NILE BASIN INITIATVE

SHARED VISION PROGRAM

PILLAR D: SOCIO - ECONOMIC, ENVIRONMENTAL AND SECTORAL ANALYSIS

ENVIRONMENTAL ANALYSIS AND MANAGEMENT COMPONENT

Country Report

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ENVIRONMENTAL ANALYSIS AND MANAGEMENT COMPONET

Background:

The Nile river is shared by 10 reparian countries: Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. Half of these countries are among the world's ten poorest countries. Today poverty, instability, rapid population growth, and environmental degradation characterize the Basin. Control of Nile Waters has long been a source of dispute and potential conflict in the region. Yet the Nile also holds great potential to foster regional, social and economic development through power generation, food production, transportation, trade, environmental conservation, and other related development activities. To realize this potential, the riparians have come to recognize that they must take concrete steps to address these challenges and that cooperative development holds the greatest prospect of bringing mutual benefits to the region.

The Nile riparians have taken a historic step towards cooperation in the establishment of the Nile Basin Initiative (NBI). Formally launched in February 1999, the Initiative is a transitional institutional mechanism, which provides an agreed basin-wide framework to fight poverty and promote economic development. This NBI is guided by a shared vision to "achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin Water resources". The NBI is comprised of the Council of Ministers of Water Affairs of the Nile Basin States (Nile-COM), a Technical Advisory committee (Nile-TAC), and a secretariat (Nile-SEC) located in Entebbe, Uganda. The World Bank, UNDP and CIDA support the formation of the NBI and on-going riparian dialogue.

The NBI has articulated a shared vision, established a transitional institutional mechanism, and formulated general guidelines to facilitate cooperative development in the Nile Basin. To translate the shared vision into action, the NBI two complementary components are (1) a Basin-wide Shared Vision Program (SVP) (2) Subsidiary Action Programs (SAP). The SVP will include a series of projects, such as capacity building, studies, and participatory activities to be implemented Basin-wide to create an enabling environment for cooperative development. In parallel, appropriate grouping of countries (two or more) will initiate SAPs to define and implement investment projects that confer mutual benefits at the sub-basin level.

The SVP encompasses five broad theme areas, referred to as "Pillars":

- Cooperative Framework (on-going UNDP sponsored D3 project)
- Confidence building and stakeholder involvement (Pillar C)
- Socio-economic, environmental and sectoral analysis (Pillar D)
- Water Resources Planning and Management (Pillar E)
- Applied Training (Pillar F)

In this process, Pillar D above addresses five components:

(1) Efficient water use for Agricultural production
(2) Socio-economic / poverty diagnostic study
(3) Assessment of opportunities for power trade and pooling
(4) Environmental analysis and management
(5) Opportunities for integrated infrastructure development.

There is clear recognition within the NBI countries that the development of Nile Waters must be environmentally sustainable in the long term. This is reinforced by the fact that the Nile is widely perceived as an environmental issue of global concern. Identifying the environment and development synergies, and thus the sustainable development opportunities, will be an important output of this initiative.

This report is part of the environmental analysis and management component of the NBI in Sudan. It reflects the proposed national priorities and action plans for the environmentally sustainable use of water resources. The proposed national priorities and action plans were developed through a consultative process that involved many stakeholders within the Nile basin.

Introduction:

Sudan is the largest country in Africa, covering an area of approximately 2,506,800 sq.m. It shares borders with Egypt, Libya, Chad, Central African Republic, DR Congo, Uganda, Kenya, Ethiopia, and Eritrea.

The 1998 Census shows that Sudan's total population is estimated at 30 million with an average growth rate of 2.8%. More than 70 % of the area of Sudan falls within the boundaries of the Nile Basin. Being the major source of life directly or indirectly, 85 % of the population are dependent on it. The Blue Nile has the highest concentration of population inhabitants, followed by the White Nile, the main Nile, and Atbara River. Most of the large cities in the country are associated with the Nile (Table 1).

The country is composed of a variety of natural environments and production systems. The soils are mainly sand in the northern and western parts, clay in the eastern and central parts, and mostly lateritic in the south. These soils are mostly poor in nutrients, humus content, water retention capacity, and are highly prone to erosion, and slow in retaining lost fertility.

The rainfall patterns in the country range from zero mm in the northern parts to over 1000-mm in the southern parts. The rainfall is generally characterized by high seasonal and annual variability, thus limiting the country's potential use of its vast natural resources.

Terrestrial ecosystems traverse the country from north to south starting by the desert, semi desert, low rainfall savanna, high rainfall savanna, and subtropical forests at the southern most tip of the country (Fig. 1).

The River Nile and its tributaries that traverse the country from south to north, forming one of the world's largest swamps in the south characterize the hydrology of the country. The River Nile is a dominating physical feature of the northeastern part of the African Continent. It is one of the longest rivers, of Africa and the longest river in the World (500km). Its Basin covers an approximate area of three million square kilometers as shown in Fig. 3 and extends from latitude 4º south to 31º north. The Nile Basin is divided into five sub-basins as follows:

(1) The White Nile
(2) The Sobat River
(3) The Blue Nile
(4) The Atbara River
(5) The Main Nile

The River Nile is described as being a complex system of a chain of rivers that have been subject to climatic changes, tectonic events and geographic processes, as well as extensive systems of river cataracts and land use especially during the past 150 years. In recent years, however, few changes occurred in response to man's activities such as building of dams across the river, tree clearance from the River Basin, and human settlement.

The White Nile originates from around Lake Equatoria in Uganda and its Sub-basin has a catchment area of approximately 378000 km^2. On entering Sudan, it is known as Bahr el Jebel and runs for about 170 km in a rocky rapid. Then it flows through the swampy "Sudd" region where large losses of water through both evaporation and evapotranspiration take place. After its emergence from the sudd, Bahr el Ghazal joins it on the west and the Sobat on the east. The river then takes the name of the White Nile and flows north in an almost flat area to join the Blue Nile at Khartoum (Ibrahim, 1984). The Sobat River which joins the Nile at Malakal flows from the Ethiopian plateau and is being fed from tributaries inside and outside Sudan. Baher El Ghazal originates from within Sudan.

The main Nile continues north and runs through number of cataracts until it reaches Lake Nasir in Egypt.

On the other hand, the Blue Nile originates from Lake Tana in Ethiopia, with a catchment area of 325000 km^2. Most of the river sub-basin lies on the northeastern side of the Ethiopian plateau and is characterized by eroded canyons, more than one kilometer deep, representing an erosion of millions of tons of fertile soil and hard rock (Ibrahim, 1984). The Blue Nile leaves the lake by passing through a series of six distinct cataracts in the upper reef. The Blue Nile collects the flows of eight major tributaries along the 800 km journey towards Sudan. It enters Sudan plains at Famaka and continues until it joins the White Nile at Khartoum. The drop of the river between Lake Tana and Khartoum is about 1470 km. Inside Sudan it collects the flows of sore seasonal streams and two main tributaries, the Dinder and the Rahad, both originating from the Ethiopian plateau.

River Atbara flows from the Ethiopian plateau and joins the main Nile at Atbara town 320 kilometers north of Khartoum. It has three tributaries, normally; setit, Basalan and Atbara

The Nile has marked seasonal and annual variations: the variation in discharge is illustrated by the fact that more than 80% of its annual flow occurs from August to October and only 20% occurs during the remaining nine months. There are also annual variations, for example the water flow in the Nile reached 139 bcm in 1879 and was as low as 51 bcm in 1913.

The percentage contribution of the main tributaries of the Nile during low flood time is as follows:

Tributary	%
Blue Nile	59
Sobat	14
River Atbara	13
Bahr el Jebel	14

Thus, 85% of the total flow comes from the Ethiopian plateau and only 15% come from the southern Great Lakes area. However, during the high flood time the percentage contribution of the tributaries is as follows:

Tributary	%
Blue Nile	65
River Atbara	22
Sobat	5
Bahr el Jebel	5

And therefore, during the high flood time 95% of the flow comes from the Ethiopian plateau and only 5 % comes from the Southern Great Lakes area.

The current annual amount of water available to Sudan from all internal and external sources amounts to about 30 bcm (Table 3). The summation of the Sudan's share of the Nile waters according to the 1959 Agreement is 20.5 bcm when measured in central Sudan (18.5 bcm when measured at Aswan in Egypt). The average flow of the non-Nile streams is 5.5 bcm, and the renewable groundwater is 4.0 bcm (Sudan National Water Policy 2000).

Natural Resources

Agriculture:

Agriculture, being the leading sector, predominates the national economy. The Gross Domestic Product (GDP) data shown in Table 2 shows that the contribution of agriculture to the national economy during the period 85/86-97 ranges between 29-47%. This rapid increase in the GDP was attributed to the expansion in the agricultural production in response to favorable weather and to the positive policy reforms that took place in 1992. Agriculture contributes more than 90% of Sudanese share from foreign trade. It accommodates more than 80% of the country's population. Also, it provides almost all

the domestic consumption demand for stable food, the domestic manufacturing enterprises demand for raw materials in the country (Sudan Position on Food Security Report, 1996).
Agriculture in the country consists of three main sub-sectors: The irrigated agriculture, the mechanized rainfed agriculture, and the traditional rainfed agriculture. The irrigated area is about 1.6 million hectares, being the largest irrigated area in sub-saharan Africa. Most of the irrigated schemes in Gezira, Rahad, New Halfa, Suki, Blue Nile, White Nile, and the main Nile lie within the Nile Basin. The area under rainfed is about 12.6 million hectares. The main crops in the country are Cotton, sorghum, wheat, and ground nut in the irrigated sector and sorghum, sesame, millet, ground nut, and melon seeds under rainfed sector.
Some of the problems that were associated with agriculture are: human concentration along the Nile strip, rapid growth of urban centers, together with tree cutting for cropping and extensive use of various sources of chemicals. Also, infectious diseases such as malaria, Bilharzia, and others dominate most of the irrigated areas in the country.

