



# Nile Basin Initiative



E. Nile Technical Regional Office (ENTRO)  
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## Eastern Nile Watershed Management Project Cooperative Regional Assessment (CRA) for Watershed Management

### EASTERN NILE WATERSHED MANAGEMENT PROGRAMME



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## **DISCLAIMER**

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## **ACKNOWLEDGEMENTS**

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## INTRODUCTION

The purpose of this component of the Watershed Management CRA is to:

- design long-term cooperative watershed activities to ensure continued exchange of experiences, professional exchanges, monitoring of program impact, as well as capacity building activities to sustain a successful program of action, and
- identify through analysis the next round of watershed management projects that are promising from a local livelihoods as well as a regional benefits point of view and are rational in view of anticipated multipurpose developments in the Eastern Nile region.

The Report is presented in three parts. Part 1 provides a Strategic Framework for the Cooperative Watershed Management Programme. It examines the challenges facing the three countries and peoples of the Eastern Nile Basin in terms natural resource degradation, achieving sustainable livelihoods and reducing poverty. The Report goes onto to identify opportunities to meet these challenges and outlines the benefits that can accrue at the household/community, the national, the Regional/Basin-wide and the Global levels. Finally, Part 1 sets out the issues and elements of a strategic framework as a basis for a Cooperative Watershed Management Programme.

Part 2 of the Report comprises the Programme Implementation Plan for the Cooperative Eastern Nile Watershed Management Programme. The Programme will continue the work of the existing Watershed Management CRA and will ensure a continued exchange of experiences, professional exchanges, monitoring of program impact, as well as capacity building activities to sustain a successful program of action.

Part 3 comprises Project profiles of ten first-round Projects that will be prepared in detail as one of the Components of the Cooperative Watershed Management Programme. These projects have been identified as having met four broad sets of criteria:

- The projects will support and enhance cooperation among the three Riparian Countries in sustainable watershed management.
- Local, National, Regional and where possible Global benefits will accrue to the projects.
- The project will address the threats to the Biodiversity and Natural Resource "hotspots" identified in the Transboundary Analysis. and
- The projects will where possible support other IDEN Projects, the JMP and other NBI projects.

**EASTERN NILE COOPERATIVE WATERSHED  
MANAGEMENT PROGRAMME**

**PART 1.**

**STRATEGIC FRAMEWORK**

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## 1. INTRODUCTION

The results of the Trans-boundary, Distributive and Cooperative Mechanisms Analyses of Eastern Nile Watershed Management Cooperative Regional Assessment (CRA) provided a broad understanding of:

- the baseline conditions in each watershed, root causes of land degradation on national level and lessons from past experience in watershed management,
- each of the selected sub-basins as "*integrated*" watershed systems,
- the challenges and opportunities for cooperative watershed management,
- the cumulative costs and benefits of alternative watershed management interventions,
- the potential distribution of costs and benefits under alternative benefit sharing scenarios, and
- the nature and scope for generating regional public goods<sup>1</sup> through the watershed management project(s).

This Part of the Report provides a Strategic Framework for a Cooperative Watershed Management Programme. It summarizes the results from the previous Trans-boundary, Distributive and Cooperative Mechanisms Analyses. It examines the challenges facing the three countries and peoples of the Eastern Nile Basin in terms natural resource degradation, achieving sustainable livelihoods and reducing poverty. The report goes onto to identify opportunities identified to meet these challenges and outlines the benefits that can accrue at the household/community, the national, the Regional/Basin-wide and the Global levels. Finally, the Report sets out the issues and elements of a strategic framework as a basis for cooperative watershed management activities.

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<sup>1</sup> A regional public good here can be seen as the positive 'spill-over' effects of a country-level activity or asset in neighbouring countries.

## **2. CHALLENGES FACING SUSTAINABLE WATERSHED MANAGEMENT IN THE EASTERN NILE BASIN**

### **2.1 Natural Resource Degradation in the Eastern Nile Basin**

#### **2.1.1 Land Degradation**

Land degradation comprises a number of processes. The main processes affecting the Eastern Nile Basin include (i) soil erosion by water and wind, (ii) soil nutrient and organic matter depletion, (iii) physical degradation (crusting, pan formation, and (iv) salinization. Soil erosion by water and its complement high sediment loads in streams and rivers together with soil nutrient depletion are the two major land degradation processes. These have major impacts on agricultural production and thus on peoples' livelihoods.

It must be emphasized that the physical impacts and costs outlined below do not reveal to full extent of the social and economic costs to the rural (and urban) population in terms of those key elements in the downward spiral of poverty and a degrading resource base such as poor nutrition and health, poor access to social services (health and education) and restricted access to alternative livelihood strategies.

#### **(i) Soil Degradation in Ethiopia**

Agricultural production forgone is caused by soil erosion, dung/crop residue burning and crop removal through:

- (i) Reduced moisture-holding capacity and nutrient loss from soil erosion.
- (ii) Nutrient breaches due to the burning of dung and crop residues and grain removal.

The total amount of soil eroded each year in the Eastern Nile Basin is estimated at 447 million tons with 68 percent, 22 percent and 10 percent eroded in the Abbay, Tekeze and Baro-Akobo Sub-basins respectively. Of the total, 151 million tons (33 percent) is from cultivated land and 201 million tons is from mainly communal grazing and settlement areas. The area of cultivated land whose use is considered to be unsustainable<sup>2</sup> is estimated at 4.7 million ha.

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<sup>2</sup> Where the rate of soil loss exceeds that of soil formation of 9 t/ha per year.



**(a) Cropland:**

The impact on crop production due to the decline in soil-moisture holding capacity caused by soil erosion is the loss of 15,570 tons/yr of grain. Each year this loss accumulates so that the loss of crop production in 25 years time will be 389,150 tons/yr. Soil erosion also causes a loss of soil nutrients that decreases crop production annually and non-cumulatively by 44,650 tons/yr.

The breaches in soil nutrient cycling caused by dung/crop residue burning and crop removal reduce crop production annually and non-cumulatively by 207,863 tons and 677,470 tons respectively. The total crop production forgone is shown in Table 1.

**Table 1. Annual Crop Production Forgone Due to Soil Erosion, Dung/Crop Residue Burning and Crop Removal in Ethiopia in the Eastern Nile Basin (tons/yr)**

Cause	year 1	year 25
Loss in soil moisture-holding capacity due to soil erosion	15,570	389,150
Nutrient loss due to soil erosion	44.650	44.650
<b>Total due to soil erosion</b>	<b>60,220</b>	<b>433,800</b>
Nutrient breaches due to dung/crop residue burning for fuel	207,860	207,860
Nutrient breaches due to crop removal	677.470	677,470
<b>Total due to nutrient breaches</b>	<b>885,330</b>	<b>885,330</b>

Crop production lost due to soil erosion as a proportion of total annual crop product is 1 percent in year 1 rising to 8 percent in year 25. The proportion lost to the annual breaching of the soil nutrient cycle is 14 percent of total annual production.

In monetary terms the losses due to soil erosion are estimated to be US\$ 11.6 million rising to US\$ 90.6 million after 25 years. Annual (non-cumulative) losses due to nutrient breaches are valued at US\$ 185 million/yr. Put another way, annual losses due to soil erosion could feed 301,000 adults rising to 2.2 million people in 25 years time. Losses due to nutrient breaches could feed 4.4 million people. This is the human cost of soil degradation in the Ethiopian Highlands.

**(b) Non-cropland Land:**

Some 66 percent of sheet erosion occurs on non-cropland, which is essentially communal lands used for settlement, grazing and fuelwood collection. This land is invariably on steep slopes with shallow soils, overgrazed with wood biomass extraction rates often exceeding sustainable growth rates. The result is a downward spiral of pasture and woody biomass degradation leading to accelerated soil erosion, increasing shortages of livestock feed and decreasing supplies of fuelwood. Decreasing supplies of

fuelwood result in the increasing use of dung and residues as fuel leading to increasing breaches in soil nutrient cycling and to declining crop yields.

**(c) Trends in Soil Erosion without Watershed Management interventions.**

With the natural increase in population the area under cropland will increase. Whilst some of the expansion will occur as infilling on suitable land, much will take place on land marginal for crop production because of shallow soils and steep slopes. In the absence of substantial watershed management interventions it is estimated that by 2025 cropland will expand by some 2.93 million ha in Ethiopia in the Eastern Nile Basin.

Assuming a similar distribution of slopes and soils as current cropland it is estimated that total soil erosion on cropland will increase by 27.2 million tons/yr or an increase of 18 percent on current rates. Using the estimated Sub-basin sediment delivery ratios there would be increases of 7.0 million tons/yr, 4.3 million tons/yr and 0.52 million tons/yr of suspended sediment in the Abbay-Blue Nile, Tekeze-Atbara and Baro-Sobat Rivers respectively.

**(ii) Soil Degradation in Sudan**

**(a) Gulley Erosion**

Extensive *kerib* land is located along the Atbara-Setit River and to a lesser extent along the Blue Nile, Rahad and Dinder rivers. Along the Atbara River it is estimated that some 3,000 ha of land are lost each year – some 40 percent above and 60 percent below the Kashm el Girba dam. The land above the dam is under traditional rainfed cropping, whilst that below the dam is rangeland used for extensive grazing. The value of the annual accumulating loss of agricultural land above the dam is estimated to be US\$ 0.4 million/yr or some US\$ 10 million after 25 years. In human terms this represents the total loss of livelihoods for some 25,000 households.

**(b) Decline of Soil Productivity on Semi Mechanized Farms**

The annual decline in yields on the Semi Mechanized Farms (SMF's) has been estimated at 2 percent per annum (World Bank, 2003). Within the Eastern Nile Basin approximately 3.6 million ha of SMF's are cropped annually and this represents an annual loss of production of 34,400 tons/yr. This represents an accumulating loss of US\$ 7.3 million/yr in the first year rising to US\$ 56.8 million/yr after 25 years.

**(c) Decline in Soil Productivity on Traditional Rainfed farms**

Approximately 672,400 ha of small-scale rainfed cropping have been mapped in the Eastern Nile Basin. Assuming the same yields as the SMF's but with half the rate of yield decline (i.e. 1 percent/yr) this would indicate an annual cumulative loss production of 3,230 tons/yr. This represents a loss of US\$ 0.8 million in the first year rising to US\$ 15.4 million after 25 years. In human terms this annual loss in grain could feed 16,100 people.

**(d) Drifting Sand and Reduction in Land productivity: Lower Atbara, Northern White Nile (West bank) and Main Nile**

Drifting sand in areas along the Lower Atbara, the northern reaches of the White Nile and along the Main Nile reduces crop production in two major ways: (i) damage to growing plants through sand coverage and leaf stripping, and (ii) through sedimentation in irrigation canals and reduced water delivery efficiencies and costs of dredging. It is estimated approximately 30 percent of cropland was affected by sand in the Lower Atbara, reducing yields. Drifting sand in canals has also led to the need to increase irrigation frequencies because of the high infiltration rates.

**(e) Moving Sand Dunes**

The most hazardous dunes are located between Dongella and Karima. The source areas for the dune fields are the very extensive areas of loose and shifting sand that overlies the rock pavement as well as the three larger dune fields to the northwest. In addition to increased sediment suspended and bed load the sand tipped into the river causes point bars to form and these in turn cause accelerated river bank erosion.

**(f) River Bank Erosion: Sudan**

In the Main Nile in Sudan most river bank erosion occurs in the first and third of four reaches. The first reach being between Khartoum and the 5<sup>th</sup> Cataract and the third between 3<sup>rd</sup> and 4<sup>th</sup> Cataracts, with the third reach experiencing the most severe erosion. Bank erosion is caused by the large and rapid changes in water level and high river velocities together with induced flow shear on the outer banks acting on the sandy layer which underlies a cohesive clayey bank material. Surveys undertaken by the Sudan Hydraulics Research Station over a period 1989 – 1999 in the Northern State Reach of the Main Nile estimated that some 19,400 feddans had been lost or severely affected by river erosion. The cost of river bank erosion for those areas that have been surveyed is estimated to be US\$ 12.5 million.

### **2.1.2 Sedimentation**

Soil erosion from cropland leads to increased sediment loads of streams and rivers. These high sediment loads have considerable negative impacts including sedimentation of dams and reservoirs, canals in irrigation schemes, increased costs for removal sediment for domestic water supplies, damage to hydro-electric turbines and irrigation pumps.

#### **(i) Sedimentation in Dams and Ponds in Ethiopia**

The main impact of high suspended sediment loads in Ethiopia is high rates of sedimentation in small dams and water harvesting structures (e.g. tanks, cisterns). A number of evaluations have noted high rates of sedimentation and loss of storage capacity in all these structures. The estimated costs of cleaning dams, ponds and tanks are US\$ 1.75 million/yr.

#### **(ii) Sedimentation in Reservoirs and Irrigation Schemes in Sudan**

Reservoir and irrigation system sedimentation may lead to reservoir storage loss. This in turn may lead to:

- agricultural production forgone,
- higher irrigation-system operation and maintenance cost,
- increased dredging in front of turbines in-takes,
- higher cost of water purification,
- pump damage,
- river bed aggradation<sup>3</sup>.
- hydroelectricity production forgone.

The five main reservoirs in Sudan are Jebel Aulia, Roseires, Senner, Kashm el Girba and Lake Nubia. Sedimentation in the two dams on the Blue Nile has now reached equilibrium between sediment entering and leaving the dams although substantial storage has been lost in the past. Sedimentation in Kashm el Girba continues with an annual loss of storage of 1.54 percent per year. Sediment levels in the White Nile are very low and do not significantly affect the Jebel Aulia dam. Sudan does not use Lake Nubia for hydro-power generation or irrigation. Thus the sedimentation in Lake Nubia does not currently incur a cost to Sudan. As the sediment appears above the low Lake levels it will be possible to utilize this land for crop irrigated production, either by pumping directly from the Lake or from shallow groundwater or for recession cropping on residual moisture. Currently, no data is available as to the extent of this new land and its annual rate of formation.

The main costs in Sudan are due to costs of cleaning irrigation canals, increased dredging of turbine in-takes and hydro-electricity production lost due to the need for flushing the reservoirs at times of high sediment loads. In the Kashm el Girba dam there are also substantial losses of storage for

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<sup>3</sup> Causing accelerated meandering and river bank erosion.

irrigation water and consequent reductions in the amount of land that can be irrigated.

**(a) Lost Irrigation Water**

This only affects the Kashm el Girba Dam. Sedimentation is leading to downstream agricultural production forgone due to the loss of water for irrigation. Assuming a water duty of 8,140 m<sup>3</sup>/ha, the annual area of irrigated land lost is 2,457 ha. Note that these losses are cumulative. The estimated costs of this loss are US 0.15 million/yr rising to US\$ 3.75 million/yr after 25 yrs.

**(b) Costs of Canal Cleaning in Irrigation Schemes**

The main irrigation schemes affected by sedimentation in canals are the Rahad, Gezira-Mangil and New Halfa, although smaller schemes are also affected. There are an estimated 19.6 million tons/yr of sediment deposited in the canals of these three major schemes. Annual costs of cleaning the canals are US\$ 11.8 million/yr.

**(c) Costs of Hydro Power Foregone**

Because of the very sediment loads in the Blue Nile and Atbara Rivers the three reservoirs are flushed to reduce sediment deposition. This reduces the head and the amount power that can be generated during this time. It is estimated that there is a reduction of 3.27 MWH due to the need for flushing with an estimated value of US\$ 0.44 million. An additional US\$ 2.0 million/yr is spent dredging the turbine in-takes at Roseires Dam.

**(d) Fisheries Production Lost due to Reservoir Flushing**

Flushing of the Kashm El Girba Reservoir causes an annual mass kill of fish<sup>4</sup>. The estimated annual fish catch in the reservoir is 500 tons/yr out of an estimated 840 tons/yr potential (FAO, 2004). Although the exact proportion destroyed is not known using a conservative estimate of 20 percent of fish stocks killed this would represent an annual value of US\$ 620,900.

**(e) Sedimentation in the Gash Delta**

The river bed is rising at a rate of 3 cms per year. However, during the flood at Kassala bridge the river bed may be scoured to a depth of several meters. Under natural conditions the distributaries were free to wander across the delta fan. Under the water management system used today sediment is deposited along the canals.

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<sup>4</sup> Comments on 1<sup>st</sup> Draft of Distributive Analysis: Sudan Committee.

Currently only 40,000 feddans can be irrigated due to breaks in the canals and sedimentation. In the 1930's some 300,000 feddans could be irrigated. Each year some 10,000 to 15,000 tons of sediment a year are dredged from each of the seven canals. In most years maintenance is required particularly around the off-take structures to avoid them being undercut or by-passed. Many off-take structures have to be reconstructed completely.

**(f) Benefits of Sedimentation in Fields**

Some 38 percent of sediment entering the three main irrigation systems is deposited in the fields and that 1 ton of sediment is equivalent to 0.94 kgs of fertilizer; this would indicate that the annual deposition of sediment in the Schemes is equivalent to 70,700 tons of fertilizer. Assuming the fertilizer is urea the benefits accruing to sediment deposition amounts to US\$ 2.74 million/yr. The gains are annual and not cumulative due to nutrient uptake by crops, leaching and volatilization losses.

**(iii) Sedimentation in Lake Nasser in Egypt**

**(a) Loss of Live Storage**

Shalash (1982) estimated the total annual inflow as 142 million tons, the average rate of outflow as 6 million tons with a net sedimentation within the Lake of 136 million tons. Live storage is estimated at 89.7 billion m<sup>3</sup>. It is estimated<sup>5</sup> that the live storage lost to date is between 2.5 and 2.8 billion m<sup>3</sup>. This has implications for power generation and for irrigation below the Aswan High Dam (AHD).

**(b) Loss of Hydro Power**

The AHD has an installed hydro-power generating capacity of 2.1 million MW capable of generating 10,000 MWh annually. Production is currently at about 8,000 MWh/yr (Abu-Zeid & El-Shibini, 1997). With annual (cumulative) loss of live storage of 0.155 percent this represents an annual cumulating loss of approximately 12.4 GWh. Using a value of S\$ 0.10 /kWh this represents an annual accumulating loss of US\$ 1.2 million rising to US\$ 30.0 million after 25 years.

**(c) Loss of Storage of Irrigation Water**

The value of water in Egypt for irrigation is estimated<sup>6</sup> to be US\$ 0.11/m<sup>3</sup>. The annual loss of live storage is 0.139 billion m<sup>3</sup>, which represents an annual

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<sup>5</sup> Reference is Professor El- Moattassem: Communication from Chairman – Egypt Steering Committee.

<sup>6</sup> From table of Indicator Values for Egypt (1997) received from Egypt Steering Committee.

accumulating cost of US\$ 15.5 million/yr rising to US\$ 387.5 million/yr after 25 years.

### 2.1.3 Deforestation and Degradation of Wood Biomass

#### (i) Definitions

"**Deforestation**" is here defined (following Reitbergen, 1993) as:

*The permanent conversion of "forest" to non forest land cover and land use.*

Trees cleared for agriculture involves a complete change in land cover from shrubland, woodland or forest to "non forest land" and an almost complete removal of wood in the area cleared. However, wood removed for fuel does not involve a complete and instant change in land cover. Shrubland, woodland or forest may remain as those land cover types for a number of years. Instead, there is a gradual erosion of wood stocks and "**degradation**" of land cover rather than "deforestation".

#### (ii) Deforestation and Degradation of Woody Biomass in Ethiopia

##### (a) Deforestation

The main cause of forest loss is agricultural clearance. This is driven by two main factors, the decline in yields on cultivated land with the subsequent abandonment of that land from cultivation, and rural population growth and expansion of cropland.

Using 1995 as the base year, it was estimated that by 2015 some 804,300 ha of forests (36 percent), 1.7 million ha of woodlands (36 percent) and 0.3 million ha of shrublands (24 percent) will have been cleared for agriculture and settlement as a result of natural population increase. On average 32,200 ha of high forest and 67,700 ha of woodland are cleared annually. Using altitude as the criteria (between 1,100 and 1900 masl) it is estimated that 29,100 ha of high forest that is ecologically suitable for wild coffee is cleared annually.

To obtain an estimation of the cost of deforestation in the Eastern Nile Basin three Direct Use and five Indirect Use values were estimated. Direct Use values included the sustainable supply of (i) timber, (ii) poles, and (iii) fuelwood. Indirect use values included (i) carbon sequestration, (ii) watershed services, (iii) potential pharmaceutical products, (iv) species and habitat biodiversity, and (v) wild coffee gene pool. The total net economic costs of deforestation of high forest and woodland in Ethiopia in the Eastern Nile Basin

are US\$ 67.4 million/yr, which accumulating to US\$ 1,683.2 million/yr in 25 years time.

**(b) Degradation of Woody Biomass**

Degradation of forest, woodland and shrubland is caused by harvesting of wood (mainly for fuel) in excess of the natural yield and results in a reduction in woody biomass. In the Eastern Nile Basin an estimated 20 million tons of wood are unsustainably harvested as fuelwood and charcoal each year. This represents an annual accumulating loss of sequestered carbon of approximately 10 million tons valued at US\$ 30.1 million/yr. Other unquantifiable losses are of non-timber forest products (fruits, medicinal products, gums and resins, etc) and biodiversity.

**(iii) Deforestation and Degradation of Woody Biomass in Sudan**

**(a) Deforestation**

Some 5.94 million ha of woodland and shrubland were cleared for the Semi mechanized farms. The complete removal of vegetation and the consequent removal of natural predators (snakes and cats) have led to an increase in rats and other vermin. Insect eating birds have disappeared leading to a big increase in the use of insecticides and insect damage. Because the land is totally cleared of all tree cover and combined with years of constant harrowing and disking the tree seed bank in the soil has been completely destroyed. The abandoned areas are a waste land with no tree cover. The quality of the grass cover is very poor because of the very low levels of soil fertility.

Pressure on the remaining woodlands is intense. This pressure is from wood removal for charcoal, fuelwood, construction, furniture and lime burning. Estimates are not available for the whole Basin but in the Bau Locality of Blue Nile State it has been estimated, using consumption data from ENTRO (2005) and stocking data from Glen (1996), that some 224,180 ha of woodland are cleared annually. Some will have been cleared legally as part of a prescribed long-term rotation, but a substantial proportion is being cleared without permit. In the absence of definitive data it is difficult to place a value on this. In addition, closed woodland cover has a value for watershed services, Non timber forest products (NTFP's) and potential pharmaceuticals and species and habitat biodiversity.

**(b) Woodland Degradation**

Not all woodland is clear felled. Fuelwood collection often reduces the woody biomass stocks without totally removing tree cover. In the Eastern Nile Basin approximately 19.7 million m<sup>3</sup> of wood fuel and charcoal (per capita



consumption of 0.73 m<sup>3</sup><sup>7</sup> are consumed forming about 80 percent of the total energy consumption. This represents some 5.9 million tons of carbon lost with a value in the Carbon markets at some US\$ 17.6 million/yr.

#### **2.1.4 Desertification and Degradation of Herbaceous Biomass**

##### **(i) Ethiopia**

An indicator of overgrazing can be determined by examining the livestock feed energy balance. In the Abbay Sub-basin the main areas of livestock feed deficits are the upper slopes of Mount Choke in East and West Gojam, the eastern weredas in North Shewa and South Wello, with more isolated areas in East and West Wellega. These areas are largely coincident with the areas of high soil erosion hazard. In the Tekeze Catchment weredas along the eastern and north-eastern part of the basin, as well as those trending north-eastwards from the Simien Massif stand out as livestock feed deficit areas and thus likely to be severely overgrazed. Again the pattern generally mirrors that of weredas with high proportions of their area experience moderate to severe soil erosion.

##### **(ii) Sudan**

The loss of pasture land due to the expansion of the Semi-mechanized farms has put additional grazing pressure on the remaining rangelands. These have become severely degraded due to overgrazing. This has been exacerbated over the past two decades by declining rainfall. Rangeland degradation has taken the form an increase in unpalatable species or species of low forage quality. This in turn reinforces overgrazing. The Ministry of Agriculture now estimate that 50 percent of the rangelands are degraded.

The concept of "desertification" has been heavily discussed in the literature since 1977 UNEP's Desertification Conference held in Nairobi. Desertification has been described as the continuous and sustained diminution or destruction of the biological potential of the land in arid or semi arid environments. Most researchers credit Aubreville (1949) with the term. The debate revolves around whether Man or Climate is to blame. The early debates centered on Man as the primary cause with the cultivation of marginal lands and particularly overgrazing.

More recently the debate has swung back and both climate and human impacts on drylands have been shown to interact. Research has shown that even though satellite images can detect no changes in greenness – the

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<sup>7</sup> MEPD/HCENR (2003) "Sudan's First National Communications under the United Nations Framework Convention on Climatic Change: Volume I: Main Communications", Khartoum.

vegetation composition can change often un-noticed. These may be of invasive species leading to reduction in forage productivity. The vegetation thus represents a new state (Westby et al., 1989) and a return to earlier vegetation may not be possible.

Rangelands in the Main Nile and Atbara Sub-basins are reported to have degraded over the past two decades with increased presence of species of poor forage quality. This has been caused in part by the reduction in rainfall in the early 1980's exacerbated by the increased grazing pressure caused by the loss of rangeland to the large expansion of the semi-mechanized farms.

In the west and north of Sudan, long stable sand dunes have been reported to be moving and threatening agricultural land and that the Nile banks between Karima and Delgo in the Northern State are now threatened by drifting sand. Ali and Bayoumi (1999) reported that the desert area in western Sudan has increased from 205,000 km<sup>2</sup> as reported by Harrison and Jackson (1958) to 340,000 km<sup>2</sup> in 1982 and that the boundary of desert shifted about 200 km south at a rate of 8 km per year.

### **2.1.5 Degradation of Wetlands in the Eastern Nile Basin**

#### **(i) Benefits of Wetlands**

Wood (2001) distinguishes between benefits deriving from (i) "natural" wetlands and (ii) from "converted" wetlands. When converted to agriculture there are a number of additional benefits and also the loss of some environmental services and supply of wetland products. Thus, conversion involves a set of trade-offs between additional benefits and lost services and products. Additional benefits include:

- crop production: either early harvest in "hungry season" or 2<sup>nd</sup> crop,
- enable cultivation of cash crops (e.g. vegetables, sugar cane),
- forage production in wet season (upland fields are under crops).

Wetlands are important components of the hydraulic system. However, they are part of environmental, socio-economic and household livelihood systems which influence and are influenced by them (Abbot and Aferwork Hailu, 2001). The hydrological system is the key environmental linkage. Upper-catchment and upstream wetland land use affects spring and stream flows and groundwater recharge. These in turn affect the sustainable on-site wetland use such as cropping, grazing and reed collection. Similarly, these on-site activities will affect users of the wetland downstream. These complex hydrological processes have implications for wetland management and management institutions not only at the local level, but also at the State and

National levels in terms water policies, institutional and cooperative mechanisms and legislation.

The agricultural system has close linkages to the wetland system through cropping systems within the wetland, grazing systems and other extractive systems (reed cutting, apiculture, medicinal plant collection). The system has internal linkages to population growth, labour and oxen constraints, indigenous knowledge, urban market opportunities (e.g. for vegetables), livestock holdings and the need for forage.

Both systems have very close linkages to households and their livelihood assets and their food security strategies. Wetland cultivation and grazing provide important elements in households' food security strategies. Wetland conservation, which protects the natural state of wetlands has important social and economic benefits to local users. It is the poorest members of the community who rely most heavily on wetlands for collection of reeds and craft products for sale as well as for water supply. Conversion to agriculture can seriously jeopardize the hydrological functioning of the wetland and reduce or destroy its environmental services (stabilizing runoff, water purification, hydrological recharge, biodiversity) and natural products (reeds, water supply, medicinal herbs).

### **(ii) Wetlands in Ethiopia**

In the Abbay Sub-basin the most extensive wetlands are found around the shores of Lake Tana, around the shore of Finchaa reservoir and in the headwaters of the Dabus River. However, across the highlands are hundreds of small poorly drained valley bottoms. A survey and inventory of wetlands in the Amahra Region (Enyew Adgo, 2005) found that many of these wetlands were under threat due to land degradation and sedimentation, and the lack of bylaws and community rules regarding their use. Many are used for dry season grazing, hay production, thatching grass and grass mats (*cheffe*).

In the area between Gimbe and Nejo within the Dabus and Abbay sub-basins many wetlands are used for cultivation. Because of severe degradation on the upland granite soils the wetlands have become vital elements in sustaining peoples' livelihoods. However, in some areas there have been reports of over-draining of these wetlands leading to the destruction of their delicate hydrography and loss of value for cultivation (Wood, 2000).

In the Baro-Akobo Sub-basin many wetlands have been drained for crop production and grazing. Experience Sub-basin indicates that there is an optimum degree of drainage that will ensure an optimum level of agricultural production. Over-drainage<sup>8</sup> has in a number of cases damaged the wetland

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<sup>8</sup> This is caused by constructing the central drainage channel too deep and lowering the water table below the rooting level of most plants.

beyond recovery for agriculture as well as losing many of the environmental services and products. Secondly, it has been found necessary to rest the wetland for one or more years to allow recovery of nutrients and soil organic matter.

Even where a wetland is optimally drained and sustainably managed the distribution of benefits is not necessarily equitable. Some people gain whilst others lose. People who gain benefits of conversion include those households with sufficient livelihood capital assets (labour, capital) to enable them to cultivate the wetland (Solomon Mulegeta, 2004). Households with large livestock holdings will gain more than those households with few or no livestock.

Large sections of the community will suffer losses if there are severe reductions in the availability of medicinal plants, thatching grass and domestic water supplies. Women in particular will be disadvantaged if springs dry up and they are required to travel greater distances for water. Downstream users may be adversely affected by increased levels of flooding, high sediment loads in streams and poor water quality and the loss of dry season flows,

### **(iii) Wetlands in Sudan**

The wetlands in the Sudan are very extensive and extremely varied. They provide vital hydrological, ecological and livelihood services.

#### **(a) Rahad-Dinder Wetlands**

The Rahad-Dinder wetlands comprise a large number of ox-bow lakes and cutoff meanders along and between the Rahad and Dinder Rivers known as *mayas*. They are found at various stages of sedimentation: from pristine small lakes through to those completely filled with sediment. The sedimentation is due to the high sediment loads of the two rivers originating in the Ethiopian Highlands. It is reported (Salwah M. Abdelhameed et al., 1997) that the rate of sedimentation in the *mayas* is increasing.

These wetlands provide a number of environmental services and products. Unlike the valley-bottom wetlands of the Ethiopian Highlands they are not cultivated. The numbers of people and livestock using the *maya'as* as source of water are considerable. Also many people are using them as a source of medicinal plants. However, there is no quantitative data on the use of these wetland products.

The sediment trapping properties of the wetlands has both costs and benefits. Sediment trapped in the *mayas* reduces downstream sediment loads. On the other hand increasing rates of sedimentation of the *mayas* reduces their flood buffering capacity leading to higher flood peaks. The exact impact of

accelerated *maya* sedimentation on reducing their buffering capacity is difficult to estimate without some detailed surveys and modeling.

The area between the Rahad and Dinder Rivers is subject to frequent flooding causing extensive damage to crops. Some reports show that about 40 percent of crops are destroyed every 3 to 4 years<sup>9</sup>. An examination of the Africover (2003) map of the area between the Rahad and Dinder Rivers indicates that there are some 414,180 ha of large-scale semi-mechanized farms (SMF's) and 46,000 ha of traditional farms: a total of 460,180 ha. Assuming that 40 percent of this area is flooded and crops destroyed every 4 years gives an estimated area of 165,700 ha of SMF's and 18,400 ha of traditional farms affected. This translates into losses every 4 years of US\$ 0.68 million for the SMF's and US\$ 0.23 million for the traditional farming sector: a total of US\$ 0.92 million. Using a social discount rate of 5 percent and a time period of 50 years gives a net present value of these losses of US\$ 8.1 million. This provides an indication of the value of the *maya* wetlands flood buffering services.

**(b) Blue Nile Sun't Forest Wetlands**

The Blue Nile wetlands comprise the *sun't* forests of *Acacia nilotica* subsp. *nilotica* and subsp. *tomentosa*. These are found in the back-swamp areas and silt-filled ox-bow lakes that are seasonally inundated. Although protected in many areas, many of the *sun't* forests are under threat from illegal felling.

**(c) Wetlands of the Pibor Sub-basin**

The rich diversity of hydrological and ecological conditions has given rise to a rich diversity of livelihood and socio-economic systems. These have over time developed a close response to the seasonal changes in hydrology and ecology. Thus, any proposals for interventions in the hydrology require a detailed and sensitive understanding of these relationships.

The complex ecological conditions make for rich and varied patterns of habitats and species and genetic bio-diversity. The wetlands in particular support very distinctive flora and fauna that is uniquely adapted to conditions in the swamps. As with the hydrology there is a dearth of information on the ecology and biodiversity status of the Sub-basin.

Much of the variability in the hydrology is because some 70 percent of the water in the Baro and Sobat catchments originates in the high rainfall areas of the Ethiopian Highlands. Formerly these highlands comprised vast areas of sparsely populated High Forest. These provided for relatively stable hydrological conditions. Under an exponentially increasing population pressure supplemented in part by in-migration, large areas are being converted to small and large scale agriculture. Additionally, there are plans to

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<sup>9</sup> Sudan comment on 1<sup>st</sup> Draft Distributive Analysis Report.

tap the hydro-power and irrigation potential of the main rivers. These changes will have significant impacts on flow regimes and sediment loads.

The Sub-basin has seen some 30 years of civil war. As a result, the complex livelihood systems and the social networks that supported them have been seriously disrupted. Considerable movements of people have taken place and only now are many of the displaced people beginning to return. The Sub-basin is thus in a state of considerable human flux. Additionally, much of the social and economic development that was taking place just prior to onset of the Civil War has been destroyed, severely damaged or lost.

### **(d) Infestation of the White Nile with Water Hyacinth**

Water hyacinth (*Eichhornia crassipes*) appeared in the White Nile in 1957 in the area of the Sudd. It has since spread north and southwards (Abdalla Abdelsalem Ahmed, 2006). It is also reported to have appeared in the Baro in Ethiopia about 1976 (EWNHS, 1996) and is also in the Sobat system. The weed has a number of serious negative impacts. The presence of the weed in the river system leads to an increased loss of water from evapotranspiration. It also reduces the areas of open water available for fishing, which is an important livelihood strategy for the people of the Sub-basin. It also acts as impedance to river navigation along the White Nile a factor of considerable economic importance.

## **2.1.6 Loss of Biodiversity**

### **(i) Gambela Regional Park and Boma National Park**

These two Parks are considered together given their close proximity and the ecological linkages between them. The Gambela Park was proposed because of the numerous large wildlife species, particularly Nile Lechwe, White eared Kob and the Whale-headed Stork. The White Eared Kob migrates every year between the Sudd in Sudan and the Gambela Marshes. A survey by Lavrenchenko et al. (1989) inventories some 88 mammal species of 9 Orders and 28 Families. In addition to White-eared Kob they include elephant, Nile Lechwe, Topi and Road Antelope. In smaller numbers Lion, Leopard, Lelwel Hartebeeste and Buffalo are also found. There are extensive areas of swamp habitat. Some 43 species of mammals and an IBA team recorded 230 species of birds (EWNHS/Bird Life International (1996). There are two near threatened bird species: the Shoebill (last recorded in 1961) and the Basra Reed Warbler (last recorded in 1976). Golubtsov et al (1989) recorded the presence of 92 fish species belong to 51 genera and 23 families.

The Park is not legally gazetted and no Management plan has been prepared. There are no visitor facilities. The two vehicles and Park stores were destroyed during the government change over in 1991. The Park contains the

Akobo large-scale farm and Alwero Dam, and irrigation developments is currently underway in the centre of the Park. There is a critical problem of illegal hunting, with a large number of arms made available because of the Sudanese Civil War. The Phugnido Refugee Camp is located adjacent to the Park. The last major study of the area was made in 1986 by the Russian Institute of Evolutionary Morphology and Animal Ecology under the UNESCO Man and the Biosphere programme. (Sokolov, 1989) although a bird survey was undertaken in 1995-96 by the Ethiopian Wildlife and Natural History Society (EWNHS-Bird Life Int., 1996).

The Boma National Park lies close to the Ethiopian border and just 70 kms southwest of the Gambela National Park. It is located between the River Kagen in the west and the Oboth in the east, and from the River Kurin in the south to the Guom swamps in the Akobo-Pibor Spillway. Although the Park was established in 1977 it has been neglected as indeed has the area generally. This is in part due to its remoteness and in part to the fact that during the Civil War the area was contested between the government and the SPLA.

A major wildlife inventory had been undertaken in 1980 (Fryxell, 1983) and provided a baseline for the 2001 study. With the exception of population estimates for Reedbuck, Ostrich and Eland populations the 2001 estimates suggest that there has been a massive decline in nearly all animal species. The most affected were the White-eared Kob and the Mongalla Gazelle. The big increase in hunting has caused the migratory routes of White-eared Kob and Elephant to change over 20 years).

### **(ii) Dinder National Park and the Alatish Regional Park**

The Dinder National Park, which was proclaimed in 1935 is located within three States: Sennar, Blue Nile and Gedarif. Its boundaries follow to the north of the Rahad in the north, to the south of the Dinder in the south and the Ethiopian border to the east, and covers an area of 8,960 km<sup>2</sup>. It is also a designated Biosphere Reserve and has been designated under the Ramsar Convention as an international Wetland. Immediately across the border within Ethiopia the Amhara Regional State has designated an area as the Alatish Regional Park. The two Parks lie on a transition ecotone between two floristic regions: the Ethiopian High Plateau and the arid Saharan-Sudanian biomes. It also lies along the boundary of two major faunal Realms of the world: the Palearctic and the Ethiopian. It is also located along a major north-south flyway of migratory birds. The Dinder National Park has a high level of biodiversity with over 160 species of birds, 27 species of large mammals and unknown number of small mammals. It comprises the last extensive tract of woodland in eastern Sudan.

Around the Park are a considerable number of Internally Displaced Peoples taking refuge from the war in Dafur in the 1970's and are settled along the Dinder and Rahad rivers and enter the Park for fishing, fuelwood and honey

collection but also for illegal hunting and present the most serious threat to the wildlife. It is estimated that 100,000 people live around the park in 36 villages.

