulsory course on Principles of Environmental Studies.

Several courses in these universities are directly or indirectly related to the requirements of the MEAs. These courses are shown in Table 5, while those proposed to future curriculum development, are shown in Table 6. In eleven universities, examined during the stocktaking analysis, the ratio of Ph D holders of staff to students is 1 to 28 and that of M Sc staff to student is 1 to 36. During 1997-2006 these universities have produced 328 PhD theses, 906 MSc theses and 50 Diploma project reports in fields related to Biodiversity, Desertification and Climate Change. At the postgraduate level, several universities offer programs leading to Diploma/ M Sc and PhD degrees pertaining to the MEAs requirements. The best example is the Institute of Environmental Studies which introduces these programs in four thematic and training areas:

- Freshwater Ecosystem Management.
- Arid Zone Management.
- Urban and Regional Management.
- Coastal Zone Management.

Besides conducting short training courses responding to emerging issues, the Institute arranged important workshops and seminars to discuss related matters.

The Desertification and Desert Cultivation Studies Institute (DADCSI) of University of Khartoum, which hosts the UNESCO Chair of Desertification, is another good example of mandated institutes which carry out activities addressing desertification in response to UNCCD, and related MEAs. Omdurman Ahlia University faculty of Environmental Sciences offers B Sc in Environmental Studies (Technology and Management) and Diploma/ M Sc degrees. International University of Africa Institute of Catastrophes and Refugees Studies runs projects which include natural disasters, food security and disaster management. Ahfad University for girls offers, among others, a degree on rural development, and community health management.

Several universities have even established centers that deal with specific areas which are related to Biodiversity, Desertification and Climate Change. These centers include Desertification Studies Center in Bakht ElRuda University, and Dry Lands Farming Research Center in University of Gadarif.

### **3.4 Research**

In Sudan, research is undertaken by many institutions, but the major contribution comes from universities, especially the old government ones. All the acts organizing the higher education and the different universities stress the importance of 'the advancement of knowledge and scientific research as a major institutional and systemic task '. Organization of Higher Education and Scientific Research Act (Article 12) came to force in 1990 while, for example, University of Khartoum (Article 5) was endorsed in 1995. The degree of shouldering this task varies considerably from one university to another and clearly reflected in the number and quality of publications and research outputs.

The sustained research activities are individual efforts, a related B Sc (Hons) program, a local national program or projects supported by joint links or international donors. However, the level of research output is low and mainly on medical sciences. Few faculty members are active in research pertaining to the conventions issues. Although the research output grew at an average annual rate of 4.2% during 1975-1985, it declined to an average annual rate of 2.8% during the

next 17 years (ElTom 2006). The number of published papers on Biodiversity is an indication of this decline:

Agro-biodiversity	53 papers (1998)
Forestry	76 papers
Livestock	24 papers (1998)
Range and pasture diversity	7 papers (1999)
Wildlife diversity	34 papers (1997)
Birds	180 papers (2001)
Insects' diversity	13 papers (1999)
Fresh water diversity	207 papers (2006)
Coastal and marine Diversity	76 papers (1999)
Biotechnology and Genetic resources	44 papers (1999)
Legal aspects	7 papers (1999)

However, several governmental institutes and centers run research pertaining to MEAs requirements in their respective areas. The major research is run by institutions under the jurisdiction of the Ministry of Science and Technology. This research is undertaken by researchers and support many post-graduate fellowships from different areas. A list of examples of these research institutes and centers is shown in Table 7. Each of these institutions is mandated by their respective ministry to carry out research which is related-in one way or another- to the MEAs concepts. Although at times, these studies cross the boundaries of the common requirements of the three conventions, there is no trans-disciplinarily approach in research formulation, nor proper harmonization between policies of the different ministries.

### 3.5 Physical Infrastructure

The sudden expansion of higher education has not been accompanied by a corresponding expansion in the physical infrastructure of Sudanese universities. The new universities were lodged in old buildings-formerly secondary schools- or in humble, newly constructed buildings. The old universities did not receive sustained maintenance or any improvement in electric supply and telecommunication. Each university has struggled to seek funds for maintenance and the introduction of communication technologies. In fact most of universities' buildings were not originally designed to be universities.

Most universities lack properly furnished classrooms, faculty and supporting staff offices, and administration facilities. The common features of these buildings are the improper lighting, inadequate ventilation and limited space containing primitive teaching aids.

Few laboratories are real laboratories, and reasonably equipped; a good research laboratory in Sudan is a luxury. The majority-having the above mentioned characteristics- lack the proper equipment, apparatus and chemicals. Libraries, where they exist, are old shelves for old books and periodicals. However, some universities have started erecting electronic web-based libraries with limited entrance. Not all the staff and the students are able to connect to internet services.