Forestry:
Harrison and Jackson (1958) estimated the tree cover in Sudan at 36-43%, while the forest resources assessment by FAO in 1990 indicated a tree cover of 19%. This was mainly due to the expansion in agriculture, building, fuelwood production and grazing. Forest area's also corresponds oppositely to population density i.e. 68% of forests is in southern Sudan where only 15% of the population lives as mentioned by Abdalla (1995).

The natural forest reserves and natural forests outside the reserves are usually put under mismanagement system, inspite the clear forest policy statement that was stated in the CNS for the protection, conservation and development. The objectives of the forest policy were:

1. Protect, conserve and develop the forest resources to maintain the ecological equilibrium, sustain agricultural production and attain self-sufficiency in forest products.
2. Improve the forest administration and encourage people participation in forestry.

To effect this policy, a presidential decree was issued in 1992 whereby 12.5 million feddans is to be reserved as forests. This only amounts to 2.2% of the total area of the country and compares very negatively to the rate of consumption of fuel wood that reaches 1 million tons annually. Forest products such as fuel wood, building material, fencing, and furniture, together with Gum Arabic plays a significant role in the national economy. Sudan produces more than 80% of the world production of Gum Arabic. Forest resources depletion is always a direct result of land clearance and cutting for fire wood.

Range Lands:
The grazing resources as supplied by the natural range lands, cover about 24 million hectares. Most of the potential range lands spread across the different ecological zones of the country. These start from the desert -where the grazing area is limited- to the savanah

rainfall, to the high rainfall woodlands savanah in the south. The average dry matter production varies from about 0.10 ton/feddan in the north to 0.60 ton/feddan in the south.
Browse species (trees and shrubs) are important components of the natural rangelands upon which livestock and wildlife depend during the dry season. In the drier areas, where Acacia species predominate, the pods, fruits, twigs and leaves are the main browse materials. On the other hand, in the wetter areas to the south broad-leaved woody plants are dominant.
In most areas in the country rangelands are under utilized during the dry season due to lack of drinking water. At the same time, areas near water points are overgrazed. The expansion of agriculture in the mechanized and traditional sectors has seriously reduced the grazing areas. A satisfactory balance between different land uses and adoption of technologies that provide easy access to water sources is a key factor for rangeland development.

Water Resources:
Surface and groundwater resources are available in the country, but are mostly shared with neighboring countries. Ten repairan countries share the Nile, as the main source of surface water: Burundi; Democratic Republic of Congo; Eritrea; Ethiopia; Egypt; Kenya; Rwanda; Sudan; Tanzania; and Uganda. The main non-Nile streams in the country are Gash, Baraka that flows from Eritrea and Azum that comes from Chad. The amount of groundwater storage in the country is estimated at about 4.1 bcm as shown in table 3. The current annual amount of water available to Sudan from all internal and external sources is about 30 bcm. Much of the underground water in the country is concentrated in the Nubian sand stone formation. This Basin falls within territorial borders of Sudan, Egypt, Libya, Chad and some isolated locations in upper Nile, Bahr El Gazal and Khartoum.
The summation of the Country's share of the Nile waters according to the 1959 Nile Water Agreement between Sudan and Egypt is about 20.5 bcm when measured at central Sudan (18.5 bcm when measured at Aswan, Egypt). This 10% loss was due to transmission.
There is a considerable potential for increasing the Nile yield by conserving some of the water that evaporates in the southern swamps. This is especially important as the country's share of the Nile water is taken up by the current 2.8% annual population growth.

Animal Wealth:
It is known that Sudan has the largest animal resources in Africa and the Arab region. In the country, livestock production is largely under traditional system, though modern dairy, fattening, and poultry raising have been introduced especially in big cities and around urban centers. Livestock population is estimated at 112 million in 1997 (Table 4).
The Livestock sector contributes around 20% to the GDP as shown in Table 5. It also provides over 21% of the country's foreign currency earnings in 1994/95. In addition Livestock has further contributions at the farm level through provision of draft power, transport and manure. Moreover, it supports partially and/or fully 40% of the population. Being raised on natural pasture, the Sudanese beef and mutton are of international reputation.

Freshwater Fisheries:

By virtue of its basic characteristics, Sudan fisheries are of a small scale, and are qualified to satisfy subsistence needs. Most of the country's fish resources remain untapped especially in the Nile Basin and its tributaries, and lakes developed behind the different dams along the course of the Nile. Generally, the country is endowed with inland and marine fisheries resources composed of a diversity of organisms including finfish, molluse and crustaceans. The potential sustainable yield of finfish is estimated at 110 thousand tons/year, mostly found in the inland waters of the 5 man-made lakes on the river Nile and its tributaries. Current fin-fish production approaches 45 thousands tons/year, which is less than 50% of the estimated potential, with a per capita consumption approaching 1.8kg/year. Freshwater pond-base fish culture is recently introduced and is expected to open new avenues for investment in this important natural resource.

Major Economic Activities:

Throughout the Nile Basin, the predominant economic activities are:

Agriculture & animal production:

Much of the arable lands, within the Nile Basin are fertile and thus, large areas of cultivable land are situated in the region between the Blue Nile and Atbara River and between Blue Nile and White Nile. Other cultivable land is in the narrow Nile valley and in the valleys of the plains region. There are three forms of agricultural development in The Nile Basin, which are 1) irrigated agriculture; 2) Mechanized rainfed agriculture; 3) traditional rainfed agriculture.

The major crops include cotton, sorghum, alfalfa, dates, wheat, cassava, beans, bananas, peanuts, potatoes, sugar cane, and sunflower. This area is also rich is animal recourses such as camels, cattle, goats, sheep, fishes and chickens.

Forestry:

The total area of natural forests in the country is estimated at 430 square km in 1990. The major forestry products in Sudan are gum Arabic, timber, senna, tannery, bees, wax and firewood. A lot of pressure is exerted on forest products, as more and more people migrate to large urban centers especially during the last few years due to drought and desertification.

Fishing:

The Nile system supports a large number of fishermen and their families especially around Dams reservoirs at Roseries, Senar, Kosti, Jebel Aulia, and lake Nasir in the north. There is a great opportunity for investment in in-land fisheries.

Mining:

The Sudan Geological Research Corporation contracted many foreign investors in the exploration of gold at Gissan and Kurmuk on the Blue Nile and exploration in the eastern part of the country. Recently Gold exploration rights were giver to foreign investors along the Nile valley in wadi Sangier north of Atbara town. There is some potential for the extraction of several minerals such as basalt, copper, chromate, manganese and mica.

There are also plans to develop several mines in the northern region to the east of the Nile and near Juba in the South.

Oil Production:
Increased demand for petroleum products led to the development of the first oil refinery for Sudan in 1964. Light produce pipeline between Port Sudan and Khartoum was added in 1977. This pipeline crosses the Nile at Atbara town through a bridge. In addition to the refinery at Port Sudan, small refineries are in production at Abu Gabra and El Obeid (Western Sudan) and Shagara (Khartoum). Furthermore, a new large refinery is under construction at El Gaili (80 km north of Khartoum) with a capacity of 50,000 barrels a day. A pipeline connecting the oil fields to the refineries at El Obeid, El Gaili and Port Sudan was commissioned in August 1999. This pipeline crosses the Nile at both El Gaili and Atbara towns and the pipes were buried 10 m under water.

Manufacturing:
Industrial activities in the country are small both in capacity and level of sophistication. They mostly use old technology and characterized by being intermediate and largely confined to the processing of agricultural products. Textile, paper mills, tanneries and sugar factories have been established along the Blue Nile and White Nile. A number of factories also produce such consumer goods as cigarettes, beverages, soap and shoes. Construction materials such as cement are manufactured at Atbara (Main Nile) and Rabak (White Nile). Also gravel and sand quarrying and brick making is practiced in many spots along the Nile River banks.

Electricity:
Electric energy in Sudan is utilized for various purposes such as irrigation, domestic water supply, domestic use, industry etc…. The main electricity grid is limited to the central and eastern parts of the country such as Khartoum, Gezira, Sennar, Damazine, Rabak, Gedarif, Kassala and New Halfa. The hydro generation schemes at Roseires and Sennar serve the grid together with diesel sets at Khartoum and Kassala; steam and gas turbine in Khartoum North; and hydro power and diesel sets at Khashm El Girba.

In addition to the main grid there are a number of isolated systems principally at the main towns, namely Port Sudan, Dongola, Karima, Atbara, Shendi, El Obeid, Juba, Malakal and Wau.

Generally the sector of energy comprises various sub-sectors including the hydroelectric energy or hydropower. Hydropower is generated from three Dams mainly, Roseries; Sennar and Khashm El Girba. The present installed electric power capacity is about 750 MW which is far less than the present domestic demand.

Transport:
The existing road and rail networks are extensive, but do not completely traverse the country from north to south and east to west. Currently, the highway route from Port Sudan to Khartoum is made via Kassala. Another highway from Khartoum to Port Sudan via Atbara is under way (The portion between Khartoum and Atbara was finished). Also,

a highway between Khartoum and Dongola in the north is under construction. Khartoum is also connected to Damazine by an asphalt road. A new highway connecting the capital Khartoum to western Sudan is under construction (the portion between Khartoum and El Obeied via Kosti was finished). In the long-term there is a proposal to build a Trans-African Routeway through Sudan. Travel by air is very limited within the Nile Basin in all parts of Sudan. Railways connect most of the large towns in Sudan.