In Ethiopia the Amhara regional Government has proposed to develop the Alatish Regional Park in Quara wereda of North Gonder Zone, almost opposite the Dinder national Park in the Sudan. The area represents the Sudan-Guinea Biome. The park has been gazetted as a Regional Park and demarcated. However, the Park lacks national legislation and international recognition (Cherie Enawgaw et al., 2006).

The Alatish Park covers an area of 2,666 km<sup>2</sup> to the north of the Dinder River, which forms its southern boundary, and to the south of the Gelegu River that forms its northern boundary. The Alatish and other ephemeral streams drain the central area. Its altitude ranges from 500 to 900 masl. The main vegetation is woodland, shrubland and lowland bamboo thicket. Studies so far have revealed that the Park contains 48 mammal species and 180 bird species. It contains such endangered species as *Loxodonta africana*, *Panthera pardus* and *Panthera leo*.

The area is intact with no permanent settlement, although Fellata pastoralists enter the Park in the dry season with over 10,000 head of livestock. The northern and eastern sides have a 2 kms buffer zone, but the southern boundary has no buffer zone as it border Beneshangul-Gumuz regional State.

The Gumuz people have settled to the south of the Park and practice hunting and fishing along the Dinder River. Settlement is increasing and agriculture expanding along the northern boundary and numbers are being swelled by migrants from other parts of Amhara region. People enter the Park area to collect honey, gums and resins. There is an urgent need to collaborate with the Beneshangul-Gumuz Regional government and with the Government of Sudan to secure the area. The Ethiopian Wildlife Conservation Organization has strongly recommended that the Alatish Park been proclaimed a National park and that in the future it should form part of a Transboundary Park with the Dinder National Park. There is also an urgent need to develop a park management plan in participation with local communities.

### **2.1.7 Summary of Costs of Natural Resource Degradation**

It is emphasized that the costs outlined below do not reveal to full extent of the social and economic costs to the rural (and urban) population in terms of those key elements in the downward spiral of poverty and a degrading resource base such as poor nutrition and health, poor access to social services (health and education) and restricted access to alternative livelihood strategies. The various cost estimates of natural resource degradation in the Eastern Nile Basin by level of costs (Local/National, Bregional/Basin, and Global) are summarized in Table 2.



**Table 2. Summary of Costs by Level of Natural Resource Degradation in the Eastern Nile Basin: Local/National, Regional/Basin) and Global**

Resource	Annual	%	25 years
	US\$		US\$
<b>NATIONAL</b>			
Soil Erosion: Ethiopian Highlands	17.4		185.5
Nutrient breaches: Ethiopian Highlands	213.1		391.8
Soil fertility loss: SMF - Sudan	7.4		146.8
Soil fertility loss: Traditional sector - Sudan	0.7		15.4
Kerib land formation	1.0		20.7
Dune encroachment: Existing crop land	3.4		3.4
Dune encroachment: Potential crop land	14.6		14.6
River bank erosion	12.5		12.5
Sedimentation (ponds)	1.8		1.8
Deforestation: Timber Value forgone	49.3		1,232.6
Deforestation: Pole Value forgone	5.6		140.1
Deforestation: Fuelwood Value forgone	13.4		334.5
Wetland Conversion	n.d.		n.d.
<b>Sub-total</b>	<b>340.2</b>	<b>61%</b>	<b>2,499.6</b>
<b>REGIONAL</b>			
Sedimentation: Irrigation area lost	15.7		391.3
Sedimentation: Dredging/Weed cleaning	12.0		12.0
Sedimentation: Dredging turbine in-takes	2.0		2.0
Sedimentation:Hydro-power lost: Flushing	0.3		0.3
Sedimentation:Hydro-power lost: Storage loss	1.2		31.1
Watershed Services (60%)	4.6		114.7
Wetland sedimentation: Loss of flood buffering	8.1		8.1
<b>Sub-total</b>	<b>43.9</b>	<b>14%</b>	<b>559.5</b>
<b>GLOBAL</b>			
Carbon Sequestration : Deforestation	5.3		131.7
Carbon Sequestration : Degradation	57.7		635.9
Pharmaceutical Value forgone	1.3		31.7
Coffee gene pool value forgone	6.4		160.4
Habitat/species Biodiveristy value forgone	2.7		66.4
<b>Sub-total</b>	<b>73.3</b>	<b>25%</b>	<b>1,026.2</b>
<b>TOTAL GROSS COST</b>	<b>457.4</b>		<b>4,085.3</b>
<b>Less: Value of sediment as fertilizer</b>	1.2		1.2
<b>Less Crop production</b>	18.1		453.1
<b>TOTAL NET COST</b>	<b>438.1</b>		<b>3,631.0</b>

A comparison between degradation costs from soil erosion and soil nutrient breaches is not strictly comparable as the first are cumulative and the second are annual. Taken together after 25 years total measurable natural resource degradation costs are US\$ 3.6 billion/yr. Some 61 percent of the costs have local/national implications, 14 percent Regional and 25 percent global.

Table 3 indicates the measurable costs of natural resource degradation by major category of Resource

**Table 3 Summary of Costs of Natural Resource Degradation by Major Category of Natural Resource**

Resource	Annual	25 years	%
	US\$	US\$	
<b>1. Soil Erosion/degradation</b>			
Erosion (sheet, gully, Kerib, river bank)	30.9	218.7	
Nutrient breaches & Fertility loss	221.2	554.0	
Dune encroachment (Existing, potential)	18.0	18	
<b>Sub-total</b>	<b>270.1</b>	<b>790.7</b>	<b>19%</b>
<b>2. Sedimentation</b>			
Sedimentation: Irrigation area lost	17.5	393.1	
Sedimentation: Dredging/Weed cleaning	12.0	12.0	
Sedimentation: Dredging turbine in-takes	2.0	2.0	
Sedimentation:Hydro-power lost: Flushing	0.3	0.3	
Sedimentation:Hydro-power lost: Storage loss	1.2	31.1	
<b>Sub-total</b>	<b>33.0</b>	<b>438.5</b>	<b>11%</b>
<b>3. Deforestation &amp; Wood Biomass Degradation</b>			
Deforestation: Timber Value forgone	49.3	1,232.6	
Deforestation: Pole Value forgone	5.6	140.1	
Deforestation: Fuelwood Value forgone	13.4	334.5	
Deforestation: Loss of Carbon Sequestration	5.3	131.7	
Degradation: Loss of Carbon Sequestration	57.7	635.9	
Deforestation: Pharmaceutical Value forgone	1.3	31.7	
Deforestation: Watershed Services	4.6	114.7	
<b>Sub-total</b>	<b>137.1</b>	<b>2,621.2</b>	<b>64%</b>
<b>4. Wetland Degradation</b>			
Wetland sedimentation: Flooding	8.1	8.1	
Wetland degradation: Over-drainage	n.d.	n.d.	
<b>Sub-total</b>	<b>8.1</b>	<b>8.1</b>	<b>0.2%</b>
<b>5. Genetic, Species and Habitat Biodiversity Loss</b>			
Deforestation: Coffee gene pool value forgone	6.4	160.4	
Deforestation: Habitat/species Biodiveristy value forgone	2.7	66.4	
<b>Sub-total</b>	<b>9.1</b>	<b>226.8</b>	<b>6%</b>
<b>TOTAL GROSS COSTS</b>	<b>457.4</b>	<b>4,085.3</b>	
Benefiuts: Sediment as fertilizer	1.2	1.2	
Benefits: Crop production	18.1	453.1	
<b>TOTAL NET COSTS</b>	<b>438.1</b>	<b>3,631.0</b>	

Soil degradation accounts for 19 percent of measurable costs, sedimentation for 11 percent, deforestation and degradation of wood biomass some 64 percent, wetland degradation 0.2 percent and loss of biodiversity 6 percent. It has not been possible to quantify or value wetland conversion.

## **2.2 Underlying Causes - Poverty and Natural Resource Base Nexus**

There are complex relationships between poverty and the natural resource base in each of the three countries. Poverty is both a cause and a resultant of natural resource degradation (Scherr, 1999). In all three countries poverty is most prevalent amongst the rural households whose livelihoods depend on agriculture. Nevertheless, the determinants and context of poverty are not confined to natural resource degradation but encompass other aspects of livelihoods: education, health, access to knowledge and information, and the wider socio-economic framework of markets, prices, technology, credit, government development policies and strategies. This suggests that simply approaching poverty reduction by arresting resource degradation through technical measures may be insufficient if the other determinants and issues related to the broader socio-economic framework are not addressed.

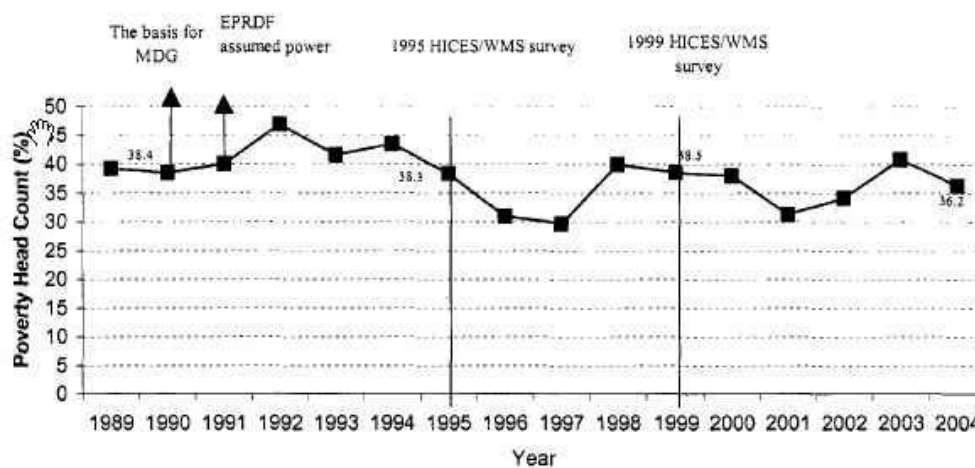
Population pressure is often cited as a cause of land degradation. Currently there are two basic hypotheses regarding the relationship between population growth and land degradation. The “neo-Malthusian” hypothesis predicts that agricultural production is unable to keep pace with population growth leading to falling agricultural production per capita, and increasing negative impacts on natural resources including land, water, forests and biodiversity. More recently, a more optimistic perspective has developed following from the work by Ester Boserup (Boserup, 1965) and others. This perspective emphasizes the responses of households and communities to population pressures that include a reduction in fallow periods, intensified use of labour and land, development of labour-intensive technologies and institutional changes. However, recent evidence suggests that more specific conditions appear to be needed for a Boserupian scenario to operate. These have been identified in the Machakos study as secure tenure, efficient markets, cash crops, supporting social organization and proven SWC measures.

### **2.2.1 Poverty in Ethiopia**

#### **(i) Incidence of Poverty**

The poverty line in Ethiopia is set using a basket of food items sufficient to provide 2200 kcals per adult per day. Together with a non-food component this represents ETB 1,070 in 1995/96 prices. The proportion defined as poor in 1999/2000 was 45 percent in rural areas and 37 percent in urban areas. According to the Sustainable Development and Poverty Reduction Plan of 2002 (SDPRP) rural poverty declined by 4.2 percent between 1995/96 and 1999/2000 although it increased in urban areas by 11.1 percent. However, a longer term analysis (World Bank, 2005) indicates that overall poverty declined only marginally between 1990 and 2004 (from 38.4 to 36.2 percent) due in large measure to no or even slightly negative growth in the agricultural sector (figure 1).

**Figure 1. Evolution of poverty incidence in Ethiopia between 1989 and 2004.**



Source: World Bank, 2005

The analysis highlighted the volatility of poverty incidence: thus poverty declined between 1994 and 1997 but increased between 1997 and 1999. Also, the average numbers hide a substantial amount of moving in and out poverty described as "churning on the margins" (Little et al., 2004). Vulnerability to poverty is high: it is estimated (World Bank, 2004) that two out three Ethiopians will be poor at five out the next ten years. Drought and highly variable rainfall are the major sources of vulnerability as are highly volatile inter-annual cereal prices. Some 75 percent of the population is estimated to be at risk to malaria and there is an increasing incidence of HIV/AIDS in rural areas. Both present significant vulnerability risks.

## (ii) Determinants of Poverty

### (a) Degrading natural Resource Base

The key underlying cause of poverty in Ethiopia is the degrading natural resource base (Alemneh Dejene, 2003). Some of the physical and economic impacts are estimated for each of the Sub-basins in chapters 4 to 7 of this report. However, these figures alone can not portray the full picture of the social and economic costs to the population. Ersado et al., (2003) have studied the severe negative impacts of poor nutrition and health of rural families' ability to adopt improved agricultural technologies. Families are locked into a downward spiral of increasing poverty and increasing degradation of their natural resources. As the research data in the previous section has shown large numbers of households are constantly "churning" in and out poverty. The degrading resource base increases households' vulnerability to natural (drought) and social (sickness) shocks. Alternative livelihood strategies are increasingly restricted.

### **(b) Population Pressure and Resource Degradation**

Grepperud (1996) tested the population pressure hypothesis for Ethiopia using econometric analysis, and found that when population and livestock pressures exceeded a specific threshold rapid degradation of land takes place. The threshold was the population and livestock carrying capacity of the land. Pender et al (2001) found in Amhara region of Ethiopia that high population densities were related to the decline in fallowing and manuring. They also found that high population densities were related to increasing land degradation and worsening household welfare conditions. In Tigray high population densities were related to more intense use of resources (more fertilizer, manure and intercropping) at the household level but increased land degradation at the community level.

### **(c) Other Contributing Determinants**

The dependency ratio is very important in determining poverty status in rural areas. Studies indicate that if the dependency ratio increases by one unit, a household's probability of falling below the poverty line increases by 31 percent. Households with more children under 15 years and those with people older than 65 years are particularly vulnerable to falling into poverty. This underscores the importance of adult labour in the welfare of rural households. Female headed rural households face a 9 percent higher probability of being poor than male-headed households although other factors such as age and education play an important role and need to be taken into consideration when targeting.

Households cultivating exportable crops (chat, coffee) have a much lower probability of being poor. Living near towns and better access to markets has a poverty reducing effect. Farm assets such as oxen are important poverty reducing factors: an extra ox reduces poverty probability by 7 percent. Households involved with off-farm activities are 11 percent more likely to be poor. This is because such activities are seen as a coping mechanism for poor people rather than a way of accumulating wealth.

## **2.2.2 Poverty in Sudan**

### **(i) Incidence of Poverty**

The extent and dynamics of poverty in the Sudan since the 1990's has been examined by the Joint Assessment Mission - JAM (2005). It is estimated that about 60 to 70 percent of the population in the North is living below US\$ 1.00 a day, whilst estimates in the south put the proportion at 90 percent. Despite the sustained growth since 1997 many experts believe that poverty has remained widespread and has actually increased. The gap between the "haves" and the "have nots" has increased. Thus whilst the traditional

agricultural sector has shown a rebound in the past decade this is only to levels that prevailed before the massive droughts of the early 1980's.

### **(ii) Determinants of Poverty**

The high rates of poverty in the South are clearly related to the negative impact the war has had on the reduction and in many cases total loss of household and community livelihood assets (capital, family labour, and secure access to land). The households and communities here are extremely vulnerable to natural and human induced sudden, seasonal and long-term changes in their natural environment and breakdowns in the social and economic networks that sustained them in the past.

Given these high rates of poverty, there will need to be substantial government support in providing rural infrastructure, establishing a climate for efficient markets and providing support to agriculture in terms of credit, extension and research. Communities themselves will need to respond to the expect influx of returning IDP's and refugees returning to their homeland. This will require very strong community level institutions that can equitably allocate access rights to the community's natural resources.

The low rates of poverty from El Gezira to Northern State are a reflection of the assured access to generally low risk irrigated cropland along the Blue and Main Niles. An assured and low-risk production environment clearly reduces the incidence of poverty. It enables households to build up assets that reduce their vulnerability to sudden changes in circumstances.

In these areas land is generally held in freehold and perceptions of tenure insecurity are low. Where leaseholds prevail the general secure natural asset base, the availability of physical (pumps, irrigation water) and financial (seasonal credit) assets creates an environment for secure and sustainable livelihoods and low vulnerability.

Elsewhere rural households land resource assets are generally rainfed cropland where rainfall amounts and variability present a high risk environment. Here, the opposite conditions prevail, where it is not possible to buildup household assets, and there are many cases where these have actually declined through land degradation (e.g. kerib land) or alienation of assets (e.g. to the large semi-mechanized farms).

Where livestock are the main livelihood capital assets these too depend on the same high risk environment as well as dwindling rangeland resources in the face of expansion of large semi-mechanized farms. The coping mechanisms that communities and groups have developed over millennia to deal with and recover from natural calamities have been insufficient in the face of insecurity and alienation of basic natural resources. Livestock assets provide a buffer in times of need. Where access to water and forage has become limiting for the reasons set out above vulnerability to shocks and hazards such rainfall variability and drought becomes more acute.

### **2.2.3 Poverty in Egypt**

#### **(i) Incidence of Poverty**

Two recent studies by IFPRI (Lofgren, 2001) and by the World Bank (Heba El-Laithy et al., 2003) review the structure and distribution of poverty in Egypt over the recent past. Lofgren (2001) reviews development strategies adopted in Egypt since the 1970's to determine if alternative strategies could have done more to reduce poverty. The World Bank study uses two household expenditure surveys undertaken in 1995/96 and 1999/2000 to examine the evolution of poverty in Egypt between these years and reveals its structure and geographic patterns. This brief review focuses on rural poverty.

Lofgren examines natural resource and human assets of rural households. The 1952 Revolution expanded education and health facilities, which boosted incomes and reduced inequality and poverty. In recent years there has been some reversal of these developments. Public education has deteriorated and become more expensive. Other things being equal, these reduce the share of the poor in the skilled labour market and in labour and land incomes. Additionally, consumer subsidies to households have declined from 11 percent in 1979 to 2 percent in 1997.

The World Bank study by El-Laithy and colleagues took into account regional and rural-urban differences in prices and demographic composition of households when calculating poverty rates. It used a minimum food basket linked to normative nutritional requirements. This was costed using regional prices and compared with the poverty line defined as the second quintile of expenditure distribution. They found that whilst poverty declined as a whole in the study period there were significant differences in poverty alleviation across regions and across different employment sectors.

In 1999/2000 the poverty rate across Egypt stood at 16.7 percent (approximately 10.7 million people). However, urban rates were only 9.2 percent compared with 22.1 percent for rural areas. The Governorates with the highest rural rates are located between Luxor and El-Fayoum. The three Governorates around Lake Nasser have rates below the national average. Across Egypt rates declined from 19.4 to 16.7 between 1995/96 and 1999/2000. But Upper Egypt rural rates increased from 29.3 to 34.2 percent in the same period. Whilst the Aswan, New Valley and Red Sea Governorates have rural poverty rates below the national average there are three groups that have been identified who are likely to be below the poverty line. The first of these are the two groups who live in the Wadi Allaqi on the eastern side of the Lake: the Ababda and the Bishari Bedouin (Briggs et al., 1993).

The second group are located in the new settlement areas west of Lake Nasser in three communities of Kalabsha, Khor Galal and Garf Hussien (IDRC, 2004). The IDRC project identified the settlers' lack of knowledge of desert agriculture and an undeveloped marketing system as hindering the agricultural development.

A third group comprise fisher people of the lake: the Saiydis, (an upper Egyptian peasant population) from two governorates with a long history of fishing immediately north of Aswan and a few Nubians being fishers even in Old Nubia. The state of the fishery has remained relatively undeveloped with fisher people living either in their boats or in temporary shelters in 150 fish camps.

### **(ii) Determinants of Poverty**

Livelihood assets include human, social, natural, physical and financial capital. Kishk (1994) pointed out that in Egypt less than 10 percent of land holders have more than 45 percent of the agricultural land whilst more than 57 percent of agricultural land holders have less than 25 percent of the land. More 90 percent of Egyptian farmers have less than 2 ha of agricultural land. His study in Middle Egypt found that given the very small plot sizes that many Egyptian farmers are barely able to make a living from current irrigated cropped area and cropping pattern. Although illegal, many small farmers resort to selling their land to builders. In 1987 net returns to food cropping were US\$ 439 /ha/yr whereas land for building was selling for US\$ 0.2 to US\$ 5.0 million /ha. The FAO Aquastat Survey for Egypt found that farmland urbanization represented a serious threat to agriculture in Egypt (FAO, 2005).

The World Bank (2003) study found that key determinates of poverty in Egypt are education (human capital), employment status (financial capital) of the household head and large family size. Private sector employees were twice as likely to be poor than those employed in the public sector because of the lack of security in employment. The largest proportion of poor is concentrated in the agricultural and construction sectors.

In the Wadi Allaqi and the Red Sea Hills where the Ababda and the Bishari adopt a number of livelihood strategies. These include sheep herding, camel herding, charcoal production, collecting medicinal plants and residual moisture crop cultivation. By adopting a range of strategies they reduce their vulnerability to natural and non-natural hazards and shocks. Similarly, many of the settlers on the Lake shore resettlement schemes adopt a strategy of leaving during the summer months to return to their home areas in Middle Egypt for wage employment and thus increasing family income.

## **2.3 Underlying Causes: Policy and Institutional Issues**

A key policy issue is that of land tenure although the details differ. In Ethiopia and Northern Sudan the State owns the land although in the Sudan some limited rural freehold does occur. In Southern Sudan Land Policy is based on customary law, although there are considerable differences in how it is applied in the different regions.



### 2.3.1 Land Policy Issues in Ethiopia

In Ethiopia the Federal Government has overall responsibility for land Policy but devolves the Land Administration to the Regional Governments. However, there is no federal institution responsible for land administration (ARD, 2004). Rural dwellers have usufruct rights to land, may lease and bequeath to immediate relatives but may not sell or mortgage their land holdings.

The four large Regions (Tigray, Amhara, Oromiya and SNNP Regions) have issued their own Land Use and Administration Proclamations and are undertaking programmes of land registration. The current land registration programmes lack consistency, including the way land is administered and user rights granted (World Bank, 2005). The most noticeable differences are in their organizational structures, inheritance and the provisions of permitting sub-leases.

Currently, the land registration programmes have a narrowly technical focus. They are not taking the opportunities to link land reform and security of title with economic investment in sustainable land management, poverty reduction and improved livelihoods. A key constraint is that land cannot be used as collateral for formal credit.

Whilst in the Highlands the boundaries of the lowest administrative unit for land administration - the *kebele* – are well known and established, this is less so in the Lowlands, where there are relatively large areas that are not settled. Land for commercial agriculture is allocated by the Regional Investment Bureau but there is no formal cadastral survey, environmental impact assessment or monitoring of subsequent land development.

### 2.3.2 Land Policy Issues in the Sudan

The root cause of land tenure problems in the North is the 1970 Unregistered land Act which stated that "*any land of any kind occupied or unoccupied which has not been registered before the commencement of the Act shall be the property of the government and shall be deemed to have been registered as such*". Under this law vast areas of subsistence farm land, forest and pasture have been converted for cash crop production without replacing the lost pasture resources. Traditional corridors of animal movements were blocked generating increased levels of resource based conflict (JAM Vol.III, 2005).

Apart from the freehold land there are two main types of agricultural land: (i) registered land, and (ii) unregistered land. The registered leases are typically for 25 years, carry use rights and lease conditions relating to environmental protection and sub-leasing. However, the leases normally cannot be sold and thus cannot be used as collateral for formal credit. Unregistered land with traditional use rights has usually been established through unlawful settlement and clearing and cultivation by individuals and groups. Communal land is under the control of the community or local ethnic group. Such land can normally be inherited but it cannot be used for collateral.

The current land policy thus limits access to credit for the vast majority of farmers who cannot use land as collateral. Secondly, the policy of 25 year leases does not provide incentives for sustainable land development and capital improvement. Thirdly, on land not demarcated by cadastral surveys, conflicting land use rights have been a source of conflict, especially between pastoralists and sedentary farmers.

Although the JAM states that land reform is a necessary pre-requisite for improved agricultural productivity and poverty reduction, the Report is silent on how this will be achieved. A Land Commission has been appointed and is currently considering the matter.

The general policy of the Forest National Corporation (FNC) aims at extending the reserved forest area to reach a national goal of 20 % of the country's area, increase the afforested area in and outside the reserved areas and raise the popular awareness of the importance of forests in the conservation of the environment and economic development. There are some 1,195 Forest Reserves covering 7 million feddans (3.9 million ha) located within the Atbara, Blue Nile and Sobat Basins. In addition there is an even larger area of State Forest land. Much of this has become degraded under pressure from charcoal and fuelwood extraction and logging. Much of it requires restocking. The FNC have limited resources to undertake this work.

Much of the Forest lies within close proximity to communities. Whilst the FNC employ a few local people in their nurseries the forests contribute little in terms of support to livelihoods. The FNC control all wood extraction and charge royalties that provides a substantial proportion of their funds. However, they are only able to effectively manage a small proportion of the state forest land.

### **2.3.3 Institutional Issues**

#### **(i) Complexity of the Institutional Framework**

The Eastern Nile Basin encompasses three countries: Egypt, Ethiopia and the Sudan. Currently there is very little coordination of Watershed Management activities across boundaries. However, Waterbury (2002) makes the point that effective international cooperative mechanisms depend as much on establishing effective cooperative mechanisms at the national level.

Both Ethiopia and Sudan are implementing devolution of substantial authority for planning and implementing development activities to Regional Administrations. Whilst allowing for development activities to be more closely aligned with regional/local aspirations, there are potential problems for coordination in river basins that encompass more than one administrative Region by the addition of another layer of administration.

In Ethiopia, whilst a Master Plan studies have been undertaken for the Abbay, Tekeze and Baro-Akobo River Basins, there is no formal institutional mechanism for Basin-wide watershed planning and coordinated development activities. This is currently under review and a draft Proclamation setting out the institutional setup for river basin development almost complete. The objective of a River Basin Organization will be to:

*"trigger, promote, coordinate, enhance and monitor the Integrated Water Resources Management process in the river basin falling within its jurisdiction and to administer the basin's water resources for the socio-economic welfare of the people in an equitable and participatory manner without comprising the sustainability of the aquatic ecosystems".*

Each River Basin organization will have a Basin High Council with federal and Regional representation and with provision for other Stakeholders as considered necessary; and a River Basin Authority.

Whilst this may take care of institutional coordination and harmonization at the macro level there are no provisions for such coordination and harmonization at the small/micro watershed level. This has emerged as a problem with the small dam programme being undertaken independently of the watershed management programme, resulting in widespread sedimentation of dams. A moratorium has been placed on the dam programme until the institutional problems can be resolved.

In Sudan there is provision for State-wide land Use Planning although this has yet to be implemented. As yet there is no provision for a Basin-wide institutional setup on the lines of the Ethiopian model or at the small/micro-watershed level. The UNESCO-HELP Project has proposals to undertake Basin-wide integrated studies of the Gash, Atbara and Blue Nile Basins.

### **(ii) The facilitating role of government**

In Egypt, Sudan and Ethiopia, the Government still maintains a strong control of all development activities in the country. The inherent danger to this is the adoption of a top-down approach and attitude. In a more open dialogue with development partners at all levels, government would benefit more from an exchange of knowledge and experience of other organizations and institutions.

Numerous activities of government capacity building are being undertaken but these alone will not be effective if not paralleled by a change in attitude. One of the main challenges is to improve information management (exchange of information between organizations, dissemination to lower levels, and building up of a common institutional memory). This would provide the fuel for the engine of up-scaling of successful but isolated development activities.

### **(iii) Watershed Management Planning**

There is a need to address discontinuities in the government structure with regard to the overall “cycle” of project identification, planning, coordination, stakeholder consultation and participation, and implementation. Currently, it is not clear who has the responsibility for watershed management and at what level. Thus, these responsibilities need to be better demarcated. It is not necessarily a problem that various organizations take up responsibilities in watershed management as long as there is a workable level of harmonization. In addition, those taking the responsibility or being given a mandate should be able to build up the required capacity to fulfill their task.

Watershed management planners should not plan in isolation but, at all levels, ensure timely consultation with implementers and beneficiaries. Plans should include arrangements for implementation, and at the lower levels, these should be agreed upon by implementers. In the ideal case, planners would also be responsible for (coordination of) implementation, provided that they have the capacity to do this.

### **(iv) Capacity to Undertake Watershed Management**

There is still a need for improved awareness of watershed management concepts, principles and their implications. Watershed management planning at watershed level is a different subject than planning at the grassroots level. At **higher levels**, planning is strategic and concerned with development pathways in selected “development units or domains” (as used in this regional assessment), planning frameworks, and identification of priority areas. At the **lower level**, planning is concerned with modus of implementation.

Watershed management, as an integrated or holistic approach, should be interpreted more pragmatically. A **holistic approach** to watershed management will need to encompass a detailed and comprehensive understanding of the underlying social, economic and policy causes behind land degradation, poverty, food insecurity and a limited range of livelihood possibilities. In more pragmatic terms, holistic means e.g. that during situation analysis it should be realized that the causes of specific problems may need to be sought in other sectors or disciplines.

**Integration** does not mean that implementation has to cover all possible sectors of integrated rural development. It means that development or sustainable land management interventions are put into context one with another (e.g. SWC to increase moisture availability to agricultural production; improved stoves as to reduce the need for fuelwood and depletion of forest cover). Devolution of responsibilities to lower levels of government administration is an official policy of both governments. A constraint to its effective implementation in both countries is the low level of capacity: both in numbers and technical expertise, particularly at the lowest levels.

Ethiopia now has a substantial capacity building programme to support its decentralization policy and a Ministry of Capacity Building has been established (Ministry of Capacity Building, 2002). The "wereda" is seen as the front-line administrative unit for all development efforts. Increasing financial, administrative and technical

In Sudan "Capacity Building and Institutional Development" is the first of nine "clusters" of the Joint Appraisal Mission's Report and is seen as fundamental to the success of Sudan's programme of equitable and sustainable development.

In both countries these are long-term programmes and there will be no quick solution to this problem. The JAM is aiming to have effective institutions and the desired capacity by 2011.

### 3. OPPORTUNITIES AND THE POTENTIALS FOR IN-COUNTRY AND TRANSBOUNDARY BENEFITS FROM BASIN-WIDE WATERSHED MANAGEMENT ACTIVITIES

#### 3.1 Strategic Considerations

It is known from lessons learned that watershed management planning can be undertaken at various levels, but implementation has to take place at grass root level. The conventional options for purely administrative and regulative solutions to land and water use problems appear to have reached their limits. It is becoming increasingly apparent that a more consensual approach to natural resource management is a more attractive solution for harmonizing interests of resource users, managers and regulators. Allowing and facilitating local communities to develop their own resource management systems is proving a more effective, economic and efficient approach than central or regional government control.

Sustainability of achievements requires ownership of its users and these are the local communities. A sense of ownership is created only through their **genuine participation** in planning and decision making. Decision making should not be the privilege of nominated leadership only. Motivation for genuine participation can only be based on **tangible benefits** and a sustained resource-base. Many benefits can be achieved through integrated watershed management for improvement of livelihoods.

The requirement of genuine participation sets preconditions to the organizational structure and approach of watershed management projects. Emerging lessons from watershed management projects in Ethiopia, Sudan and elsewhere include the following:

- A participatory project cannot be target-driven right from its start. In its initial phase, the project design should focus on the process of establishing participation rather than on seeking to achieve physical targets. It also requires appropriate institutional development at community-level; appropriate in the sense that institutions are created (or strengthened if already existing) to respond to the emerging needs, and may therefore differ from place to place. Needs depend on priorities in watershed management activities, functionality of existing traditional institutions and prevailing group dynamics within a community. A standardized institution for all communities (such as a village watershed committee) will be an imposed one and will undermine the feeling of project ownership in the community.
- It is important to strive for a simple organizational and coordination structure, based on existing structures and clearly stipulating linkages with higher levels (need for support).

- Institutional arrangements are required that allow for multi-disciplinary and multi-agency collaboration and across ministries, contributing to breaking through single sector approaches.

### **3.2 Technical Interventions: Levels and boundaries of analysis**

It is often stated that a watershed approach to development conflicts with the administrative and political reality and that their boundaries rarely coincide. Implementation activities are initiated and carried out within an administrative jurisdiction. This argument is countered by pointing out that the physical world has no respect for administrative or political boundaries and activities in the upper part of a watershed can serious impact on people in the lower parts in another administrative or political jurisdiction. In practice the two approaches need to be complementary and an administrative/political realism should be superimposed on watershed planning to obtain administrative support and action.

Watershed management is a system-orientated concept with a holistic approach to problems and potentials. For this reason it will be necessary to identify “bundles” of interventions that complement each other where possible in a synergistic way. Given the cross-sectoral, sustainable livelihoods and poverty focus of the Watershed Management with its stated objective of tackling the underlying problems of natural resource degradation in the East Nile Sub-basins, many of these “bundles” will comprise technological, institutional and policy components.

Most technological interventions are targeted at the agricultural<sup>10</sup>/pastoral household and rural community level although some are targeted at medium scale watersheds. The organizational, institutional and policy interventions/recommendations are targeted at the higher administrative and political levels.

In addition, strategic choices in development have to be made to achieve the following:

- balanced identification of priority areas for watershed protection, based on an agreed set of criteria;
- dual attention for both rehabilitation of degraded food-insecure areas and timely protection of strongly eroding high potential areas,

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<sup>10</sup> Included here are tenant farms on government irrigation schemes, farm workers on large-scale mechanized farms and as well as smallholder farmers.

### **3.3 Technological Interventions: Basic Considerations**

Considerable experience has been built up in Ethiopia, Sudan and elsewhere in the world on the technological aspects of integrated watershed management. In particular there has been an increasing emphasis on biological measures using where possible locally available materials and away from physical structures.

A thorough understanding of the land use systems and their inter-linking components will ensure that any potential technical interventions will not adversely impact on and where possible support the other components in the system.

At the micro/mini watershed level technical interventions will need to be developed in an integrated manner that takes into account the nested nature of watersheds and the hydraulic system. For example the development of small dams should be integrated into other components of the watershed management plan with catchment management interventions being implemented in the upper micro-catchments and moving progressively downstream. Similarly, external water-harvesting measures will need to be similarly planned and executed. In-field water harvesting measures will need to be integrated with soil fertility enhancing measures if full benefits are to be achieved. Proposed interventions should range beyond soil and water conservation technologies and include inter-linked technologies related to crop, animal and tree husbandry.

### **3.4 Household and Community Level: Local Rural-Urban Linkages**

The results of the benefit-cost analysis of on-farm and community interventions in the Distribution Analysis demonstrate that there is significant potential for increasing household farm incomes, increasing food supply with improved levels of nutrition and health, reducing vulnerability to climate, social and economic shocks and improving the quality of the natural resource base. However, a key finding is that a number of the interventions have substantial costs in terms of labour for construction or establishment. For a number of the interventions it takes a number of years for benefits to be realized (on-farm and community tree planting) or benefits only slowly accrue (SWC measures).

In the areas of food deficits there are a number of programmes that support households and communities through food/cash for work and safety net support measures. However, there is an urgent need to extend support to households and communities in apparently more favourable areas where there is clear evidence that the high costs of initial labour requirements are an impediment to adoption of SWC measures on cropland.

Watershed Management interventions can have a substantial impact on arresting degradation of the natural resource base both on cropland and also on non-cropland. This is a vital entry point in breaking the cycle of poverty and



resource degradation and attacks one of the root causes of poverty in the Eastern Nile Sub-basin. Conservation of the non-croplands through enclosure and tree enrichment planting can provide not only direct benefits to communities in terms of increased livestock feed and improved livestock productivity and increased supply of fuelwood and timber, but also an increase in wild plants of food and medicinal values that are of considerable importance to the most disadvantaged community members such as female headed households. The regional and global benefits are enumerated below.

SWC structures on cropland and the enclosed areas on non-cropland can reduce runoff and increase infiltration to groundwater. There is evidence (WFP, 2005) that where integrated watershed management measures have been implemented that groundwater levels have risen and long dormant springs have started to flow.

Supporting interventions can have substantial benefits to households and communities. Measures to increase market accessibility and integration such as feeder roads and extension of telecommunications can have positive impacts by reducing market transaction costs thus benefiting both producers and consumers. These interventions can enable an expansion of local economic multipliers. At the local level these can occur through increased incomes being spent on purchases of local non-tradable goods i.e. goods made locally rather than those imported. Work in an inaccessible area of Nigeria similar to many parts of rural Ethiopia and Sudan suggested a multiplier of 1.32 for the non-tradable sector (Hazell & Roell, 1983). In addition, there could be increased backward multipliers (from an increased demand for improved inputs) and forward multipliers (from an increase in marketed agricultural products). These in turn increase employment opportunities in the many small urban centres for rural and urban households.

Capacity building interventions can have a number of positive benefits at the local level. Increased access to improved technologies (with increased support to extension and research services) combined with access to literacy and skills training have been shown to be strongly correlated with increased adoption of improved agronomic technologies. Support to the Extension Service with improved information linkages between farmers and research can increase the relevance of agricultural research to the traditional small-holder sector. Increased road accessibility and skills training can enable rural households to have better access to non-farm employment opportunities.

Increased access to micro credit can provide an important enabling environment for farmer adoption of improved technologies, in particular fertilizer and improved seeds. Credit together with support to small enterprise training can also enable the development of small enterprises in the small urban centres further increasing employment opportunities. It must be emphasized that there can be a number of important synergies between the various interventions most particularly in improving rural-urban linkages, the increasing economic development of small urban centres and increased agricultural production.

Support to Community Level Land Use Planning and Community Woodland Management Planning in Sudan can enable rural communities to better manage the natural resource base and sustainably harvest wood and other non-wood products. This in turn assists in reducing local conflicts over natural resource use and increase access to all groups. Strategic Land Use Planning and Zoning in the High Forest areas of the Ethiopian Highlands can clearly delineate areas for small-holder and large-scale commercial agricultural development based on stakeholder participation and sustainable land suitability principals. Similarly, areas for Community Forests can also be clearly delineated on the same basis. Clear and transparently developed land use zoning can allow for sustainable development and management of the Forest and Land resources at the local level.

### 3.5 National Level

At the national level Watershed Management interventions can increase the rate of poverty reduction and numbers of households needing safety net support. In both Ethiopia and Sudan the highest incidence of poverty is with the traditional agricultural smallholder sector. By targeting this sector (rather than the commercial agricultural sector) a proportionally greater impact can be achieved in reducing the numbers of households living below the poverty line.