Environmental Education and research, pertaining to the requirements of the three conventions, require certain field equipment to undertake accurate studies. Most of the universities and research institutions are devoid of these facilities; such as GIS, GPS and digital continuously-

recording machinery. Most universities lack proper natural history museums, herbaria, pilot farms, arboreta, animal farms, experimental ponds or meteorological observatory units. The studies and research pertaining to the three conventions require the sustained existence of these basic infrastructures, each in its respective unit.

#### **4.0 Capacity Performance**

On the individual level, the Ministries of Higher Education and Scientific Research, and Science and Technology together with other sectors' institutions contain human resource of high calibre and professionalism. Their capabilities of conception, formulating policies, legislation and strategies are not questioned. Their efforts in mobilizing information and knowledge, and in building consensus among stakeholders are widely appreciated. Unfortunately, most of this achievement is not used in the policy formulation process.

However, on the systemic level, the existing educational system in general does not adequately addresses scientific and practical linkages between the themes of the three conventions and between these elements and natural environment. It does not help in development of educational packages that address the three themes and their cross-cutting issues in an integrated manner.

Higher education policy remained conservative since independence until the withdrawal of government support from the education sector in the 1990s. Hence, with the increasing demand for education, started the era of commercialization of higher education at the institutional level. Politics have also impacted legislative and institutional frameworks and aggravated the situation.

Chen and Dahlman (1998) have pointed out that three different aspects of knowledge are positively correlated with long-term economic growth:

- Human capital or education and training.
- Innovation and technological adoption
- Information and communication technologies (ICTs) usage.

Sadlak (1998) believes that any society that does not give at least 12% of the age group access to higher education does not have a chance to survive in the type of future that lies ahead. In Sudan the gross tertiary enrolment rates rose 3% in 1990 to 7% in 2000 (UNESCO 2005) but still five percent points below the threshold value suggested by Sadlak. More over, the imbalance in composition of students of science, engineering and technology versus social sciences, commercial studies and law, added to the weakness of the capacity. The result is frequently a graduate with low level of English language proficiency, and very little technical experience.

The inability of the present system to be of service to society is due to several weaknesses mainly attributed to resistance to structural reforms. There is a need to articulate traditional disciplines differently as a result of the emergence of new scientific and technological fields, the shift to a problem-based mode of production of knowledge away from the classic discipline-led approach (World Bank 2002).

There is no specific act for the three conventions in the policy of both ministries concerned. However, Articles referring to environmental education in universities' policies were added later in vague sentences that lack innovations for mainstreaming education with sustainability. In addition, there is no enabling system linking scientific research to policy making so as to adopt these innovations and to meet the requirements of the conventions. The legislated role of the HCENR in this respect is suppressed and even ignored in policy formulation.

Research is structurally weak and directed towards solving single discipline problems rather than solving complex emerging problems pertaining to climate change, biodiversity loss and land degradation. Although there is a considerable body of research pertaining to the three conventions requirements, it is still lower than achieving the education oriented Millennium Development Goals (World Bank-in Hopper 2002). One drawback of this situation is the lack of communication among researchers, resulting in duplication, overlapping and wasted efforts. Frustrating as it is, this environment killed the team spirit and suppressed any innovations in research and teaching.

## **5.0 Capacity Constraints**

The constraints hindering the obligations from tertiary education and research to fulfill the conventions requirements are many and very often intricate. They include:

- Absence of mission, common vision and strong policy directive.
- Commercialization of higher education despite the increasing demand for education.
- Untrained staff who graduated locally and quickly promoted on no qualification-bases.
- Low number of qualified staff and majority are non-Ph. D. and part-time faculty.
- Most qualified lectures are aging (over 50 years), without planned replacement policy.
- Imbalance in composition of students of science, engineering and technology versus social sciences, commercial studies and law, due to the unplanned expansion of higher education system.
- Students are not accepted on merit-base criterion only.
- The level of English language proficiency of graduate students is so low that they find it difficult to undertake research and to write up reports.
- Lack of proper laboratories, lecture rooms and field work facilities.
- Poor libraries devoid of electronic capabilities.
- Funding is meager, below the minimum level required for running universities.
- Inability of universities to generate additional income.
- Decline of government support to study abroad.
- Faculty emigration to better environments.
- Weak coordination and streamlining of research programs between the ministries.
- No reliable information system and standardized data base linking the universities and institutions.

## **6.0 Opportunities**

There is no reason not to harmonize policies of curricula between universities and integrate research objectives among ministries. New areas of teaching, pertaining to the requirements of the conventions, can be introduced and a common research policy can be erected. The HCENR is the sole candidate for playing this role of coordination and harmonization.