Tourism:
The Nile and its tributaries across the country provide an excellent tourist attraction. Dinder National Park and Game Reserve is a good example to mention. This national park with an area of approximately 900,000 ha is equipped with safari residence and other facilities for tourists. The park used to harbor a variety of games including antelopes, big ants, giraffe's etc… However, to date the park has lost most of its wildlife population due to:

1. Disturbance of game habitat by the expansion of mechanized farming.
2. The influx of neighboring communities who practice hunting and charcoal making.
3. Pouching activities.

There is also Khartoum forest, which is a declared bird sanctuary, with some recreational and amusement facilities. A short distance north of Khartoum there is sabalogah cataract with boating facilities. Another tourism attraction along the Nile valley is the presence of historical sites at Nagaa and Musawarat, Bejrawia, Barkal etc… A number of tourists enjoy safari hunting in many locations within the Nile Basin.

Legal and Institutional Framework:
Throughout history, since independence Sudan has built up a good deal of experience in natural resources conservation and the inclusion of the issue of environment in natural resources utilization plans. This build up of experience stemmed from the fact that environment touches many aspects of development related activities along the River Nile and its tributaries. These include for example soil protection, agricultural development, livestock management, water management, energy generation and distribution, mineral development, fisheries, forestry and wildlife.

This diversity in environment related activities brought up the notion of multi-sectoral support and cooperation in facing major environmental problems nation wide and specifically along the River Nile where the major economic activities take place. In this regard, when the country faced the drought and desertification in early 1970's a number of experts from different institutions drew the national action plan and strategy to combat desertification (DECARP). This has resulted in the formation of the National Drought and Desertification Coordination Unit (NDDCU) representing a wider range of multi-stakeholders.

The countries strive to integrate the environmental, economic and social factors in the development process started by passing sectoral regulations. Even though, the country has not enacted an organic or a comprehensive environmental and natural resources

development law relating to the Nile Basin. In 1901 the Forest Act was inaugurated (Tollentino, 1994). This act was clear evidence that there was an early recognition of the importance of Forests in protecting the Nile environment and specifically its hydrology. Table 5. Shows some of the laws, Acts, Ordinances and regulations as related to the Nile Basin environment. Compared to what is now referred to as environmental laws which are resource or conservation-oriented, many of the entries in table 5. Are use-oriented on account of the country's needs that were hampered by unusually varied ecological regions and climatic conditions.

After independence three major socio-economic development plans were drawn; namely the 10-year plan 1959/1969, followed by the 5-year plan 1970/75, and the 6-year plan 1977/83. During these periods, the issue of natural resource conservation and environmental protection received no explicit treatment, except in the 6-year plan that contained some topics on tree plantation, soil conservation, forest conservation and checking of desertification. However, a major recognition of the role of the environment in socio-economic development in the country that occurred in 1986 when the first national economic conference (again a broader multi-stakeholder involvement) was held. That conference emphasized the importance of the environmental issues and called for the incorporation of such aspects in development policies and plans, which are basically concentrated along the Nile Basin.

Another important support to the protection of environment within the overall sustainable development framework took place at the 2nd National Economic Conference that was held in 1992. A 10-year Comprehensive National Strategy (CNS) 1992/2002 for socio-economic development was produced, ratified, endorsed by the Council of Ministers and finally ratified into a law. This was the first time that the natural resources conservation and environmental protection within the different sectors i.e. agriculture; water; forestry; livestock; industry; energy etc… were clearly stressed. It should be noted that this CNS was adopted just before the 1992 Earth Summit (UN Conference on Environment and Development - UNCED). This early recognition of the environmental problems gave Sudan's report to UNCED, which was just a summary of the efforts taken to integrate the development and environment, a valued reputation. The CNS was a mere commitment to save the environment. Sudan's report to UNCED had identified clear methodologies for the achievement of the goal, and objectives of the CNS, which were manifested in the following general environmental policy:

1. The general environmental policy shall be the promotion of the environment, its conservation, and the sustainable utilization and development of natural resources.
2. The sources of the said policy shall be the Islamic principle dictating the conservation of the natural environment, the established scientific principles dealing with ecological balance and biodiversity.

The environmental policy, also stated that the governmental organs and the voluntary organizations shall use all possible means to achieve the following objectives:

(One) The integration of environment and development in the decision-making processes of governmental organs and the private sector.

(Two) The qualitative and quantitative promotion of environment for the dignity and welfare of the citizens.

(Three)The sustainable utilization of water, forests, range-lands, wildlife and other renewable natural resources and the conservation of non-renewable natural resources such as petroleum and minerals.

(Four) The protection of the River Nile, other rivers, and the Red Sea Environment and Sustainable Use of their resources.

(Five) The achievement of Sustainable Agriculture and Forest, through encouragement of scientific research, the development and experimental projects.

(Six) The achievement of equilibrium between the population and the exploitation of resource.

(Seven) The encouragement of popular participation in the efforts of conservation and promotion of environment and natural resources.

(Eight) The acknowledgement and fulfillment of inter-regional equity.

The protection of the Nile Environment is well situated into the objectives of the Comprehensive National Strategy as shown by Babiker and Yagoub, 1999 who pointed out some of the successes of sustainable development strategies in Sudan.

Sudan as a member of the international community signed, ratified, and accessed to a number of international and regional environmental conventions/agreements as shown in Table 6. The commitment to save the environment was reflected in the preparation of the National Action Plan to Combat Desertification, which is the most serious environmental problem across the country. Although a tedious process to develop the environment protection law started, yet more work is needed to develop the enforcement and implementation modalities within the concerned departments. The country is involved with other efforts to save the environment such as the preparation of the following:

1) National Biodiversity Strategy and Action Plan.
2) National communication Report on climate change
3) National Agenda 21 Report
4) National Human Development Report

These prolonged efforts to address the sectoral and overall environmental concerns of the country will for sure pave the way for the Nile Basin Initiative. The environmental analysis and management component will therefore rest on a solid ground of heritage in the policy and legal framework of the Sudan. This is especially true in light of the fact that the environment protection law, which was inaugurated in March 2000, stated as one

of its objectives to save the environment of the Nile and its tributaries. The following institutions are the key players in the field of environment:

The Higher Council for Environment and Natural Resources:
In 1991, the government of Sudan took a major initiative and established the Higher Council for Environment and Natural Resources (HCENR), in order to consolidate its efforts, and make its, policies, laws, plans and institutions effective tools to combat the problems associated with natural resources depletion and environmental hazards. The HCENR was well situated in the government hierarchy being under the chairmanship and supervision of the Prime Minister. A general secretariat headed by a Secretary General (SG) assists the HCENR in the discharge of its functions.

The HCENR as a coordinating and advisory body was entitled with the following as stated in its Act (1991):

1. Lay down general policies and long term plans, for environmental protection and sustainable development of natural resources.
2. Coordination of efforts for environmental and natural resources management among concerned governmental agencies and between federal and state governments.
3. Periodic review of relevant legislation's in the field of environment and natural resources.
4. Support research on the environment and natural resources.
5. Promotion of environmental awareness and education.

Ministry of Environment and Tourism:
In 1995, the government of Sudan took an important step towards, fulfilling its commitment to the UNCED by establishing the Ministry of Environment & Tourism (MET). The mandate of the MET was to oversee environmental management and integration of environmental protection into national development strategies. The priorities set forth for it include raising public awareness, enforcement of environmental law regulations, data collection, and encouraging the formation of voluntary organizations. In this new development HCENR became the technical arm for MET. In addition to the HCENR, The MET supervises the following institutions:

- The National Tourism Corporation which is responsible for planning and promotion of tourism.
- The General Administration for Wildlife Conservation which is responsible for wildlife protection and management including protected areas.
- The Antiquities and Museums Corporation is in charge of historical and archeological sites.

The Ministry of Agriculture and Forestry:
The Ministry of Agriculture and Forestry undertakes the responsibility of natural resources development plans and strategies. The main departments concerned with natural resources development are:

-Soil conservation and land use administration.
-Range and pasture administration.

-Forest National Corporation.
-Agricultural Research Corporation.
-National Irrigated Schemes administration.
-National Drought and Desertification control Unit.

Ministry of Irrigation and Water Resources:
The Ministry of Irrigation and Water Resources is responsible for the implementation of the national irrigation and water resources policy through the following departments:

-Planning department.
-Nile water department.
-Dams department.
-Irrigation affairs department.
-Projects department.
-Hydro-mechanical department.
-National Water Corporation (Dissolved in 1999)

The Ministry of Health:
The Ministry of Health's mandate is the improvement of preventive and social medicine, promotion of medical services, health education and public participation. Also, the ministry monitors the environmental hazards in factories and industrial areas. The main divisions of the ministry are:

-Planning and development.
-Social rural health.
-Health statistics and research.
-Medical supplies corporation.
-Laboratory and medical research.
-International health and training.
-Environmental health

The Ministry of Energy and Mining:
The Ministry of Energy and Mining Coordinates oil and gas explorations, transport, and exportation. It also, supervises mining activities, electricity generation and distribution, and the renewable energy programme. The main departments are:

- Sudanese Petroleum Corporation.
- Sudan Geological Research Corporation
- National Electricity Corporation
- National Energy Affairs Department

The Institute of Environmental Studies (IES):
The Institute of Environmental Studies is situated at the University of Khartoum and is basically oriented towards teaching and training. It was established in 1979 and has a skeleton staff. It depends very mush on collaborators. The staff and students carry out research on various environmental issues of national and regional significance with particular emphasis on the following:

- Arid lands management
- Fresh water ecosystems management
- Urban and regional management
- Coastal zone management

Environment and Natural Resources Research Institute (ENRRI):
This research institute was established in 1991 as part of the National Research Center with mandates for research, training and publication of research results. The main departments include:

- Desertification control
- Use and impact of agro-chemicals
- Biological control of pests
- Use of bio-fertilizers
- Waste management and pollution control

Sudanese Environmental Conservation Society (SECS):
The Sudanese environment conservation society is one of the most active NGOs, with more than 80 branches distributed all over the country. Its basic mandate is environmental awareness and the promotion of environmental protection and management among its members, the public and the policy makers. The main environmental issues under consideration are:

- Poverty alleviation
- Women and environment
- Waste management
- Energy saving devices
- Use of pesticides
- NGO networking on major environmental issues

The Sudanese Development Association (SDA):
This is one of the active NGOs in the field of policy research and implementation of small-scale projects for poverty alleviation. SDA is also active in the area of public awareness campaigns on major environmental issues. Some of the main projects include:

The Environmentalist Society (ES):
The ES is a relatively smaller NGO. Its members are basically professionals in the field of environment and sustainable development. The mandate of this NGO is to carry out policy research in the area of major environmental issues such as:

- Community development
- Poverty alleviation
- Legal and policy framework
- Capacity building

As shown above, Sudan has a strong base of trained manpower in the different thrusts of natural resource management. This is strongly supported by more than 40 universities, training institutes, and research centers covering most of the Nile Basin. All the ministries mentioned above are well equipped with qualified staff and personnel to

implement the pertaining policy guidelines. With little training on the environmental problems that are emerging at both the national and international level, these ministries will have the necessary capacity to effect environmentally sustainable development initiatives.