A recent study by IFPRI and ASARECA<sup>11</sup> (Omamo et al., 2006) covering all the counties in the Region including Ethiopia and Sudan found that the largest poverty reductions will come not from growth in export sub-sectors but from growth in those sub-sectors for which demand is the greatest – such a crop staples, livestock products, oil seeds and fruits and vegetables. Another more detailed study for Ethiopia (Daio et al., 2006) confirms these findings. The studies also found that agricultural productivity growth alone is insufficient to meet the Millennium Development Goals (MDG) poverty reduction targets. Growth in non-agricultural sectors and improvements in market conditions are also required.

Interventions that increase the easily accessible supply of fuelwood (on-farm tree planting) and the reduction in its consumption (using fuel efficient stoves) can have consider impacts on reducing the work loads of women and children. In addition, there can be positive impacts on their health and well-being through the reduction in smoke inhalation thus reducing the incidence of respiratory diseases.

Interventions to increase market accessibility and integration can have positive impacts across the Basin in each country as market transaction costs are substantially reduced. Sub-regional multipliers: backward and forward as well as growth of tertiary and secondary urban centres can stimulate the sub-regional economies. It is difficult to predict the size of these multipliers.

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<sup>11</sup> The Association for Strengthening Agricultural Research in Eastern and Central Africa

Bhattari et al., (2007) have examined irrigation development across India and irrigation multipliers to the economy as a whole. They found irrigation multiplier values of 3 to 4.5 suggesting that about two thirds of the irrigation benefits have accrued to the non-irrigation sector, with farmers receiving the other third. Whilst markets and the economy as a whole in India are better integrated and accessible, with increasing market integration in Ethiopia and Sudan Sub-regional economic multipliers could become increasingly important.

Interventions to support State-wide Strategic land Use Planning in Sudan could have clear linkages to Sub-regional economic development. The Strategic Plans should be developed with full stakeholder participation and could assist in clarifying development objectives and strategies. The plans could contribute to the harmonization of sectoral development strategies and so developing the synergy between sector developments identified in the IFPRI/ASARECA Study as necessary for substantial poverty reduction.

Capacity Building interventions could contribute to the increased effectiveness of the agricultural Extension and Research Services. In each country the increase in both the quantity and quality of human capital could impact on the quality of research outputs and on extension advice. The Land Policy reforms in Sudan could have far reaching effects in increasing access to natural resources by the most disadvantaged, reducing Sub-regional and regional conflicts over resource access and use, and in increasing crop and livestock productivity. These will further re-enforce Sub-regional economic growth and its attendant multipliers.

### **3.6 Sub-basin and Regional Level**

Benefits at this level reach across the political boundary and accrue to the Eastern Nile Basin as a whole. Currently there is little trans-boundary trade between Ethiopia and Sudan but the expansion of economic development in the Sub-basin on both sides of the border, coupled with an extension of cross-border road-links, the potential for increasing integration of the Sub-regional economies of both countries becomes possible.

This is particularly so for the Ethiopian Northwestern and the Sudan Northwestern Sub-regions. This would be further facilitated with the construction of the proposed rail link between Sudan and Ethiopia as well as the expansion of cross-border power transmission. Increased access to Port Sudan for western Ethiopia would have a positive impact in reducing transport costs for both imports and exports. The expanding industrial sector in Sudan could provide off-farm employment opportunities for both Sudanese and Ethiopian households and so providing financial capital for investment in agriculture, agricultural processing and small-scale service sector enterprises in the small urban centres.

In the Baro-Sobat-White Nile Sub-basin currently there is little trans-boundary trade between Ethiopia and Sudan. On both sides of the border there are no road links and the border area is extremely peripheral in both countries.

However, there are strong cultural ties with the Anuak and the Nuer peoples who live in both countries. Good road access from Gambella town to the Juba – Lokichokia road to Kenya would open both the Boma area in Sudan and the Gambella area in Ethiopia to markets in Kenya, Uganda and the Democratic Republic of Congo.

There are clear linkages and synergies that can be developed here to initiatives being developed under the Joint Multi-purpose Programme, and to the Transboundary Trade in Power, Irrigation and Drainage and Flood Control and management CRA's.

Closer cooperation in crop early warning systems, establishing joint strategic grain reserves and purchase of grains for food relief either side of the border would enable faster responses to local food shortages to the mutual benefit of both countries. Increased food security on both sides of the border will contribute to overall food security for the region.

The quantifiable benefits to reduced erosion in the Ethiopian Highlands and sediment loads in the Eastern Nile river system on reducing costs within Sudan of dredging of power intakes and irrigation canals, loss of power generating potential due to the need for reservoir flushing are relatively small in comparison to the national benefits. Nevertheless, they could also contribute to a reduction in costs that it has not been possible to quantify: of pump and turbine damage and the removal of sediment for domestic and industrial water supplies. The reduced sediment loads in the Rahad and Dinder Rivers could reduce the siltation of the maya'a wetlands in Sudan and thus reduce the incidence and extent of flooding and the damage this causes to crop production. They could also contribute to a reduction in the sedimentation of the Meroe Dam and to an increase in its economic life. A reduction of Abbay-Blue Nile and Tekeze-Atbara River systems' sediment load could also contribute to a reduction in the rate of loss of live storage in Lake Nasser/Nubia and the loss of potential irrigation water and power generation for Egypt.

In the Baro-Sobat-White Nile River systems the quantifiable benefits to reduced erosion in the Ethiopian Highlands and sediment loads are very small. However, the rapid and uncontrolled loss of forest cover in the Ethiopian Highlands could have significant impacts on the hydrology of the Baro-Sobat River system. At the small catchment level these are likely to result in increased flood and given the relatively small size of the Baro-Akobo catchment area would impact on the flooded grasslands of both Ethiopia and Sudan. As these are vital components in the livelihood systems of both the Anuak cultivators and the Nuer pastoralists severe disruption to their economies could result. Strategic Land use Zoning of the high forest together with the watershed management components could contribute to reducing any potential negative impacts of increased flooding.

Support to the establishment of the Dinder-Alatish Transboundary Park could facilitate the increased effectiveness of biodiversity conservation of this important area of fauna and flora. It could also increase the potential for eco-

tourism and increased employment opportunities for people in and around the Park. It could also provide a tangible example of the benefits of trans-boundary cooperation between Sudan and Ethiopia. A similar example of trans-boundary cooperation could be an intervention to develop a plan for the sustainable management and development of the Rahad-Dinder Wetlands. This would require a cross-border study and the development of a catchment management plan. It also has clear linkages with the establishment of the Transboundary Park as much of the information on hydro-ecology will contribute to an effective Park management plan.

Support to the trans-boundary collaborative wildlife and habitat survey and assessment of the areas encompassing the Gambella and the Boma National Parks could contribute to enhanced wildlife and habitat conservation. It could also establish the institutional mechanisms for continuing cooperative measures. The basis would be established for developing Park Management Plans that complement each other. There could be increased potential for "Eco-tourism and thus increased employment opportunities for Park inhabitants on both sides of the border. It could also provide a tangible example of the benefits of trans-boundary cooperation between Sudan and Ethiopia.

### **3.7 Global Level**

The global benefits identified in the Distribution Analysis relate to the increased amount of carbon sequestered in wood biomass, herbaceous biomass and soil carbon. In some cases it has been possible to quantify these and the results are provided in tables 2. In other cases such as improved pasture development in the Butana Plains this has not been possible because of the uncertainties in quantifying the amount of increased pasture that will result. Nevertheless, small-scale experiments have clearly demonstrated that increased herbaceous biomass will substantially increase the amount of carbon sequestered in the soil and that there is considerable untapped potential for increased carbon sequestration under improved pastures (FAO, 2003). This is notwithstanding that the increased herbaceous matter will be consumed by livestock – the carbon is stored in the soil. The small scale example of improved rangeland management supported by the GEF in Bara Province of North Kordofan described in chapter 8 indicates how this may be implemented at the local level.

Other global benefits accruing to the programme of interventions relate to the conservation of biodiversity. At the local level this is represented in the increase in native plant species in enclosed areas that have all but disappeared in the open access communal areas. Such an increase in species diversity will also be seen in the improved management of the pastures of the Butana Plains. Substantial conservation of genetic, species and habitat diversity will accrue to the supporting interventions to the Dinder and Alatish Parks and to the development of the management plan for the Dinder-Rahad Wetlands. The proximity of the Park to the desert and semi-

desert makes it an important buffer zone for the vegetation cover of central Africa in addition to its significance in providing genetic material for the rehabilitation in the semi-arid and arid areas (ArabMAB (2006)).

Pagiola (1997) reports that there are positive benefits to biodiversity from practicing sustainable land management practices. These include an increase in below ground biodiversity including organisms such as insects and other invertebrates that play a vital role in maintaining soil fertility. However the greatest impacts on biodiversity are indirect. By increasing the lands productivity this reduces the need to clear more agricultural land and thus reducing deforestation and preserving biodiversity. Thus, the interventions targeted at the traditional and the commercial farming sectors in Ethiopia and Sudan will generate these benefits.

The Ethiopian Highlands are one of the six Vavilov centres of crop endemism. Of particular importance is the gene pool of the cereal crop barley, included within which are strains resistant to rust. An Ethiopian variety of barley crossed with other varieties helped save the United States barley crop from being devastated by rust and so saved the United States millions of US\$. In situ conservation of the barley, teff and wheat gene pools are of global significance. The value of the coffee pool of US\$ 420 million has been demonstrated by Hein and Gatzweiler (2006).

In Sudan a large number of natural selections of sorghum and millet have over millennia accrued a gene pool of considerable importance. In addition, the cultivation of *Acacia seyal* for its gum has also through centuries of natural selection accrued an important gene pool for this species.

Interventions to support traditional agriculture could enable farm households to be buffered from natural shocks and allow them to maintain these important gene pools.

## **4. A STRATEGIC FRAMEWORK FOR LONG-TERM COOPERATIVE WATERSHED MANAGEMENT IN THE EASTERN NILE BASIN**

The challenges and opportunities for sustainable watershed management in the Eastern Nile Basin have identified in the previous two chapters. This chapter sets out the elements of a strategic framework for the long-term cooperative watershed management in the Basin.

### **4.1 Objectives**

The immediate objective of the Eastern Nile Watershed Management Programme is to provide continued and enhanced support the sustainable watershed management of the Eastern Nile Basin in order to:

- Improve the living conditions of the people.
- Create alternative livelihoods.
- Enhance agricultural productivity.
- Protect the environment and in the long term reduce sediment transport and siltation of infrastructure.
- Prepare for sustainable development oriented investments.

The overriding regional significance of this will be its contribution to enhanced food security and poverty alleviation in the region and its long term contribution to arresting degradation of the natural resource base.

The policy guidelines adopted by the NBI's Council of Ministers of Water Affairs (Nile-COM) in February 1999 further define the primary objectives. These objectives are:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and

- To ensure that the program results in a move from planning to action.

## **4.2 Key Watershed Management Issues to be Addressed**

### **4.2.1 Need for Cooperation and Coordination among Riparian Countries**

The Transboundary and Distributive Analysis has identified environment, natural resources and development synergies, and thus sustainable watershed management opportunities in the Basin as a major priority. More effective cooperation and coordination between the riparian countries is essential if the Eastern Nile Basin's natural resource base is to be managed in ways that help improve the quality of life of the inhabitants.

In strategic terms it is vital that riparian cooperation and coordination is strengthened through trans-boundary activities including establishing a watershed management data and information system, monitoring of watershed management interventions, supporting erosion-sedimentation research, undertaking longer-term hydro-ecological-livelihood studies and institutional capacity building.

Emphasis must be given to encouraging diverse stakeholder groups to work together, not only within their own countries but especially with counterparts in other riparian countries, as an essential contribution to building the mutual understanding, relationships and trust that will be essential to collaborative problem-solving for the Eastern Nile Basin as a whole.

### **4.2.2 The Need to Enhance and Expand the Watershed Management Knowledge Base**

The Transboundary and Distributive analyses revealed considerable data gaps and imperfectly understood science of many aspects of watershed management. This was particularly in the areas of soil erosion by water, deposition within the landscape and sediment delivery to the drainage system. Factors operate at different intensities at different watershed scales making analysis and prediction of these complex systems extremely difficult. The difficulties of analysis are compounded by the lack of consistency in the required data. The impacts of soil erosion on agricultural productivity and the linkages to livelihood strategies in terms of private profitability of conservation technologies are also imperfectly understood.

Another important area of watershed management and developing interventions to enhance sustainable livelihoods is the important role wetlands play in livelihood strategies. Wetlands comprise complex hydro-ecological systems and are of considerable importance to household and community livelihoods in Ethiopia and Sudan. As well as their importance to supporting



livelihoods wetlands also provide important hydrological functions in the river systems as well as having considerable importance in terms of biodiversity conservation. Complex trade-offs between conservation and development of wetlands will be necessary if the twin goals of sustainable livelihoods and biodiversity conservation are to be met. This is also an area where research is required if sustainable development interventions of wetlands are to be prescribed.

Data and knowledge gaps will require cooperative solutions in terms of shared information and data collection, harmonization of data collection and research methods and the integration of information and research results into policy formation.

### **4.2.3 The Need to Develop Effective Cooperative Systems of Monitoring and Evaluation of On-going and Future Watershed Management Interventions**

Currently there is a wide range of watershed management activities on-going and many more are proposed. It will be essential to monitor the impacts of these activities and undertake detailed evaluations of their impacts on household and community livelihoods. There is considerable scope for knowledge sharing amongst the three Riparians on experiences gained and lessons learnt in terms of watershed management. This will enable solutions to be rapidly developed to address problems that emerge from the monitoring and evaluation activities.

It will be important the cooperative data and information collection and research results are well integrated and coordinated across the Basin to achieve maximum synergy. There are also implications for capacity building and institutional strengthening at various levels to support these cooperative activities.

### **4.2.4 The Need for Capacity Building and Institutional Strengthening at Various levels.**

The Cooperative Mechanisms Analysis revealed the increasing levels of complexity in terms of institutional mechanisms that are required for cooperative activities. At the first level – for example information sharing - the mechanisms can be relatively simple. As the level of cooperation rises to involve joint trans-boundary activities the mechanisms increase in complexity. Joint activities require coordination by Basin-wide institutions such as ENTRO as well as concerned national government and non-government institutions. The complexity of existing institutions involved with watershed management activities has been alluded to in both the Country and the Sub-basin Trans-boundary Analysis. Support to strengthening ENTRO and national institutions

will be required as more complex cooperative mechanisms are required to coordinate joint trans-boundary activities.

Transboundary cooperative watershed management activities are relatively new in the Eastern Nile Basin – this Watershed Management CRA being one of the first. The need for capacity building across a wide range of disciplines and subjects at all levels has been identified in the Trans-boundary Analysis of the CRA as a key pre-requisite for effective trans-boundary watershed management data collection, multi-disciplinary watershed management research and monitoring and evaluation of watershed management activities.

### **4.2.5 Transboundary Biodiversity and Natural Resource Hotspots under Threat**

The Transboundary Analysis identified a number of important biodiversity hotspots that are under considerable pressure from expanding human activities. Three areas in particular involve National Parks or Biosphere Reserves that are trans-boundary in nature. These are the Wadi Allaqi that is located in both Egypt and Sudan, the Dinder National Park and the Alatish Regional Park that adjoin each other across the Sudan-Ethiopia border and the Gambella and Boma National Parks that are important elements in the massive circulatory migration of the White-eared Kob between Sudan and Ethiopia.

Other trans-boundary natural resource hotspots include the Abbay-Blue Nile Highland and Lowland wetland systems, and those of the Baro-Sobat-White Nile Sub-basin. The complex hydro-ecological systems of these wetlands are imperfectly understood and yet play important roles in supporting livelihood systems, as repositories of genetic, species and habitat diversity and performing essential hydrological functions. There is a clear need to obtain a deeper understanding of these very important watershed management roles.

### **4.2.6 Harmonisation of Policy**

Trans-boundary cooperative watershed management will require some degree of harmonization of national policies. This is particularly so in respect of data collection and information sharing, and in cooperative monitoring and evaluation of watershed management activities.

To be of use to policy makers it is important that data and information and research results are relevant to policies in question and presented in a form that is effective for policy review and revision.

### **4.3 Key Elements of a Long-term Watershed Management Strategy**

Arising from the watershed management issues that have been identified in the trans-boundary analysis a number of areas for long-term cooperative watershed management have been identified. These included:

- Developing a coordinated watershed management data collection and information sharing.
- Developing a coordinated Monitoring and evaluation of watershed management activities.
- Undertaking research into the complex relationships between soil erosion (water and wind), deposition, sediment delivery to river systems, impact on agricultural productivity and the impact that has on sustainable livelihoods.
- Undertaking surveys and studies on the complex hydro-ecological-livelihoods systems to obtain a deeper understanding of these relationships to enable more effective and sustainable development planning.
- Undertaking surveys and studies and developing mechanisms and institutions for cooperative conservation of genetic, species and habitat biodiversity resources.
- Capacity Building in the fields of (but not limited to) Watershed Management Planning, Relationships between Land degradation and Livelihoods, Relationships between wetlands environmental, hydrological and livelihoods functions, and undertaking Monitoring, Evaluation and Impact Studies
- There must institutional support provided to ENTRO to enable effective programme coordination, support cooperative mechanisms and to enhance confidence building and trust among the Riparians. Support will also be required at the National level to enable effective coordination with a trans-boundary context the various activities that will form part of the long-term cooperative programme.

#### **4.3.1 Cooperative Activities involving Coordination: Basin-wide Information Exchange and Database**

Given the large seasonal variation and very rapid response times in stream flows of the Abbay-Blue Nile and Tekeze-Atbara Rivers the sharing of flow,

sediment and meteorological data collection has a number of advantages to Sudan and Egypt.

Sutcliffe and Lazenby (1994) have pointed out that the one major gap in the investigation of the hydrological regimes of the Nile Basin is the measurement and analysis of erosion and sediment load: particularly for the Abbay-Blue Nile and Tekeze-Atbara Sub-basins.

Monitoring of suspended sediment loads throughout the Sub-basin at the outlets of micro-catchments, sub-catchments and catchments of varying size would provide input into research to develop a more complete understanding of the linkages between catchment size, geomorphology, soils and land use and the dynamics within the sub-basin. It would be important that data collection systems be harmonized across the Eastern Nile Basin.

### **4.3.2 Coordinated Basin-wide Impact Monitoring and Evaluation of Watershed Management activities**

With the possibility of significant reductions in suspended sediment from catchments in the upper Sub-basin as a result of the ongoing Watershed Management interventions (soil and water conservation structures, water harvesting and small dams) it will be important to monitor any changes in bed sediments and bank erosion in the downstream catchment. An integrated erosion-sediment monitoring programme could be combined with a bed and bank monitoring programme downstream to provide a complete system-wide understanding of erosion, sediment delivery, suspended sediment, and bed aggradation and degradation.

In addition to the monitoring of physical impacts it will be vital to monitor and evaluate impacts of watershed management interventions on households' and communities' livelihoods and poverty reduction. This will require a social and economic impact analysis that must be integrated with the systems of physical monitoring. Given the complexity and size of the Eastern Nile Basin an effective system of sampling will be required on the one hand to capture this diversity and on the other to make the programme manageable.

It is important the results of the monitoring and evaluation studies feed into the national and basin-wide development policy making process. The research and evaluation results will address the policy implications of the findings and recommendations for policy review and possible revision and trans-boundary harmonization.

### **4.3.3 Cooperative Research into Complex Resource Degradation-Livelihood Strategy-Poverty Linkages**

The data collection and monitoring activities will be informed by detailed research at various catchment scales into the physical processes of erosion, deposition, sediment delivery and sedimentation of structures. The research into physical processes will be linked to research into the impacts of resource degradation on household and community livelihood strategies and coping mechanisms and abilities to incorporate sustainable land management technologies into their livelihood systems. Important elements to be determined are the complex relationships between resource degradation and poverty.

There are a number of opportunities for collaborative research involving government and non-government research institutions in the three Riparian Countries. As with all cooperative activities the research activities will fully integrated with and support capacity building activities. The joint activities will also contribute to confidence building and trust strengthening among the riparian countries.

It is important that the research results feed into the policy making process as well as the review of on-going and proposed watershed management interventions. Information sharing will be another import element to enable the transfer of successful watershed management technologies and their scaling up.

### **4.3.4 Detailed Studies and Planning for the Sustainable Management of Wetlands**

The need to develop a deeper understanding of the various roles and functions of wetlands in the Eastern Nile Basin has been identified above. This will be achieved through collaborative trans-boundary studies into the various types of wetlands in the Abbay-Blue Nile and Baro-Akobo Sub-basins. A holistic approach will be used to gain an understanding of the wetlands in the context of the watershed at different scales. Thus the relationships between upland land use and wetland hydrology and their dynamics will be an important element of the studies.

Again, the results of the studies will feed into the policy making and review process and into the design of development programmes to ensure that "lessons learnt" are fully incorporated.

#### **4.3.5 Surveys and studies to Support Cooperative Biodiversity Conservation**

Three biodiversity "hotspots" have been identified as under threat: (i) the Wadi Allaqi located in Egypt and Sudan, (ii) the Dinder and Alatish Parks located in Sudan and Ethiopia, and (iii) the area between and including the Gambella and Boma National Parks in Sudan and Ethiopia. The ecological systems of the three areas are inextricably linked across the international borders. Detailed wildlife inventories and livelihood surveys are required as a basis for developing joint long-term trans-boundary conservation management plans for these areas. The livelihoods studies will provide essential data upon which to involve the local communities in the management activities.

Capacity building will also be an important element of the surveys and studies to ensure subsequent effective conservation management.

#### **4.3.6 Hydro-ecological-livelihoods Study in the Baro-Sobat-White Nile Sub-basin,**

The Baro-Sobat-White Nile Sub-basin is the most isolated of the four Sub-basins. The Sub-basin Lowlands have seen nearly two decades of civil war with the resulting breakdown in physical, economic and social infrastructure. Under the Comprehensive Peace Agreement (CPA) the region is now initiating development programmes to support sustainable livelihoods development and reduce vulnerability to external shocks. The Sub-basin exhibits a complex system of hydrology and ecology that strongly influences the livelihood systems of the peoples of the Sub-basin.

There are immense problems in the Sub-basin of initiating and sustaining all aspects of rural and urban development, reducing poverty, developing sustainable livelihoods and restoring economic and social networks. The CPA and JAM have set in considerable detail the modalities and conditionalities required to achieve these. However, in terms of watershed management and seeking to achieve sustainable livelihoods the key problems can be summarized as follows:

- The need to obtain a detailed knowledge of the complex hydrology-ecology systems in the whole of the Sobat-White Nile Sub-basin (in both Ethiopia and Sudan). Whilst the Bahr el Jebel was thoroughly studied as part of the Jonglei Canal investigations, the Sobat-White Nile Sub-basin was not studied in detail. This will involve establishing an effective and consistent hydrological and climatic monitoring network.
- The need to obtain a detailed knowledge of the relationships between the hydrology-ecology and livelihood systems and their dynamics, as a basis for effective and sustainable development planning and

implementation. Already by the early 1980's socio-economic conditions in the Sub-basin (and that of the Bahr el Jebel) were changing rapidly from those studied in the 1950's and 60's (Howell et al., 1988). Twenty years of civil war will have caused further changes.

- The need to determine the potential impacts of upstream hydrological developments (dams, hydro-power, irrigation) on the sensitive hydrological-ecological and livelihood systems downstream in both Ethiopia and Sudan.
- The need to make a full inventory and status assessment of the habitat and species bio-diversity as a basis for effective and sustainable conservation planning.

### **4.3.7 Capacity Building**

Capacity building has been identified as a key pre-requisite to sustainable watershed management cooperation in the Eastern Nile Basin. Institutional strengthening would be achieved through improved communication, information exchange and specific training. These would be implemented through specially commissioned courses, regional training workshops, linkages to universities and national research institutes and civil society organizations involved in watershed management activities.

Capacity building will also be an important element of all activities and programmes involving data and information collection, monitoring and evaluation, land degradation-livelihoods research and wetland studies.

### **4.3.8 Institutional Strengthening**

Institutional strengthening will be supported at various levels. At the Basin-wide level ENTRO is the key institution for coordination of the whole Cooperative Watershed Management Programme. The Programme is one of some complexity in comparison with the CRA and ENTRO will require substantial strengthening in terms of resources and technical expertise.

The wide range of cooperative activities and of national actors and stakeholders in the programme will require a considerable degree of coordination at the national level. This will require strengthening of the national coordinating institutions.

**PART 2,**

**PROGRAMME IMPLEMENTATION PLAN**

**EASTERN NILE BASIN – COOPERATIVE WATERSHED  
MANAGEMENT PROGRAMME**



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## ACRONYMS AND ABBREVIATIONS

CCBO	Community-based Organization
CQ	Consultant Qualifications
CRA	Cooperative regional Assessment
DSS	Decision Support System
ENCOM	Eastern Nile Council of Ministers
ENSAP	Eastern Nile Subsidiary Action Programme
ENSAPT	Eastern Nile Subsidiary Action Programme Team
ENTRO	Eastern Nile Technical Regional Office
EN-WMP	Eastern Nile Watershed Management Programme
FAO	United Nations Food and Agriculture Organization
FMR	Financial Management Report
GEF	Global Environment Facility
GIS	Geographical Information System
IC	Individual Consultant
ICB	International Competitive Bidding
IDEN	Integrated Development of the eastern Nile
IMS	Information Management System
NBI	Nile Basin Initiative
NCB	National Competitive Bidding
NGO	Nongovernmental organization
NPO	National Project Coordinator
PIP	Project Implementation Plan
PMU	Programme Management Unit
PSC	Programme Steering Committee
QCBS	Quality & Cost-Based Selection
SAP	Subsidiary Action Program
SVP	Shared Vision Program
UNDP	United Nations Development Programme
UNOPS	United Nations Office for Project Services

## **INTRODUCTION**

This Programme Implementation Plan (PIP) has been produced as an integral component of the IDEN Watershed Management Cooperative Regional Assessment (CRA). It derives from the Transboundary Analysis undertaken at both Country and Sub-basin levels, the Distributive Analysis, the Cooperative Mechanisms Analysis and the preparation of ten Project Profiles. The latter constitute the first round of Projects of Component 4 of the Eastern Nile Watershed Management Programme, the subject of this PIP.

## I. The Programme

### A. Programme Development Objective

*Eastern Nile Subsidiary Action Programme (ENSAP):* The Eastern Nile Subsidiary Action Program (ENSAP), which includes the countries of Egypt, Ethiopia, and Sudan, seeks to initiate a regional, integrated, multipurpose program through a first set of investments. Within this regional context, the Eastern Nile riparian countries decided that the objective of the first ENSAP project, referred to as the Integrated Development of the Eastern Nile (IDEN) project, was to initiate a regional, integrated, multipurpose development program that confirms tangible win-win gains and demonstrates joint action for the Eastern Nile countries. IDEN comprised the following seven components: Eastern Nile Planning Model, Baro-Akobo Multipurpose Water Resources Development, Flood Preparedness and Early Warning, Ethiopia–Sudan Transmission Interconnection, Eastern Nile Power Trade Investment, Irrigation and Drainage, and Watershed Management.

***Watershed Management CRA:*** The recently completed first Cooperative Regional Assessment (CRA) for Watershed Management in the Eastern Nile Basin undertook a Transboundary Analysis, a Distributive Analysis and identified mechanisms for cooperation. The CRA identified the baseline conditions and provided an understanding of four Sub-basins as integrated water systems: the Baro-Sobat-White Nile, the Abbay-Blue Nile, the Tekeze-Atbara and the Main Nile from Khartoum to the Aswan High Dam. The CRA identified a programme of Direct and Supporting Interventions for sustainable watershed management. The potential impacts of these were assessed in qualitative and in some case quantitative terms at the local, national, regional and global levels.

***Objectives.*** The immediate objective of the Eastern Nile Watershed Management Programme (EN-WMP) is to provide continued and enhanced support the sustainable watershed management of the Eastern Nile Basin in order to improve the living conditions of the people, create alternative livelihoods, enhance agricultural productivity, protect the environment and in the long term reduce sediment transport and siltation of infrastructure and prepare for sustainable development oriented investments. The overriding regional significance of this will be its contribution to enhanced food security and poverty alleviation in the region and its long term contribution to arresting degradation of the natural resource base.

### B. Key Policy and Institutional Reforms Supported by the Programme

The EN-WMP supports the Eastern Nile Basin countries to develop sound approaches to sustainable watershed management at the regional and national level. The Eastern Nile countries recognize that future development of the Basin must be environmentally and socially sustainable. Identifying natural resource base and development synergies and thus sustainable development opportunities in the Eastern Basin is now a major priority. Focusing on trans-boundary issues provides

the riparian countries with a major opportunity to make significant progress towards their economic, social and environmental goals in ways that have proved difficult to achieve independently.

The policy guidelines adopted by the NBI's Council of Ministers of Water Affairs (Nile-COM) in February 1999 further define the primary objectives of the NBI. These objectives are:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **C. Sector Issues addressed by the Programme and Strategic Choices**

Identifying the environment, natural resources and development synergies, and thus the sustainable development opportunities in the Basin, has emerged as a major priority. More effective cooperation and coordination between the riparian countries is essential if the Eastern Nile Basin's natural resource base is to be managed in ways that help improve the quality of life of the inhabitants.

This Programme will strengthen riparian cooperation and coordination through trans-boundary activities including establishing a watershed management data and information system, monitoring of watershed management interventions, supporting erosion-sedimentation research, undertaking longer-term hydro-ecological-livelihood studies and institutional capacity building. Emphasis will be given to encouraging diverse stakeholder groups to work together, not only within their own countries but especially with counterparts in other riparian countries, as an essential contribution to building the mutual understanding, relationships and trust that will be essential to collaborative problem-solving for the Eastern Nile Basin as a whole.

### **D. Programme Description**

*Programme Components:* The Eastern Nile Watershed Management Programme will provide enhanced support to sustainable watershed management activities that address the root causes of poverty of the peoples of the Basin. There are six main areas: (1) Programme Coordination, (2) establishing a watershed management data and information system, (3) establishing and undertaking coordinated watershed monitoring for the Eastern Nile Basin, (4) prioritizing and preparing a first and second round of watershed management projects, (5) undertaking a joint hydro-ecological-livelihoods study in the Baro-Sobat-White Nile Sub-Basin, and (6) capacity building in

the fields of watershed management planning, monitoring, evaluation and impact assessment.

**Component 1 – Programme Coordination** – This component will support effective coordination of the programme implementation and management. It will increase the capacity of ENTRO to effectively coordinate cooperative Watershed Management activities across the Eastern Nile Basin and ensure effective cooperation among the riparian countries and across other ENTRO Programmes and projects. It will also provide for building institutional capacity at the national level by supporting three National Programme Coordinators (NPC's). The NPC's will interact between the Regional Thematic Specialists and national individuals, institutions and organizations involved in implementing all of the Programme's components within their respective countries. The Programme Steering Committee will provide guidance to the project. The Steering Committee will review and approve annual work plans and will receive and review annual substantive and financial reports on project activities.

**Component 2 – Establishing a Watershed Management Data and Information System** – This component will establish within ENTRO a system to systematically collate and store relevant data and information for effective watershed management planning, monitoring, evaluation and undertaking environmental, social and economic impact studies. The system will comprise a documentation centre, a social, environmental and economic data base and a Geographical Information System. The Data and Information System will build on that established by the Watershed Management CRA. This component will have strong linkages to Component 3 and to other data collation and storage activities: e.g. the collation and storage of stream flow and meteorological data.

**Component 3 - Establishing and undertaking coordinated watershed monitoring for the Eastern Nile Basin.-** This component will establish a long-term coordinated system of monitoring of erosion (water and wind) and erosion control, sediment loads and land cover change at various catchment scales. The component will have strong linkages to component 2. It will be important to not only monitor implementation of watershed management interventions but also determine their impacts at the local, regional and global levels. Assessment of impacts will include physical, social and economic. It will not be possible to undertake this across the whole Basin. A number of hydrologically linked micro and sub-catchments will be selected, representative of specific agro-ecological and livelihood systems (e.g. annual cropping, perennial cropping, agro-pastoral, pastoral). These will be studied in detail to obtain a deeper understanding of the impacts of watershed management interventions on livelihoods and on poverty reduction. The Programme would support purchase of transport and equipment, participatory field studies, data collection and analysis.

**Component 4 - Preparing a first and second round of watershed management projects** – The Watershed Management CRA identified and prepared Project Briefs for a number of potential follow-up watershed management projects. In a first Phase the Programme will support ENTRO in prioritizing and preparing full project Documents from these Briefs, seek financing sources and coordinate their implementation. In a second phase the Programme will support ENTRO in identifying

and preparing a second round of watershed management projects that address issues and constraints identified by the Monitoring and Evaluation studies.

***Component 5 - Hydro-ecological-livelihoods Study in the Baro-Sobat-White Nile Sub-basin*** – The hydrology, ecology and livelihoods of the peoples of the Lowlands in this Sub-basin are inextricably linked. It will be important to obtain an understanding of these complex relationships before any major development initiatives are undertaken by the Southern Sudan government. Although some studies were undertaken in connection with the construction of the Jonglei canal, the Baro-Sobat Sub-basin was largely not covered. As some of the peoples of the Sub-basin are found in both Ethiopia and Sudan and given the strong hydrological linkages it would be important that this is undertaken as a joint Ethiopian-Sudanese study. The Programme would support participatory field studies, data collection and analysis, transport and equipment.

***Component 6 – Capacity Building and Institutional Strengthening in the fields of Watershed Management Planning, Monitoring, Evaluation and Impact Studies*** - This component would support capacity building and institutional strengthening through improved communication, information exchange and specific training. These would be implemented through specially commissioned courses, regional training workshops, linkages to universities and national research institutes and civil society organizations involved in watershed management activities. It would have strong linkages with Components 2, 3 and 5.

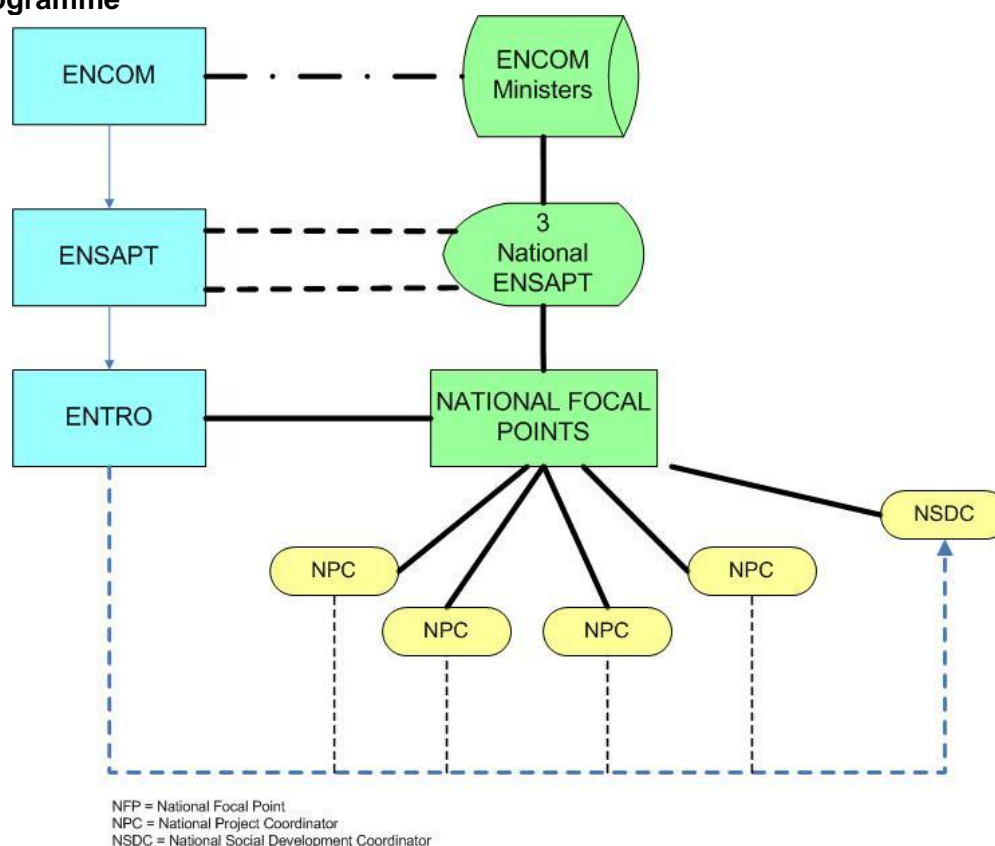
## II. Institutional Arrangements and Programme Administration

### A. Coordination and Programme Implementation

#### (i) ENSAP and ENTRO

The Eastern Nile Subsidiary Action Programme (ENSAP) is an investment programme by the Governments of Egypt, Ethiopia and the Sudan under the umbrella of the Nile Basin Initiative (NBI). It is led by the Eastern Nile Council of Ministers (ENCOM). ENCOM comprises the Ministers representing key stakeholder ministries and the ENSAP Teams (ENSAPT) comprising three technical country teams. The primary objective of ENSAP is to achieve joint action of the ground to promote poverty alleviation, economic growth and arresting environmental degradation. The Eastern Nile Technical Regional Office (ENTRO), which is a legal entity established by an ENCOM decision in 2002, manages and coordinates the preparation of ENSAP Projects. (Figure 1)

**Figure 1. Institutional Structure of the Eastern Nile Subsidiary Action Programme**

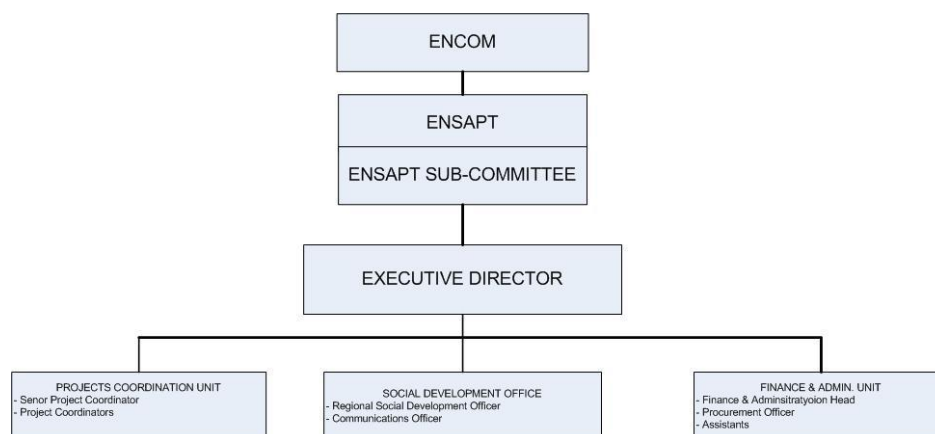


The Eastern Nile Technical Regional office (ENTRO) currently prepares, manages and coordinates projects within the Eastern Nile basin. As well as coordinating the implementation of ENSAP, ENTRO strengthens institutions and provides secretariat support to ENCOM/ENSAPT. ENTRO has a Social Development Office (SDO) that supports all ENSAP Projects through capacity building in social development, input into project design, formulation of guidelines and the initiation of studies and analysis.