The United Nations Environment Program (UNEP), together with its partners, is supporting a partnership program - MESA (Mainstreaming Environment and Sustainability into African Universities) – with the goal of mainstreaming environmental and sustainability concerns into teaching, research, community engagement and management of universities in Africa. Higher education in Sudan can grasp this opportunity to help meet convention requirements. This partnership included the following:

- An Education for Sustainable Development (ESD) Innovations short courses developed

and implemented by partners (UNEP 2006);

- Seminars for university leaders;
- A biennial conference where universities report on innovations on research, teaching and community engagement, and to engage in North-South dialogue; and
- Pilot programs linking universities, communities and business and industry in sustainable development partnerships.

The MESA Universities Partnership also supports the New Partnership for Africa's Development (NEPAD) environmental action plan and the objectives of the African Ministerial Conference on the environment. One of the strategic actions in the NEPAD Environmental Action is the "development of capacity in all aspects of environmental issues in Africa" (UNEP 2003). Universities will have a key role to play in strengthening capacity for sustainable development through ESD initiatives.

The MESA Universities Partnership constituted a major contribution to the United Nations Decade of Education for Sustainable Development (UNDESD). Its goals are:

- Facilitate networking, linkages, exchange and interactions among stakeholders in ESD.
- Foster an increased quality of teaching and learning in education for sustainable development.
- Help countries make progress towards, and attain the Millennium Development Goals (MDGs) through ESD efforts.
- Provide countries with new opportunities to incorporate ESD into education reform efforts (UNESCO 2005).

The Nile Basin Initiative (NBI) - Environmental Education Program is another useful opportunity to be grasped. The NBI provides good opportunities to further co-operation and linkages, to re orientate education towards sustainable development. The newly erected Environmental Education Lecturers Network will enhance trans-boundary linkages and harmonization of curricula. Sudan universities are known to have exchange programs with European universities rather than with African universities.

There are opportunities to network, share information and do joint programs among universities, to help link conventions aims with emerging national issues such as poverty and peace.

## **7.0 Priority Capacity Development Requirements**

### **7.1 Policy Development**

The policy adopted by the ministry can be directed to overcome the constraints noted above. If the general university goals are well integrated with the goals of EE, then it is possible to provide scientific and technical education incorporating indigenous knowledge and traditional practices. By so doing the universities can produce educational packages that address the three themes of the conventions and their cross-cutting issues in an integrated manner.

The policy must allow integration of a number of disciplines which were previously regarded as separate and distinct, leading to multi-disciplinary programs. Consequently the research policies will shift to problem-based modes of study and at the same time meet convention requirements.

The higher education policy needs to rebalance the composition of students of science, engineering and technology versus social sciences, commercial studies and law. The philosophy

of the policy must underpin teaching that requires active collaboration from the students and more practical hours so that they learn rather than memorization.

## **7.2 Curriculum Development**

Curriculum developers in the universities and institutes are to integrate the environmental dimension in the newly emerging scientific and technological fields. As curriculum development is a continuous process, periodic updating of the curricula in a participatory approach is essential in order to harmonize and standardize terminologies and methodology.

Different syllabi need to be revised in order to accommodate new developments and adapt them to national socio-economic situation. Syllabi are expected to cover areas related to issues such as Biosafety Clearing House, Genetic Resources and Benefit- Sharing, Intellectual Property Right, Right of Equity and Technology Transfer.

Development of educational packages that address the three themes of the conventions and their cross-cutting issues would enable modules to be exchanged with Nile basin countries and other African countries.

## **7.3 Teaching**

All staff members are expected to inject the environmental dimension in the courses they teach, with special consideration to locality. Advanced courses in environmental management attended by all students are particularly encouraged. Several areas of teaching still need more practical and field hours than they are. These areas include:

- Identification and monitoring biodiversity and its conservation.
- The physical components of Desertification (Climate, soil and water resources).
- Natural resources.
- Climate change impacts.

## **7.4 Research**

Structurally weak research needs strengthening in order to solve problems by systematic observation and developing appropriate technologies. This necessitates strengthening the capacity of collecting, analyzing and dissemination of data so that researchers will be capable to monitor, evaluate and report. Research should be directed towards sustainable development and to the cross-cutting issues and synergies arising from the research requirements of the conventions. The newly emerging issues invite more attention in the research process and formulating advanced common research projects; these issues include:

- Climate change (Inventories, vulnerability, adaptation and mitigation).
- Biodiversity management.
- Desert cultivation studies.
- Development of renewable energies and appropriate technologies.

However, more attention is also needed to start pilot programs linking universities and research institutions to communities, business and industry in sustainable development partnerships. Common projects and joint workshops will promote the capacity for meeting the requirements under the conventions.