As regard to other institutes and organizations mentioned in this chapter, Mohamed (1999) has curried out an assessment of the environmental capacities in the Sudan. This assessment has revealed some of the constraints, gaps and problems facing these institutes and organizations.

There are encouraging signs in the direction of bringing order and upgrade capacities in the environmentally sustainable development in the country. These signs are reflected in the improvements tacking place at the HCENR and the establishment of state environmental council's with coordination capabilities.

Environment Management

The Comprehensive National Strategy (1992-2002) represents the main source of official policy in the country. The main policy directives in relation to the environment include the conservation, management, and national use of the natural resources as an original commitment founded on the values of the nation (Tarig, 2000)

The right to a sound and healthy environment is recognized as a basic right of the citizens to guarantee their health and welfare. Such issues as sustainable development and the rational use of natural resources (intergenerational equity), international and regional cooperation for transboundary environmental issues is also included in CNS as stated earlier in this report.

The main constitutional organs dealing with legislation, policy making and execution in the country are:

- The National Assembly (legislation)
- The Federal Council of Ministers (policy making)
- The States legislative councils (legislation)
- The States Council of Ministers

The constitution regulates the federal and state relationships on the basis of coordination. Many articles in the constitution deals with this coordination such as article 40, article 116 , article 166(2) etc…. The legislative relations between federal and state governments are founded on the federal principle. In this regard the national and state legislation are mutually independent and coordinate within their respective spheres.

Based on the coordinated linkages between federal and state legislation, the Higher council for environment and natural resources was founded as the basic institution responsible for the coordination of national policies as well as initiation of legislation in the fields of environment and natural resources. The President of the republic originally headed this inter-ministerial council and having branches at the state level when it was

established in 1991. In light of the establishment of the Ministry of Environment and Tourism in 1995, the council became the technical arm of the newly formed ministry.

State branches of the HCENR have been established in about 10 States. The state branches are comprised from the concerned State Ministers, members of the NGOs and the community leaders. The State Wali (Governor) is the Chair of the State Council.

The state branches of the HCENR were confronted with many problems such as lack of funds, lack of trained personnel, and most importantly lack of awareness about such issues as sustainable development and environmental conservation and natural resources management.

The government has formulated and adapted relevant policies to guide national development and natural resources utilization and management at sectoral as well as at national level. Measures such as development of a package of rural credit, expansion of extension services, introduction of improved technologies, adaptive research, provision of agricultural inputs, use of supplementary irrigation, and setup of animal service centers were undertaken at the policy level for better utilization of the country's immense natural resource base.

A lot of efforts were undertaken to revise natural resource policies. These include draft National forest policy, 1997; and draft national Water Policy, 2000. Other efforts that relate to natural resource utilization is the agricultural census and industrial census during 1999-2000. In 1998 the council of ministers issued a directive on the use of environmental impact assessment (EIA) studies together with the economic feasibility studies for any development project. Later on EIA became a requirement by law according to the environment protection law that was passed in 2000.

Following the ratification of the United Nation's Convention to Combat Desertification, the government formulated the NAP, but due to lack of fund much of the proposed measures were not implemented. Also, the National Biological Strategy and Action Plan (NBSAP) was drafted awaiting financial support to carry out the proposed programmes on the construction, management and utilization of the biological diversity resources in the country.

Environmental Issues

As shown in table 5, law protects the management of wildlife resources, yet the enforcement of this law is the problem. Table 7 shows some of the protected areas in Sudan.

Although the environmental problems in the Nile Basin across the country are of relatively smaller scale, yet considerable attention should be directed towards them. The pristine state of the environment in most parts of the Nile Basin may soon decline due to many factors. The most important issues related to the Nile Basin environment could be as follows (Table 8):

Land degradation:
Experience has shown that human activity to utilize the natural resources will lead to some sort of change in the existing environment. As noted earlier, 85% of the population depend directly or indirectly on the Nile Basin to make a living. This has resulted in a steady increase in the pressure on land resources. Land degradation was manifested in:

Deforestation:
The Nile Basin has two distinct characteristics as regard to deforestation. The area north of Sennar has low and unreliable rainfall and thus low vegetation cover. This area is prone to desertification due to high population concentration and extensive agricultural activities on a narrow strip of land. On the other hand, the area south of Sennar is rich in vegetation with large forest reserves. The deforestation problem in this area is due to the fact that, the sources of firewood and charcoal in the northern area reached almost zero and there is a progressive pressure on these sources to the south. The energy supply for Sudan in 1992 as shown in table (9) indicates that 82% of the energy supply comes from bioenergy sources. If the National Forest Corporation relates this to the afforested areas during 1993/94 season (table 10), we can see the problem.

Erosion
Generally both water quantity and quality depend largely on the prevailing conditions and characteristics of the catchment. In the country, the Nile and its tributaries are subjected to different climatic changes and land use patterns. Since the drop of the Blue Nile between Lake Tana and Khartoum is about 1470 km, this leads to high velocity of the running water. Eroded canyons that lead to erosion of millions of tons of fertile soil and hard rock also characterize it. The Blue Nile catchment is naturally prone to high rates of erosion and therefore should be managed to reduce sediment yields, by such practices as terracing, introduction of vegetation cover, control of overgrazing etc.. It should be noted that the White Nile catchment is almost flat and is characterized by the presence of the swamps that play a key role in reducing sediment load, though it increases water loss by direct evaporation and evapotranspiration.

Wetland degradation:
Due to the unrest in the south, the literature data on the richness of the vegetation in the southern Sudan is very limited. Most of the data that is available is reflected in the Jongli Investigation Team report (1954). The wetlands of the southern Sudan are generally vast areas expanding from Nemule in the far south to Malakal in the northern edge of the wetlands. The area is characterized by gentle slope that leads to water spreading over large areas forming what is known as Sudd. Some of the most important causes of wetland degradation could be:

- Illegal logging of the most important tree species.
- Burning of vegetation for land clearance.
- Chemical control of aquatic weeds.
- Drying up of swamps for development projects.
- Water hyacinth infestation

Much could be done to conserve the heritage of the country's wetlands on the eve of peace.

River Bank and Lakeshore Degradation:
Historically, in Sudan, there was abundance of natural resources. But has been degraded due to:

- Absence of land use planning and lack of Coordination among the concerned departments and institutions within the government system.
- Massive increase in animal population beyond the local environment capacity with it consequent overgrazing.
- Expansion of mechanized rainfed agriculture.
- Population pressure and expansion in urbanization and ever increasing demand for energy sources like firewood.

All these factors & others have contributed to the degradation of the Nile riverbank across the country from south to north. The data in table (1) reflects this problem clearly.

Mining:
Mining activities usually disturb the ecology of the affected area. Quite extensive soil removal and clearance of trees, shrubs, and vegetation takes place. Without proper management, these disturbances usually lead to large rates of erosion and sediment transport. Mostly mining is associated with the use of chemicals, such as washing and cleaning of Gold where mercury is used. This is due to the lack of awareness about its dangerous effects. The washing out of small quantities of mercury into the Nile by runoff can pose a potential danger on the whole ecosystem. Enforcement of legislation, together with training and education in the field of mining could reduce the potential hazards of such practices.

Loss of biodiversity
The different ecological zones of the country reflect a rich biodiversity of plants & animals. The diversity in animal or plant species increases with the increase of annual rainfall. The IUCN Red Book (1990) shows that there are 35 species, which are threatened with extinction including 17 animal species, 9 plants, and 8 birds. Human activities within the Nile Basin, such as uncontrolled agricultural expansion, hunting, over grazing, deforestation and fire, destroy the ecological balance and lead to loss of valuable species, ecosystem and habitats.

Water borne diseases:
Since 85% of the population depend directly or indirectly on the river Nile, it is clear that water pollution from both point and non-point sources can occur frequently. This is especially true in light of the fact that there is an invariably lack of awareness about the dangers of not using proper pit latrines. The displaced communities around most big cities in the Nile Basin do not use pit latrines. During the rainy season, the runoff carries much of the water borne microbes, to the river. This usually results in epidemic diseases outbreak. The famous diseases that prevail in the Nile Basin that could be attributed to water pollution are Malaria, diarrhea, Bilharzis, and typhoid. Proper management of

human excrements and domestic waste in villages and urban centers around the Nile Basin can lead to considerable human health improvement.