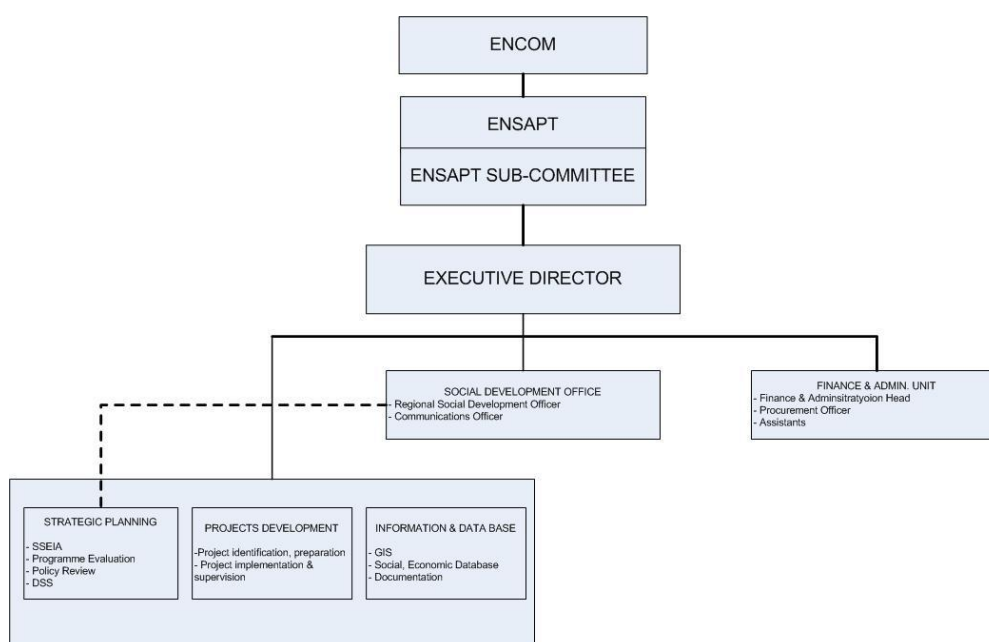
At the Country level ENSAP has National Focal Points (NFP) that undertakes overall coordination and liaison of National Coordinators and Working Groups (of specific projects) and the National Social Development Coordinators (NSDC's). Restructured in 2003. ENTRO itself is led by the Executive Director and has three Units: (i) Projects Coordination Unit, (ii) Social Development Office and (iii) the Finance and Administration Unit. The Projects Coordination Unit has a Senior Project Coordinator and Project Coordinators for each of the ENSAP Projects (Figure 2)

**Figure 2. Current Organizational Structure of ENTRO**



However, as the Joint Multi-purpose Programme moves into Phase II and the long-term CRA's come into operation the organizational structure of the Projects Coordination Unit is likely to see considerable expansion<sup>12</sup>. Although its exact composition cannot be determined at this stage it would incorporate a functional structure as shown in figure 3.

**Figure 3. Possible Future Organizational Structure of ENTRO**



<sup>12</sup> See the Initial Watershed Management CRA's Report - "Cooperative Mechanisms Analysis".

The Eastern Nile Watershed management Programme would be coordinated through the **Projects Development Unit** and in particular through ENTRO's Regional Watershed Management Coordinator **who will be the Eastern Nile Watershed Management Programme Coordinator**. The Programme Coordinator will be supported by technical specialists in project planning and monitoring and evaluation.

### **(ii) Programme Steering Committee**

A *Programme Steering Committee* will be established to provide strategic guidance to the Programme. The Steering Committee will review and approve annual work plans and will receive and review annual substantive and financial reports on Programme activities. The Steering Committee will be composed of the Watershed Management focal point from each participating country. Any relevant donor partners, the World Bank, and other appropriate parties will be invited as observers to the meetings. The Steering Committee is expected to meet at least annually and may circulate among the three Countries. It will be alternately chaired by the host country member of the Steering Committee. ENTRO's Project Coordinating Unit will provide secretariat support to the Committee.

### **(iii) National Programme Coordinators**

The Programme will employ a **National Project Coordinator** (NPC) in each of the participating countries. The NPC will be responsible for supervising and coordinating the implementation of Programme's activities at the country level. At the National level the NPC will keep the National Focal Point (who covers all activities, projects and programmes under ENSAP) informed on all matters relating to the Watershed Management Programme.

The NPC will provide a critical link between ENTRO's Watershed Management Coordinator and the national and international specialists and organizations involved in implementing the various Programme components within the respective countries. The NPC will be a full-time position that is Programme-funded and competitively hired with the active involvement of the concerned Ministry. The NPCs will be housed in a Ministry to be selected by each Country. They will be supported by a National Working Group (NWG) comprising representatives from a wide range of concerned Stakeholders.

### **(iv) Universities and Research Institutes**

Two Sub-components of Component 2: Establishing and undertaking coordinated watershed monitoring for the Eastern Nile Basin would be contracted to Research Teams from Universities and/or Research Institutes: the sample watershed erosion-sediment monitoring Sub-component and the sample watershed impact assessment studies Sub-component.

This will support the Programme's capacity building component, contribute to the sharing of knowledge and enhance cooperation among the riparian countries.

**B. Participation and Stakeholder Involvement**

Significant Programme components aim to broaden and deepen stakeholder involvement in watershed management. Programme implementation will ensure participation of all relevant stakeholders, including Ministries of Water, Agriculture, and Forestry, NGOs, educational institutions, local and traditional communities, and private sector organizations. Local stakeholders, especially communities and smaller NGOs/CBOs. This will be particularly important in the impacts assessments undertaken at the local level and in the Hydro-Ecological-Livelihoods Study.

A wide range of stakeholders is also expected to be involved in and benefit from the capacity building and institutional strengthening component through information and knowledge exchange.

**C. Donor Coordination and Financing**

To be determined.

### **III. Programme Implementation – Component Activities**

#### **A. Objective**

The primary objective of the long-term Eastern Nile Watershed Management Programme (EN-WMP) is to provide continued and enhanced support to sustainable watershed management of the Eastern Nile Basin in order to improve the living conditions of the people, create alternative livelihoods, enhance agricultural productivity, protect the environment and in the long term reduce sediment transport and siltation of infrastructure and prepare for sustainable development oriented investments.

The Programme will strengthen cooperation and coordination among the riparians of the Eastern Nile Basin by supporting a series of measures focusing on various aspects of trans-boundary watershed management. Programme activities will include establishing a watershed management data and information system; establishing and undertaking coordinated watershed monitoring for the Eastern Nile Basin; undertaking a joint hydro-ecological-livelihoods study in the Baro-Sobat-White Nile Basin; and capacity building in the field of watershed management planning, monitoring, evaluation and impact assessment. Emphasis will be given to encouraging diverse stakeholder groups to work together, both within their own countries and with counterparts in other riparian countries, as an essential contribution to building the mutual understanding, relationships and trust that are essential to collaborative problem-solving in the future.

#### **B. Approach**

Hitherto, the countries of the Eastern Nile Basin have generally worked in isolation while developing and implementing their plans for the use, conservation or development of the Basin' resources. This Programme will help build bridges between the countries, to better enable a variety of key stakeholders to identify and take advantage of the opportunities offered by international collaboration. In its totality, the Programme aims to create many "points of contacts" among and between a large and varied set of stakeholders in the three Eastern Nile Basin countries. As these contacts grow, and as independent networks are established around common issues of concern, this is expected to contribute to an overall reduction of tension, to building of greater understanding and trust and, eventually pave the way for sustainable cooperative developments for poverty alleviation.

For example, through monitoring and evaluation of watershed management interventions and capacity building the Programme will bring together decision makers, watershed management experts and communities to create a variety of networks of key actors in the region. Decision makers will become better informed of linkages, opportunities and tradeoffs as a result of integrated watershed management thereby improving their abilities to frame more effective policies and plans with improved sustainability prospects. Improved regional exchanges and capacities will encourage streamlining of the monitoring of watershed management interventions. Bringing together experts in watershed management, hydrology, ecology, livelihoods development, environmental, sociology and economics for joint Programme implementation and capacity enhancement and institutional strengthening will help to develop a spirit of cooperation and shared experiences.

### C. Programme Components and Activities

The Programme will support continued cooperation in trans-boundary watershed management by supporting activities in the following areas:

- (1) Establishing the Programme Steering Committee, Programme Coordination Unit and hiring national programme Coordinators,
- (2) Establishing a watershed management data and information system,
- (3) Establishing and undertaking coordinated watershed monitoring for the Eastern Nile Basin,
- (4) Prioritizing and preparing a first round of watershed management projects previously identified and then deriving from the monitoring and evaluation studies preparing a second round of watershed management projects;
- (5) Undertaking a joint hydro-ecological-livelihoods study in the Baro-Sobat-White Nile Basin, and
- (6) Capacity building in the field of watershed management planning, monitoring, evaluation and impact assessment.

<b>Table 1: Summary of Component Activities and Tasks</b>
<b>COMPONENT 1 – PRIG</b>
<b><i>Sub-component 1.1 Programme Management Staff</i></b>
<i>1. Establish Programme Steering Committee</i>
<i>2. Establish Programme Management Unit</i>
<i>3. Hire National project Coordinators</i>
<b>COMPONENT 2 – WATERSHED MANAGEMENT INFORMATION CENTRE AND DATA BASE</b>
<b><i>Sub-component 2.1 Document Centre</i></b>
<i>Activities &amp; Tasks</i>
1. Procure and install hardware/software
2. Establish Subject Areas and set up Computerized Document Record System (with keyword areas)
3. Collate and sort all available documentation: hard copy and digital
4. Enter records into Database:
5. Make Document Database available on-line (ENTRO web site)
<b><i>Sub-component 2.2 Social, Environmental and Economic Data Base</i></b>
<i>Activities &amp; Tasks</i>
1. Procure and install hardware
2. Establish data base structure: thematic areas; geographic area;
3. Collate and sort all available information
4. Establish system for future data collection (hydrology, sediment, demography, etc)
5. Make Social, Environmental and Economic Data Base available on-line (ENTRO web site)
<b><i>Sub-component 2.3 Geographic Information System</i></b>
<i>Activities &amp; Tasks</i>
1. Procure and install hardware/software
2. Establish geo-data base structure
3. Prepare inventory of available GIS data (including digital remote sensing data) relevant to Watershed Planning in East Nile Basin
4. Collate all available GIS data (including digital remote sensing data); enter into Geo-data base.
5. Develop meta data base (theme, source, description, scale)
6. Make meta data base available on-line (ENTRO web-site)

<b>COMPONENT 3 – Monitoring, Evaluation and Impact Assessment of Watershed Management Interventions</b>
<b><i>Sub-component 3.1 Establish Basin-wide System of Monitoring Sediment</i></b>
<i>Activities &amp; Tasks</i>
1. Develop Basin-wide System of Sediment monitoring System (harmonization of methodologies, data recording & communication)
2. Identify key monitoring stations, identify gaps.
3. Procure equipment and install
4. Collate all previous data
5. Design data base and data entry protocols
6. Data entry
<b><i>Sub-component 3.2 Establish System of Monitoring Erosion and Sediment in Sample Watersheds</i></b>
<i>Activities &amp; Tasks</i>
1. Identify University Research Teams and conclude Research Contracts
2. In participation with stakeholders - select Sample Micro and Sub-watersheds;
3. Develop system of erosion and sediment monitoring and data collection, design data base
4. Procure and install equipment; hire & train recorders; develop data collection & communication system
5. Undertake baseline physical survey (soils, slope, land cover, land management, climate)
6. Collect and analyze data
7. Determine Erosion: Land Management: Sediment delivery: Sediment load relationship at various catchment scales
8. Determine impact of Soil & Water Conservation Measures on sediment load & stream flows.
<b><i>Sub-component 3.3 Establish System of Environmental, Social and Economic Impact Assessment of Watershed Management Interventions in Sample Watersheds</i></b>
<i>Activities &amp; Tasks</i>
1. Identify University Research Teams and conclude Research Contracts
2. Using the same sample micro and Sub Watersheds: establish contact with local communities, and key government and non-government stakeholders.
3. Develop programme of social, environmental and economic impact assessment
4. Undertake Baseline Surveys
5. Undertake analysis and determine impacts
6. Write and produce Reports
7. ENTRO analyze and determine Policy and Strategy Implications
<b>COMPONENT 4: PREPARING A FIRST AND SECOND ROUND OF WATERSHED MANAGEMENT PROJECTS</b>
<b><i>Sub-component 4.1 Prioritizing, Preparing and Coordinating Implementation of First Round of Watershed Management Projects</i></b>
<i>Activities and Tasks</i>
1. Prioritize projects on basis of agreed criteria
2. Prepare Project Documents
3. Seek funding sources
4. Establishing institutional arrangements for implementation
5. Negotiate & sign contracts/sub-contracts
6. Coordinate implementation
<b><i>Sub-component 4.2 Identifying, Preparing and Coordinating Implementation of Second Round of Watershed Management Projects</i></b>
1. Identify 2 <sup>nd</sup> Round projects
2. Prepare Project Documents
3. Seek funding sources
4. Establishing institutional arrangements for implementation
5. Negotiate & sign contracts/sub-contracts
6. Coordinate implementation
<b>COMPONENT 5 - Undertaking a joint hydro-ecological-livelihoods study in the Baro-Sobat-White Nile Basin</b>
<i>Activities &amp; Tasks</i>
1. Prepare TOR, Invite expressions of interest, shortlist, invite proposals, evaluate and select.
2. ENTRO Supervise Implementation and chair Regional Workshops
3. Consultants hold stakeholder consultations, collect and analyze data
4. Establish linkages between hydrology, ecology and livelihood systems
5. Present findings at International Workshop with all key stakeholders
6. Prepare and produce Reports

<b>COMPONENT 6 – Capacity Building and Institutional Strengthening</b>
<b><i>Sub-component 6.1 Formal Training</i></b>
<p>Activities &amp; Tasks</p> <ol style="list-style-type: none"> <li>1. Prepare work plan</li> <li>2. Request UNESCO-IHE to prepare training course in Integrated Watershed Management Planning</li> <li>3. Request NRI, Egypt to host the Training Course</li> <li>4. Identify Course participants</li> </ol>
<b><i>Sub-component 6.2 Regional Training Workshops:</i></b>
<p>Activities &amp; Tasks</p> <ol style="list-style-type: none"> <li>1. Identify in-basin Training Institutes for training in Social Impact Assessment; Environmental Impact Assessment, and Environmental Economics</li> <li>2. Conduct 3 Training Works Shops in Social Impact Assessment; Environmental Impact Assessment, and Environmental Economics</li> </ol>

## **D. Detailed Programme Components**

### **1. Establishing Programme Steering Committee and Programme Coordinating Unit**

Total funding: US\$ 2.390 million

This component will enable effective coordination of all programme components and activities. It will increase the capacity of ENTRO to effectively coordinate cooperative Watershed Management activities across the Eastern Nile Basin and ensure effective cooperation among the riparian countries and across other ENTRO Programmes and projects. It will also provide for building institutional capacity at the national level by supporting three National Programme Coordinators (NPC's). The NPC's will interact between the Regional Thematic Specialists and national individuals, institutions and organizations involved in implementing all of the Programme's components within their respective countries

#### **1.1 Programme Steering Committee**

##### *1.1.1 Introduction*

This component will support the establishment and the operational activities of the Programme Steering Committee. The programme will support meetings of the Committee. The Committee is expected to meet at least annually and may circulate among the three Countries.

##### *1.1.2 Organisation*

The Steering Committee will be composed of the Watershed Management focal point from each participating country. Any relevant donor partners, the World Bank, and other appropriate parties will be invited as observers to the meetings. It will be alternately chaired by the host country member of the Steering Committee. ENTRO's Project Coordinating Unit will provide secretariat support to the Committee.

### **1.2 Programme Management Unit**

#### *1.2.1 Introduction*

The Programme Management Unit (PMU) will strengthen ENTRO's capacity to (i) to coordinate and implement the national components of the Programme, (ii) ensure effective cooperation with the IDEN Projects and the Joint Multi-purpose Programme (JMP), and (iii) effectively coordinate cooperative Watershed Management activities across the Eastern Nile Basin.

#### *1.2.2 Organization*

The PMU will comprise the Regional Watershed Programme Coordinator, two thematic Specialists in Project Planning and Monitoring and Evaluation with Secretarial support. It will be supported by three national project Coordinators and their respective National Working Groups.

### **1.3 National Project Coordinators**

#### *1.3.1 Introduction*

The Programme will support institutional strengthening at the National Level by supporting three full-time National Programme Coordinators (NPC's). The NPC's will interact between the Regional Thematic Specialists and national individuals, institutions and organizations involved in implementing all of the Programme's components within their respective countries.

#### *1.3.2 Organization*

The NPC will provide a critical link between ENTRO's Watershed Management Coordinator and the national and international specialists and organizations involved in implementing the various Programme components within the respective countries. The NPC will be a full-time position that is Programme-funded and competitively hired with the active involvement of the concerned Ministry. The NPCs will be housed in a Ministry to be selected by each Country. They will be supported by a National Working Group (NWG) comprising representatives from a wide range of concerned Stakeholders.

## **2. Establishing a watershed management data and information system,**

Total funding: US\$ 0.215 million

This component will establish within ENTRO a system to systematically collate and store relevant data and information for effective watershed management planning, monitoring, evaluating and undertaking environmental, social and economic impact studies. The system will comprise a documentation centre, a social, environmental and economic data base and a Geographical Information System. The Documentation centre, Data Base and geographic Information System will build on those established by the Watershed Management CRA. This component will have strong linkages to Component 2 and to other data collation and storage activities



undertaken by ENTRO: e.g. the collation and storage of stream flow and meteorological data.

### **2.1 Document Centre**

#### *2.1.1 Introduction*

This sub-component will provide key stakeholders across the basin with improved access to relevant watershed management information. The sub-component will support exchange of information, research findings, workshop materials and lessons learned from watershed management activities in and outside the Eastern Nile Basin.

#### *2.1.2 Organization*

The Document centre will be located in ENTRO in the Information and Data Base Unit. One Knowledge Management Specialist/editor will compile and make available watershed management resource materials. Hard copy materials will be converted to soft copy and entered into the Digital Document Data Base. Thus the Information centre will comprise hard and a softy copies. The Document Centre will collate relevant publications as they become available, and will make frequent web searches for new information.

### **2.2 Social, Environmental and Economic data base**

#### *2.1.1 Introduction*

This sub-component will support Project identification and formulation as well as strategic watershed management planning and impact evaluation. It will be important that the data base is maintained and regularly updated.

#### *2.2.2 Organization*

The Data base will be located in ENTRO within the Information and Data Base Unit. One Information Technology (IT) Specialist will collate and enter all available social, environmental and economic data of relevance to the Eastern Nile Basin. The Data Base will maintain close contact with National Project Coordinators in order to ensure that data is the most current.

### **2.3 Geographic Information System**

#### *2.3.1 Introduction*

Spatial data is of particular importance in project planning and monitoring and evaluation at all spatial levels. The Geographic Information System (GIS) will store all spatial data collated and assembled during the first round of the CRA's and will continue to add to the GIS as new data sets become available.

#### *2.3.2 Organization*

The GIS will be located in ENTRO within the Information and Data Base Unit. A first step will be to ensure the provenance of the data and to ensure compatibility with the selected GIS software system adopted by ENTRO. Where possible, linkages will be

established between the Social, Environmental and Economic Data Base and the GIS.

### **3. Monitoring, Evaluation and Impact Assessment of Watershed Management Interventions**

Total; funding US\$ 5.35 million

This component will establish a long-term coordinated system of monitoring of erosion (water and wind) and erosion control, sediment loads and land cover change monitoring at various catchment scales. The component will have strong linkages to component 2. It will be important to not only monitor implementation of watershed management interventions but also determine their impacts at the local, regional and global levels. Assessment of impacts will include physical, social and economic. It will not be possible to undertake this across the whole Basin. A number of hydrologically linked micro and sub-catchments will be selected, representative of specific agro-ecological and livelihood systems (e.g. annual cropping, perennial cropping, agro-pastoral, pastoral). These will be studied in detail to obtain a deeper understanding of the impacts of watershed management interventions on livelihoods and on poverty reduction. The project would support purchase of transport and equipment, participatory field studies, data collection and analysis.

#### **3.1 Establish Basin-wide System of Monitoring Sediment Loads**

##### *3.1.1 Introduction*

It will be important that data collection methods, frequencies and presentation of data are harmonized across the Eastern Nile Basin<sup>13</sup>. A communications strategy and network will be established. This could be based on the internet with national centres communicating to the ENTRO Data and Information Unit. There will be scope for network upgrading. There will be a reassessment of the station network and installation of additional stations. This will facilitate monitoring for the purpose of River Basin Management.

##### *3.1.2 Approach*

As a first step all available data previously recorded will be collated and where possible standardized. Cooperation across the Eastern Nile Basin provides an opportunity for monitoring the Basin as a River Basin System, i.e. as aggregate of interrelated functional subsystems rather than purely hydrological units or segments. This will require stations at locations in the river basin related to these functional sub-systems (floodplains absorbing important sediment outputs, the cataract system in Sudan, main swamp areas, sub-watersheds where large scale watershed management activities are anticipated, lowlands with intensive land use changes and resettlement). These subsystems would also serve as broad management or main development units.

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<sup>13</sup> And across the whole Nile Basin if such sediment monitoring system is established.

### *3.1.3 Organization*

The coordinated monitoring of sediment loads will form one component of a larger system of hydrological and meteorological monitoring providing the Eastern Nile Planning Model and the Nile Basin Decision Support System (DSS) with essential data. The sediment data will also be used in the long-term monitoring of Watershed Management interventions and in particular component 2.2: the system of monitoring of erosion and erosion control and sediment delivery in sample watersheds..

## **3.2 Establish System of Erosion and Sediment Monitoring and Research in Sample Watersheds**

### *3.2.1 Introduction*

The objective will be to obtain an understanding of the complex inter-relationships between erosion, deposition and sediment delivery at the micro-watershed level and sediment loads and fluvial transport at increasing larger catchments.

### *3.2.2 Approach*

A number of hydrologically linked micro and sub-watersheds will be selected and a long-term system of erosion and sediment monitoring established. The micro-catchments and sub-catchments will be representative of specific agro-ecological and livelihood systems (e.g. annual cropping, perennial cropping, agro-pastoral, pastoral). The approach will be to use empirical data from instrumented measurements of erosion, deposition and sediment loads as input to computer modelling analysis. Monitoring of Land Use and Land Cover change of the sample Sub-catchments would be undertaken. The impact of specific watershed management interventions would be determined.

### *3.2.3 Organization*

The programme of monitoring and research will be undertaken by selected Research Institutions and Universities. The Programme would be coordinated by ENTRO.

## **3.3 Establish a System of Social, Environmental and Economic Impact Assessment of Watershed Management Interventions**

### *3.3.1 Introduction*

The objective of this sub-component will be gain an understanding of the complex linkages between the natural resource base and its utilization, livelihood systems of households and communities and the dynamics of change occasioned by the implementation of watershed management interventions and other endogenous factors.

### *3.3.2 Approach*

Using the same sample micro-watersheds contact will be established with key stakeholders and a process of participatory action research developed that will

explore and analyse the resource-livelihoods complex and determine the environmental, social and economic impacts of watershed management interventions on various stakeholder livelihoods.

### *3.3.3 Organization*

The programme of monitoring and research will be undertaken by selected Research Institutions and Universities. The Programme would be coordinated by ENTRO.

## **4. Preparing a First and Second round of Watershed Management Projects**

Total funding: US\$ 1.385 million

The Watershed Management CRA identified and prepared Project Briefs for a number of potential follow-up watershed management projects. In a first Phase the Project will support ENTRO in prioritizing and preparing full project Documents from these Briefs, seek financing sources and coordinating their implementation. In a second phase the project will support ENTRO in identifying and preparing a second round of watershed management projects that address issues and constraints emanating from the Monitoring and Evaluation studies. Costs include support to the Watershed Management Programme Coordinator.

### **4.1 Prioritizing, Preparing and Coordinating the Implementation of a First Round of Watershed Management Projects**

#### *4.1.1 Introduction*

The Watershed Management CRA prepared 11 project briefs for potential implementation. ENTRO will through a process of discussion with the national ENSAP Teams prioritize these projects and prepare full project documents and seek financing for their implementation.

#### *4.1.2 Approach*

In collaboration with the ENSAP Teams criteria for prioritizing the projects will be established. It is possible that in some cases projects may be integrated where synergy between the projects can be achieved. ENTRO will then develop full Project Documents for each project. The project implementation procedures would be established. On the basis of the priorities established ENTRO would seek financing for each project. Following the securing of funds ENTRO would initiate and coordinate Project implementation.

### **4.2 Identifying, Preparing and Coordinating Implementation of a Second Round of Watershed Management Projects**

#### *4.2.1 Introduction*

Emanating from the monitoring and research activities of Component 1 a number of key issues and constraints will be identified relating to the implementation of the programme of watershed management interventions. A second round of watershed management projects will be identified to address these issues and constraints.

### 4.2.2 *Approach*

Analysis of the monitoring and impact assessments being undertaken under the auspices of Component 2 and also of the outputs of the First Round of Watershed management projects will reveal a number of issues and constraints not previously identified in the Watershed Management CRA. Some of these could be the result of major changes in national Policies and Strategies that impact of peoples' livelihood strategies and utilization of the natural resource base. Other issues could emerge from the implementation of other IDEN projects and components in the Joint Multipurpose Programme. It will be important to recognize the context within which watershed management interventions are being implemented is extremely dynamic and ENTRO must be responsive to these dynamics.

As with the First Round projects ENTRO would identify and prepare full Project Documents and determine implementation modalities. It would continue to seek funding and initiate and coordinate project implementation.

## **5. A Joint Hydro-Ecological-Livelihoods Study in the Baro-Sobat-White Nile Sub-basin**

Total; funding US\$ 1.02 million

### 5.1 *Introduction*

The hydrology, ecology and livelihoods of the peoples of the Lowlands in this Sub-basin are inextricably linked. It will be important to obtain an understanding of these complex relationships before any major development initiatives are undertaken by the Southern Sudan government. Although some studies were undertaken in connection with the construction of the Jonglei canal, the Baro-Sobat Sub-basin was largely not covered. As some of the peoples of the Sub-basin are found in both Ethiopia and Sudan and given the strong hydrological linkages it would be important that this is undertaken as a joint Ethiopian-Sudanese study.

### 5.2 *Approach*

Given the complexity of the relationships and linkages between the hydrology, ecology and livelihood systems the study would of necessity be multi-disciplinary and fully integrated. An important first step will be to establish a comprehensive analytical framework within which the study can proceed and to allow all team members to understand the linkages of their specific areas of study to the other components. An initial identification of all stakeholders and their areas of interest will be very important step in developing the framework. A full understanding of the livelihood systems will entail study methodologies that are fully participatory and address all stakeholders. Knowledge sharing and dissemination of results throughout the course of Study with all stakeholders will be very important to ensure relevance and accuracy of the Study findings.

### 5.3 *Organization*

This is a study of some complexity and will require careful coordination by ENTRO. Consultation and knowledge sharing with stakeholders (including donor (s)) will be important and ENTRO will provide the forum for this to take place.

## **6. Capacity Building and Institutional Strengthening**

Total; funding US\$ 5.025 million

This component would support capacity building and institutional strengthening through improved communication, information exchange and specific training. These would be implemented through specially commissioned courses, regional training workshops, linkages to universities and national research institutes and civil society organizations involved in watershed management activities. It would have strong linkages with Components 1, 2 and 4.

### **6.1 Formal Training in watershed Management**

This sub-component will contribute to increasing the levels of understanding of technical staff at the national level in the various aspects of watershed management at the national level.. The Programme would support the design and holding of training courses (6 months) in Watershed Management Planning. These could be held in-country through or at the UNESCO-IHE in the Netherlands or the Hydraulics Research Institute Regional Training Centre in Egypt.

### **6.2 Regional Training Workshops**

These would be shorter course (2 weeks) in specific aspects of Watershed management Planning, monitoring and evaluation. Subjects would cover but be not limited to Social Impact Assessment, Environmental Impact Assessment and Environmental Economics, Natural Resources Management, Project Monitoring and Evaluation, Project Management and Management Information Systems. The course participants would be drawn from the three riparian countries and would contribute to fostering knowledge exchange and confidence building.

## IV. Programmes Costs and Financing

### A. Programme Costs

**Table 2. Programme Cost Summary (US\$ '000)**

WATERSHED MANAGEMENT PROGRAMME: COSTS	US\$ '000
Component	
<b>1. Programme Coordination</b>	
1.1 Programme Management Staff	1,718.0
1.2 Programme Office Equipment, Furniture , etc	80.0
1.3 Vehicles	22.0
1.4 Programme Management Expences	420.0
1.5 National Programme Coordinator Expences	303.0
<b>COMPONENT 1 TOTAL</b>	<b>2,543.0</b>
<b>2. Watershed management Information and Data base</b>	
2.1 Document Centre	70.0
2.2 Environmental, social and Economic Datra Base	40.0
2.3 Geographic Information System	105.0
<b>COMPONENT 2 TOTAL</b>	<b>215.0</b>
<b>3. Monitoring, Evalaution and Impact assessment: WSM Interventions</b>	
3.1 Basin-wide Sediment Monitoring System	300.0
3.2 Erosion & Sediment Moniroing & Research: Sample Watersheds	2,525.0
3.3 Environmental, Social and Economic Impact Assessment: WSM Interventions	2,525.0
<b>COMPONENT 3 TOTAL</b>	<b>5,350.0</b>
<b>4. Preparation First &amp; Second Round WSM Projects</b>	
4.1 Prioritizing, Preparing and Coordinating implementation of First Round Projects	606.0
4.2 Identifying, Preparing and Coordinating implementation of Second Round Projects	404.0
<b>COMPONENT 4 TOTAL</b>	<b>1,010.0</b>
<b>5. Joint Hydro-Ecological-Livelihoods Study: Baro-Sobat-White Nile Sub-basin</b>	
<b>COMPONENT 5 TOTAL</b>	<b>1,020.0</b>
<b>6. Capacity Building</b>	
6.1 Formal Training	3,550.0
6.2 Regional Training Workshops	1,475.0
<b>COMPONENT 6 TOTAL</b>	<b>5,025.0</b>
<b>PROGRAMME TOTAL</b>	<b>15,163.0</b>

**B. Programme Financing**

To be determined.



**C. Programme Implementation Schedule**

WATERSHED MANAGEMENT PROGRAMME: WORK PLAN	FY 1				FY 2				FY 3				FY 4				FY 5	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
<b>Component</b>																		
<b>1. Establish Programme Steering Committee and Programme Coordinating Unit</b>																		
1.1 Establish Programme Steering Committee	■	■				■				■				■				■
1.2 Establish & Support Programme Coordinating Unit	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1.3 Hire and Support National Programme Coordinators	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>2. Watershed management Information and Data base</b>																		
2.1 Document centre	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2.2 Environmental, social and Economic Data Base	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2.3 Geographic Information System	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>3. Monitoring, Evalaution and Impact assessment: WSM Interventions</b>																		
3.1 Basin-wide Sediment Monitoring System	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3.2 Erosion & Sediment Moniroing & Research: Sample Watersheds	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3.3 Environmental, Social and Economic Impact Assessment: WSM Interventions	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>4. Preparation First &amp; Second Round WSM Projects</b>																		
4.1 Prioritizing, Preparing and Coordinating implementation of First Round Projects	■	■	■	■	■	■	■	■	■	■	■	■						
4.2 Identifying, Preparing and Coordinating implementation of Second Round Projects													■	■	■	■	■	■
<b>5. Joint Hydro-Ecological-Livelihoods Study: Baro-Sobat-White Nile Sub-basin</b>																		
	■	■	■	■	■	■	■	■	■	■	■	■						
<b>6. Capacity Building</b>																		
5.1 Formal Training		■	■	■		■	■	■		■	■	■		■	■	■		■
5.2 Regional Training Workshops		■	■	■		■	■	■		■	■	■		■	■	■		■

## V. Procurement, Disbursement and Financial Management

### A. Procurement Methods

Technical equipment and other goods costing US\$ 150,000 and more per contract will be subject to International Competitive Bidding (ICB) requirements. For goods in the range between US\$ 80,000-US\$ 150,000 contracts may be awarded on the basis of National Competitive Bidding (NCB) – it should be noted that for this Programme, NCB includes all of the participating riparian countries and bidding opportunities will therefore be published in all riparian countries for NCB. For goods contracts below US\$ 80,000 contracts will be awarded on the basis of the World Bank's Shopping procedure, where price quotations will be obtained from at least three qualified suppliers from at least two eligible countries or from comparison of quotations obtained from three domestic suppliers from the riparian countries.

As much of work undertaken in this Programme is capacity building and technical assistance to the Eastern Nile Basin riparian countries, a large percentage of the expenditures will be for Consultants' Services, much of which will be based in the Eastern Nile Basin. Following agreed upon criteria, ENTRO will maintain and update a list of consultants that will be used to establish shortlists. The shortlists will be established based on expressions of interests received through GPNs and Specific Advertisements placed in the UNDB and/or regional newspapers, depending upon the estimated value of such assignments. Consultant firms, Universities and other Research Institutions financed under the Programme will be selected in accordance with Bank Consultant Guidelines through a Quality and Cost-Based Selection (QCBS), and by using the Bank's Standard Request for Proposals. Specialized Consultants' Services from the Nile riparian countries, below an estimated contract value of US\$ 50,000 equivalent, will be selected on the basis of Consultant Qualifications (CQ) from the predetermined roster of qualified consultants. Training under the Programme will be implemented according to an annual training plan that ENTRO will prepare and submit to the World Bank for non-objection before implementation. More specifically, the following selection procedures would be used for Consultants' Services:

- (a) *Quality-and-Cost-based Selection*: All consulting service contracts valued at more than US\$ 200,000 equivalent would be awarded through the Quality and Cost Based Selection (QCBS) method. QCBS will also be used for all contracts awarded to consulting firms between US\$ 50,000 and US\$ 200,000 equivalent. To ensure that priority is given to the identification of suitable and qualified national consulting firms, short-lists for QCBS contracts estimated at or less than US\$ 200,000 equivalent may be comprised entirely of national consultants from the Nile riparian countries, with no more than two firms on the short-list from any one riparian country, (in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines), provided that a sufficient number of qualified individual or firms (at least three) are available. However, if foreign firms have expressed interest, they would not be excluded from consideration.
- (b) *Consultant's Qualification Selection (CQ)* may be used for Consultants' Services contracts below an estimated contract amount of US\$ 50,000 equivalent, for research and targeted interventions for which organizations with specialized expertise, strong capacities to work with multinational groups and proven track records would be recruited. CQ may also be used for the

selection of training institutions for contracts to provide training services that are estimated to cost up to US\$ 150,000 equivalent per contract.

- (c) Consultants for services meeting the requirements of Section V of the Consultant Guidelines will be selected under the provisions for the *Selection of Individual Consultants* method. Individual Consultants (IC) will be selected through comparison of curriculum vitae against job description requirements of those expressing interest in the assignment, or those having been identified directly by the PMU. Civil servants from the riparian countries cannot be hired as consultants under the Programme.
- (d) *Indefinite delivery contracts* may be used for contracts on a retainer basis. Services under this type of contract are likely to be those which will be required on a recurrent basis and could include, but are not limited to, services such as translation, interpretation, workshop facilitation and community training etc.

Training, workshops, conference attendance and study tours will be carried out on the basis of approved annual programs that will identify the general framework of training and similar activities for the year, including the nature of training/study tours/workshops, the number of participants, and cost estimates. For national training and workshops, preference will be given to consultants from the country in which the training is being organized, provided that a sufficient number of qualified individuals or firms (at least three) are available. For regional training, preference will be given to consultants from the Eastern Nile Basin riparian countries, provided that no more than two consultants from any one riparian are short-listed and a sufficient number of qualified individuals or firms (at least three) is available.

The regional and technical nature of this Programme will result in the possibility that a number of tasks and activities may best be undertaken by existing state owned universities or research institutions in the Eastern Nile Basin riparian countries. The Programme thus will involve contracting research institutions, think tanks and academic institutions that are government owned in the respective countries where the services are required to be rendered. This work will likely be in the fields of: (a) watershed management, (b) environmental and social impact assessment, (c) environmental economics, (d) erosion and sedimentation data and modeling; and (e) livelihoods assessment.

As these unique assignments will be specific for the respective countries, it is very unlikely that suitable expertise from private sector consultants will be available.

University professors or scientists from research institutes can be contracted individually under Bank financing provided that they have full time employment contracts with their institution, have regularly exercised their function for a year or more before they are contracted under Bank funding, and selection is made on a competitive basis, with full justification, and in accordance with relevant Bank policies.

The following documents are to be submitted to the World Bank for prior review:

- (a) *Goods and Equipment*: All Contracts above US\$ 150,000 will be submitted for prior review.

- (b) *Consultants' Services*: All contracts with firms above US\$ 200,000, will be submitted for prior review, while the first contract with firms below US\$ 200,000 will be reviewed. Individual consultant contracts above US\$ 50,000 will all be subject to prior review. Terms of Reference will be written by the appropriate the ENTRO Watershed Management Programme Coordinator staff. A large portion of this Programme will consist of small stand-alone Consultants' Services. To streamline Programme operations, the World Bank will not review the Terms of Reference for any contract less than US\$ 50,000.

**B. Disbursement**

To be determined

**C. Financial Management**

To be determined

## VI. Reporting

### A. Programme Reports

During the implementation of the Programme, the following reporting will be required:

- **E-mailed monthly narrative report** (maximum 2 pages). Outlining the work accomplished in the preceding month, an outline of the work expected to be completed during the coming month, and if appropriate, comments and/or recommendations relating to any unforeseen conditions which may affect the progress or the quality of the work. The responsibility for reporting is with the Watershed Management Programme Manager.