## **7.5 Training**

Training is the corner stone for building capacity of meeting the requirements dictated by the three conventions. Training through structured courses (Training of Trainers 'TOT' - Educate the Educators 'ETE' and Training of Curricula Developers) on issues relevant to the conventions is vital for the development of the policy formulation. Training opportunities should include university leaders, technical professionals and agency staff and be supplemented by regular participation in relevant national and international events.

The previous government's support for potential faculty to study abroad must be resumed for the sake of mutual exchange and enhancing professionalism. This is not to undermine the importance of local training opportunities (on-the-job and on-the-site) within different ecosystems in Sudan.

## **7.6 Strengthening infrastructure and communication**

Building an enabling environment for teaching and research is a government and community duty. Most classrooms lack modern teaching aids. Laboratories are poor in apparatus, experimental facilities and modern equipment. Few specialized laboratories are available for advanced experimentation in Biodiversity and Desertification topics, and laboratories connected to satellite information systems are badly needed.

More electronic libraries with international journals on Biodiversity, Desertification and Climate Change topics should be installed to further the outreach capacity. A reliable information system and database for the conventions productions could be erected in order to link universities and research institutions and open gates into global linkages and information sharing.

Teaching and research in the fields of the three conventions require more working hours in the field. Due consideration must be given to required field facilities and camping equipment. Ex-situ and in-situ conservation infra-structure, such as museums, botanical gardens, national parks and observatory units, are important components in teaching and research activities which need strengthening.

## **7.7 Raising Understanding and Awareness**

The HCENR is to lead in creating an enabling environment for long-term program of awareness of multi-disciplinary nature, relating socio-economic factors and rural development. The program should deliver the essence of MEAs to the target groups and demonstrate the multi-disciplinary and cross-cutting objectives of the conventions. Key target groups include university leaders, curriculum developers, faculty concerned, student unions and non-governmental organizations (NGOs) in the education sector.

The aim of the campaign is to fight the absence of common vision and understanding in the minds of the policy makers in the ministries of Higher Education and Scientific Research and Science and Technology and other relevant research institutes. Lecturers will benefit from the program by gaining momentum for their efforts to inject environmental dimension in their courses and by thinking of innovations in mainstreaming education with sustainability. Students will share the global concern on the impacts of climate change and apprehend the locally witnessed biodiversity loss and desertification phenomena. Nevertheless, as the ultimate common aim of the three conventions is to positively change the behaviour of the community, the role of NGOs is imperative.

**Table 5. Selected Examples of Courses Taught**

- Taxonomy - Ecology - Natural Resources
- Environmental studies - Biodiversity
- Material Science - Desertification
- Pollution - Climate change
- Sustainable Development - Environmental Geology
- Environmental Legislature - Arid Lands Environment
- Environmental Impact of Elements of Periodic Table
- Quality Control, Specification and Environment
- Skills of Environmental Management - Wildlife Damage
- Environmental law - Environmental Impact Assessment
- Environmental Management - Natural Products
- Wildlife Conservation and Management -
- Biotechnology Application - Biotechnology and Environment
- Range Management - GIS
- International Conventions and Protocols -
- Human Sustainable Development - Safety climate sciences -
- Drought and Desertification.

**Table 6. Proposed Courses for Future Curriculum Development**

- Biotechnology and Molecular Biology for Conservation of Biodiversity
- Waste management
- Environmental Pollution Control
- Environment Friendly Raw Materials
- Desert Cultivation Air and Atmosphere Chemistry
- Ecohydrology
- New technology in Environmental Conservation
- Gene Banks, Seed Banks and Germplasm Resources
- Advanced Forest Management
- Wet land Ecology and conservation
- Petroleum Microbiology
- Forest Certification
- Biodiversity Conservation - Community Conservation
- Wildlife and Poverty
- Interactions of conservation on Environment and Forests
- Oceanic Climate change

**Table 7. Government Centers Involved in Research Pertaining to MEAs Requirements**

- Academy of Ministry of Science and Technology
- Medicinal and Aromatic Plants Research Institute
- Environment and Natural Resource Research Institute
- Energy Research Institute
- Remote Sensing Authority
- Forestry Research Center + Tree Seed Center
- Agricultural Research Corporation Centers
- Land and Water Research Center
- Desertification and Water Research Center
- National Meteorological Authority
- National Corporation for Rural Water
- Soil and Water Studies Center
- Geological Research Authority
- Veterinary and Animal Production Research Authority Centers
- Western Sudan Research Corporation
- Wildlife Research Center
- Fisheries Research Centers
- National Council for Population
- National Drought and Desertification control, Coordination and Monitoring Administration Center
- National Documentation and Information Center

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