Water quality degradation:
The concentration of the major economic activities along the river Nile and its tributaries leads to the migration of laborers to theses areas and the spread of infections diseases. This is basically due to the fact that water sources are extremely vulnerable to degradation by pollution. In such reverine environment, water pollution usually increases with an increase in water intensive industries particularly textiles, tanneries, sugar, paper and pulp industries, in the Nile Basin there are:

1. Tanneries: White Nile, Gazira and El Bagnir tanneries

2. Textile: Al Haj Abdalla spinning factory, Al Managil Textile factory, Wad Medani farmer union textile factory, Wad Medani Al Hassaheisa Friendship textile factory, and Khartoum North textile factory.

3. Sugar cane-processing companies:
El Guneid, Assalaya, New Halfa, and west Sennar.

4. Paper and pulp: Khartoum North paper and pulp factory.

Also, the recent development in petro-industries in the country may affect water quality. Water quality degradation is a common occurrence in both rural and urban areas in the Nile Basin due to many factors such as (Sudan draft water policy):

- Lack of sewage systems and adoption of high cost technologies (e.g. septic tanks and deep lined soak-away well in urban sanitation.
- Low level of awareness among rural communities.
- Utilization of deep soak-away wells drilled below water table causing pollution of groundwater.
- Untreated industrial waste (from tanneries, slaughter abattoir and soap factories) which is dumped on the ground.

Pesticides and fertilizer run-off:
Sudan in the biggest country in Africa as regard to the use of pesticides, herbicides, fertilizers, and other chemicals especially in agriculture. Irrigated agriculture in the Gezira, Rahad, New Halfa and Suki depend heavily on various forms of chemical fertilizers. In light of the fact that there is no control on rates of application, this poses a serious environmental problem throughout the Nile Basin because all irrigated agriculture is associated with the Nile. Surface run-off of these chemicals into the Nile waters can occur in various ways. The stock of obsolete fertilizers in irrigated schemes is a direct threat to the environment.

Water hyacinth and other weeds:
The White Nile between Kosti and Juba provides the only reasonable mean of transportation for goods and human begins. This part of the river Nile was heavily

infested with water hyacinth weed. This was an introduced species that proliferated in the Nile water. Thus causing many problems such as navigation risks, evaporation, and diseases. Also, some chemicals that were used to control this weed created an environmental problem by being very hazardous to human being and freshwater flora and fauna.

Recent, current and planned environmental initiatives in Sudan:

Considerable efforts at both national and international levels has been exerted for the development of major economic sectors in Sudan e.g. Agriculture, Animal wealth, Forestry, Range & pastures, Industry, Energy … etc. It should be noted that during the consultation process many departments were either skeptical in providing information on environment related initiatives or do not want to provide such information. Mach of the information gathered on recent, current and planned environmental initiatives in Sudan were summarized in table 11.

During 1992 - 1996 the Forest National Corporation received funds from different sources such as FAO, DANIDA, EEC for forest development programmes. A number of major studies were undertaken such as assessment of forest cover, Household energy requirement, and annual forest cover.

Also during 1986 - 1992 the Forest National Corporation received fund from DANIDA and launched a major afforestation and reforestation programme in north Sudan basically along the river Nile.

The wildlife conservation administration received funds from different sources during the nineties to establish wetland-protected areas, to develop a water management programme for the Dinder National Park, and the assessment of wildlife resources in semi-arid regions in Sudan. This administration also conducted an assessment survey on wildlife habitat in the protected areas in Sudan.

Global Environment Facility (GEF) has approved 750.000$ for the Dinder National Park Rehabilitation Project in 1999. This project supports the wildlife conservation administration effort, to rehabilitate the park's wetlands, roads, and the safari accommodation. The project will also help wildlife conservation administration to train its staff. This project was complemented with anther 500.000$ from UNDP for the community development. It will target the integration and involvement of the communities around the park in its protection.

The Sudan National Action Plan to combat Desertification process started in 1997 with an initial funding of about 310.000$ from UNDP. A multi-disciplinary team of experts to assess past experience in desertification control in Sudan and to propose a strategy and National Action Plan (NAP) in the context of the convention to combat desertification was formed. Later United Nation services office was commissioned to further promote the team work and finalize the initial stages of the NAP. The NAP was finalized with a number of ambitious projects that await funding.

Sudan Climate Change Enabling Project was funded by GEF under the United Nations Climate Change Framework Convention. The budget allocation was $ 290.000 and it started in 1997. The assessment studies of the vulnerable sectors were done, together with the scenarios for mitigation measures. The process is still continuing, to finalize Sudan's National Communication Report.

Support to a strategic planning process aiming at environmentally sustainable development in the Sudan. This project was financed by UNDP offering about $500.000 in 1996 to support the strategic planning process aiming at environmentally sustainable development. This was in response to the need for the development of Agenda 21 at the local level. A number of activities were implemented under this initiative such as straining of a considerable number of technicians working at different institutions and sectors. Support to pilot initiatives at the federal and state level targeting capacity building of local communities in environmentally sustainable development activities.

National Biodiversity Strategy and Action Plan. This project in supported by GEF under the Convention on biological diversity with $340.000 in 1999. Much of the assessment work at the national level was accomplished and the national biodiversity strategy was drafted. A final workshop is scheduled to take place during May 2000 for the endorsement of the strategy.

Opportunities

The Nile Basin Initiative was founded on the basis of benefit sharing among the people who depend on the Nile for their living. It is through the benefit sharing and equitable utilization of the base of the natural resources in the Nile basin that a confidence building can take place among the communities who dwell the Basin. Some of the opportunities for transboundary environmental initiatives may be.

Watershed management:

Both branches of the Nile come across a diversified ecological setup. This diversity in the ecological setup has led to many environmental problems in the Basin due to the misconception of abundance of the natural resources base and especially water. These problems include among others, deforestation, overgrazing, expansion of mechanized farming, logging, and others. As a result of this misuse, the quality of the Nile water drops sharply during the rainy season due to high sediment load that results from soil erosion. Thus, collaboration in watershed management among the Nile Basin States is of paramount significance.

Protected Area Management:

National parks and game reserves play a significant role in the conservation of biodiversity. Most of the National parks and game reserves are established near water dividing lines and areas of sensitive environments. In Sudan, the Dinder National Park and Game reserve is situated in the southeastern border with Ethiopia, and Nimule National Park is at the southern most borders with Uganda. Regional cooperation to

facilitate the management of such parks would for sure lead to sustainable utilization of this important resource.

Tourism:
The river Nile was known for its rich environment and scenic nature. It is a gift of nature. This potential source of income was not tapped by its dwellers for centuries, except for some isolated forms of utilization as represented by safari tours in some countries of the Basin.

In Sudan the base for tourism is relatively poor. Thus, any improvement in the tourism industry would lead to a steady increase in the foreign currency earnings. This would result in a chain of income generating activities for the local communities across the Nile Basin. This would even be of great significance if these communities were able to move freely across the borders. Thus, the promotion of tourism would be of benefit to the inhabitants of the Nile Basin.

Wetland Management
Sudan harbors some of the richest wetlands in Africa. These include:
1. The sudd which is a wetland complex that is known to be the biggest of its type in Africa the world (Osman, 1999)
2. The Machar marches which is a triangle north of the river sobat and east of the White Nile.
3. Bahr El Gazal swamps which is fed solely by local rainfall within Sudan.
4. Dindir wetlands which are formed along the Dinder River, a tributary to the Blue Nile.
5. Blue Nile wetlands, which are a systematic inundation's along the Blue Nile with unique biodiversity.

The development of wetland management guidelines at the regional level would for sure benefits these special ecosystems.

River Bank and Lakeshore Degradation
The development of regional standards for river bank and lakeshore development strategies will ease the pressure of misuse and environmental degradation. The expansion of urban centers along the Nile has resulted in many forms of river bank degradation. Tree cutting and over cultivation of the river bank soils known as Jerof is leading to many problems as regard to the Nile water quality.

Floods and Droughts
In Sudan major floods were recorded in 1876, 1946, 1988, 1994 and 1988 with more frequent floods during the nineties. Also the country has experienced drought spills during the sixties, seventies and the hardest during 1983/84 season. These overwhelming disaster usually results in great human misery and loss of live, property and severe environmental degradation. The formulation of contingency plans for disaster preparedness at the national and regional level is essential for the dwellers of the Nile Basin.

Priority Actions:

The priority actions for the management and protection of the River Nile Basin in Sudan are summarized in table 12.

- Development of disaster management plan for floods at the National level is urgently needed. This could be achieved through strengthening of the early warning system and the collection, analysis and exchange of information at the national and regional level. Also, development and enforcement of a law that prohibits settlement in flood prone areas. Start feasibility studies to develop flood control dams.

- Development of a watershed management plans at the national level and the setup of a monitoring system to upgrade the management plan. Adoptions of technologies that combat water erosion such as strip cultivation, counter cultivation… etc at the upstream reaches. Enforce legislation to limit over exploitation of natural resources at the basin level.

- Development of a contingency plan for combating diseases outbreak during the rainy season and national disasters. Conduct an awareness programme on sanitation measures, especially the use of pit latrines among displaced and rural communities in the basin to limit runoff of waterborne microbes. Also, provision of basic health care and immunization programmes throughout the basin.

- Setup of technical guidelines on agro-forestry and adoption of the national policy requirement by increasing the national reserve forests, to reach the target of 25% of the country's total land. Adoption of national integrated land use plan through piloting especially in the upstream reach and along the main Nile where sand creep and haddam (eroding river banks) is taking its toll.

- Development of biodiversity conservation programme through the development of national parks and game reserves. Also, development of a special wetland management plan to conserve the heritage of varieties and species in these sensitive environments. It is necessary to implement the national strategy and action plans for biodiversity that were drafted recently. It is also necessary to develop legislation for the protection of endangered species and declaration of special wetlands such as Mashar, Sudd, Bahr El Gazal, and Dinder wetlands as national reserves.