**Distribution:** ENTRO, National Programme Coordinators, World Bank (Donor). For internal use only.

- **Semi-Annual Programme Implementation Progress Reports.** Covering the intervals between the annual reports the e-mailed monthly narrative reports will be expanded to include a narrative summary of activities undertaken during the past six months. This should include: (a) the status of implementation progress, problems encountered and corrective actions needed; (b) the current costs of each Programme component and estimated costs for completion; and (c) the degree of achievement of Programme objectives, as measured by the status of Programme indicators. These reports will include special sections on procurement and disbursement (attaching the most recent FMR) with information on: progress of procurement activities against plans set forth in the PIP; variations in progress, reasons for variations and actions being taken to address these problems; and Programme expenditures (foreign and local costs).

**Timing:** First report to be submitted 6 months after Programme effectiveness.

**Distribution:** ENSAPT, National Programme Coordinators, World Bank (Donor).

- **Annual Substantive Programme Progress Report:** The Programme Manager will complete an annual substantive Programme progress report, which will clearly describe and assess Programme progress against the established work plan, Programme documents, and the overall objectives of the Programme. Every effort will be made to simplify and unify reporting arrangements; therefore, the Programme Manager will review the annual reporting requirements of the World Bank, (the Donor) and the other relevant agencies and donors and design a unified reporting format acceptable to all that meets most of the reporting requirements of the donors and agencies in one single report.

**Timing:** First report to be submitted 12 months after Programme signature and two months ahead of the first Annual Programme Review.

**Distribution:** ENSAPT, World Bank and (Donor).

- **Substantive Work Plan:** Will be attached to the Annual Substantive Programme Progress Report and will include an updated procurement plan.
- **Mid term evaluation:** Resources have been set aside in accordance with standard procedure to ensure that a mid-term evaluation can be carried out. The Terms of Reference and timing of this evaluations will be determined through the Annual Review process or by correspondence. The evaluations will normally be independent and thus carried out by consultants not previously associated with the Programme.

**Timing:** Mid-term evaluation: During third year of Programme implementation.

**Distribution:** ENSAPT. This report may be shared with other parties upon request in accordance with established policy.

### **Additional substantive Programme outputs:**

- **Ad hoc Reporting and Substantive Reports.** The Programme will be producing a large number of ad hoc substantive reports within the thematic areas in which it is operating. These reports will be produced at either the national or regional levels for a variety of purposes.

**Distribution:** As per intention of report.

**Additional distribution:** ENSAPT, World Bank (and Donor)

### **Financial reports:**

**Financial Monitoring Reports.** ENTRO will be responsible for submitting quarterly FMRs as well as annual budgets, Programme monitoring reports, and consolidated financial statements to the World Bank.

- **Quarterly FMR.** Procurement and disbursement information for the preceding quarter and projections for the following six months will be consolidated in the quarterly Financial Management Report (FMR). The FMRs will also include a summary of the physical progress in Programme implementation, with an explanation of variances from implementation targets.

**Timing:** quarterly for each fiscal year of Programme effectiveness.

**Distribution:** ENSAPT, World Bank (and Donor).

## VII. Monitoring and Evaluation

### A. Introduction

**Purpose.** The monitoring and evaluation process is an integral element of the Watershed Management Programme. This process will provide information on whether the Programme interventions are successful in achieving the development objectives and whether implementation is proceeding in accordance with the plan. The process integrates the measurement and monitoring of *both development and performance indicators*. Monitoring is a continuous process and provides necessary information which facilitates an assessment of the progress of Programme implementation. Moreover, monitoring ensures that progress is maintained according to schedule, and measures the quality and effect of the processes and procedures.

**Audience for monitoring efforts.** The monitoring efforts provide the ENCOM, ENSAPT and ENTRO, the World Bank, (the Donor) and others with the information needed to analyze the current Programme situation and identify solutions to keep the schedule and achieve the desired objectives.

**Programme evaluation.** In addition to the ongoing monitoring efforts, two Programme evaluations will be carried out during implementation, at mid-term and at Programme completion. These two evaluations will provide a perspective on Programme implementation, corrective measures required (mid-term evaluation) in addition to providing information on which effects and impacts have been achieved during the Programme implementation period.

**Monitoring and Evaluation Plan.** This Monitoring and Evaluation Plan (M&E Plan) will be adapted from the Programme Logical Framework (Annex A). The plan will provide a narrative for Programme components and the corresponding output indicators. The plan will further outline how each indicator is measured and where relevant information is found.

**Methodology.** The M&E process will utilize both conventional and participatory strategies and will engage a range of stakeholders. Monitoring is mainly based on quantitative and objective indicators and objective assessments. Only when it is not possible to get objective assessment, does the plan resort to subjective assessment.

**Ongoing learning.** Programme monitoring results will be presented to all Programme stakeholders. The findings and results will be used by ENTRO and the Watershed Management Programme Manager to improve performance and to take corrective action throughout the Programme implementation period.

### B. M & E Strategy and Action Plan

**Approach.** The first task will be to develop a detailed Monitoring and Evaluation Plan based on the information already provided in the present document. The first activity in the Plan will be to review the Programme to develop detailed performance indicators against which Programme performance can be measured. These indicators will be in conformity (but in greater detail) with the Logframe and Monitoring Plan provided in the present document.

**Establishing the baseline situation.** The Programme Manager will develop component specific baseline situations along the following parameters:

- Present availability information; documentation; environmental, social and economic data; and GIS data (Component 1).
- Present availability, location and status of sediment monitoring data; research results and other data on erosion and deposition; and research and other data on natural resources-livelihoods-poverty linkages within the Eastern Nile Basin (Component 2).
- Present availability and location of data and information on hydro-ecological-livelihoods linkages in the Baro-Sobat-White Nile Sub-basin (Component 4).

The baseline situation may be developed based on literature review, sampling surveys, rapid assessments or other accepted methodologies.

**Developing the M&E Strategy and Action Plan and the Tracking Matrix.** With the clearly defined baseline situation, and with further detailed performance indicators, the M&E Strategy will be developed. The Strategy will outline benchmarks and timelines for achievements of the various outcomes. Attached to the M&E Strategy will be an Action Plan, which clearly spells out the steps, activities and actions which are required from various stakeholders, consultants, etc. A relatively simple overview tracking matrix will also be established to monitor performance. This tracking matrix will be updated regularly, (at least once every two months). The tracking matrix will form an important input to reporting to ENSAPT, the World Bank and donors. It will also be a useful base on which to write the semi-annual and annual reports

### C. Key Performance Indicators

The key Outcome/Impact indicators listed in the Monitoring and Evaluation Plan are as follows:

- Increased regional cooperation in watershed management,
- Increased number of basin-wide networks of watershed management professionals and increased number of experts knowledgeable in the subject;
- Greater appreciation of erosion, deposition and sedimentation and impacts on livelihoods and poverty;
- Expanded information, knowledge base and know how on watershed management available to professionals and NGOs;
- Greater awareness of the linkages between macro/sectoral policies, the natural resource bas, livelihoods and poverty.



**ANNEX 1. LOGICAL FRAMEWORK**

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluations	Critical Assumptions
<p><b>Basin-wide Goal</b></p> <p>To achieve the sustainable socio-economic development through the equitable utilization of, and benefit from, the common Eastern Nile Basin's natural resources.</p> <p>ENTRO's vision is to see a series of new projects being prepared and implemented; working for the shared benefits of cooperation.</p>	<p><b>Basin-wide Indicators</b></p> <p>Increasing levels of regional cooperation and coordination through ENSAP and ENTRO.</p>	<p><b>Reports</b></p> <p>ENTRO's Annual Report.</p>	<p><b>(From Objective to Goal)</b></p> <p>Continued political and financial commitment to the Eastern Nile Technical regional Office by the three riparian states.</p> <p>Continued donor support.</p>
<p><b>Programme Development Objective</b></p> <p>The immediate objective of the long-term Eastern Nile Watershed Management Programme (EN-WMP) is to provide continued and enhanced support the sustainable watershed management of the Eastern Nile Basin in order to improve the living conditions of the people, create alternative livelihoods, enhance agricultural productivity, protect the environment and in the long term reduce sediment transport and siltation of infrastructure and prepare for sustainable development oriented investments.</p> <p>The overriding regional significance of this will be its contribution to enhanced food security and poverty alleviation in the region and its long term contribution to arresting degradation of the natural resource base.</p> <p>Enhancing the analytical capacity for a basin-wide perspective to support the sustainable watershed management and development of the Eastern Nile Basin's natural resources, and</p> <p>Engaging stakeholders, from local communities to national policy makers, universities, from non-governmental organizations to line ministries, in management and protection of the basin's shared resources.</p>	<p><b>Outcomes/Impact Indicators</b></p> <p>Increased regional cooperation in water shed management; sediment monitoring; and environmental, social and economic impacts of WSM Interventions</p> <p>Basin-wide networks of water shed management professionals</p> <p>Expanded information and knowledge base on erosion, deposition and sediment delivery available to professionals and NGOs</p> <p>Greater awareness of the linkages between natural resource utilization, livelihoods and poverty.</p>	<p><b>Programme Reports</b></p> <p>Watershed Management Programme reports that clearly document the results of monitoring, impact assessment and studies</p> <p>Programme monitoring and evaluation reports.</p>	<p><b>(From Objective to Goal)</b></p> <p>The Eastern Nile Basin riparian governments:</p> <p>Agree on the planning, implementation and monitoring of the Programme.</p> <p>Programme component work plans and financial arrangements for the programme are in place.</p> <p>Stakeholders from both the public sector and civil society at large are willing to actively participate in and collaborate with the programme.</p> <p>Full Financing for all planned Programme components.</p>

## EASTERN NILE WATERSHED MANAGEMENT CRA

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluations	Critical Assumptions
<p><b>Outputs:</b>  <b>1. Programme Coordinating Mechanisms</b>                      1.1 Establish Steering Committee                      1.2 Establish Programme Coordinating Unit                      1.3 Hire National Programme Coordinators</p>	<p><b>Outcome/Impact Indicators</b>                      1.1 Steering Meets at least annually                      1.2 Staff hired and Unit operating                      1.3 NPC's hired and operating</p>	<p><b>Programme Reports</b>                      Annual Project Report – including project monitoring and evaluation, and workshop reports.</p>	<p>(From Outputs to Objective)                      1. Qualified and motivated staff and other resources are available in the region.</p>
<p><b>Outputs</b>  <b>2. Watershed Management Information Centre and Data Base</b>                      2.1 Document Centre established and operating                      2.2 Environmental, Social and economic Data Base established and operating                      2.3 Geographic Information System established and operating</p>	<p><b>Outcome/Impact Indicators</b>                      2.1 Hardware &amp; software procured &amp; installed                      2.1 Document data base structure developed                      2.1 All relevant available documentation collated and indexed &amp; entered into data base                      2.2 Hardware &amp; software procured &amp; installed                      2.2 Data base structure developed                      2.2 All relevant available data collated &amp; entered into data base                      2.3 Hardware &amp; software procured &amp; installed                      2.3 Geo Data base Structure developed                      2.3 Feature data sets and map files collated, meta data recorded and files entered into GIS                      2.3 Additional feature data sets and map files obtained</p>	<p><b>Programme Reports</b>                      Annual reports                      2.1 Bibliography prepared (hard &amp; digital copy)                      2.2 Meta data base established &amp; disseminated (hard &amp; digital)                      2.3 Meta data base established &amp; disseminated (hard &amp; digital copy)</p>	<p>(From Outputs to Objective)                      2.1 Qualified staff recruited                      2.2 Qualified staff recruited                      2.2 Data made available                      2.3 Qualified staff recruited                      2.3 Geo data made available</p>
<p><b>Outputs</b>  <b>3. Watershed Management Interventions Monitored, Evaluated &amp; Assessed</b>                      3.1 Basin-wide System of Sediment Monitoring                      3.2 System of Research &amp; Monitoring Erosion and Sediment in Sample watersheds</p>	<p><b>Outcome/Impact Indicators</b>                      3.1 Basin-wide system of harmonized sediment data collection established                      3.1 Gaps identified &amp; equipment installed                      3.1 Basin-wide system of communication &amp; data transfer established                      3.2 Competent Research Monitoring Teams identified                      3.2 Sample watersheds Identified                      3.2 Research &amp; Monitoring Framework developed</p>	<p><b>Programme Reports</b>                      Annual Programme Report – including Programme monitoring and evaluation, and workshop reports.                      3.1 Meta data base development &amp; disseminated (hard &amp; soft copy)                      3.1 Annual Bulletins published                      3.2 Minutes of Knowledge Sharing Workshops published &amp; disseminated                      3.2 Research &amp; Monitoring Reports Published &amp; Disseminated</p>	<p>(From Outputs to Objective)                      3.1 Full cooperation from riparian countries in harmonizing data collection;                      3.2. Competent Researchers available.</p>

## EASTERN NILE WATERSHED MANAGEMENT CRA

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluations	Critical Assumptions
3.3 System of Environmental, Social and Economic Impact Assessment of WSM Interventions in operation	<p>3.2 Equipment procured &amp; installed</p> <p>3.2 Data Collected &amp; Analyzed</p> <p>3.2 Physical Impacts of WSM Interventions determined</p> <p>3.3 Competent Research Monitoring Teams identified</p> <p>3.3 Research Framework developed</p> <p>3.3 Data Collected &amp; Analyzed</p> <p>3.4 Environmental, Social and Economic Impacts of WSM Interventions determined</p>	<p>3.3 Minutes of Knowledge Sharing Workshops published &amp; disseminated</p> <p>3.3 Research &amp; Monitoring Reports Published &amp; Disseminated</p>	<p>3.3 Competent Researchers available</p>
<b>Outputs</b>	<b>Outcome/Impact Indicators</b>	<b>Programme Reports</b>	<b>(From Outputs to Objective)</b>
<p><b>4. First &amp; Second Round Watershed Management Projects</b></p> <p>4.1 Prioritization, Preparation &amp; Coordination of Implementation of First Round of watershed Management projects</p> <p>4.2 Identification, Preparation &amp; Coordination of Implementation of Second Round of Watershed Management Projects</p>	<p>4.1 Projects prioritized according to agreed set of criteria</p> <p>4.1 Project Documents prepared ready for donors</p> <p>4.1 Financing sources identified and agreed</p> <p>4.1 Institutional arrangement for project implementation agreed</p> <p>4.1 Projects Implemented</p> <p>4.2 Projects Identified</p> <p>4.2 Project Documents prepared ready for donors</p> <p>4.2 Financing sources identified and agreed</p> <p>4.2 Institutional arrangement for project implementation agreed</p> <p>4.2 Projects Implemented</p>	<p>Annual Programme Report – including Programme monitoring and evaluation reports.</p> <p>4.1 Programme Documents</p> <p>4.1 Programme progress reports</p> <p>4.1 Programme Completion reports</p> <p>4.1 <i>Ex post</i> Evaluation reports</p> <p>4.2 Programme Documents</p> <p>4.2 Programme progress reports</p> <p>4.2 Programme Completion reports</p> <p>4.2 <i>Ex post</i> Evaluation reports</p>	<p>All Nile countries ready to participate in component.</p> <p>4.1 Agreement from riparian Countries on prioritization</p> <p>4.1 Financing Sources obtained</p> <p>4.2 Financing Sources obtained</p>
<b>Output</b>	<b>Outcome/Impact Indicators</b>	<b>Programme Reports</b>	
<p><b>5. Joint Hydro-Ecological-Livelihoods Study: Baro-Sobat-White Nile Sub-basin</b></p>	<p>- Study Consultants identified and contracted</p> <p>- Stakeholder Consultations undertaken.</p> <p>- Survey, Participatory Data Collection and Analysis completed</p> <p>- Findings presented at Workshops</p>	<p>- Annual Programme Report – including Programme monitoring and evaluation, and workshop reports.</p> <p>- Reports of Workshops</p> <p>- Study Reports of Analysis and Findings</p>	<p>- Stakeholders are willing to participate in and share information</p>
<b>Outputs</b>	<b>Outcome/Impact Indicators</b>	<b>Programme Reports</b>	<b>(From Outputs to Objective)</b>
<p><b>6. Capacity Building &amp; Institutional Strengthening</b></p> <p>6.1 Formal Training</p>	<p>6.1 Training Institutions identified and Courses</p>	<p>Annual Programme Report – including Programme monitoring and evaluation, and workshop reports.</p> <p>6.1 Participants Course Evaluation reports</p>	

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluations	Critical Assumptions
<p>6.2 Regional Training Workshops</p>	<p>prepared.                      6.1 Course participants identified                      6.1 Training Courses implemented.                       6.2 Training Institutions identified and Workshops prepared.                      6.2 Workshops participants identified                      6.2 Training Workshops implemented.</p>	<p>6.2 Participants Workshop Evaluation reports.</p>	

## ANNEX 2. DETAILED COSTS

WATERSHED MANAGEMENT PROGRAMME: COSTS						
Component	US\$ '000					TOTAL
	PY1	PY2	PY3	PY4	PY5	
<b>1. Programme Coordination</b>						
<b>1.1 Programme Management Staff</b>						
WSM Programme Coordinator	150.0	150.0	150.0	0.0	0.0	450.0
Project Planning Specialist	72.0	72.0	72.0	72.0	72.0	360.0
Monitoring & Evaluation Specialist	72.0	72.0	72.0	72.0	72.0	360.0
Secretarial Services	10.0	10.0	10.0	10.0	10.0	50.0
3 National Programme Coordinators	60.0	60.0	60.0	60.0	60.0	300.0
1 Driver	10.0	10.0	10.0	10.0	10.0	50.0
WSM Prog. Coord. Regional Travel (15 trips)	30.0	30.0	30.0	0.0	0.0	90.0
WSM Prog. Coord. International Travel (1 trip)	6.0	6.0	6.0	0.0	0.0	18.0
Subject Matter Specialists: Regional Travel (4 trips)	8.0	8.0	8.0	8.0	8.0	40.0
<b>Subtotal</b>	<b>418.0</b>	<b>418.0</b>	<b>418.0</b>	<b>232.0</b>	<b>232.0</b>	<b>1,718.0</b>
<b>1.2 Project Management Office Equipment, furniture, etc</b>						
Office equipment (Computers, etc)	15.0	0.0	0.0	15.0	0.0	30.0
Office furniture	20.0	0.0	0.0	0.0	0.0	20.0
Office (rent equivalent)	6.0	6.0	6.0	6.0	6.0	30.0
<b>Subtotal</b>	<b>41.0</b>	<b>6.0</b>	<b>6.0</b>	<b>21.0</b>	<b>6.0</b>	<b>80.0</b>
<b>1.3 Vehicles</b>						
Vehicle	22.0	0.0	0.0	0.0	0.0	22.0
<b>1.4 Project Management Expenses</b>						
Steering Committee Meetings (2/yr)	70.0	70.0	70.0	70.0	70.0	350.0
Communications	4.0	4.0	4.0	4.0	4.0	20.0
Utilities	2.0	2.0	2.0	2.0	2.0	10.0
Vehicle operation	2.0	2.0	2.0	2.0	2.0	10.0
Printing, dissemination	3.0	3.0	3.0	3.0	3.0	15.0
Sundry expenses	3.0	3.0	3.0	3.0	3.0	15.0
<b>Subtotal</b>	<b>84.0</b>	<b>84.0</b>	<b>84.0</b>	<b>84.0</b>	<b>84.0</b>	<b>420.0</b>
<b>1.5 National Programme Coordinator Expenses</b>						
Office equipment, furniture, etc (3 sets)	18.0	0.0	0.0	0.0	0.0	18.0
Office Management Expenses	6.0	6.0	6.0	6.0	6.0	30.0
Secretarial Services	30.0	30.0	30.0	30.0	30.0	150.0
Transportation	9.0	9.0	9.0	9.0	9.0	45.0
Regional travel	12.0	12.0	12.0	12.0	12.0	60.0
<b>Subtotal</b>	<b>75.0</b>	<b>57.0</b>	<b>57.0</b>	<b>57.0</b>	<b>57.0</b>	<b>303.0</b>
<b>COMPONENT 1 TOTAL</b>	<b>640.0</b>	<b>565.0</b>	<b>565.0</b>	<b>394.0</b>	<b>379.0</b>	<b>2,543.0</b>
<b>2. Watershed management Information and Data base</b>						
<b>2.1 Document centre</b>						
Equipment (hardware, software)	15.0	0.0	0.0	0.0	0.0	15.0
Office accomadation (rent equivalent)	6.0	6.0	6.0	6.0	6.0	30.0
Materials	5.0	5.0	5.0	5.0	5.0	25.0
<b>Sub-total</b>	<b>26.0</b>	<b>11.0</b>	<b>11.0</b>	<b>11.0</b>	<b>11.0</b>	<b>70.0</b>
<b>2.2 Environmental, social and Economic Data Base</b>						
Equipment (hardware, software)	15.0	0.0	0.0	0.0	0.0	15.0
Office accomadation (rent equivalent)	0.0	0.0	0.0	0.0	0.0	0.0
Materials	5.0	5.0	5.0	5.0	5.0	25.0
<b>Sub-total</b>	<b>20.0</b>	<b>5.0</b>	<b>5.0</b>	<b>5.0</b>	<b>5.0</b>	<b>40.0</b>
<b>2.3 Geographic Information System</b>						
Equipment (hardware, software)	30.0	0.0	0.0	0.0	0.0	30.0
Office accomadation (rent equivalent)	0.0	0.0	0.0	0.0	0.0	0.0
Materials	15.0	15.0	15.0	15.0	15.0	75.0
<b>Sub-total</b>	<b>45.0</b>	<b>15.0</b>	<b>15.0</b>	<b>15.0</b>	<b>15.0</b>	<b>105.0</b>
<b>COMPONENT 2 TOTAL</b>	<b>91.0</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>	<b>215.0</b>
<b>3. Monitoring, Evalaution and Impact assessment: WSM Interventions</b>						
<b>3.1 Basin-wide Sediment Monitoring System</b>						
Equipment (hardware, software)	150.0	25.0	0.0	0.0	0.0	175.0
Communications, Report Production	15.0	15.0	15.0	15.0	15.0	75.0
Materials	10.0	10.0	10.0	10.0	10.0	50.0
<b>Sub-total</b>	<b>175.0</b>	<b>50.0</b>	<b>25.0</b>	<b>25.0</b>	<b>25.0</b>	<b>300.0</b>
<b>3.2 Erosion &amp; Sediment Moniroing &amp; Research: Sample Watersheds</b>						
Equipment (hardware, software)	250.0	25.0	0.0	0.0	0.0	275.0
Monitoring/Research Contracts	400.0	400.0	400.0	400.0	400.0	2,000.0
Knowledge Sharing & Dissemination, Report production	50.0	50.0	50.0	50.0	50.0	250.0
<b>Sub-total</b>	<b>700.0</b>	<b>475.0</b>	<b>450.0</b>	<b>450.0</b>	<b>450.0</b>	<b>2,525.0</b>
<b>3.3 Environmenta, Social and Economic Impact Assessment: WSM Interventions</b>						
Equipment (hardware, software)	25.0	0.0	0.0	0.0	0.0	25.0
Monitoring/Research Contracts	450.0	450.0	450.0	450.0	450.0	2,250.0
Knowledge Sharing & Dissemination	50.0	50.0	50.0	50.0	50.0	250.0
<b>Sub-total</b>	<b>525.0</b>	<b>500.0</b>	<b>500.0</b>	<b>500.0</b>	<b>500.0</b>	<b>2,525.0</b>
<b>COMPONENT 3 TOTAL</b>	<b>1,400.0</b>	<b>1,025.0</b>	<b>975.0</b>	<b>975.0</b>	<b>975.0</b>	<b>5,350.0</b>

## EASTERN NILE WATERSHED MANAGEMENT CRA

<b>4. Preparation First &amp; Second Round WSM Projects</b>						
<b>4.1 Prioritizing, Preparing and Coordinating implementation of First Round Projects</b>						
Project Planning Consultant (6 months)	96.0	96.0	96.0	0.0	0.0	288.0
Monitoring & Evaluation Consultant (6 months)	96.0	96.0	96.0	0.0	0.0	288.0
Workshops, Knowledge Sharing, Report Production	10.0	10.0	10.0	0.0	0.0	30.0
<b>Sub-total</b>	<b>202.0</b>	<b>202.0</b>	<b>202.0</b>	<b>0.0</b>	<b>0.0</b>	<b>606.0</b>
<b>4.2 Identifying, Preparing and Coordinating implementation of Second Round Projects</b>						
Project Planning Consultant (6 months)	0.0	0.0	0.0	96.0	96.0	192.0
Monitoring & Evaluation Consultant (6 months)	0.0	0.0	0.0	96.0	96.0	192.0
Workshops, Knowledge Sharing, Report Production	0.0	0.0	0.0	10.0	10.0	20.0
<b>Sub-total</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>202.0</b>	<b>202.0</b>	<b>404.0</b>
<b>COMPONENT 4 TOTAL</b>	<b>202.0</b>	<b>202.0</b>	<b>202.0</b>	<b>202.0</b>	<b>202.0</b>	<b>1,010.0</b>
<b>5. Joint Hydro-Ecological-Livelihoods Study: Baro-Sobat-White Nile Sub-basin</b>						
Equipment (hardware, software)	125.0	25.0	0.0	0.0	0.0	150.0
Study Contracts	350.0	250.0	200.0	0.0	0.0	800.0
Knowledge Sharing, Report production & Dissemination	15.0	25.0	30.0	0.0	0.0	70.0
<b>COMPONENT 5 TOTAL</b>	<b>490.0</b>	<b>300.0</b>	<b>230.0</b>	<b>0.0</b>	<b>0.0</b>	<b>1,020.0</b>
<b>6. Capacity Building</b>						
<b>6.1 Formal Training</b>						
Commision Training Courses (course design course materials)	150.0	150.0	0.0	0.0	0.0	300.0
Trainers Fees	100.0	100.0	100.0	100.0	100.0	500.0
Trainees expences (travel, per diem, etc)	550.0	550.0	550.0	550.0	550.0	2,750.0
<b>Sub-total</b>	<b>800.0</b>	<b>800.0</b>	<b>650.0</b>	<b>650.0</b>	<b>650.0</b>	<b>3,550.0</b>
<b>6.2 Regional Training Workshops</b>						
Commision Training Courses (course design course materials)	50.0	50.0	50.0	50.0	50.0	250.0
Trainers Fees	25.0	25.0	25.0	25.0	25.0	125.0
Trainees expences (travel, per diem, etc)	220.0	220.0	220.0	220.0	220.0	1,100.0
<b>Sub-total</b>	<b>295.0</b>	<b>295.0</b>	<b>295.0</b>	<b>295.0</b>	<b>295.0</b>	<b>1,475.0</b>
<b>COMPONENT 6 TOTAL</b>	<b>1,095.0</b>	<b>1,095.0</b>	<b>945.0</b>	<b>945.0</b>	<b>945.0</b>	<b>5,025.0</b>
<b>PROGRAMME TOTAL</b>	<b>3,918.0</b>	<b>3,218.0</b>	<b>2,948.0</b>	<b>2,547.0</b>	<b>2,532.0</b>	<b>15,163.0</b>

**PART 3.  
PROJECT PROFILES**

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## ACRONYMS AND ABBREVIATIONS

ADLI	Agricultural Development Led Industrialization
AHDA	Aswan High Dam Authority
CPA	Comprehensive Peace Agreement
CRA	Cooperative Regional Assessment
ENCOM	Eastern Nile Council of Ministers
ENPM	Eastern Nile Planning Model
ENSAP	Eastern Nile Subsidiary Action Programme
ENTRO	Eastern Nile Technical Regional Office
EN-WMP	Eastern Nile Watershed Management Project
EWDCD	Ethiopian Wildlife Development & Conservation Department
GEF	Global Environmental Facility
GoS	Government of Sudan
IDEN	Integrated Development of the Eastern Nile
IDP	Internally Displaced Person
JAM	Joint Assessment Mission
JMP	Joint Multi-Purpose Programme
km	Kilometre
km <sup>2</sup>	Square kilometer
KwH	Kilowatt Hour
m	metre
m <sup>3</sup>	cubic metre
masl	meters above sea level
MCM	Million Cubic Meters
MDG	Millennium Development Goals
MFED	Ministry of Finance & Economic Development
MIWR	Ministry of Irrigation and Water Resources
MWRI	Ministry of Water Resources and Irrigation
NBI	Nile Basin Initiative
Nile-COM	Nile Council of Ministers
NWRP	National Water Resources Plan
NBI	Nile Basin Initiative
NCS	Natiuonal Conservation Strategy
NFP	National Focal Point
NP	National Park
NTEAP	Nile Transboundary Environmental Assessment Programme
PASSED	Plan for Accelerated and Sustainable Development to End Poverty
RBA	River Basin Authority
PRSP	Poverty Reduction Strategy Plan
SDO	Social Development Officer
SKAP	South Kassala Agricultural Project
SPLMA	Sudan Peoples Liberation Movement Army
SVP	Shared Vision Programme
SWC	Soil and Water Conservation
SDPRP	Sustainable Development & Poverty Reduction Programme
t	ton
UNESCO	United Nations Education, Scientific and Cultural Organization
US\$	United States Dollar
USAID	United States Agency for International Development
WB	World Bank
WSM	Watershed Management

## **1. INTRODUCTION**

### **1.1 Background**

The objective of this component of the Watershed Management CRA is to provide recommendations for future watershed interventions that derive from the Transboundary and Distributive Analysis previously undertaken. In particular this report presents a number of project profiles each setting out objectives, background and rationale, scope and extent, and a rough cost estimate. They identify the anticipated type of benefits to be expected and their distribution (mainly on local, district/state, sub-regional or watershed/regional level or beyond). Finally, the profiles identify any relations and benefits to likely interventions that are being identified through other IDEN studies.

These projects are located within the framework of the Long Term Watershed Management CRA where they comprise a set of first round watershed management projects that will be prepared in detail, funding sources identified and implemented within the long term Eastern Nile Subsidiary Action Programme (ENSAP).

This chapter firstly sets out the strategic policy and development context for the proposed projects at the national level and that of ENSAP. It then provides details of the criteria, rationale and justification why these projects were selected.

### **1.2 National Level Policy and Development Framework**

This section outlines the national macro development policy frameworks of Ethiopia and Sudan and of Egypt (with particular respect to Lake Nasser and its environs). This is to set the proposed projects into the context of the broad national development policies and strategies.

#### **1.2.1 Ethiopia**

##### **(i) Agricultural Development Led Industrialization**

At the core of Ethiopia's macro development policy is the Agricultural-Development-Led-Industrialization (ADLI) strategy. This is a strategy "in which agriculture and industry are brought together in a single framework, wherein the development of agriculture is viewed as an important vehicle for industrialization by providing raw material, a market base, surplus labour and capital accumulation" (MFED, 2001). In addition there are number of other policy and strategy documents including:

- Rural Development Policies, Strategies and Instruments,
- Land Policy,
- Food Security Strategy,
- Productive Safety Net Programme, and
- Voluntary Resentment Programme

## **(ii) Sustainable Development and Poverty Reduction Programme**

In terms of implementation the Governments Sustainable Development and Poverty Reduction Programme (SDPRP) of 2001 and its successor the Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) of 2006 are the key strategy documents. Amiss Tahoma (2006) has summarized the main development thrusts of the two documents as follows:

### Main thrusts of SDPRP

- ADLI
- Civil Service and Justice Reform
- Capacity Building
- Governance, decentralization and empowerment

### Main thrusts of PASDEP

- Massive Push to Accelerate growth
- Geographically Differentiated Strategy
- Addressing the Population Challenge
- Strengthening Infrastructure
- Managing Risk and Volatility
- Scaling up to Reach the Millennium Development Goals (MDG's)
- Creating Jobs.

Four pathways for agriculture are identified in the PASDEP: (i) Smallholder Intensification, (ii) Commercialization, (iii) off-farm diversification and urbanization and (iv) resettlement and migration.

Intensification entails enhancing smallholders' access to inputs (improved seeds, fertilizers, oxen). It shifts its previous focus on food crops to ensure food self-sufficiency to the production of marketable farm products – both for domestic and export markets – by both large and small farmers. Elements of this strategy include a shift to higher valued crops, a focus on high-potential areas, facilitating the development of large-scale commercial agriculture, and better integrating farmers with markets.

For the first time in over 30 years commercialization of agriculture now receives considerable prominence. Elements include rural roads, irrigation development, a change in delivery for extension and research, selected government support for commercialization where there are gaps in private provision. Some 35 commodities have been identified that have potential for high growth.

Although ADLI strategy recognized the importance of linkages between agriculture and other sectors in fact there has been little development of these linkages (Amdissa Teshome, 2005, Berhanu Nega, 2004). In PASDEP diversification is targeted at the household and the national level. At the household level crop diversification will be facilitated through provision of seed, irrigation and improved marketing and support given to diversification into other farm enterprise (livestock fattening, honey production). Support would also be provided to encourage transfers into non-farm employment through skills training and education. It recognizes that the hundreds of small towns "represent tremendously important growth poles" and that the urban sector will be an important element. Rural-urban linkages will be strengthened through improved access roads, improved telecommunications, development of micro-credit markets and rural electrification.

### **(iii) Voluntary Resettlement**

Linked to diversification are proposals for resettlement. Voluntary resettlement aims to relocate rural families to areas where there is sufficient land and rainfall as a way of ensuring food security. It is planned to resettle 2.2 million people (440,000 households and so reliving pressure in the land-stressed highlands.

### **(iv) Food Security Strategy**

The Food Security Strategy focuses on chronically food insecure households and incorporates many of the elements of the PASDEP. The productive Safety Net Programme also targets chronically poor households and aims at preventing household asset depletion and creating community assets through public works. It is seen as an instrument for balancing pro-poor growth with the shift to commercialization and economic growth. PASDEP is thus an umbrella policy and strategy that brings all sectoral and cross-cutting policies and strategies under one umbrella.

## **1.2.2 Sudan**

### **(i) Decentralization**

In the past five years Sudan has embarked on a policy of administrative decentralization. According to the Local Government Act of 2003, the Sudan has been divided into 26 States, some 16 located in the north and 10 in the south. Each State is divided into a number of Localities (Mahaliyat). The aim of decentralization is to improve the delivery of basic social services and address the severe spatial disparities in access to education, health, water, agricultural extension and other government services.

Decentralization and concomitant capacity building will be undertaken over two phases: Phase I (2005 – 2007) and Phase II (2008 – 2011). Priorities in the local government will be:

- Enhancing management capacity by empowering suitable structures to lead reform;
- A broad consultation on organizational structures;
- Developing a comprehensive strategy for institutional arrangement, policies and guidelines for public services and training;
- Improving systems and practices of local publicprivate partnerships in service delivery;
- Support to Locality development planning;
- Improving Locality information systems;
- Establishing Locality monitoring systems;
- Promoting civil society participation in planning and organization of government activities;
- Mobilizing local revenue generation for State and Local Government.

### **(ii) National Comprehensive Strategy**

Sudan's main objectives and priorities for sustainable development were spelt out in the National Comprehensive Strategy – (NCS) which provides policy directions to all economic and social sectors. The NCS incorporates the country's environmental strategy, which states clearly that environmental issues must be embodied in all development projects. Within the NCS, the government manages the economy through a series of three years rolling plans and annual budget processes. The NCS has also served as a key reference document and basis for sectoral policies and measures.

A weakness of the NCS is the lack of coherence as it was a result of work of different sectoral teams without emphasis on horizontal and vertical integration

### **(iii) Comprehensive Peace Agreement**

The Comprehensive Peace Agreement (CPA), signed between GoS and SPLMA on 9 January 2005, represents a remarkable event in the history of Sudan and is a major opportunity for restoring peace and the social contract between the state and society in the country.

The CPA provides for a socially informed land tenure policy and legislation as it accords specific reference to ownership of land and natural resource. It calls for competency in land administration, provides for incorporation of customary laws and practices and establishes an independent Land Commission for the purposes of arbitration, rights of claims in respect to land, land compensation and the possibility of recommending land reform policies.

The CPA is expected to have many implications (institutional and administrative) - e.g. the establishment of a Land Commission for the south parallel to existing central institutions responsible for land and natural resources management.

There is now a counterpart ministry of Environment and Wildlife in Southern Sudan and it is expected that the post CPA developments will witness greater decentralization on all levels. This will necessitate the initiation of a dialogue on developments in the sub-basins in Sudan as a basic requirement for sustainable development in the sub-region. Of special concern also are issues related to conflict resolution, internally displaced refugees, good governance, and the rights of the socially, economically and politically marginalized groups in post conflict Sudan

#### **(iv) Joint Assessment Mission**

The Joint Assessment Mission Report (JAM) is the most recent document guiding the economic development in post peace period in Sudan. The reports have developed the policy guide lines and interventions in eight clusters, including the economic policy cluster. The issue of environment has been classified as one of the cross-cutting issues. The report identified many environmental challenges Sudan is facing and need to be addressed during the short and medium term to enable the country make an equitable and sustainable development in the foreseen future.

The JAM report has stated that the foremost challenge is to minimize the negative environmental impacts that returning refugees and Internally Displaced Populations (IDPs) may pose on the natural resources base through increased deforestation and destructive agricultural practices

Under the coordination and leadership of the Ministry of Finance and National Economy, Sudan is also in the process of formulating a national poverty reduction strategy. This strategy is expected part of the country's long-term strategic plan and seeks to involve all groups of Sudanese society.

#### **(v) Poverty Reduction Strategy Plan**

The preliminary draft of the Poverty Reduction Strategy Plan (PRSP) was prepared in January 2004 with participation and contribution of a number of highly qualified national experts, The PRSP is considered to be the main available document of the government of the Sudan for poverty reduction. It covers the sixteen States of North Sudan for the period 2005-2007.

PRSP main objectives are:

- Maintain Economic Stability.
- Ensure Political Stability
- Social Stability.

- Environmental integrity
- Improve standards of living
- Assist in the flow of financial resources.

### 1.2.3 Egypt (Lake Nasser and Environs)

#### (i) Master Land Use Plan 1987 - 2017

A Master Land Use Plan of Egypt was prepared in 1986. It concluded that the construction of the Aswan High Dam (AHD) not only made the intensification of agriculture feasible in the old lands but also it could be extended to new “reclaimed” areas. Some 650,000 fedddans (273,000 ha) out of 805,000 fedddans (338,100 ha) of land reclaimed during 1960-70 was made possible due to the increased supply of water from AHD. The total land that can be reclaimed is subject to water availability.