- Development of a framework programme on solid waste management for urban centers along the River Nile Basin. Raising awareness among rural and urban dwellers on sanitation measures. Legislation on sewage discharge and setting guidelines for the use of deep-soak-away wells and septic tanks is essential. It is also important to conduct feasibility studies on the use of sewage treatment system and piloting on the best practices.

- Development of EIA guidelines for major industries in the Nile Basin. Legislation on industrial waste management and technical backstopping on modern systems of industrial waste management is highly recommended for industries throughout the Nile Basin.

- It is important to adopt poverty alleviation programmes in the Nile Basin especially for disadvantaged groups and displaced communities. Piloting on income generating activities and environmental education and awareness programmes is important in reversing the degradation pattern in natural resources and environment. Sustainable human development programmes are very essential to empower local communities to safeguard the environment in the Nile Basin.

- A framework programme on the use of herbicides, insecticides, fertilizers and other chemicals used in Agriculture and health fields. It is essential to support the ongoing efforts on the integrated best management supported by FAO since 1978. Development of EIA guidelines for the use of the above chemicals that might reach the Nile water through run-off is a priority. Legislation on the introduction and use of chemicals that produce hazardous waste is important to limit the build up of the national stock of obsolete pesticides that already exists in the country.

- Development of a training programme for artisan gold mining and introduction of alternative mining technologies. Carry out an environmental awareness programme about the misuse of mercury in gold mining. Development of technical guidelines and capacity building for the Geological Research Corporation.

- Coordination of the international community effort, targeting refugee problems. Development of site-specific plans for rehabilitation of refugee affected areas.

- Development of control measures for infectious weeds such as water hyacinth along the White Nile from Jebel Aulia to the South. It is important to introduce new technologies as pilot initiative and the limit of chemical control methods that degrades water quality and the environment at large.

Stakeholder analyses and consultation:

The National consultation process started right after getting home from Entebbe, Uganda in December 1999. Due to the inter-linkages between different pillars, it was suggested that a working group at the country level would be formed to coordinate the consultation process. This working group is comprised from the national experts in addition to the TAC members. It was under the guidance of His Excellency the Minister of Irrigation & Water Resources. The working group meetings were biweekly starting December 22,1999.

The formatted tables 1, 3 and 5 were distributed to 22 National institutions related to Nile Basin Initiative. A list of the institutions contacted is shown below. The initial response

was very slow, albeit, some very important indications about the major environmental issues and Priority Actions came out from the responses received. The data collected from these institutions, up to the workshop were analyzed and arranged for presentation during the workshop (Table 9).

During the period from December 23, 1999 to February 7, 2ooo, the consultation process focussed on actual visits to the following institutions with the aim of:

(1) Collecting any pertaining information
(2) Institution's perspective on major environmental threats in the Nile or its tributaries
(3) Institution's perspective on Priority Actions.
(4) Potential project components.

The contacted Institutions are:

(1) Institute of Environmental Studies
(2) National Forest Corporation
(3) Higher Council of Environment & Natural Resources
(4) Ministry of Irrigation and Water Resources
(5) Ministry of Agriculture and Forestry
(6) Ministry of Justice
(7) Ministry of International Cooperation & Investment
(8) Ministry of Economic Planning
(9) Ministry of Animal Resources
(10) Animal Resources Research Corporation
(11) Agricultural Research Corporation
(12) Hydraulic Research Station
(13) Institute of Environment and Natural Resource Research
(14) College of Agriculture, University of Khartoum
(15) College of Environment & Natural Resource Studies/Juba University
(16) Sudanese Environmental Society, NGO
(17) Environmentalist Society, NGO
(18) Wildlife Research Center
(19) Fisheries Research Center
(20) Wildlife Department
(21) The Higher Council of Civil Defense
(22) Institute of Disaster Management

Individuals:

Prof. Asim Mograbi, Biologist
Prof. Mahmoud A. Mahmoud, Agro - breeder
Mr. Yahya Abd El Mageid, Irrigation Engineer
Mr. Mohamed Osman El Samani, Rural Development Specialist
Dr. Hamid Ali El Hag, Director, UNESCO Chair on water
Dr. Kamal Badi, Former Director, FNC.

A one-day workshop was organized on February 8th 2000 at Al Shaheid El Zubeir International Conference Center in Khartoum from 9:00am to 2:00pm. The timetable of the workshop is shown as Appendix A. A wide range of stakeholders was invited to attend the workshop as seen from the list of invitees (Appendix B).

The workshop was officially opened by His Excellency the Minister of Environment & Tourism. The Minister of Irrigation and Water Resources was unable to attend the opening ceremony due to participation in another important workshop held at the same time on privatization of the electricity sector. Sure, some of the concerned stakeholders participated in the electricity workshop.

The National Consultant gave a presentation that covered:

(One) NBI overview
(Two) The Environmental Analysis and Management Component
(Three)The Basic Environmental Issues
(Four) An initial analytical overview of the Environmental Issues
(Five) An initial listing of the Priority Actions.

The Nile- TAC member, Dr. Osman Eltom Hamad, chaired the workshop where a through discussion of the presentation took place. A separate report on the workshop deliberations was prepared in Arabic due to that most of the participants spoke in Arabic (it will be translated into English). Much of the comments, suggestions, and concerns elaborated by the participants were reflected in the National Report.

The main constraint to the consultation process was the awareness factor. Many institutions and individual complaint about the fact that this is the first time they here about the NBI. Considerable time was spent on the introduction of the objectives of the unfolding process. The second constraint was the limited funding that is available for the consultation process including the workshop. It was clear from the comments of the workshop participants that a one day activity is not enough to introduce the idea of the environmental analysis and management component. Due to the limited funding available, it was very difficult to consult with some of the potential stakeholders especially outside the capital Khartoum. The response to the consultation was very low due to the problem of conflict of interest. Some of the consulted institutions think that this initiative was theirs.

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Table 1. Population of Major towns along the Nile

Town	Population
Dongola	61,290
Edamar	89,507
Atbara	87,878
Khartoum	3512,144
Medani	211,251
Sennar	186,392
Singa	84,281
Damazine	100,861
Roseires	142,608
Eldiuem	132,635
Kosti	210,924
Rabbak	59,261
Malakal	-
Juba	-
Wau	-

Source: Fourth Population Census of Sudan 1993

Table 2. Gross Domestic Product of the Sudan and of agriculture at factor cost at 1981/92 prices for the period 1985/86 - 97.

Year	GDP	Agric. GDP	Agric. Contribution
85/86	6259	2364	38
86/87	6526	2354	36
87/88	6267	1927	31
88/89	6228	2076	31
89/90	6614	2003	30
90/91	6691	1918	29
91/92	7447	2552	34
92/93	8389	3188	38
93/94	8990	3605	40
94/95	9757	4245	44
96	10438	4697	45
97	1113	5235	47

Source: Ministry of finance

Table 3: Internal and External Water available in Billion m3/year

Water Resources	**Quantity**	**Constraints**
Sudan present share from the Nile	20.5	Seasonal pattern coupled with limited storage facilities
Non-Nile Streams	5.4	Highly variable, short duration flows which are difficult to monitor or harvest. Some are shared with neighbors.
Renewable Ground Water	4.1	Deep water entailing high cost of pumping. Remote areas of weak infrastructure.
Present Total	**30.0**	
Expected share from reclamation of swamps	6.0	Capital intensive with considerable social and environmental cost
Total	**36.0**	

Source: draft Sudan National Water Policy

Table 4: Livestock numbers during the period 91/92-97 (000 heads).

Year	Cattle	Sheep	Goats	Camels	Total
91/92	21630	23043	18650	2787	66110
92/93	25091	26317	22693	2849	77150
93/94	27571	30977	27567	2886	89001
94/95	30077	37146	33319	2903	103445
96	31699	37202	35216	2915	107911
97	33103	39835	36037	2936	111911

Source: Ministry of Animal wealth.

Table 5: National Laws and Regulations related to Nile Environment and Resources in Sudan

Laws, Ordinance, Regulations		Year (in force)	Government Agency Concerned
1.	Environmental Policy Act	Draft Proposal, 1996	HCENR and Attorney General
2.	Water Resources low	1995	Ministry of Irrigation
3.	Irrigation & Flood Contract Act	1990	Ministry of Irrigation
4.	Environmental Health Act	1993	Ministry of Health
5.	Public Health Act	1953	Ministry of Health
6.	Rural Water Provision & Development Corporation Act	1967	National Water Corporation
7.	General Electricity & Water Corporation Act	1966	Ministry of Energy & Mining
8.	Water Hyacinth Act	1960	Ministry of Agriculture & Forestry
9.	Freshwater Fisheries Act	1954	Ministry of Animal Wealth
10.	Nile Pumps Control Ordinance	1939	Ministry of Irrigation
11.	Nile Pumps Use Control (Tenancies Regulation)	1969	Ministry of Irrigation
12.	Nile Pumps Control (General Amendments '2' Regulations)	1969	Ministry of Irrigation
13.	Nile Pumps Control (Stand by) Regulations	1953	Ministry of Irrigation
14.	Nile Pumps Control (General Regulations)	1951	Ministry of Irrigation
15.	Public Farms Ordinance	1939	Ministry of Irrigation
16.	Regulation of Inland Navigation Act	1990	River Transport Corporation
17.	Wildlife Conservation & National Parks Act	1987	Ministry of Interior
18.	Wildlife Conservation Forces Act	1981	Ministry of Interior
19.	Wildlife Protection Act	1936	Ministry of Interior
20.	Hides & Animals Skins Act	1954	Ministry of Interior
21.	Preservation of Wild Animals Act	1935	Ministry of Interior
22.	Game Regulations	1935	Ministry of Interior
23.	National Parks, Sanctuaries & Reserves Regulations	1939	Ministry of Interior
24.	Arms Ammunition & Explosive Ordinance	1933	
25.	Local Government Act	1981	Various
26.	Forest Act	1989	Ministry of Agriculture
27.	Forest National Corporation Act	1989	Ministry of Interior
28.	Central Forests Act	1932	Ministry of Interior
29.	Provincial Forest Act	1932	Ministry of Interior
20.	Mining & Quarries Act	1973	Ministry of Energy & Ministry
21.	Plant Diseases Act	1913	Ministry of Agriculture & Forestry