The strategy for agricultural development up to 2017 has a number of aims.

- a. To increase the annual rate of growth in agricultural production from 3.4% to 3.8% during the remaining period of the Fourth 5-Year Plan, and to 4.1% annually up to 2017. This goal is attainable only through vertical and horizontal expansion of plant and animal production, which will have positive impacts on job creation, producer incomes and the overall standard of living of the rural population.
- b. To reclaim no less than 150,000 fedddans (63,000 ha) annually. The Master Plan assesses the reclaimable and cultivable lands in the Delta, Southern Valley, East Owaynat, the area of and round Lake Nasser and East and West of Suez Canal by the year 2017 at about 3.4 million fedddans (1.43 million ha). The inhabited area would reach 25% of the total area of Egypt.
- c. To increase the agricultural production horizontally and vertically through the efficient allocation and use of soil and water resources. The maintenance and development of the natural resource base is an integral part of Egypt’s sustainable agricultural development program.
- d. To develop a national strategic reserve of the basis food commodities by focusing on the efficient use of the available resources and redirecting investments to such areas that help fulfill the increasing food needs of the population. This shall be accompanied with rationalization of food consumption levels, reduction of post-harvest losses.

The Master Land Use Plan indicates that around Lake Nasser and in the Tushka Depression there are about 2.88 million fedddans (1.21 million ha) of land reclaimable using Nile water and 0.55 million fedddans (0.23 million ha) reclaimable by ground water. The main reclaimable areas around Lake

Nasser are located in the East bank of the Lake in Wadi El-Allaqi and Wadi El-Targi. Those in the west bank are found in Wadi Kurker, Kalabsha, Dekka, Marwa, Tushka, Abu Simbal, Khor Sara, Tomas and Affia (Desert Research Center, 2005).

However, there are a number of conflicting estimates regarding the actual potential for land reclamation around Lake Nasser. Aerial photos show that 1.5 million feddans (0.63 million ha) are reclaimable in the elevated area of and around Lake Nasser (Encyclopedia of Southern valley and Tushka, 1999). Hanna and Osman (1993) stated that more than one million feddan (0.42 million ha) can be reclaimed around the reservoir. The Egypt Water Master Plan (1986) however, shows only about 195,000 feddans (81,900 ha) of high priority to be reclaimed out of 781,600 feddans (328,270 ha). In 1987, a joint study between Cairo University and MWRI showed that the arable area of and around Lake Nasser is about 103,500 feddans (43,470 ha).

The Government's initial plan is to cultivate 50,000 feddan (21,000 ha) around Lake Nasser's shores. They are situated on the western shore, and only one area of 9,000 feddans (3,700 ha) on the east side shore, i.e. the Wadi Allaqi area. On the west side the three areas are: Wadi Kurker, 14,000 feddans (5,880 ha), Kalabsha, 22,000 feddans (9,240 ha), and Abu Simbal 5,000 feddans (2,100 ha).

Studies carried out by the Desert Research Center (DRC, 1999) show that lifting water from Lake Nasser depends on the elevation above sea level (masl). Two methods can be used:

- (a) Lifting water for high lands (above 182 masl) by using giant pump stations and floating pipe line then connected to affixed pipe line on land.
- (b) Lifting water for Lake Shore farming and irrigation by using small mobile pump motors that the farmer moves from field to another. These pumps are connected to a flexible hose and then to 4-6 aluminum pipes.

As part of the national strategy to combat poverty, the Government of Egypt plans to settle approximately one million people on reclaimed desert in the area around Lake Nasser by the year 2017. In order to avoid any negative impacts there are a number of research projects being undertaken to develop sustainable strategies for improving the socioeconomic conditions, health and livelihoods of poor and marginalized settlers living in fragile ecosystems.

The Ministry of Water Resources and Irrigation (MWRI) has prepared a National Water Policy to the year 2017 including three main themes:

- optimal use of available water resources;
- development of water resources; and
- protection of water quality and pollution abatement.



**(ii) Water Master Plan**

At present, Egypt is addressing the issue of limited water quantity by managing the demand side. MWRI formulated a water master plan in 1981. This plan is currently being updated. The process of updating the water Master Plan aims to allocate available water resources according to various needs and demands that are feasible from the economic perspective. It also aims to gain social acceptance and political support. The Water Master Plan is updated through the National Water Resources Plan (NWRP) project.

The NWRP has been operated since 1998 and is jointly funded between MWRI and the Netherlands Government. This project is directed towards developing a National Water Resources Plan that describes how Egypt will safeguard its water resources both quantity and quality and how it will optimize the use these resources in response to the socio-economic and environmental conditions.

**1.3 Policy Framework of the Eastern Nile Subsidiary Programme (ENSAP)**

The policy guidelines adopted by the NBI's Council of Ministers of Water Affairs (Nile-COM) in February 1999 further define the primary objectives of the NBI. These objectives are:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

The Eastern Nile Subsidiary Action Program (ENSAP), which includes the countries of Egypt, Ethiopia, and Sudan, is initiating a regional, integrated, multipurpose program through a first set of investments. Within this regional context, the Eastern Nile riparian countries decided that the objective of the first ENSAP project, referred to as the Integrated Development of the Eastern Nile (IDEN) project, was to initiate a regional, integrated, multipurpose development program that confirms tangible win-win gains and demonstrates joint action for the Eastern Nile countries. IDEN comprised the following seven

components: Eastern Nile Planning Model, Baro-Akobo Multipurpose Water Resources Development, Flood Preparedness and Early Warning, Ethiopia–Sudan Transmission Interconnection, Eastern Nile Power Trade Investment, Irrigation and Drainage, and Watershed Management.

***Watershed Management CRA:*** The first Cooperative Regional Assessment (CRA) for Watershed Management in the Eastern Nile Basin undertook a Transboundary Analysis, a Distributive Analysis and identified mechanisms for cooperation. The CRA identified the baseline conditions and provided an understanding of four Sub-basins as integrated water systems: the Baro-Sobat-White Nile, the Abbay-Blue Nile, the Tekeze-Atbara and the Main Nile from Khartoum to the Aswan High Dam. The CRA identified a programme of Direct and Supporting Interventions for sustainable watershed management. The potential impacts of these were assessed in qualitative and in some case quantitative terms at the local, national, regional and global levels. An outcome of the Watershed Management CRA was the preparation of a long term Eastern Nile - Watershed Management Project (EN – WMP).

***Eastern Nile Watershed Management Project (EN-WMP):*** The immediate objective of the Eastern Nile Watershed Management Project (EN-WMP) is to provide continued and enhanced support the sustainable watershed management of the Eastern Nile Basin in order to improve the living conditions of the people, create alternative livelihoods, enhance agricultural productivity, protect the environment and in the long term reduce sediment transport and siltation of infrastructure and prepare for sustainable development oriented investments. The overriding regional significance of this will be its contribution to enhanced food security and poverty alleviation in the region and its long term contribution to arresting degradation of the natural resource base.

The EN-WMP will support the Eastern Nile Basin countries to develop sound approaches to sustainable watershed management at the regional and national level. The Eastern Nile countries recognize that future development of the Basin must be environmentally and socially sustainable. Identifying natural resource base and development synergies and thus sustainable development opportunities in the Eastern Basin is now a major priority. Focusing on trans-boundary issues provides the riparian countries with a major opportunity to make significant progress towards their economic, social and environmental goals in ways that have proved difficult to achieve independently.

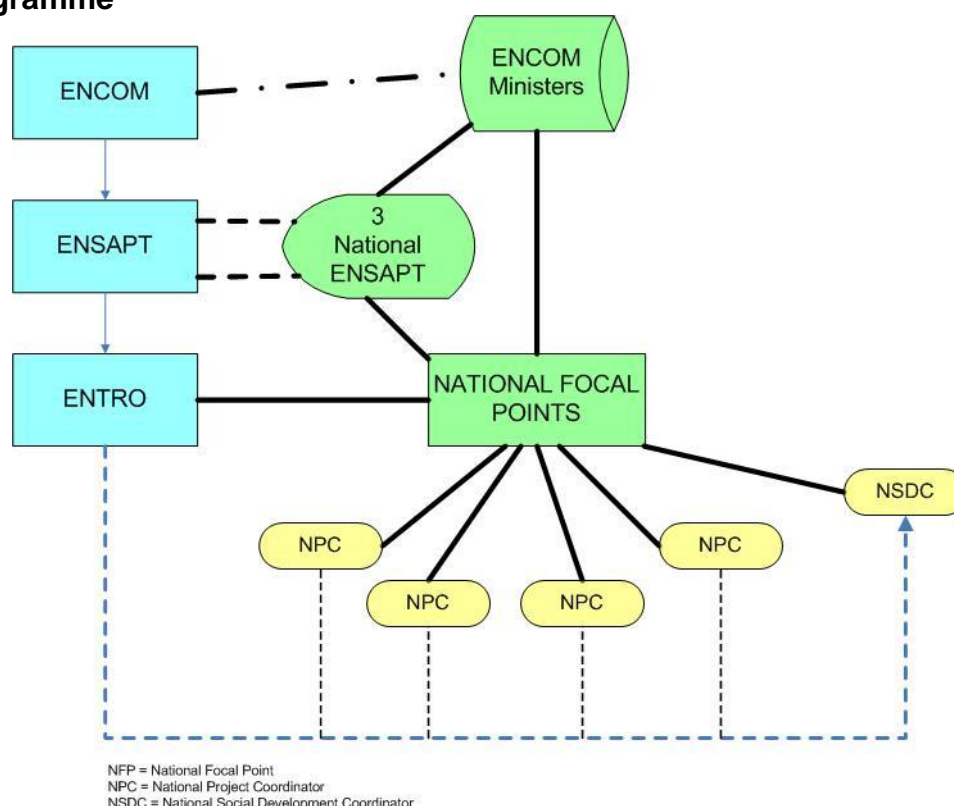
A component within EN-WMP was the preparation, funding, implementation and coordination of a first round of watershed management projects, and the subsequent identification of a second round of projects.

## 1.4 Institutional Framework for Project Implementation in the Eastern Nile:

### 1.4.1 ENSAP

The Eastern Nile Subsidiary Action Programme (ENSAP) is an investment programme by the Governments of Egypt, Ethiopia and the Sudan under the umbrella of the Nile Basin Initiative (NBI). It is led by the Eastern Nile Council of Ministers (ENCOM). ENCOM comprises the Ministers representing key stakeholder ministries and the ENSAP Teams (ENSAPT) comprise three technical country teams. The primary objective of ENSAP is to achieve joint action of the ground to promote poverty alleviation, economic growth and arresting environmental degradation. The Eastern Nile Technical Regional Office (ENTRO), which is a legal entity established by an ENCOM decision in 2002, manages and coordinates the preparation of ENSAP Projects. (Figure 2)

**Figure 1. Institutional Structure of the Eastern Nile Subsidiary Action Programme**

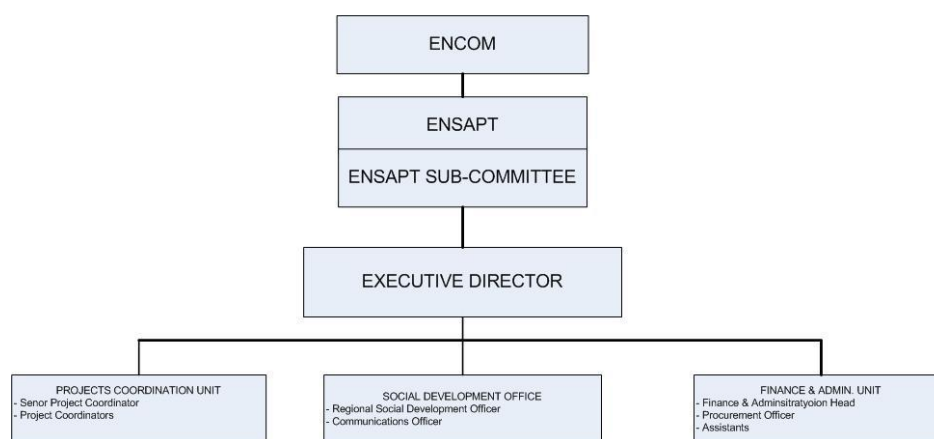


### 1.4.2 Eastern Nile Technical Regional Office

The Eastern Nile Technical Regional office (ENTRO) currently prepares, manages and coordinates projects within the Eastern Nile basin. As well as coordinating the implementation of ENSAP, ENTRO, strengthens institutions and provides secretariat support to ENCOM/ENSAPT. ENTRO has a Social Development Office (SDO) that supports all ENSAP Projects through capacity building in social development, input into project design, formulation of guidelines and the initiation of studies and analysis.

At the Country level ENSAP has National Focal Points (NFP) that undertakes overall coordination and liaison of National Coordinators and Working Groups (of specific projects) and the National Social Development Coordinators (NSDC's). Restructured in 2003. ENTRO itself is led by the Executive Director and has three Units: (i) Projects Coordination Unit, (ii) Social Development Office and (iii) the Finance and Administration Unit. The Projects Coordination Unit has a Senior Project Coordinator and Project Coordinators for each of the ENSAP Projects (Figure 2)

**Figure 2. Organizational Structure of ENTRO**



The current ENSAP programme is a set of sub-projects comprising the Integrated Development of the Eastern Nile (IDEN). IDEN comprises seven components:

- Eastern Nile Planning Model,
- Baro-Akobo Multi-purpose Water Resources Development,
- Flood Preparedness and Early Warning,
- Ethiopia-Sudan Transmission Interconnection,
- Eastern Nile Power Trade Investment
- Irrigation and Drainage
- Watershed Management

The general elements of a CRA are (i) institutional strengthening, (ii) a participatory process for building trust and confidence, and (iii) to gain a transboundary understanding the watershed system from a basin wide perspective.

The results of the analyses of the sectoral CRA's and Fast Track Projects will be brought together in the design and decisions in a joint multi purpose programme (JMP) of interventions. The JMP will encompass a comprehensive set of components including investments in infrastructure linked to the River and Power Systems; Watershed and Environmental Management; Enhanced Agricultural production; Leveraged growth and economic integration and supported by an Information base and Institutional regimes.

### **1.4.3 National Institutions**

In all three countries the two primary institutions that have responsibilities for Watershed Management activities are the Ministries of Water Resources and Ministries of Agriculture (each with slightly different names in each country). The Ministry of Agriculture in Egypt also includes responsibilities for land reclamation, whilst that in Ethiopia is within a broader ministry of Rural development. However, in matters of "river basin" planning the Ministries of Water Resources in each country take the lead. In Ethiopia draft legislation is already drafted to establish River Basin Authorities (RBA's) which will have a clear mandate in matters of basin planning and watershed management.

Although the three countries have a federal structure of government, decentralization of development responsibilities is further advanced in Ethiopia. However, in Egypt the Aswan High Dam Authority (AHDA) has wide ranging responsibilities for developments in and around Lake Nasser, although the institution works closely with the Ministries of Water Resources and Irrigation and Agriculture and land Reclamation.

## **1.5 Criteria for Identifying the First Round Proposed Watershed Projects**

### **1.5.1 Introduction**

The Watershed Management CRA terms of reference called for the identification:

*through analysis, the next round of watershed management projects, that are promising from a local livelihoods as well as a regional benefits point of view and are rational in view of anticipated multipurpose developments in the Eastern Nile region .*

The Distributive Analysis identified a comprehensive set of watershed management interventions to be implemented within Ethiopia, Sudan and Egypt. The majority of these had substantial in-country benefits in terms of reducing poverty, sustaining livelihoods and arresting the decline in the integrity of the natural resource and environmental base of the countries concerned. A number of these had regional and global benefits. Many of the interventions identified were, or were likely to be in the future, integral parts of on-going development programmes.

The Cooperative Mechanisms Analysis examined a continuum of increasing levels of potential cooperation amongst the three riparian countries of the Eastern Nile Basin. These ranged from uni-lateral action with no cooperation through coordination (e.g. of information collection and sharing), collaboration (e.g. collaborative research or collaborative Watershed Management Planning) to Joint Activities (e.g. administration of Transboundary National Parks). Within this framework many of the interventions outlined in the Distributive Analysis required a relatively low level of cooperation between the riparian countries, notwithstanding downstream (i.e. regional or Global benefits that could accrue to them).

A number of criteria were identified to enable a selection to be made of a first round set of potential projects from those identified in the Transboundary Analysis and outlined in the Distributive Analysis.

- Support and enhance cooperation among the three Riparian Countries in sustainable watershed management,
- Local, National, Regional and where possible Global benefits would accrue to the projects, and
- the projects would where possible support other IDEN Projects, the JMP and other NBI projects.

The "Benefits" criterion is broad in its interpretation. Benefits include positive impacts on (i) poverty reduction, (ii) support to sustainable livelihoods and reducing vulnerability, (iii) reducing or arresting natural resource degradation. Benefits accruing to these development goals are inextricably linked and are thus, considered together. Benefits were also assessed at the local/national, Regional/Eastern Nile Basin and the Global scales. All selected Projects have benefits at all three levels. All Projects selected also support to a greater or lesser extent ongoing or proposed Projects within the NBI or ENSAP framework.

The criteria are elaborated upon below.

### **1.5.2 Implementation Requires Cooperation**

The most important criterion is whether and to what degree the proposed project fosters cooperation among the riparian countries and contributes to confidence building and knowledge exchange.

ENTRO's Strategic Plan 2006-2010 (ENTRO, 2006) states "Country-level planning in the Eastern Nile focuses on development needs at national and/or local levels. In contrast, ENSAP is a programme for multi-country cooperative investments that capture development with trans-boundary implications." ENTRO's Mission is to "serve ENCOM and ENSAPT in their pursuit of cooperation and joint action in the eastern Nile".

In selecting a first round a Watershed Management projects for preparation under the EN-WMP an assessment was made as to whether project preparation, planning and implementation would enhance cooperation and build confidence among the three riparian countries. Interventions that could be effectively implemented within the national framework of development activities were accorded a lower priority.

In considering Projects that would enhance cooperation, careful consideration was given to the degree of cooperation that project planning and implement would entail. The continuum outlined in the Cooperative Mechanisms Analysis was used to determine the relative degree of complexity in terms of institutional mechanisms. Thus Projects were categorized into the three broad categories: (i) Coordination, (ii) Collaboration and (iii) Joint Activities. This was for the purpose of action planning rather than prioritizing. Thus a "Joint Activities" project could score high in terms of priority but be scheduled later because of the need for ENTRO to develop the more complex institutional mechanisms.

### **1.5.3 Project Implementation Accrues Local, Regional Benefits and Possibly Global Benefits**

A second criterion examined the anticipated benefits and their distribution and the range and size of benefits in terms of their impact at the local, national, Regional (Basin-wide) and Global levels. At the local level benefits that contributed significantly to poverty reduction, enhancing sustainable livelihoods and/or to arresting/reducing degradation of the natural resource base were accorded a higher priority.

Areas of severe resource degradation or "hot spots" were identified in the Transboundary Analysis and were taken into consideration in the Project selection. Empirical work in Sudan and in Ethiopia has indicated generally high levels of poverty in all rural areas and most particularly amongst pastoralists, agro-pastoralists and rainfed agriculturalists. There are in both countries large numbers of households "churning at the margin" of the poverty line. For this reason no specific group or geographic area was used as

criteria, rather the level and degree of impact the intervention had on the levels of household production, income and vulnerability.

The expectation of regional benefits such as the alleviation of downstream environmental, economic and/or social damages, were also seen as very important. Cooperative action in terms of watershed management is likely to be more forthcoming where benefits accrue to two or more riparians.

Where a Project accrues global benefits this is also very important particularly in terms of seeking and obtaining financing from one of the global financing mechanisms: e.g. the Global Environment Fund (GEF), Carbon Fund, etc.

#### **1.5.4 Addresses Threats to Environmental and Natural Resource Hotspots**

Three biodiversity "hotspots" have been identified as under threat and have priority in terms of cooperative action: (i) the Wadi Allaqi located in Egypt and Sudan, (ii) the Dinder and Alatish Parks located in Sudan and Ethiopia, and (iii) the area between and including the Gambella and Boma National Parks in Sudan and Ethiopia. The ecological systems of the three areas are inextricably linked across the international borders. Detailed wildlife inventories and livelihood surveys are required as a basis for developing joint long-term trans-boundary conservation management plans for these areas.

#### **1.5.5 Relationship to other ENSAP Projects and the Joint Multi-purpose Programme**

Another criterion assessed whether and to what degree the proposed projects are related or support other IDEN/ENSAP projects, the Joint Multi-purpose Programme (JMP) or Projects/Programmes within the NBI. It is important to identify potential areas for synergy between other ENSAP, the eastern Nile Multipurpose Programme and NBI to realize maximum benefits from cooperative projects within the Eastern Nile.

#### **1.5.5 A Strategic Framework for Action**

The interventions outlined in matrices 1 (Ethiopia), 2 (Sudan) and 3 (Egypt) of the Distributive Analysis were assessed using the criteria outlined above. All the Projects selected conformed to the three criteria. There were no other interventions in the Matrices presented in the Distributive Analysis that conformed to all three criteria. The list is therefore inclusive. Costings were estimated on the basis of similar components of projects within the NBI and other recent project documents, and are therefore approximate.



The results of the assessment are presented in the matrix below. All projects have the potential to be included in the first round of Watershed Management projects to be prepared in Component 3 of the long-term Eastern Nile Watershed Management Project. Whether all or only a selection of these projects are included in the First Round and the order in which they are prepared is clearly a decision to be made by ENTRO, ENSAPT and ENCOM. However, the matrix provides a basis for such an assessment.

**Matrix 1. A Strategic Framework for Action**

INTERVENTIONS	Outline costs (US\$ million)	Links IDEN Projects, JMP, NBI	INSTITUTIONAL COMPLEXITY	DIRECT BENEFITS	SECONDARY BENEFITS	REGIONAL/GLOBAL BENEFITS
<b>PROFILE 1:</b> Collaborative Research into arresting drifting sand and moving sand dunes	1.65	Yes Fast track WSM (Egypt, Sudan)	Simple: In-country Research on-going	practical and effective means of arresting drifting sands and moving dunes established,	shared scientific knowledge of the physics of wind blown sand,	<ul style="list-style-type: none"> <li>Firm foundation and modalities established for future collaborative research and cooperation.</li> </ul>
<b>PROFILE 2:</b> Establishment of the Trans-boundary Wadi Allaqi Biosphere Reserve	1.20	Yes Fast track WSM Eqypt	Simple: Biosphere Reserve already established in Eqypt	<ul style="list-style-type: none"> <li>shared experiences in Biosphere Reserve management,</li> <li>cost-effective joint management of the Reserve as one ecosystem, and</li> </ul>	<ul style="list-style-type: none"> <li>shared scientific knowledge of this unique ecosystem.</li> </ul>	<ul style="list-style-type: none"> <li>Enhanced conservation of biodiversity.</li> </ul>
<b>PROFILE 3:</b> Joint Tekeze-Atbara Ground and Surface Water Survey & Development Plan	8.22	Yes Fast Track WSM Sudan, IDEN Irrigation & Drainage	Moderately complex: Some institutional networking thru UNESCO-HELP	<ul style="list-style-type: none"> <li>Improved and more potable water supplies and improved health and well-being.</li> <li>Improved water supplies for livestock.</li> </ul>	<ul style="list-style-type: none"> <li>Sustainable exploitation of surface water in terms of water harvesting &amp; irrigation would increase crop production, reduce food insecurity and improve livelihoods.</li> </ul>	<ul style="list-style-type: none"> <li>Experience would be gained in joint surveys and development planning of shared natural resources.</li> <li>Sustainable exploitation of surface and sub-surface water resources would be achieved across the Sub-basin.</li> </ul>
<b>PROFILE 4:</b> Joint Dinder-Rahad Watershed Management Plan	8.50	Yes IDEN Flood Control, Irrigation & Drainage	Moderately complex: Need to establish new institutional mechanisms	<ul style="list-style-type: none"> <li>Upstream at the local level WSM interventions would have a positive impact on crop and livestock production through reduced soil erosion</li> </ul>	<ul style="list-style-type: none"> <li>Positive impacts on livelihoods and increased food security.</li> <li>Downstream at the local level reduced sediment loads &amp;</li> </ul>	<ul style="list-style-type: none"> <li>Increased flood buffering capacity of Maya'as reducing flood damage on rainfed and irrigated cropland.</li> <li>Biodiversity value of the maya'a wetlands</li> </ul>

## EASTERN NILE WATERSHED MANAGEMENT CRA

				and degradation	sedimentation of <i>maya'a</i> wetlands <ul style="list-style-type: none"> <li>• More assured water supply for human, livestock and wildlife.</li> </ul>	would be enhanced.
<b>PROFILE 5:</b> Abbay-Blue Nile Wetlands Survey and Management Plan	8.10	Yes: IDEN Flood Control, Irrigation & Drainage	Moderately complex: Need to establish new institutional mechanisms	<ul style="list-style-type: none"> <li>• Accurate inventory and threat assessment of the Blue Nile Wetlands would be obtained;</li> <li>• Sound plan for their sustainable management and conservation would be developed</li> </ul>	<ul style="list-style-type: none"> <li>• Hydrological services maintained (flood buffering, sediment reduction, dry season flows enhanced)</li> <li>• Sustainable livelihoods enhanced; vulnerability reduced</li> </ul>	<ul style="list-style-type: none"> <li>• Biodiversity value of wetlands preserved and enhanced.</li> </ul>
<b>PROFILE 6:</b> Establishment of the Dinder-Alatish Transboundary National Park	4.80	Yes: NBI Environment	Moderately complex: Need to establish new institutional mechanisms, although initial Ethiopia-Sudan discussions over number of years	<ul style="list-style-type: none"> <li>• Shared experiences in community-based Park management</li> </ul>	<ul style="list-style-type: none"> <li>• Cost-effective joint management of the Park as one ecosystem,</li> <li>• Strong possibility of international recognition and ability to secure both Government and external funding.</li> </ul>	<ul style="list-style-type: none"> <li>• Firm foundation and modality established for future cooperation in biodiversity conservation between the Sudan and Ethiopia.</li> <li>• Biodiversity preserved and enhanced.</li> </ul>
<b>PROFILE 7:</b> Joint Wildlife and Habitat Inventory and Assessment: Boma & Gambella National Parks	2.80	Yes NBI Environment	Moderately complex: Need to establish new institutional mechanisms, although work already commenced in Sudan	<ul style="list-style-type: none"> <li>• Shared experiences in wildlife and habitat inventory and assessment,</li> <li>• Shared experiences in scientific research,</li> <li>• Cost-effective joint survey across an area of two countries,</li> </ul>	<ul style="list-style-type: none"> <li>• Assessment of the total ecosystem and a firm foundation for Park Management Planning for the two Parks,</li> </ul>	<ul style="list-style-type: none"> <li>• Firm foundation and modality established for future cooperation in biodiversity conservation between the Sudan and Ethiopia.</li> <li>• Enhanced conservation of biodiversity.</li> </ul>

EASTERN NILE WATERSHED MANAGEMENT CRA

<p><b>PROFILE 8:</b> Comprehensive Watershed Management Research project: Choke Mountain Chain, Abbay-Blue Nile Sub-basin</p>	<p>9.80</p>	<p>Yes IDEN Flood control, Irrigation &amp; Drainage</p>	<p>Moderately complex: Need to establish new institutional mechanisms</p>	<p>Increased scientific knowledge of the complex relationships between land cover, land management, hydrology, erosion, deposition in the landscape, sediment delivery to the river system and fluvial sediment transport</p>	<p>More effective watershed management interventions and a deeper understanding of their potential impacts at various scales;</p>	<p>Increased cooperation and knowledge sharing and confidence building among countries of the Eastern Nile Basin; Increased capacity in sciences of hydrology, erosion and sedimentation and the establishment of a cadre of professionals knowledgeable in the practical applications of these areas.</p>
<p><b>PROFILE 9:</b> Southwest Ethiopian Highlands: Participatory Development of Sub-catchments</p>	<p>4.8</p>	<p>Yes IDEN Irrigation &amp; Drainage</p>	<p>Moderately complex: Need to establish new institutional mechanisms although some initial work over past 5 years</p>	<p>At the local level an integrated system of natural resource management would be established agricultural production diversified &amp; sustainably increased</p>	<p>food security increased supporting sustainable livelihoods and reducing poverty.</p>	<p>At the Sub-catchment and regional levels equitable access to water resources by downstream irrigators and mini-hydro power developments would be assured. At the Global level sustainable management and use of the forest</p>

						resources would ensure the conservation of biodiversity and in particular the wild coffee gene pool.
<b>PROFILE 10:</b> In-depth Study: Determination of the Economic, Social and Environmental benefits & Costs of Watershed Management Interventions in the Eastern Nile Basin	0.95	Yes IDEN Eastern Nile Planning Model	Simple: Some on-going work thru TerrAfrica	Increased knowledge of the economic, social and environmental benefits and costs of watershed management interventions in the context of multi-purpose cooperative development of the eastern Nile Basin and thus increasing the scope and effectiveness of impact assessment of such investments;	Increased capacity in environmental and social economics and the establishment of a cadre of professionals knowledgeable in the practical applications of this area of economics.	increased cooperation and knowledge sharing and confidence building among countries of the Eastern Nile Basin;

## PROJECT PROFILE 1. COLLABORATIVE RESEARCH INTO ARRESTING DRIFTING SAND AND MOVING SAND DUNES

### I. Objectives

The objective of the project is to support a collaborative research programme into methods and techniques of arresting drifting sand and moving sand dunes onto valuable cropland and settlements.

### II. Background and Rationale

Drifting sand is an acute problem in irrigated lands of the Lower Atbara, the northern part of the White Nile (West bank) and Main Nile in Sudan and along the western shore of Lake Nasser/Nubia. Around Lake Nasser the most extensive areas of sand are to the west and that the prevailing winds are from the northwest. Both factors, which when combined explain the problem of drifting sand into the Lake. The Dam Authority in collaboration with the Environment Research Institute is undertaking some research studies on wind speed, sand dunes movements, types and quantities of sand, estimates of sand volumes which are deposited into the lake using sand traps in 12 stations on the western side of the lake where there are active sand movements. The purpose of this research is to find the most effective ways of solving the problem.

It has been estimated that the moving sand amounts to 700m<sup>3</sup>/km annually and that wind blown sand constitutes 1 to 2 percent of sediment entering the Lake. Thus, approximately 1.36 million tons are blown into the lake annually.

According to a study carried out by the Public Corporation for the Development of the High Dam Lake of the Ministry of Agriculture and Land Reclamation the woody vegetation in the area is mainly desert scrub including; *Tamarix mannifera* (Tarfa or Abal) which grows very densely and to very appreciable sizes in seasonally inundated areas or in areas which are not regularly inundated to a distance of three kilometers from the lake. From the air the Tarfa seems to grow in a form of a belt along the lake shore. It is not known how effective this belt of trees is in preventing wind blown sand reaching the Lake.

It was reported that a main source area for the sand is the Tushka Depression. If a large area of the depression is developed for irrigation it is possible that the amount of sand entering the Lake will be reduced. Moattassem (2005) has called for more research in order to determine a more accurate estimate of sand entering the lake.

In the Sudan the main area where shifting wind blown sand is a problem is in the Gash Irrigation Scheme. In 1923 the irrigation Advisor the Sudanese Government noted the problem of drifting sand into the new canals, which suggests that there was no cover in the central area of the delta even then. A part of the problem is the gradual degradation of the flooded woodland due to extraction of fuelwood and wood for charcoal and house construction.

A second area is along the lower Atbara where drifting sand is covering fields and canals. A study by Mekii Abdel Latif (2005) found drifting sand a serious problem endangering crop production in a large number of villages. Approximately 30 percent of the cropland is invaded by sand. Sand in irrigation ditches causes severe problems in water management and entails long hours of pump operation because of the increased porosity of canal linings. Wind-borne sand causes severe physical damage to plants often completely shredding leaves.

Along the Dongola reach of the Main Nile moving sand dunes encroaching on irrigated land and into the river is an additional problem. Moving sand dunes can overwhelm settlements, fields and roads. The dominant wind direction is from the northeast. Thus the most hazardous dunes are located to the northeast of the Nile. These are located between Dongola and Karima. There are 14 smaller dune fields: four are on the river and ten are close by. Three larger fields are located 20 to 60 kms from the river. The source areas for the dune fields are the very extensive areas of loose and shifting sand that overlies the rock pavement as well as the three larger dune fields to the northwest.

Those on the river present a hazard for tipping sand into the river, whilst the other 10 are a hazard to settlements and irrigated fields. The latter currently do not present an immediate problem. The smaller dune fields total some 67,000 feddans (14,300 ha). However, they are generally elongated and aligned in the main wind direction some 2 to 4 kms wide although 5 to 15 kms long. This means they present a narrow advancing front, which reduces the length of tree breaks required to halt the dunes.

An examination of the Africacover map of the area reveals that approximately 6,200 feddans (2,570 ha) of currently irrigated land that is immediately threatened. There is an unknown area of potentially irrigable land currently not developed, estimated at 33,000 feddans (13,860 ha). In the absence of any measurements it is difficult to estimate the amount of sand tipping into the River. Two of the 14 dune fields abut the river, each with a front of about 2.6 kms.

Both countries are undertaking research programmes into methods of arresting these phenomena. This research includes the physics of wind blown sand, assessing the most suitable plant species for shelter-belts and sand stabilization and the most effective modes of plant establishment and survival.

Clearly, synergy could be obtained by collaboration in these research activities. At the lowest level this could be simply through exchange of information of research results, through to field visits and joint workshops to a single collaborative research programme.

### **III Accordance with Policy and Development Frameworks**

The Project accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental

concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

The Project accords with Egypt's Master Land Use Plan and its National Water Master Plan by addressing concerns of water availability and water quality. It also accords with Egypt's National Strategy to Combat Poverty by addressing concerns of agricultural sustainability for the proposed 1 million people to be settled around the shores of Lake Nasser by 2017.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The project would support the collaborative research programme by supporting field trials, capacity building, knowledge exchange and dissemination of lessons learnt. An assessment of lessons learnt from a number of sites in Sudan in controlling sand encroachment was made by the Drylands Coordination Group (Musnad and Nasr, 2004) and by UNEP. The key role was played by strong community participation in shelterbelt establishment in Ed Debba in Northern State. At a more technical level the key lessons learnt from an assessment of 19 sites across Sudan were as follows:

- the most effective shelterbelt design incorporated six external rows rectangular in shape, 6 times longer than tree height and orientated perpendicular to the wind. The belts should be 30-40 percent penetrable by the wind. Successive internal belts should be placed at distances 10 times tree height;
- Drip irrigation was found to be the most effective and efficient form of irrigation.

In Egypt the Aswan High Dam Authority (AHDA) in collaboration with the Environment Research Institute is undertaking some research studies on wind speed, sand dunes movements, types and quantities of sand, estimates of sand volumes which are deposited into the lake using sand traps in 12 stations on the western side of the lake where there are active sand movements. The purpose of this research is to find the most effective ways of solving the problem.

The key locations of research would include (but not limited to) areas of drifting sand in the Atbara, northern White Nile (west bank) and Main Nile Sub-basins (including the areas surrounding Lake Nasser/Nubia (Map 1).



## V. Cost Estimate

The estimated costs of the Project is US\$ 1.65 million, with US\$ 0.33 million provided by the two countries (20%) and US\$ 1.32 million from international funding.

Satellite Imagery	-	US\$ 0.25 million
Field trials:	-	US\$ 0.56 million
Capacity building (Physical):	-	US\$ 0.42 million
Knowledge Exchange & Dissemination	-	US\$ 0.42 million

## VI. Anticipated Benefits and their Distribution

The collaborative research programme would have a number of national and regional benefits:

- practical and effective means of arresting drifting sands and moving dunes established,
- shared scientific knowledge of the physics of wind blown sand,
- a firm foundation and modalities established for future collaborative research and cooperation.

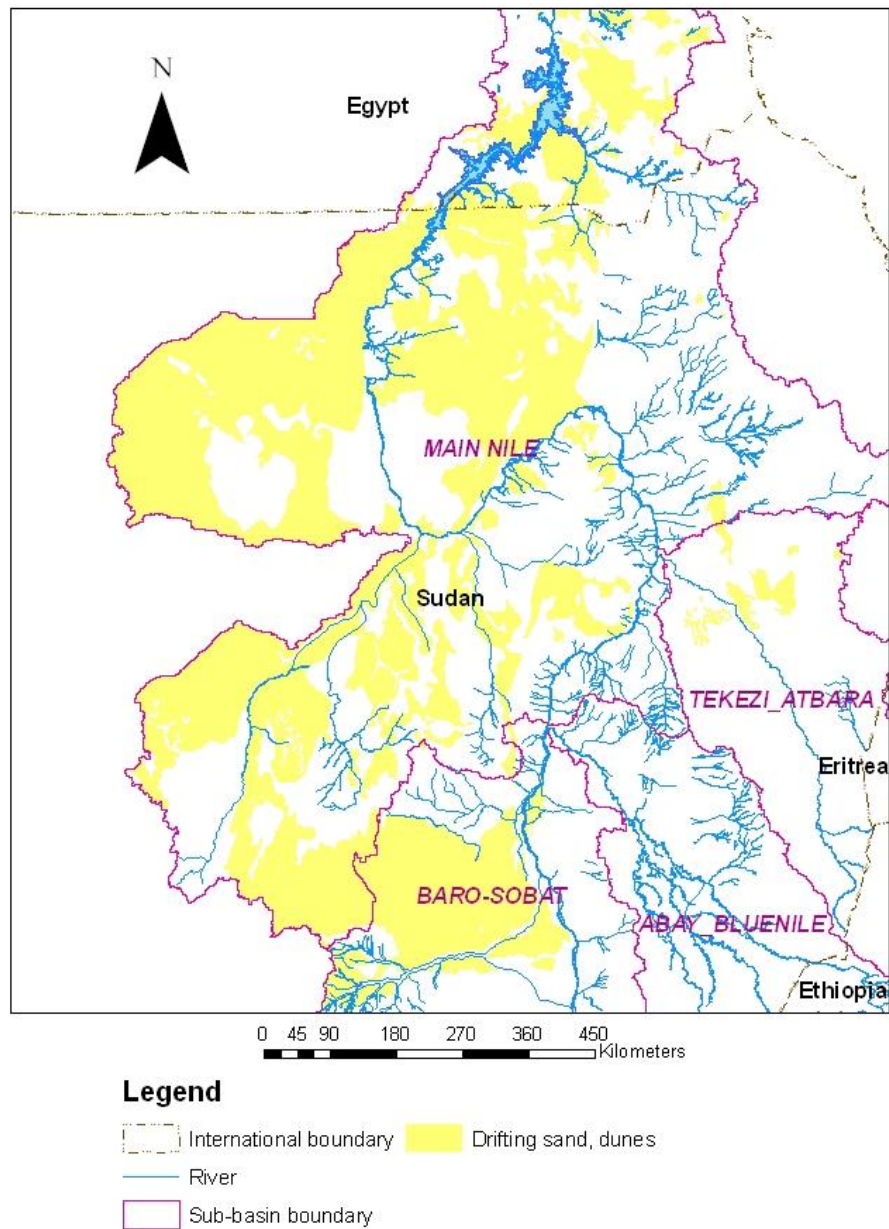
## VII. Options for Phasing and Timing

- Formal expression of commitment by Egyptian and Sudanese Governments to establish a collaborative research programme,
- Establish a Joint Steering Committee
- Develop Work Plan and responsibilities,
- Implement Research Programme,
- Information and knowledge sharing: Regional Workshops
- Dissemination of Research findings.

## VIII Relationships to other IDEN Projects

Watershed Management Fast Track Project: Sudan Lower Atbara component.  
Watershed Management Fast Track Project: Egypt-Sudan: Lake Nasser/Nubia Management Framework  
NBI: Nile Transboundary Environmental Action Project.

## EASTERN NILE BASIN MAIN AREAS OF DRIFTING SAND AND MOVING DUNES



**Map 1. Eastern Nile Basin: Location of Shifting Sand and Moving Sand Dunes.**

## **PROJECT PROFILE 2. ESTABLISHMENT OF THE TRANSBOUNDARY WADI ALLAQI MAN AND THE BIOSPHERE RESERVE**

### **I. Objectives**

The objective of the project is to provide support to the Governments of Egypt and the Sudan in establishing a Transboundary Wadi Allaqi UNESCO Man and the Biosphere Reserve.

### **II. Background and Rationale**

The Wadi Allaqi extends some 250 kms southeastwards from Lake Nasser/Nubia into northern Sudan (see map 2). It is the most extensive drainage system in the Nubian Desert and lies across the geological boundary of two formations: the basement complex to the southeast and the Nubian Sandstones to the northwest. From an ecological perspective the Wadi forms an integrated unit based on linear channels, which have hydrological and ecological integrity. Human habitation of the wadi is of great antiquity. Currently, the Wadi is inhabited by the nomadic Ababda and Bisharin peoples.

Within Egypt the area was declared a Protected Area in 1989 under the jurisdiction of the Egyptian Environmental Affairs Agency. In 1993 it was declared a UNESCO Man and the Biosphere Reserve. The Reserve is zoned into two "Core" Areas, each with "Buffer" zone and the remaining "Transition" area.

It has been proposed that the Sudan part of the Wadi be encompassed within a trans-boundary Man and the Biosphere Reserve to extend protection to the whole of the Wadi.

### **III Accordance with Policy and Development Frameworks**

The Project accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

The Project accords with Egypt's National Strategy to Combat Poverty by addressing concerns of agricultural sustainability for the proposed 1 million people to be settled around the shores of Lake Nasser by 2017.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;

- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

#### **IV. Scope and Extent**

The Project would provide support to both Egypt and the Sudan to develop an integrated Biosphere Reserve Management Plan that encompasses the whole of the Wadi. This would require undertaking botanical, ecological and livelihoods surveys from the Egyptian part of the Reserve into the newly designated area within the Sudan.

The project would provide human capacity building support to enable close collaboration between Egypt and the Sudan both at the local and the national levels. This would involve provision of logistical support to undertake the necessary surveys. The project provides support to enable knowledge exchange through workshops and meetings.

#### **V. Cost Estimate**

Estimated cost of the project is US\$ 1.20 million with US\$ 0.24 million provided by the two riparian countries (20%) and US\$ 0.96 million external funding.

Capacity Building (Human)	-	US\$ 0.36 million
Knowledge Exchange	-	US\$ 0.84 million

#### **VI. Anticipated Benefits and their Distribution**

A Trans-boundary Biosphere Reserve would have a number of local, Regional and Global benefits:

- shared experiences in Biosphere Reserve management,
- cost-effective joint management of the Reserve as one eco-system, and
- shared scientific knowledge of this unique ecosystem.
- enhanced conservation of biodiversity.

#### **VII. Options for Phasing and Timing**

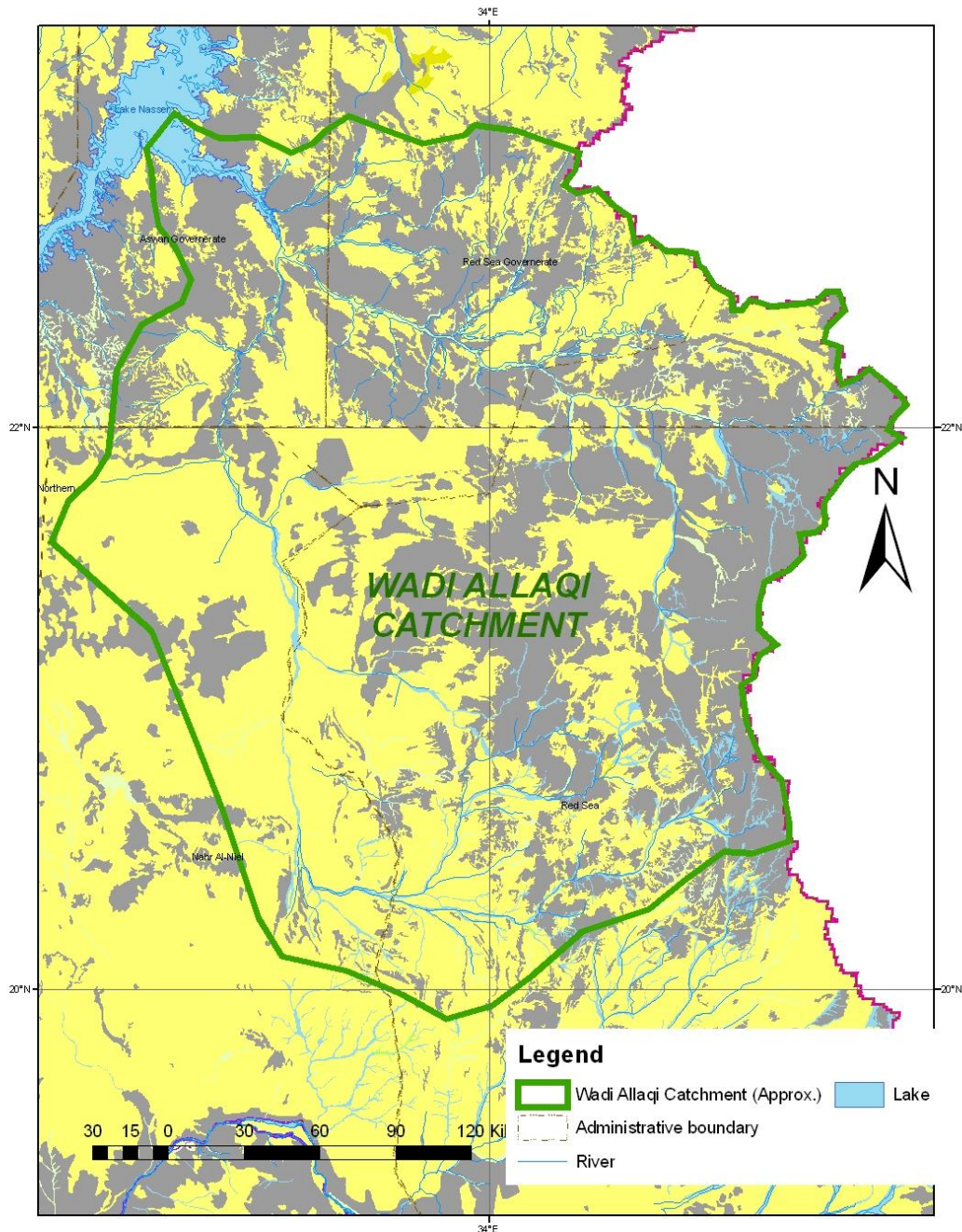
The establishment of the Trans-boundary Reserve would follow a number of sequential stages:

Formal expression of commitment by Egyptian and Sudanese Governments to establish a Transboundary Biosphere Reserve,  
Establish a Joint Steering Committee  
Develop a single Reserve Management Plan  
Implement human capacity building  
Establish formal joint monitoring system

### VIII. Relationships to other IDEN/NBI Projects

Supports the IDEN Watershed Management Fast Track Project - Egypt-Sudan: Lake Nasser/Nubia Management Framework, also the NBI Nile Transboundary Environmental Action Project.

#### EASTERN NILE MAIN NILE SUB-BASIN WADI ALLAQI CATCHMENT



**Map 2. Catchment Boundary (Approx.) of the Wadi Allaqi: Location of the Proposed extension to the Biosphere Reserve**

## **PROJECT PROFILE 3. JOINT TEKEZE-ATBARA GROUND AND SURFACE WATER SURVEY AND DEVELOPMENT PLAN**

### **I. Objectives**

The objective of the project is to provide support to the Governments of Ethiopia and the Sudan in undertaking a joint hydrological survey (surface and ground water) of the Tekeze-Atbara Sub-basin.

### **II. Background and Rationale**

The Consultants' Report for the Sudan Fast Track Watershed Management Project talking of the upper Atbara area in Sudan stated that

*"Perhaps the biggest break-through in the economic and social development of the area will follow from a full and proper assessment of the distribution of water (especially underground) resources and (of even greater importance) the technologies available to exploit them".*

A previous study (the South Kassala Agricultural Project - SKAP) advocated that groundwater supplies should be reserved for domestic supplies whilst surface water resources should be developed for irrigated agriculture.

In Sudan many shallow wells in many villages are polluted, saline or seasonal. On the Ethiopian side of the border the Humera Lowlands are being resettled and are being opened up to Commercial agriculture. Given that the hydro-geology is the same it would be cost-effective to undertake the surface and ground water survey and development plan as a joint exercise.

In the Ethiopian Highlands surface and sub-surface water supplies are being developed for small-scale irrigation and water supplies (domestic and livestock). Whilst the macro hydrology of Tekeze Sub-basin has been studied in a recent Master Plan Study, there is need for more detailed information on the micro hydrology in order to develop small-scale irrigation and village water supplies in both a cost and technically effective way.

The development plan will not only indicate the most appropriate technologies but also develop in participation with communities the most appropriate institutional arrangements for cost-sharing and operation and maintenance.

### **III Accordance with Policy and Development Frameworks**

The project accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.

The Project supports Sudan's Decentralization Policy in the following aspects:

- Improving systems and practices of local publicprivate partnerships in service delivery;
- Support to Locality development planning;
- Improving Locality information systems;
- Establishing Locality monitoring systems;

The Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The Project would provide support to the Project by providing funds for the survey and development planning; for physical and human capacity building in terms of logistics, equipment and training in surface and ground water survey techniques; in participatory planning, knowledge sharing and dissemination of the survey finding and the Development Plan.

The area of the Project would cover the whole of the Tekeze-Atbara Sub-basin (Map 3).

### **V. Cost Estimate**

Estimated cost of the project is US\$ 8.22 million with US\$ 1.64 million provided by the two riparian countries (20%) and US\$ 6.58 million external funding.

Survey Logistics:	-	US\$ 2.90 million
Capacity Building (Human/Physical):	-	US\$ 2.48 million
Participatory and Development Planning:	-	US\$ 2.01 million
Knowledge sharing/Dissemination:	-	US\$ 0.83 million

## **VI. Anticipated Benefits and their Distribution**

A joint survey and development plan would have a number of benefits at the Local and Regional levels:

At the local level benefits to local communities would be substantial in terms of improved and more potable water supplies and improved health and well-being. In addition there would be benefits to livestock production in terms of improved water supplies for livestock. The sustainable exploitation of surface water in terms of water harvesting and irrigation would increase crop production, reduce food insecurity and improve livelihoods.

At the regional scale experience would be gained in joint surveys and development planning of shared natural resources. Sustainable exploitation of surface and sub-surface water resources would be achieved across the Sub-basin.

## **VII. Options for Phasing and Timing**

The survey of would be undertaken in a number of sequential steps:

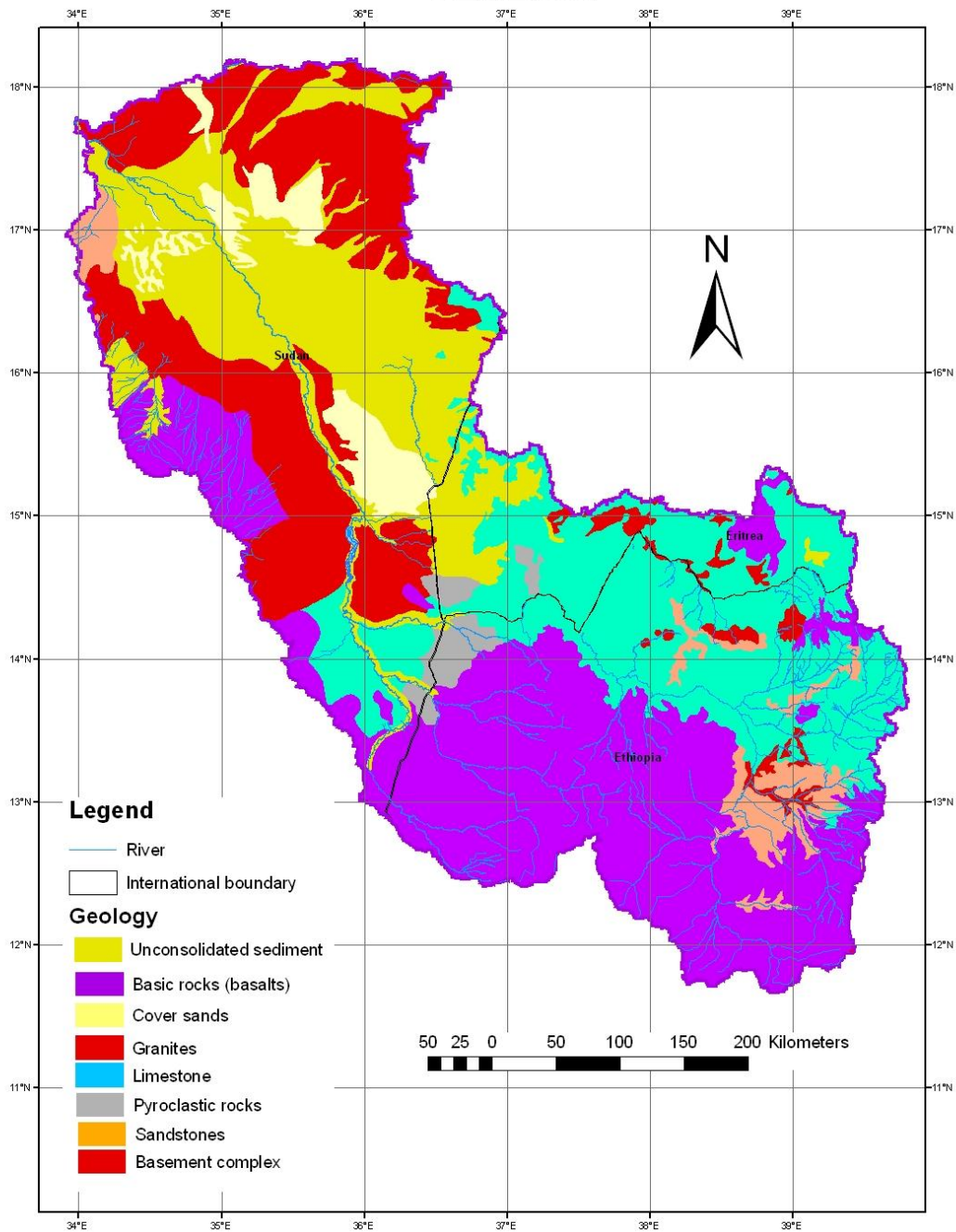
- Formal expression of commitment by the Ethiopian and Sudanese Governments to undertake the survey,
- Establish a Joint Steering Committee,
- Design the survey and determine logistics and responsibilities
- Implement training,
- Undertake the survey and analysis,
- Formulate the Development Plan, and
- Information and knowledge sharing: Regional Workshop

## **VIII. Relationships to other IDEN Projects**

Supports IDEN Irrigation and Drainage and IDEN Flood Control and Management Projects.



## EASTERN NILE TEKEZI-ATBARA SUB-BASIN GEOLOGY



**Map 3. Geology of the Tekeze-Atbara Sub-basin: Surface and Sub-surface Water Survey and Plan**

## **PROJECT PROFILE 4. JOINT DINDER-RAHAD WATERSHED MANAGEMENT PLAN**

### **I. Objectives**

The objective of the project is to provide support to the Governments of Ethiopia and the Sudan in undertaking a joint development and formulation of a Watershed Management Plan for the Rahad-Dinder Catchment

### **II. Background and Rationale**

Currently, the Dinder-Rahad Catchment within Ethiopia is relatively undeveloped. Although only supplying 4 km<sup>3</sup> compared with the 50 km<sup>3</sup> of the Blue Nile as it leaves Ethiopia the sediment loads are high. The Catchment experiences frequent and extensive flooding on the Sudan side of the border. Excess sedimentation is occurring in the *maya'a* wetlands in the Dinder Park and beyond.

On the Sudan side of the border is a considerable belt of woodland and shrubland that is in the Dinder National Park. On the Ethiopian side of the border is the proposed Alatish National Park. However, the wooded clay plains on the Ethiopian side offer considerable potential for rainfed cropping and livestock production and parts are now being developed for sesame production. A key problem of the area is water supplies as the rivers generally do not flow for part of the dry season. Groundwater resources are known from the alluvial aquifers but the main Nubian sandstone aquifer lies below the basalt and requires considerable technical expertise to locate.

The cooperative development of a Catchment Watershed Management Plan could ensure that the sediment loads in the two main rivers are reduced. Expertise that has been developed in the Sudan in avoiding problems of rainfed cropping on the clay soils would be of considerable use to land developers in Ethiopia. A joint groundwater survey of the Lowlands could reduce costs and increase accuracy. There are thus a number of cooperative activities in terms of watershed management planning that are mutually beneficial.

### **III Accordance with Policy and Development Frameworks**

The project accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.

The Project supports Sudan's Decentralization Policy in the following aspects:

- Improving systems and practices of local publicprivate partnerships in service delivery;
- Support to Locality development planning;
- Improving Locality information systems;
- Establishing Locality monitoring systems;

The Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The Project would provide support to the Project by providing funds for the surveys, data collection, data analysis and watershed management planning; for physical and human capacity building in terms of logistics, equipment and training in survey techniques; in participatory planning, knowledge sharing and dissemination of the survey finding and the Watershed Management Plan.

### **V. Cost Estimate**

Estimated cost of the project is US\$ 8.50 million with US\$ 1.7 million provided by the two riparian countries (20%) and US\$ 6.80 million external funding.

Survey/Planning Logistics	-	US\$ 6.35 million
Capacity Building (Physical & Human)	-	US\$ 1.28 million
Knowledge Sharing/Dissemination	-	US\$ 0.85 million

## **VI. Anticipated Benefits and their Distribution**

A joint survey and watershed management plan of this catchment would have a number of benefits at the local, Regional and Global levels:

Upstream at the local level implementation of the integrated watershed management interventions would have a positive impact on crop and livestock production through reduced soil erosion and degradation with secondary impacts on livelihoods and increased food security. Downstream at the local level with reduced sediment loads and sedimentation of *maya'a* wetlands there would be a more assured water supply for human, livestock and wildlife. At the regional level reduced sedimentation of the *maya'a* wetlands would increase their flood buffering capacity reducing flood damage on rainfed and irrigated cropland. At the global level the biodiversity value of the *maya'a* wetlands would be enhanced.

## **VII. Options for Phasing and Timing**

The survey of would be undertaken in a number of sequential steps:

Formal expression of commitment by the Ethiopian and Sudanese Governments to undertake the survey,

Establish a Joint Steering Committee

Design the survey and determine logistics and responsibilities

Implement training,

undertake the survey and analysis

Develop Watershed Management Plan

Information and knowledge sharing: Regional Workshop

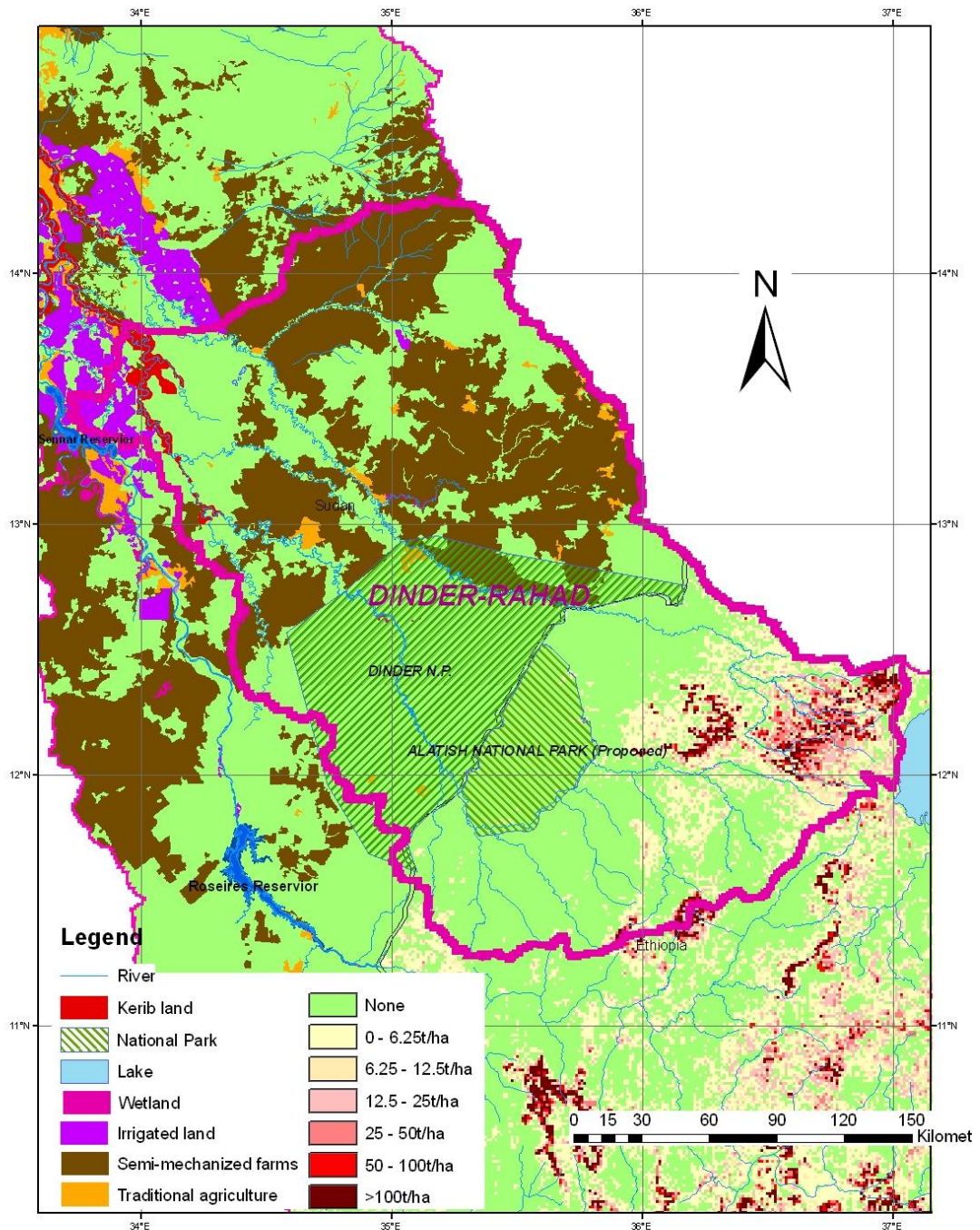
## **VIII. Relationships to other IDEN Projects**

The project supports the following:

Watershed Management Fast Track Project: Sudan Dinder National Park component.

IDEN Flood Control and Management and Irrigation and Drainage Projects

### EASTERN NILE ABAY - BLUE NILE SUB-BASIN DINDER-RAHAD CATCHMENT



Map 4. Rahad-Dinder Catchment: Location for the Proposed Watershed Management Plan

## PROJECT PROFILE 5. JOINT ABBAY-BLUE NILE WETLANDS SURVEY AND CONSERVATION PLAN

### I. Objectives

The objective of the project is to provide support to the Governments of Ethiopia and the Sudan in undertaking a joint survey of the Abbay-Blue Nile Wetlands and developing a Plan for their conservation and sustainable management.

### II. Background and Rationale

In the lowlands between the Dinder and Rahad Rivers the wetlands are locally known as "*maya'as*". They are depressions along and between the rivers. The area way from the river is covered with fossil streams and rivers. The depressions are abandoned meanders which have formed "ox-bow" lakes. These lakes however are ephemeral as they gradually silt up, fill with swamp vegetation and then as they silt up dry out.

This area is frequently subject to severe flooding. The wetlands have the capacity to "buffers" flood peaks allowing the flow to pass through the system more easily. Many of the Dinder-Rahad wetlands are now cutoff from the main river systems by the expansion of large-scale rainfed agriculture. It is not known how far this is responsible for the recent flooding and far they are due to silting up of small lakes and ponds from sediment derived from the Ethiopian highlands. However, it is a subject that requires immediate and detailed investigation.

Whilst the wetlands within the Dinder National Park are now part of a well developed conservation programme those outside the park have no protection. Little is known of the contribution to the hydrology of the Dinder and Rahad drainage systems or of their biodiversity value. Indeed, they have not been mapped by the recent Africover mapping project.

A first step would be to undertake a detailed inventory and study of their distribution, their hydrology in relation to the Dinder-Rahad system (in particular to the seasonal flooding), their biodiversity status and their utilization by local peoples. Given the integrated nature of the catchment in Ethiopia and Sudan the study should encompass the whole of the Dinder-Rahad Watershed to understand sediment sources and run-off characteristics.

The wetlands in the lowlands along the Blue Nile comprise the *sun't* forests of *Acacia nilotica* subsp. *nilotica* and subsp. *tomentosa*. These are found in the back-swamp areas and silt-filled ox-bow lakes that are seasonally inundated. Many of these *sun't* forests are under threat from illegal felling. There is a need to undertake a detailed survey and threat assessment of these wetlands and develop a Conservation Plan.

In the Ethiopian Highlands there are three types of wetlands. Around Lakes Tana and Chomen are lacustrine wetlands of papyrus and reed that fringe the lake shores. In some places (e.g. in the Fogera Plain) these have been reclaimed and at lake Chomen some have been flooded by the reservoir behind the Fincha'a Dam. To the north and west of the Abbay on the Gojam Plateau are extensive seasonally flooded grasslands in wide valley plains. These provide valuable dry season grazing for livestock when the hill pastures are in poor condition. South of the Abbay and west of the Didessa River are valley bottom wetlands that are increasingly being drained for crop production and grazing.

The wetlands of the Abbay-Blue Nile thus provide an extremely wide range of hydro-ecological conditions and thus a wide range of products and services of value to peoples livelihoods as well to the general hydrology of the whole Sub-basin.

### **III Accordance with Policy and Development Frameworks**

The project accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.

The Project supports Sudan's Decentralization Policy in the following aspects:

- Improving systems and practices of local publicprivate partnerships in service delivery;
- Support to Locality development planning;
- Improving Locality information systems;
- Establishing Locality monitoring systems;

The Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

#### **IV. Scope and Extent**

The Project would provide support to the Project by providing funds for the survey and conservation planning; for physical and human capacity building in terms of logistics, equipment and training in survey techniques; in participatory planning, knowledge sharing and dissemination of the survey finding and the Conservation Plan.

The survey would cover all wetland types within the lowlands and highlands of the Abbay-Blue River Basin (Map 5).

#### **V. Cost Estimate**

Estimated cost of the project is US\$ 8.10 million with US\$ 1.62 million provided by the two riparian countries (20%) and US\$ 6.48 million external funding.

Survey/Planning Logistics	-	US\$ 4.05
Capacity Building (Physical & Human)	-	US\$ 2.85
Knowledge Sharing/Dissemination	-	US\$ 1.20

#### **V. Anticipated Benefits and their Distribution**

A joint survey and conservation plan of this important element of hydrology, biodiversity and livelihoods support would have a number of benefits at the local, Regional and Global levels:

Upstream at the local level a deeper understanding of the role of wetlands in peoples' livelihoods would inform and enrich development and poverty reductions programmes. At a higher the results would provide valuable information for understanding the hydrology of the Abbay-Blue Nile river system both for water storage, irrigation and flood control planning. At the global level the conservation plans would provide enhanced conservation of valuable species and habitat biodiversity.

#### **VI. Options for Phasing and Timing**

The survey of would be undertaken in a number of sequential steps:

- Formal expression of commitment by the Ethiopian and Sudanese Governments to undertaker the survey,
- Establish a Joint Steering Committee,
- Design the survey and determine logistics and responsibilities,
- Implement training,
- Undertake the survey and analysis



- Develop Conservation Plan, and
- Information and knowledge sharing: Regional Workshop

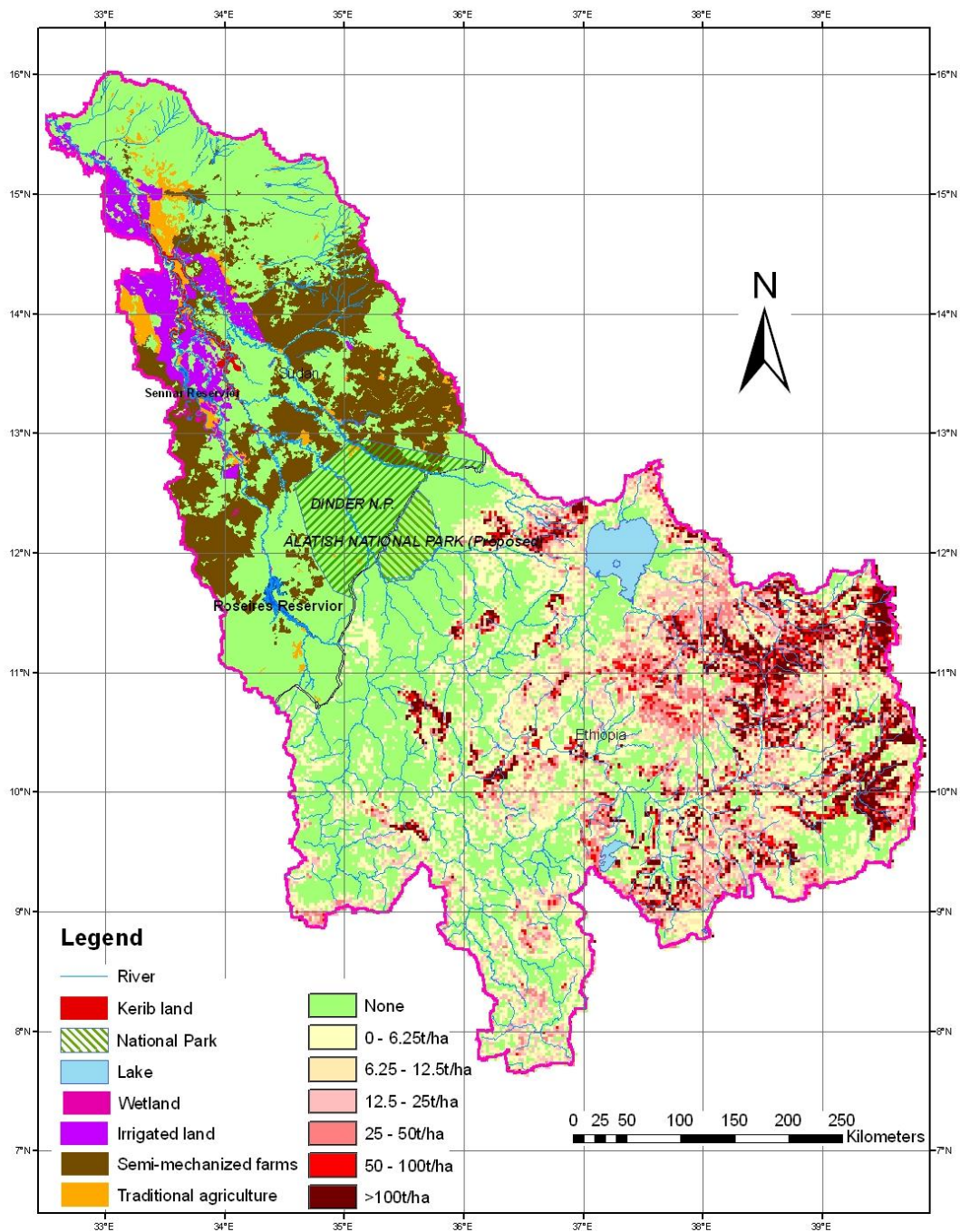
## **VII. Relationships to other IDEN Projects**

Watershed Management Fast Track Project: Sudan Dinder National Park component.

IDEN Irrigation and Drainage and the Flood Control and Management Projects.

NBI Transboundary Environmental Action Project.

## EASTERN NILE ABAY - BLUE NILE SUB-BASIN



**Map 5. Abbay-Blue Nile Sub-basin: Location of the Wetlands Survey and Management Planning**

## **PROJECT PROFILE 6. ESTABLISHMENT OF THE DINDER-ALATISH TRANSBOUNDARY PARK**

### **I. Objectives**

The objective of the project is to provide support to the Governments of Ethiopia and Sudan in establishing a Transboundary Park comprising the Dinder National Park in Sudan and the Alatish National Park in Ethiopia.

### **II. Background and Rationale**

The Dinder National Park, which was proclaimed in 1935 is located within three States: Sennar, Blue Nile and Gedarif. Its boundaries follow to the north of the Rahad in the north, to the south of the Dinder in the south and the Ethiopian border to the east, and covers an area of 8,960 km<sup>2</sup>. It is also a designated Biosphere Reserve and has been designated under the Ramsar Convention as an international Wetland. Immediately across the border within Ethiopia the Amhara Regional State have designated an area as the Alatish National Park

The Park lies on a transition ecotone between two floristic regions: the Ethiopian High Plateau and the arid Saharan-Sudanian biomes. It also lies along the boundary of two major faunal Realms of the world: the Palaearctic and the Ethiopian. It is also located along a major north-south flyway of migratory birds.

It has a high level of biodiversity with over 160 species of birds, 27 species of large mammals and unknown number of small mammals. It comprises the last extensive tract of woodland in eastern Sudan. Its importance to conservation can be summarized as follows (ArabMAB, 2006):

- The proximity of the Park to the desert and semi-desert makes it an important buffer zone for the vegetation cover of central Africa in addition to its significance in providing genetic material for the rehabilitation in the semi-arid and arid areas.
- The park is an important watershed area protecting the most important feeders of the Blue Nile, the Dinder and Rahad rivers.
- The Park, together with the south-western corner of the Ethiopian Plateau make a complete Ecosystem for wild animals, for which the Park is the dry season habitat for migratory species.
- The park supports a high diversity of fauna and flora, including such animals of international conservation importance as the African elephant, African buffalo and the lion.

There are three groups of people who have an interest in the park. The first is the original inhabitants of the areas - a small group of Maganu people who continue to live in the south-eastern part. This community has a unique culture that needs to be preserved. They depend on subsistence farming in the rainy season and supplement their diet by collecting fruits and wild honey. In the dry season they move to the Dinder for fishing.

The second group are pastoralists and agro-pastoralists who enter the Park in the Dry Season looking for forage and water because much their rangeland has been converted into semi-mechanized farms. Included in this group are the Um Barrarow or Falata who use the Park in the dry season along the Dinder River and move into Ethiopia during the wet season. They burn the tall grasses in the dry season to make green grass available, but in doing so eliminate susceptible herbs and shrubs.

Around the Park are a considerable number of Internally Displaced Peoples taking refuge from the war in Dafur in the 1970's and are settled along the Dinder and Rahad rivers and enter the Park for fishing, fuelwood and honey collection but also for illegal hunting and present the most serious threat to the wildlife. It is estimated that 100,000 people live around the park in 36 villages.

The Dinder and the Rahad Rivers and their tributaries drain the Park. They rise in the Ethiopian Highlands and are highly seasonal almost drying out in the dry season. Due to the abrupt change in gradient the rivers meandering a large number of cut-off meanders have been formed locally called *Maya'as*. They are generally flat and cover an area some 0.16 to 4.5 km<sup>2</sup>. Rain and flood water fill them during the rainy season. The *maya'as* provide a valuable source of water and forage for domestic livestock and wildlife, as well as unique habits rich in biodiversity.

Under natural conditions there is a constant evolutionary sequence of the formation of young *maya'as* that are deeper with clear water. Gradually they pass through stages of becoming gradually silted up. Over long periods of time with the meandering new *maya'as* are being formed. The spectrum runs from young productive *maya'as* to old non-productive dry ones.

With the accelerated erosion in the Ethiopian Highlands this gradual and long term evolutionary process has been disturbed because increased flood peaks and high sediment loads. The area is now subject to annual flooding and many of the *Maya'as* are becoming silted up with a consequent loss of habitat biodiversity and forage productivity.

In Ethiopia the Amhara regional Government has proposed to develop the Alatish Regional Park in Quara wereda of North Gonder Zone, almost opposite the Dinder national Park in the Sudan. The area represents the Sudan-Guinea Biome. The park has been gazetted as a Regional Park and demarcated. However, the Park lacks national legislation and international recognition (Cherie Enawgaw et al., 2006).

The Park covers an area of 2,666 km<sup>2</sup> to the north of the Dinder River, which forms its southern boundary, and to the south of the Gelegu River that forms its northern boundary. The Alatish and other ephemeral streams drain the central area. Its altitude ranges from 500 to 900 masl. The main vegetation is woodland, shrubland and lowland bamboo thicket. Studies so far have revealed that the Park contains 48 mammal species and 180 bird species. It contains such endangered species as *Loxodonta africana*, *Panthera pardus* and *Panthera leo*.

The area is intact with no permanent settlement, although Fellata pastoralists enter the Park in the dry season with over 10,000 head of livestock. The northern and eastern sides have a 2 kms buffer zone, but the southern boundary has no buffer zone as it border Beneshangul-Gumuz regional State.