32.	Agricultural Pest Control Act	1919	Ministry of Agriculture & Forestry
33.	Seeds Act	1990	Ministry of Agriculture & Forestry
34.	Mining & Quarries Regulations	1972	Ministry of Energy & Mining
35.	Mechanized Farming Public Corporation (establishment Regulation)	1975	Ministry of Agri. & Forestry
36.	Land Settlement & Regulation Act	1925	Local Government Admin.
37.	Taxation of Land & Date Trees Ordinance	1925	Ministry of Agriculture
38.	Town & Village Planning Act	1961	Local Gov. Administration
39.	Acquisition Act	1970	Local Gov. Administration
40.	Unregistered Land Act (Receded)	1970	Local Gov. Administration
41.	Encouragement & Investment Act	1991	Ministry of Finance & Economic Planning

Table 6: Status of Some International and Regional Environmental Conventions/Agreements in Relation to Sudan

Convention	Signature	Ratification	Accession
Convention on Biological Diversity (1992)	*		
United Nations Framework Convention on Climate Change 1992	*	*	
International Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification particularly in Africa (1994)	*		
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989)			
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	*	*	
Convention concerning the Protection of the World Cultural Heritage (1972)			
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971)			
United Nations Law of the Sea (1982)			
Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1991)	*	*	
Lusaka Agreement on Co-operative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (1994)			

Source: Tolentino (1994)

Table 7. Protected Areas of *Sudan*

Protected area	Size 1000 ha	Year declared	Major habitats and significant species	Impacts and conflicts	Management	Global recognition
Dinder National Park	890	1935	- Acacia, Balanites combretum types and Revered plus Mayas - Acacia nilotica, Ziziphus doom palm and Tamari	Use of park Resources and frequently trespassing by nomads	No comprehensive management plan	Biosphere Resource category IX
Sabaloka Game Reserve	116	1946	- Semi desert Acacia tortilis on western bank of Nile - Gazzetted for Vila sheep now extinct - Migrant and endemic birds found in the reserve	Human influence illegally use of Resources	No Comprehensive management plan	Category VI
Fanyikango Game Reserve	48	1935	- seasonal and permanent swamps - Echinochloa stagnina type of vegetation - Mammal, sp. Such as Nile lechewe , hippo and crocodiles	Poaching and Trespassing	No Comprehensive management Plan	Category VI
Zeraf Game Reserve	970	1939	- seasonal swamps include most of sudd - home of elephant herds, Nile lechwe, sitatringe and swamps dwelling animal and birds	Human activities	No Comprehensive Management plan	Category VI
Shambe National Park	62	1985	- Flood plain grassland - Papyrise papyrus, vetriveria nigritana, and Echinochloa stagrina - Protection of white rhino and birds	Poaching or illegal use of Recourses by community	No Comprehensive management plan	Category II
Badinigilo National park	1,650	1986	- Rolling Savannah country with small ranges of hills and Nile riverine - Scattered large trees including dom palm (hyphaena spp.) poor Acacia sayel.	Extensive seasonal poaching and trespassing	No Comprehensive management plan	Category II
Juba Game Reserve	20	1939	Deciduous woodland and grassland around Juba town	Human activities, settlement, of displaced destruction of trees for charcoal	No Comprehensive management plan	Category VI
Nimule National Park	41	1954	- Woodland Savannah or bush with sprinkling of Tamariduse indica. - Elephant and other species	Fishing and Poaching	No Comprehensive management plan	Category II
2. Sudan Killepo Game Reserve	120.000 ha.	1975	• This park falls within the mountains Savannah grasslands with potential flora & funna Spp. • On the Uganda side, this park enjoys complete protection.		• Currently no obvious pressu • No information available ab conflict.	

Table 8: Threats to the Nile Environment and Resources in Sudan

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
		Land Degradation			
Deforestation	1. Decrease in tree cover 2. Scanty trees. 3. Reduction in areas suitable for wildlife 4. Drying up of habitat 5. Reduction in numbers. 6. Deterioration in plant cover	1. Consumption fuel. 2. Building materials 3. Human migration 4. Agricultural activities. 5. Tree Cutting for charcool	1. Drought. 2. Population increases. 3. Human activity. 4. Aridity	High	High
Soil erosion	1. Gully Erosion. 2. Sand creep. 3. Wind erosion	1. Removal of the green cover. 2. . Removal of trees	1. Drought. 2. Human activities. 3. Change in climate. 4. Desertification.	High	High
Wetland degradation	1. Less diversity richness. 2. Deterioration of habitat. 3. Drying up of habitats.	1. Water pollution. 2. Human activity. 3. Over grazing 4. Farming	1. Lack of funding. 2. Human activity. 3. Agricultural activities	High	High
River bank and lakeshore degradation	1. Erosion. 2. Bare Land. 3. Haddam erosion	1. Human concentration. 2. Animal concentration. 3. Erosion.	1. Agricultural activities. 2. Urban development	High	High
Mining impacts	1. Erosion.	1. Removal of vegetation cover. 2. Poisonous pollutant.	1. Lack of planning. 2. Disimplimentation of legislation	High	High
Loss and destruction of valuable species, special ecosystems and habitats	1. Disappearance of valuable species, Varieties, cultivators in Range Ecosystem 2. Agrobiodiversity 3. Disappearance of important flora and funna	1. Consumption fuel. 2. Agricultural activities. 3. Over grazing	1. Drought. 2. Population increases. 3. Human activity. 4. Aridity	High	High

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
Water quality degradation:					
Pollution (point and non-point source)	1. Industrial wastes. 2. Agric. Chemicals. 1. Health hazard of irrigation canals water	1. Concentration of Agro Industrial plants 2. Agro Chemical uses Close to the rivers. 3. Waste disposal.	1. Presence of agro-Industrial Plant 2. Agro-Chemical use 3. Lack of pit latrines	High	High
Eutrophication	1. None.	1. None.	1. None.	High	High
Water weeds infestation	1.Navigation risk. 2. Evaporation. 3. Reduction in crop yield.	1. Movement along the river Nile. 2. Mismanagement of funding	1. Introduction of species. 2. Human activities.	High	High
Water borne diseases	1. Epidemic diseases. 2. Illness.	1. Lack of sanitation. 2. Sewage discharge	1. Water borne microbes. 2. Lack of latrines 3. Lack of sewage system.	High	High
Siltation	1. Gully erosion. 2. Decreased dams reservoirs	1. Removal of vegetation covers. 2. Human activities.	1. Bad watershed management. 2. Water erosion.	High	High
Sewerage discharge in lakes (from boats)	1. Eutrophication 2. Alteration of environs. 3. Threat to public health.	1. Lack of sewage treatment plants. 2. Lack of maintenance of existing plants	1. Inadequate pollution control regulation 2. Monitoring. 3. Enforcement.	High	High
Urban and industrial issues					
Sanitation concerns (urban runoff, sewerage discharge)	1. Health emergency during rainy season. 2. Eutrophication 3. Alteration of environment. 4. Threat to public health	1. Lack of pit latrines 2. Lake of waste management plan 3. Migration to big cities. 4. Lack of sewage treatment plants. 5. Lack of maintenance.	1. Lack of Planning 2. Poverty. 3. Inadequate 4. Pollution control 6. Regulation 7. Monitoring. 8. Enforcement.	High	High
Urban planning and industrialization on lakeshores and river banks	1. Pollution of drinking water 2. Accumulation of waste and Garbage 3. Conversion of agricultural lands to settlements. 4. Destruction of habitats.	1. Migration 2. Lack of land use planning	1. Lack of Planning 2. Concentration of economic activities. 3. Unsustainable development.	High	High
Water-borne diseases	1. Diseases among displaced people.	1. Lack of awareness.	1. Sanitation 2. Lack of awareness 3. Lack of planning 4. Poverty.	High	High

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
Disaster preparedness and remediation					
Navigation risks, aids, and mapping	1. Water pollution 2. Risk of ship collision	1. Use of old ships 2. lack of technology 3. Inaccurate navigation charts	1. High cost of replacement 2. Hazards due to hinted depth channels	Medium	Medium
Oil spills	1. Fresh water pollution 2. Destruction of Habitat 3. Loss of species	1. Lack of monitoring 2. Use of old ships 3. Pollution	1. Lock of EIA 2. Lack of new technology 3. Lack of oil spills contingency plans 4. mis-management	Low	Low
Floods and droughts	1. Displacement and migration 2. Loss of properties 3. Outbreak of diseases 4. Dryness 5. Loss of Biodiversity	1. Deforestation 2. Lack of early warning systems 3. Dryness 4. Mismanagement 5. Climatic conditions	1. 1.Lack of disaster management plans 2. 2.Lack of planning 3. climate change 4. Erosion 5. Human activities	High	High
Refugee problems	1. Destruction of natural resources	1. Political instability 2. Wars 3. Natural disasters	1. Conflict over natural Resources 2. Civil unrest	High	High
Uncertain impacts of climate change	1. Loss of species 2. Ecosystem degradation 3. Desertification 4. Wildlife habitat deterioration 5. Impacts on food security	1. Forest fires 2. Human and climate 3. Irregular rainfall and its distribution	1. Emission of green house gases	High	High

Table 9: Sudan energy supply (1992)

000 Ton eq petroleum		
Type	**Supply**	**%**
Hydropower	86	1
Petroleum	1356	12
Bio energy	9647	83
Residents	588	5
Total	11677	100

Source: Ministry of energy. Energy balance 1994.

Table 10: Afforested area's (1993/94 season).

Type	**Area**
Within reserved forest	29158
Sand dune fixation	653
Around rainfed farms	630
Within community forest	69
Within public building	236
Total	30,728

Source: National Forest Cooperation annual reports 1993/94

Table 11: Recent, Current and Planned Environmental Initiatives, Programmes and Projects in *Sudan*

Programme / Project	Period	Budget (US$)	Implementing Agency
1. Rehabilitation of Dinder National Park	2000 - 2002	1,25 million	Higher Council for Environment and Natural Resources
2. Census of water birds	1 month	2000	W.C.A Wildlife conservation Administration (WCA)
3. Establishment & Information Center		3000	W.C.A
4.Establishent & Monitoring Blocks		5000	W.C.A
5. Surveys of Key wildlife areas		5000	W.C.A
6. Establishing wet lands protected areas		10000	W.C.A
7. Wildlife Research Pilot farm Khartoum	1997-99	5000	Wildlife Research Center
8. Watershed Management in D.N.P	1996-99	2000	W.C.A
9. Assessment of wildlife Resources in semi-arid regions of Sudan	1997-99	2500	W.C.A
10. Assessment of wildlife Habitats of Protected areas in Sudan	2000-2005	25000	W.C.A
11. Forest Rehabilitation	92-95	400,000 1,624,100	Forest National Corporation
12. Forestry Development in the Sudan	1992 - 1996	7,699,609	FNC
13. Restocking of Gum Arabic Belt (UNSO)	1990 - 1994	3,670,660	FNC
14. Restocking of Gum Arabic (Norway)	1989 - 1992	644,431	FNC
15. Afforestation and Reforestation in Northern Sudan	1986 - 1992	3,3293,828	FNC
16. Management of Jabel Marra Forests	1989 - 1997	21,519,70 DM	FNC
17. VILLAGE Extension Section	1990 - 1993	598,319 Sterling	FNC
18. Diagnosis and combating Desrtifcation in different areas	Long term	2 Million	Land and Water Research Center (ARC)
19. Reclamation of Degraded Soils	Long term	1 Million	DILTO
20. Climate Change Enabling Project	1997-1999	290.000$	HCENR
21. National Biodiversity Strategy &Action Plan (NBSAP) Enabling Activity	1999	334.000 $	HCENR
22. Support to a Strategic Planning Process Aiming at Environmentally Sustainable Development in the Sudan	1996-1999	500.000 $	HCENR

Table 12. Priority Actions in *Sudan*

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
1. Floods &droughts	1. Development of disaster management plan 2. Strengthening the early warning system. 3. Data base formation	1. National	1. Technical development 2. Capacity building 3. Collection, analysis and exchange of information	High
2. Soil erosion and siltration	1. Development of Watershed Management plans 2. Monitoring 3. Combat water erosion	1. National	1. Technical development 2. Management information 3. Capacity Building.	High
3. Water borne diseases	1. Provision of Health care and Immunization 2. Disaster control measures	1.National. 2. Regional	1. Technical development 2. Capacity building 3. Human resources development. 4. Contingency plans	High
4. Water weeds infestation	1. Use of biological Control 2. Use of plant residue for energy production.	1. National 2. Regional	1. Technical development 2. Capacity building 3. Feasibility studies 4. Management plans	High
5. Deforestation	1. Establish agro forestry activities development 2. Integrated landuse planning	1.National. 2. Regional	1. Technical development 3. Management information 4. Capacity building	High
6. Biodiversity	1. Development of biodiversity conservation strategy &action plans 2. Development of management plans	1. National	1. Assessment studies 2. Management information 3. Capacity building	High
7. River Bank Erosion	1. Regulation of Flow 2. Development of landuse Plan	1. National 2. Regional	1. Sediment transport and morphology Studies and research 2. Capacity buildings 3. Technical development	High
9. control of pesticide use	1. Regulation 2. Awareness programmes	1. National 2. Regional	1. Use of organic fertilizers 2. Technical development 3. Capacity building	High
11. urban Development	1. Upgrading of solid waste management 2. City expansion plans 3. Regulations	National	Feasibility study capacity building Technical development	High
12. industrial development	1. Feasibility study 2. Development of EIA guidelines 3. Development strategies	National	1. Feasibility study 2. capacity building 3. Technical development	High
13. Community Development	Development and Implementation of poverty alleviation programmes	National	1. Feasibility studies 2. Technical Assessment 3. Technical Development	High

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
14. Wetland degradation	1. Water sanitation 2. Development of Human activities 3. Management plan 4. Data base information	National	1. Technical development 2. Capacity building 3. Collection & analysis and exchange of information	Higr
15. Mining impact	1. Development of management plans 2. Implementation of legislation	Local	1. Awareness programme 2. Capacity building 3. Technical development	Medium
16. Siltation	1. Watershed management plans 2. Galley erosion control. 3. Sustainable development strategies	National	1. Constriction of dams 2. Technical development 3. Capacity building	High
17. Sewerage discharge in lakes and river banks	1. Increase of sewage treatment plants. 2. Regulation 3. Maintenance of existing plants	National	1. Adequate pollution control regulation and monitoring 2. Technical development 3. Capacity building	High
18. Refugees problem	1. Political stability 2. Contingency plans 3. Precautionary measures	National	1. Sustainable development 2. Rehabilitation of affected areas 3. Capacity building	High
19. Uncertain impacts of climate change	1. Regulate human activity 2. Regulate forest fires	National	1. Decrease emission of green gases 2. Capacity building	High

Appendix A: The Workshop timetable:

OPENING SESSION	
9:00 – 9:10	Workshop overview / HCENR
9:10 – 9:20	Nile Basin Initiative Overview / TAC
9:20 – 9:30	UNDP Representative
9:30 – 9:40	Minister of Environment and Tourism
9:40 – 10:00	Minister of Irrigation and Water Resources
10:00 – 10:30	BREAKFAST
10:30 – 11:30	Presentation of Draft National Report
11:30 – 1:15	Discussion
1:30 – 2:00	Recommendation
OPENING SESSION	
9:00 – 9:30	Workshop overview / HCENR
9:10 – 9:20	Nile Basin Initiative Overview / TAC
9:20 – 9:30	UNDP Representative
9:30 – 9:40	UNDP Representative
9:40 – 10:00	Minister of Environment and Tourism
10:00 – 10:30	Minister of Irrigation and Water Resources
10:00 – 10:30	BREAKFAST
10:30 – 11:30	Presentation of Draft National Report
11:30 – 1:15	Discussion
1:30 – 2:00	Recommendation

Appendix B: A LIST OF INVITED INSTITUTIONS AND INDIVIDUALS TO THE WORKSHOP

1. Environmental Studies Institute
2. Faculty of Health (University of Khartoum)
3. Faculty of Science (University of Elneelein)
4. Faculty of Science (University of Khartoum)
5. Almagboal Institute (University of Sudan for Science &Technology)
6. Geologist Trade Union
7. UNISCO National Committee
8. Agricultural Research Corporation
9. Ministry of Agriculture and Forestry
10. Higher Council for Environment & Natural Resources
11. Sudanese Environmental Conservation Society
12. Agricultural Engineers Union
13. Sudanese Engineering Society
14. Union of Engineers
15. Ministry of Irrigation – Nile water corporation
16. Ministry of Irrigation – Planning Administration
17. Ministry of Irrigation – Dams Administration
18. Hydraulic Research Station
19. Water &Irrigation Administration Institute
20. Irrigation Water Administration
21. UNISCO Chair for Water
22. Abas Hidait Allah, Consultant, Ministry of Irrigation.
23. National Electricity corporation
24. Khartoum Water corporation
25. Sudan Meteorological Authority
26. Under Secretary - Ministry of Irrigation
27. Farmers Union
28. Sugar corporation
29. State Support Fund
30. Ministry of International Cooperation
31. Ministry of Finance & National Economy
32. Ministry of Justice - under secretary
33. Ministry of Animal Resources - under secretary.
34. Arab Organization for Agricultural Development.
35. River Transportation Administration.
36. Ministry of Agriculture - under secretary.
37. State Minister - Ministry of Agriculture & Forestry.
38. National Coordinator, F A O Regional Projects, Coordinator
39. Khartoum State Water Company.
40. Khartoum State, Ministry for Engineering Affairs.
41. Khartoum State Ministry of Finance.
42. Administration for Ground & Surface Water.
43. Social & Economic Research Institute.
44. Energy Research Institute.
45. Department of political science –university of Khartoum.
46. World Health Organization.
47. Save the Children -Great Britain.

48. Environmentalist Society.
49. Sinnar State, -Minister of Agriculture.
50. Sinnar State, -Minister of Engineering Affair.
51. Gazira State, - Minister of Agriculture
52. Gazira State, - Minister of Engineering Affair.
53. Bawadina Society (NGO).
54. Arab corporation for Investment.
55. Environment Research Institute and Natural Resources.
56. Ministry of Industry.
57. Wildlife Administration.
58. Minister of Environment &Tourism.
59. Ministry of Environment &Tourism-under secretary.
60. National Drought & Desertification Control Unit
61. Higher Council for Population.
62. Fredrich Ebert Foundation.
63. General Corporation for Irrigation Works & Streams Earth Moving.

Map of Sudan


LIBYA
EGYPT
SAUDI ARABIA
Wādī Hālfā
Port Sudan
Red Sea
Nile
CHAD
KHARTOUM
Kassalā
ERITREA
Blue Nile
White Nile
ETHIOPIA
CENTRAL AFRICAN REPUBLIC
0 150 300 km
0 150 300 mi
Juba
DEM. REP. OF THE CONGO
UGANDA
KENYA