The Gumuz people have settled to the south of the Park and practice poaching and fishing along the Dinder River. Settlement is increasing and agriculture expanding along the northern boundary and numbers are being swelled by migrants from other parts of Amhara region. People enter the Park area to collect honey, gums and resins.

There is an urgent need to collaborate with the Beneshangul-Gumuz Regional government and with the Government of Sudan to secure the area. The Ethiopian Wildlife Conservation Organization has strongly recommended that the Alatish Park been proclaimed a National park and that in the future it should form part of a Transboundary Park with the Dinder National Park. There is also an urgent need to develop a park management plan in participation with local communities.

There is considerable scope to develop an international trans-boundary park by combining the Dinder and the proposed Alatish National Parks. Both Parks are located alongside each other, either side of the border between Ethiopia and Sudan. The Dinder Park is well established, gazetted and internationally recognized. In contrast, the Alatish Park currently has only Regional government recognition although the Federal Ethiopian Wildlife Development and Conservation Department (EWDCD) has recommended that it be nationally gazetted and also made the recommendation for the establishment of a Transboundary Park.

There is now considerable experience in Sudan of a community-based approach to Park management in the Dinder National Park. Both Parks experience seasonal grazing from Felata pastoralists and are subject to pressures from people living around the Park.

### **III Accordance with Policy and Development Frameworks**

The project accords with the Ethiopia's Environmental Policy and the Conservation Strategy of Ethiopia. In particular, with respect to the conservation of genetic, species and ecosystem biodiversity; the conservation and sustainable use of forest, woodland and tree resources; and the protection of water resources – in particularly wetlands.

The project also accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.

The Project accords with Sudan's National Water Policy, in particular as it affects the environment and related matters such as pollution and catchments degradation. It

also accords with the Environmental Protection Policy (2001) regarding the conservation of biodiversity. In addition, the Project supports Sudan's Decentralization Policy in the following aspects:

- Improving systems and practices of local publicprivate partnerships in service delivery;
- Support to Locality development planning;
- Improving Locality information systems;
- Establishing Locality monitoring systems;

Finally, the Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes.

The Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The Project would provide support to both Ethiopia and Sudan to develop Park Management Plans that although separate are compatible with each other. The project would also provide physical and human capacity building support to enable physical infrastructure (roads, offices) within the Park and training to Park staff. In the initial stages of establishment there will be need for close collaboration between Ethiopia and Sudan both at the local and the national levels. The project provides support to enable this process through workshops and meetings. There is considerable experience in Southern Africa in establishing Transboundary Parks and the project would provide funds for a Study Tour to enable concerned Ethiopian and Sudanese officials to learn from experiences in that Region.

### **V. Cost Estimate**

Estimated cost of the project is US\$ 4.80 million with US\$ 0.96 million provided by the two riparian countries (20%) and US\$ 3.84 million external funding.

Preparation Compatible Management Plans	-	US\$ 1.30 million
Capacity Building (Physical & Human)	-	US\$ 2.40 million
Knowledge Sharing, Study Tour & Working Meetings	-	US\$ 1.10 million

## **VI. Anticipated Benefits and their Distribution**

A cooperative or joint management of a Trans-boundary Park would have a number of advantages:

- shared experiences in community-based Park management
- cost-effective joint management of the Park as one eco-system, and
- the strong possibility of international recognition and ability to secure both Government and external funding.

## **VII. Options for Phasing and Timing**

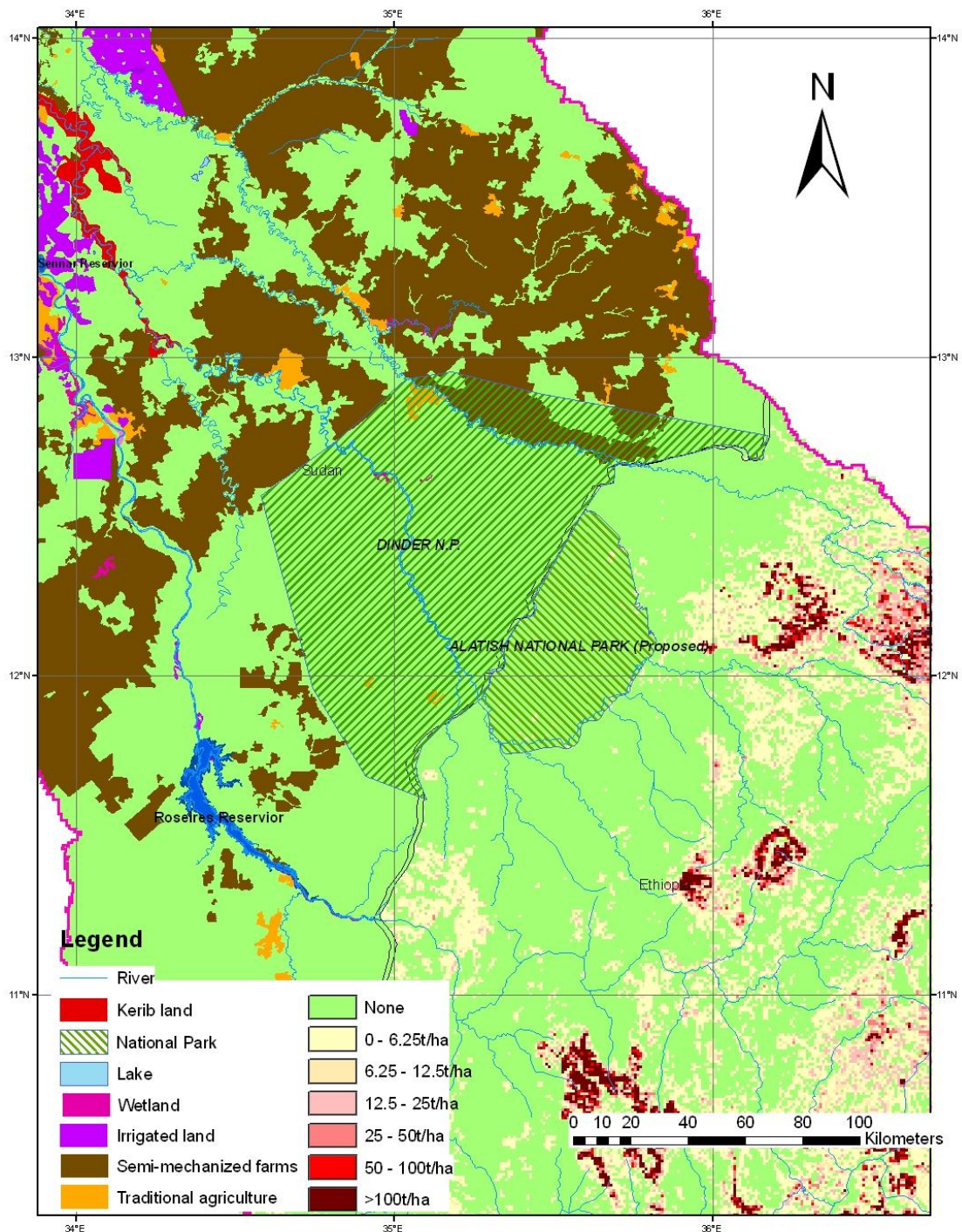
The establishment of the Trans-boundary Park would follow a number of sequential stages:

- Gazetting of the Alatish Regional Park and as a "National Park".
- Formal expression of commitment by Ethiopian and Sudan Governments to establish a Transboundary Park.
- Establish a Joint Steering Committee.
- Develop compatible Park Management Plans.
- Implement physical and human capacity building.
- Establish formal joint monitoring system

## **VIII. Relationships to other IDEN Projects**

The Watershed Management Fast Track project in Sudan is providing support to the Dinder Park. The NBI – NTEAP has a Community Development micro-grant project in the Dinder Park.

## EASTERN NILE DINDER NATIONAL AND ALATISH REGIONAL PARK



**Map 6. Location of the Proposed Dinder-Alatish Transboundary Park.**



## **PROJECT PROFILE 7. JOINT WILDLIFE AND HABITAT INVENTORY AND ASSESSMENT: BOMA AND GAMBELLA NATIONAL PARKS**

### **I. Objectives**

The objective of the project is to provide support to the Governments of Ethiopia and the Sudan in undertaking a joint wildlife and habitat inventory and assessment in the area in and between the Gambella National Park in Ethiopia and the Boma National Park in the Sudan.

### **II. Background and Rationale**

There are two national parks in the Baro-Sobat-White Nile Sub-basin: the Gambella National Park in Ethiopia and the Boma National Park in the Sudan.

The Gambella Regional Park is 506,100 ha in extent and is located between the Akobo and Ghilo rivers, east of the road between Gambella and Gog. The Gambella Park was proposed because of the numerous large wildlife species, particularly Nile Lechwe, White eared Kob and the Whale-headed Stork. The White Eared Kob migrates every year between the Sudd in Sudan and the Gambella Marshes. A survey by Lavrenchenko et al. (1989) inventories some 88 mammal species of 9 Orders and 28 Families. In addition to White-eared Kob they include elephant, Nile Lechwe, Topi and Road Antelope. In smaller numbers Lion, Leopard, Lelwel Hartebeeste and Buffalo are also found. There are extensive areas of swamp habitat. Some 43 species of mammals and an IBA team recorded 230 species of birds (EWNHS/Bird Life International (1996)). There are two near threatened bird species: the Shoebill (last recorded in 1961) and the Basra Reed Warbler (last recorded in 1976). Golubtsov et al (1989) recorded the presence of 92 fish species belong to 51 genera and 23 families.

The Park is not legally gazetted and no Management plan has been prepared. There are no visitor facilities. The two vehicles and Park stores were destroyed during the government change over in 1991. The Park contains the Akobo large-scale farm and Alwero Dam, and irrigation developments is currently underway in the centre of the Park. There is a critical problem of illegal hunting, with a large number of arms made available because of the Sudanese Civil War. The Phugnido Refugee Camp is located adjacent to the Park. The last major study of the area was made in 1986 by the Russian Institute of Evolutionary Morphology and Animal Ecology under the UNESCO Man and the Biosphere programme. (Sokolov, 1989) although a bird survey was undertaken in 1995-96 by the Ethiopian Wildlife and Natural History Society (EWNHS-Bird Life Int., 1996).

The local inhabitants include the Anuak to the east, who cultivated along the Baro and Akobo Rivers and the agro-pastoral Nuer to the west and into Sudan.

The Boma National Park encompasses an area of some 2.28 million ha of the clay plains and a mosaic of wetlands, seasonally flooded grasslands and open wooded savanna grassland in the north-western part. The south-eastern part of the Park includes part of the Boma Plateau and the escarpment that separates the plateau from the plains. It was declared a National Park in 1977 but has not been gazetted. The area is extremely inaccessible, most particularly during the wet season. The main routes have been mined and minor routes un-maintained. The Park is now managed by the New Sudan Wildlife Organisation (NSWO) and a regional headquarters has been established at Boma town. There are 22 Staff including 5 Senior Staff but facilities and equipment are lacking (Morjan et al., 2001).

Some five ethnic groups inhabit the park and its environs: the Murle (Boma plateau agriculturists), Murle (plains pastoralists), Jie, Anuak, Suri (Kichepo). The plains Murle, Suri and the Jie are predominantly pastoralists whilst the Anuak and plateau Murle are predominantly agriculturalists. The pastoralists used to have very large herds of cattle, sheep and goats but have lost substantial numbers during the conflict and now own 25 to 30 percent of their previous holdings.

In the wet season of 2001 a Team supported by USAID and in collaboration with the University of Missouri, USA, undertook a survey to assess the impact of conflict on the Boma National Park looking in particular at the status of food security livestock and wildlife (Deng, 2001). Generally the pastoralists saw internal tribal conflict as the major source of livelihood vulnerability the agriculturalists saw drought as the main external shock to their livelihoods. Hunting and wild food collecting was a coping mechanism adopted by all peoples as an alternative livelihoods strategy, although the degree to which this strategy was adopted varied among the different groups.

Some 800,000 White Eared Kob migrate every year between the Sudd in Sudan and the Gambella Marshes. Elephant also follow a migratory route of some 1,500kms into and between the two National parks.

A major wildlife inventory had been undertaken in 1980 (Fryxell, 1983) and provided a baseline for the 2001 study. With the exception of population estimates for Reedbuck, Ostrich and Eland populations the 2001 estimates suggest that there has been a massive decline in nearly all animal species. The most affected were the White-eared Kob and the Mongalla Gazelle. A summary is provided in table 17. The big increase in hunting has caused the migratory routes of White-eared Kob and Elephant to change over 20 years (Map 24).

**Table 1. Comparison between Wildlife Population estimates in the years 1980 and 2001.**

Species	2001 count Wet season	1980 count Wet season	1980 count Dry season
White-eared Kob	176,120	680,716	849,365
Lesser Eland	21,000	2,612	7,839
Oribi	3,920	2,939	2,264
Reedbuck	28,840	2,000	3,000
Road Antelope	1,960	2,059	3,085
Mangalla Gazelle	280	5,933	21,678
Warthog	280	293	4,868
Ostrich	3,640	1,306	2,151
Tiang	N.S.	24,078	29,460

Lelwel Hartebeest	5,600	8,556	47,148
Zebra	N.S.	24,078	29,460
Buffalo	N.S.	2,965	11,179
Giraffe	N.S.	4,605	9,028
Waterbuck	N.S.	620	2,462
Steinbuck	N.S.	292	1,981
Grants Gazelle	N.S.	1,222	1,811
Elephant	N.S.	1,763	2,179

Source: Deng, 2001.

N.S. – Not seen

The vegetation survey revealed an increase in tree densities an indication of habitat improvement and stability.

There is an urgent need to undertake an aerial and ground survey across the whole area in and between to the two parks to determine the status of both wildlife and habitats. Given the inter-dependence of the areas in Sudan and Ethiopia this will have to be a joint trans-boundary survey.

### **III Accordance with Policy and Development Frameworks**

The project accords with the Ethiopia's Environmental Policy and the Conservation Strategy of Ethiopia. In particular, with respect to the conservation of genetic, species and ecosystem biodiversity; the conservation and sustainable use of forest, woodland and tree resources; and the protection of water resources – in particular wetlands.

The project also accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.

The Project accords with Sudan's National Water Policy, in particular as it affects the environment and related matters such as pollution and catchments degradation. It also accords with the Environmental Protection Policy (2001) regarding the conservation of biodiversity. In addition, the Project supports Sudan's Decentralization Policy in the following aspects:

- Improving systems and practices of local publicprivate partnerships in service delivery;
- Support to Locality development planning;
- Improving Locality information systems;
- Establishing Locality monitoring systems;

Finally, he Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes.

The Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The Project would provide support to the survey by providing funds for the ground and the aerial survey. It will be important to undertake a livelihoods survey of peoples living in the area to provide a basis for subsequent participatory management planning of the two parks. Finally, the project will support for training of Park staff in techniques of aerial and ground wildlife and habitat surveys and for subsequent analysis and knowledge sharing.

### **V. Cost Estimate**

Estimated cost of the project is US\$ 2.80 million with US\$ 0.56 million provided by the two riparian countries and US\$ 2.24 million external funding.

Survey (Ground/aerial)	-	US\$ 1.40 million
Livelihood Survey	-	US\$ 0.56 million
Capacity Building (Human)	-	US\$ 0.50 million
Analysis/Knowledge Sharing/Dissemination	-	US\$ 0.34 million

### **VI. Anticipated Benefits and their Distribution**

A joint survey of this important biodiversity area would have a number of benefits:

- shared experiences in wildlife and habitat inventory and assessment,
- shared experiences in scientific research,
- cost-effective joint survey across an area of two countries,
- an assessment of the total ecosystem and a firm foundation for Park Management Planning for the two Parks,
- a firm foundation and modality established for future cooperation in biodiversity conservation between the Sudan and Ethiopia.

## **VII. Options for Phasing and Timing**

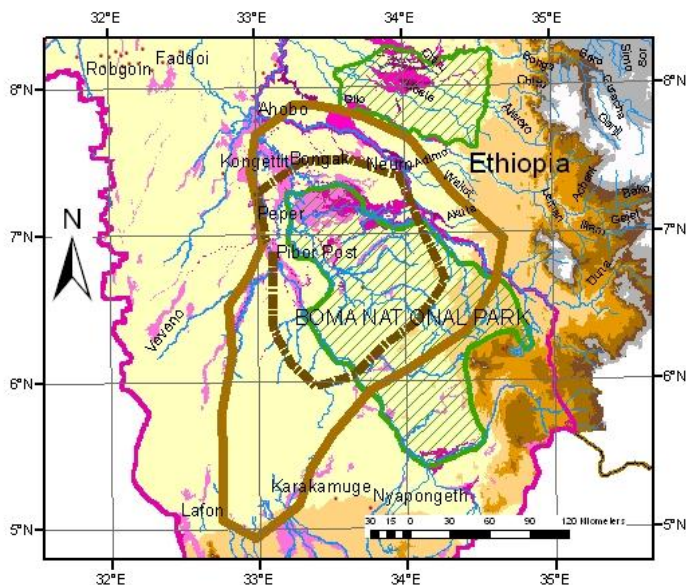
The survey of would be undertaken in a number of sequential steps:

- Formal expression of commitment by the Ethiopian and Sudanese Governments to undertaker the survey,
- Establish a Joint Steering Committee,
- Design the survey and determine logistics and responsibilities,
- Implement training,
- Undertake the survey and analysis, and
- Information and knowledge sharing: Regional Workshop

## **VIII. Relationships to other IDEN Projects**

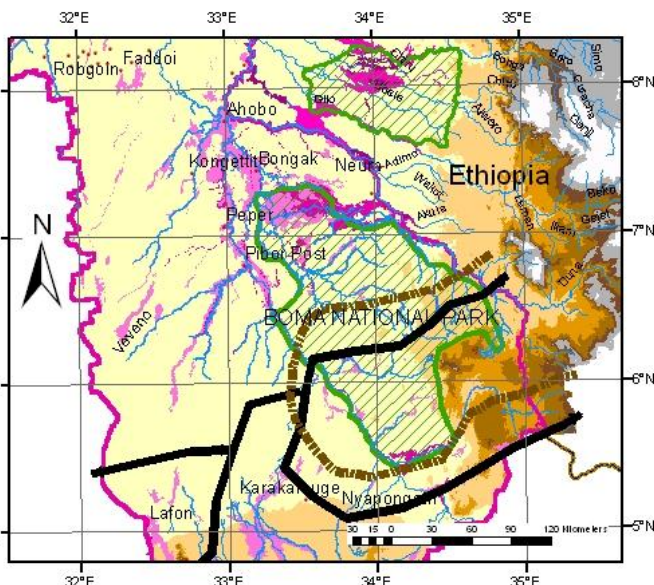
Baro-Sobat-White Nile Multi-purpose Water Resources development Project

**BARO-SOBAT-WHITE NILE SUB-BASIN  
WHITE EARED KOB MIGRATION ROUTES  
1980 AND 2001**



- Legend**
- Kob migration routes**
- 1980 kob migration route
  - 2001 kob migration route
  - National Park
  - Permanent swamp
  - Seasonal swamp
  - Small town
  - Large town
  - River
  - International boundary

**BARO-SOBAT-WHITE NILE SUB-BASIN  
ELEPHANT MIGRATION ROUTES  
1980 AND 2001**



- Legend**
- Elephant migration routes**
- 1980 migration route
  - 2001 migration route
  - National Park
  - Permanent swamp
  - Seasonal swamp
  - Small town
  - Large town
  - River
  - International boundary

## **PROJECT PROFILE 8. COMPREHENSIVE WATERSHED MANAGEMENT RESEARCH PROJECT – CHOKE MOUNTAIN CHAIN, ETHIOPIA**

### **I. Objectives**

The objective of this joint research project is to provide support to a wide-ranging and comprehensive watershed management research project covering a number of Sub-catchments that drain the Choke Mountain chain into the Abbay River system and located in the Western Highlands of Ethiopia. The major objective of the programme would be to gain an understanding of the complex hydrological-land use and erosion-deposition relationships at various scales: micro-catchment, sub-catchment, catchment and Sub-basin. The project will provide information of value not only to the eastern Nile Basin but also to sustainable land management programme throughout Africa.

### **II. Background and Rationale**

There are many complex relationships between land use/land cover and hydrology, and between land use/land cover, erosion, deposition and sediment delivery to the stream-river system. Different processes act with different intensities at different catchment scales. The science of these relationships is only imperfectly understood.

In developing basin-wide cooperative and joint activities it will be important that all riparian countries see the benefits (and the costs) in quantitative terms as far as is possible. This is most critical in assessing a programme of watershed management activities that has both up-stream and down-stream costs and benefits. If an element of benefit and cost sharing within a joint project is to be introduced and accepted it will be vital that the quantitative impacts that a programme of watershed management interventions can be determined.

Hitherto, these complex relationships have only been researched at the micro-scale: field plot and micro-catchment. No research has been undertaken at the various catchment scales to gain an understanding of the various levels of inter-actions and relationships. This project aims to redress this large gap in our understanding of these relationships. It will involve a number of inter-related research activities being undertaken at different scales.

Institutionally, the Project will be implemented by a number of research institutes and organizations from all three Eastern Nile countries under the coordination of ENTRO.

The Project would be undertaken in two phases. The first phase would develop a comprehensive framework for research activities that take cognizance of the scale effects of the various factors relating to hydrology, land cover, erosion, deposition in the landscape, sediment delivery and fluvial transport. Both surface and groundwater aspects would be covered. The second phase would implement a series of inter-

related research activities over a period of five years in order to capture the natural variance in many of the controlling parameters.

### **III Accordance with Policy and Development Frameworks**

The project accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on arresting natural resource degradation which is a root cause of poverty in all three countries of the Eastern Nile Basin. It will support programmes to improve agricultural productivity, improve water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.

The Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The Project would provide funds for both the research design phase and the research implementation phase. Information sharing will be a key component of the project to ensure maximum synergy from the wide range of disciplines involved. Human and institutional capacity building will also be important components of the project to ensure that a body of expertise is developed and maintained.

### **V. Cost Estimate**

Estimated cost of the Phase I of the project is US\$ 1.8 million with US\$ 0.3 million provided by the three riparian countries and US\$ 1.5 million external funding.



Estimated cost of the Phase II of the Project is US\$ 8.00 million with US\$ 1.60 million provided by the three riparian countries (20%) and 6.80 million from external funding.

Phase I (Research design)	-	US\$ 1.8 million
Phase II:		
Research Contracts	-	US\$ 4.8 million
Capacity Building (Human & Physical)	-	US\$ 2.0 million
Knowledge sharing/Dissemination	-	US\$ 1.2 million

### **VI. Anticipated Benefits and their Distribution**

There are a number of local, regional and global benefits that would accrue to the Project:

- increased scientific knowledge of the complex relationships between land cover, land management, hydrology, erosion, deposition in the landscape, sediment delivery to the river system and fluvial sediment transport,
- Contribution to more effective watershed management interventions and a deeper understanding of their potential impacts at various scales;
- Increased cooperation and knowledge sharing and confidence building among countries of the Eastern Nile Basin; and
- Increased capacity in sciences of hydrology, erosion and sedimentation and the establishment of a cadre of professionals knowledgeable in the practical applications of these areas.

### **VII. Options for Phasing and Timing**

The project would be undertaken in two Phases following a number of sequential steps:

Phase I:

- Establish a Joint Steering Committee of with representatives of all concerned Research Groups and Institutions;
- Design the Research Framework, methodologies of the various research elements, and determine logistics and responsibilities;
- Commence training and capacity building activities;

Phase II

- Implement Research Activities, Monitor progress and coordinate related activities;
- Information and knowledge sharing: Workshops and dissemination of preliminary findings
- Document Research results. .

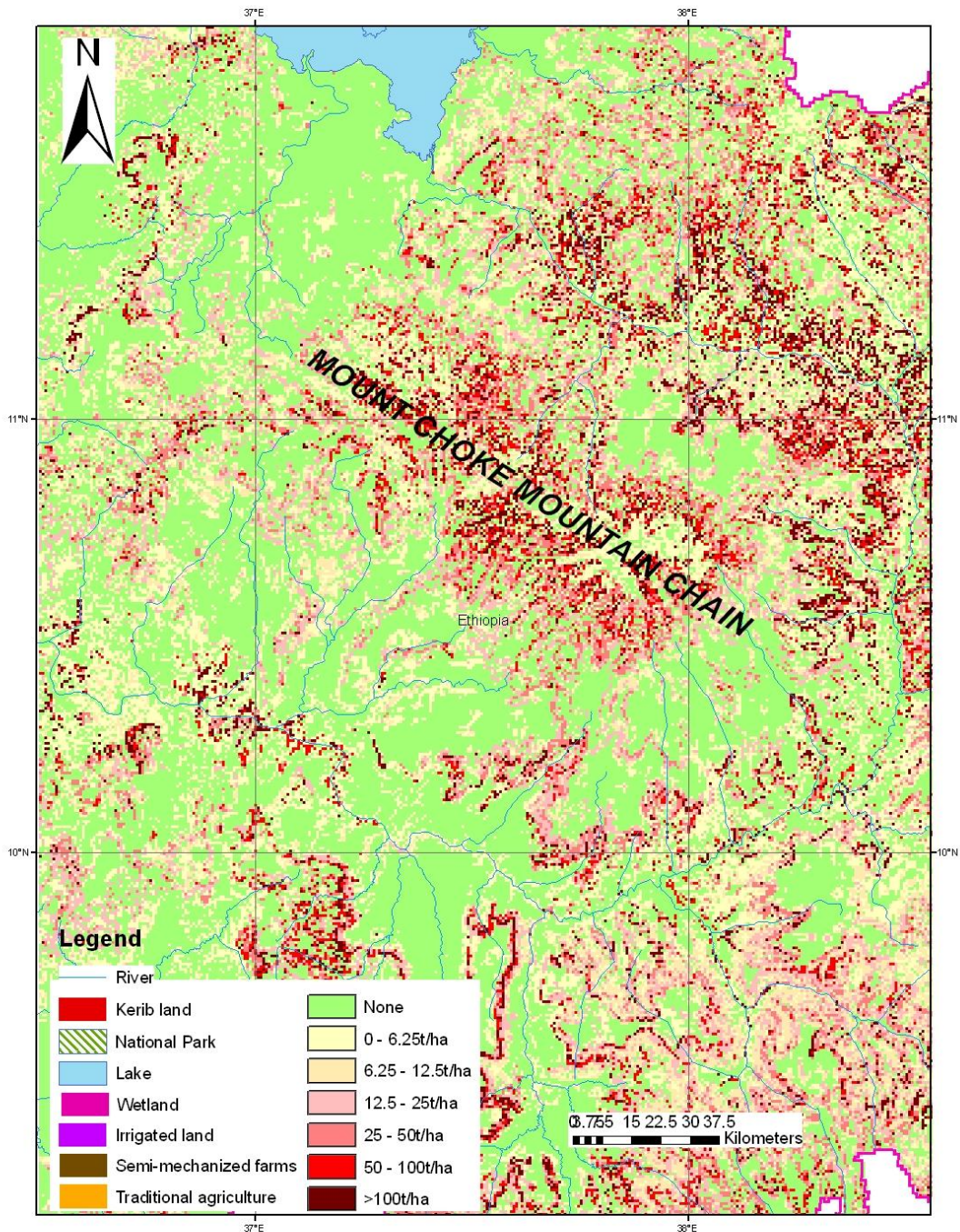
### **VIII. Relationships to other IDEN Projects**

The project will support the following projects through an improved understanding of the processes and impacts of resource degradation in the Eastern Nile Basin:

Joint Multi-purpose Programme

Long-term Watershed Management CRA

## EASTERN NILE MOUNT CHOKE MOUNTAIN CHAIN NATURAL RESOURCE DEGRADATION



**Map 8. Location of the Proposed Comprehensive Watershed Management Research Project**

## **PROJECT PROFILE 9. SOUTHWEST ETHIOPIAN HIGHLANDS - PARTICIPATORY DEVELOPMENT AND MANAGEMENT OF SUB-CATCHMENTS**

### **I. Objectives**

The objective of this joint project is to provide support to developing a participatory two tier approach to sustainable development and management of Sub-catchments and their Micro-catchments in the Southwestern Ethiopian Highlands. The project would also support the establishment of the higher level institutional procedures and organization to facilitate coordination at the Sub-catchment level. The project will provide information of value not only to the eastern Nile Basin but also to sustainable land management programme throughout Africa.

### **II. Background and Rationale**

The Highlands of the Upper Baro-Akobo Sub-basin are a mosaic of forest patches, upland cropland and grazing land and valley-bottom swamps – many of which are being drained for crop production. The area is under increasing population pressure and has varying, but growing, levels of food-insecurity. With mean annual rainfall exceeding 1,500 mm/yr the area has been identified as having good micro-hydro power potential. The valley-bottom swamps are located in micro-catchments at the top of a nested-hierarchy of hydrologically linked micro-catchments and sub-catchments that comprise the Upper Baro-Akobo Sub-basin. Whilst, currently only 5-15 percent of these swamps have been drained for crop production with increasing land pressure and food-insecurity the pace of swamp conversion is likely to accelerate.

A sustainable approach to swamp development for multiple uses has been developed by a local NGO based on traditional practices, a scientific study of ecological succession and governed by local institutions. On the uplands, community-based approaches to participatory forest management have also been developed. Related developments have taken place with respect to sustainable harvesting, improved marketing and quality control of non-timber forest products. In particular, the development of the production, quality control, certification and improved marketing of organically produced coffee is also receiving attention. There is a need to bring all these separate development initiatives together through a process of participatory land use planning at the micro-watershed level but which then integrates these into the overall planning and development at the Sub-catchment level to ensure equitable access to water across the Sub-catchment. This process would be linked to the proposed land use zoning of the remaining High Forest areas.

This two tiered level of watershed management planning would ensure that larger investments such as mini hydro power developments and lowland irrigation would be assured of sufficient water. Additionally, infrastructural developments such as

improved road access to markets and crop processing plants would form an integral part of the overall Sub-catchment development. This two tiered approach to watershed management is only just now beginning to receive attention. Previous approaches initially used the Sub-catchment as the only level of development, which were then changed to the micro-catchment approach. There is a need to integrate the two approaches and increase the role for community participation with market incentives.

### **III Accordance with Policy and Development Frameworks**

The project accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.

The Project supports Sudan's Decentralization Policy in the following aspects:

- Improving systems and practices of local publicprivate partnerships in service delivery;
- Support to Locality development planning;
- Improving Locality information systems;
- Establishing Locality monitoring systems;

The Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The Project would provide support to the Project by providing funds for participatory land use planning at the micro-catchment level and for the water and other infrastructural planning at the Sub-catchment level; for physical and human capacity

building in terms of logistics, equipment and training in survey techniques; in participatory planning, knowledge sharing and dissemination of the survey finding and the Micro-Catchment and Sub-catchment Plans.

Institutionally, the Project will be implemented by a number of research institutes and organizations from all three Eastern Nile countries under the coordination of ENTRO.

### **V. Cost Estimate**

Estimated cost of the project is US\$ 4.80 million with US\$ 0.96 million provided by the three Riparian countries (20%) and US\$ 3.84 million external funding.

Micro-catchment Participatory Land Use Planning	-	US\$ 2.88 million
Sub-catchment Planning	-	US\$ 0.74 million
Capacity Building (Physical & Human)	-	US\$ 0.70 million
Knowledge Sharing	-	US\$ 0.48 million

### **VI. Anticipated Benefits and their Distribution**

There are a number of local, regional and global benefits that would accrue to the Project.

At the local level an integrated system of natural resource management would be established that would diversity and sustainably increase agricultural production thereby increasing food security, supporting sustainable livelihoods and reducing poverty. At the Catchment and Sub-basin levels equitable access to water resources by downstream irrigators and mini-hydro power developments would be assured.

At the Global level sustainable management and use of the forest and wetland resources would ensure the conservation of biodiversity and in particular the wild coffee gene pool.

### **VII. Options for Phasing and Timing**

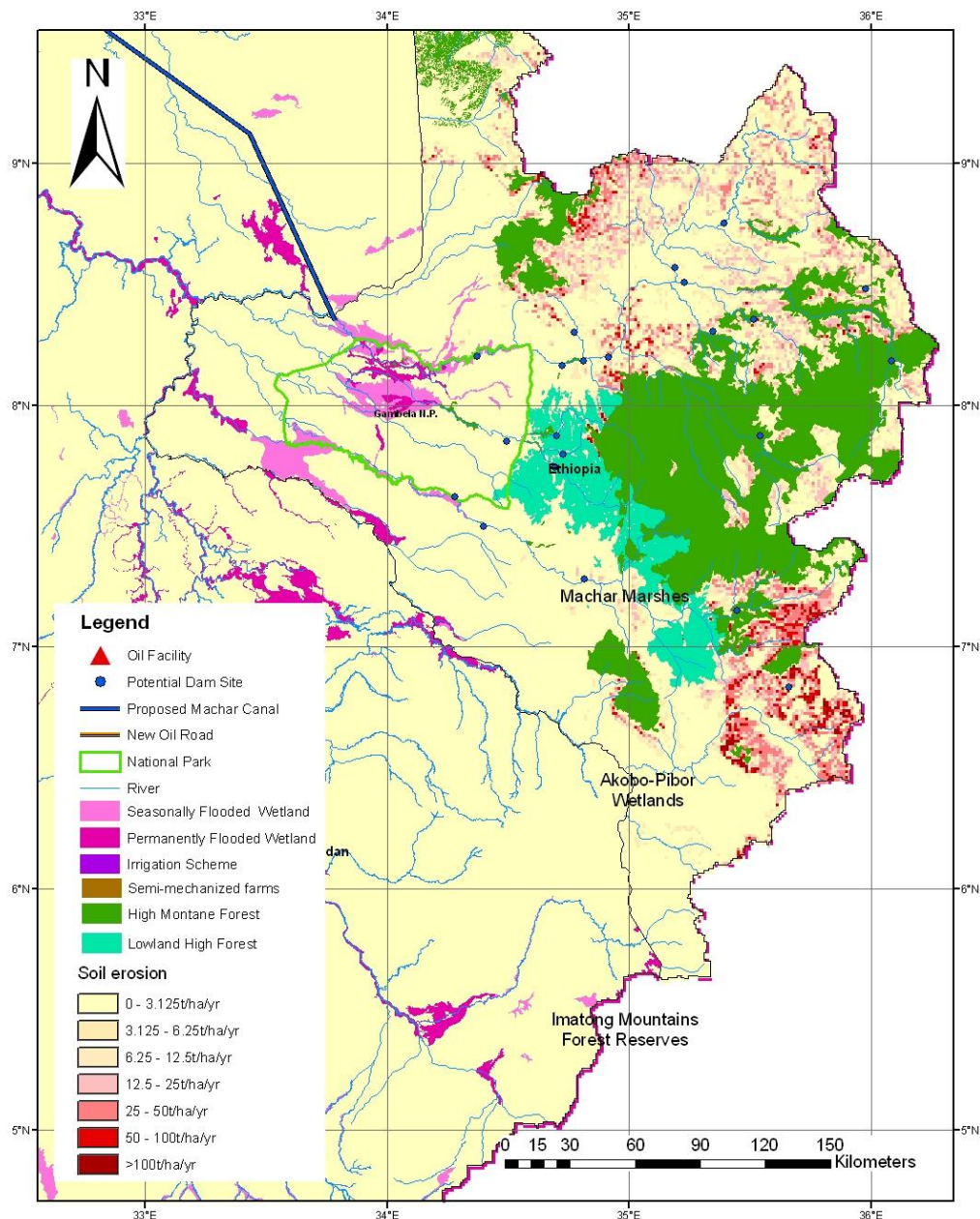
The project would be undertaken in a number of sequential steps:

- As the Project covers three Regional States, establish a Joint Steering Committee;
- Establish local and Sub-catchment institutional arrangements and organizational mandates;
- Design the methodology of the Micro-catchment and the Sub-catchment surveys and participatory planning, and determine logistics and responsibilities;
- Implement training and capacity building activities;
- Undertake the participatory planning at micro-catchment level (local stakeholders) and collaborative planning at the Sub-catchment levels (local and regional Stakeholders); and
- Information and knowledge sharing: Regional Workshops.

## VIII. Relationships to other IDEN Projects

Baro-Sobat-White Nile Multi-purpose Project.

### EASTERN NILE BASIN BARO-SOBAT-WHITE NILE SUB-BASIN NATURAL RESOURCE DEGRADATION



**Map 9. Baro-Akobo Sub-basin: Location of the Participatory Development and Management of Sub-Catchments Project**

## **PROJECT PROFILE 10. IN-DEPTH STUDY: DETERMINATION OF ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS AND COSTS OF WATERSHED MANAGEMENT INTERVENTIONS IN THE EASTERN NILE BASIN**

### **I. Objectives**

The objects of this in-depth study would be to determine the range of economic, social and environmental benefits and costs at local, national, regional and Global levels of watershed management interventions across the Eastern Nile Basin.

### **II. Background and Rationale**

A preliminary estimate of the economic, social and environmental benefits and costs of a basin wide programme of watershed management interventions was undertaken in the in the Watershed Management CRA. This preliminary assessment estimated that current annual costs of natural resource degradation were some US\$ 671.4 million and that these would rise to US\$ 4.5 billion over the next 25 years. The Report estimated that the total incremental costs of a 10 year programme of watershed management interventions were US\$ 4.67 billion whilst the incremental benefits were \$US 13.18 billion: a benefit:cost ratio of 2.8.

This in-depth study would build on this and undertake a much more in-depth analysis than was possible in the CRA, which by its nature was reconnaissance and preliminary.

The Study would be inter-disciplinary and involve economists, hydrologists and natural resource scientists from Universities and/or Research organizations from the three Countries in the Eastern Nile Basin. Its findings would feed into the evaluation process of the Joint Multi-purpose Programme of investments as well as providing key data and information to the Eastern Nile Planning model.

### **III Accordance with Policy and Development Frameworks**

The project accords with Ethiopia's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) with particular emphasis on arresting natural resource degradation which is a root cause of poverty in all three countries of the Eastern Nile Basin. It will support programmes to improve agricultural productivity, improve water resources development, development of potable water supplies and the expansion of small irrigation to reduce vulnerability to climatic shocks and to enhance sustainable livelihoods.



The Project also accords with the Sudan's National Comprehensive Strategy (which incorporates the National Environmental Strategy) by incorporating environmental concerns into development programmes. It also accords with the policy outlined in the Joint Appraisal Mission (JAM) that identified the need to address environmental challenges in order to ensure equitable and sustainable development. It also accords with Sudan's Poverty Reduction Strategic Plan to integrate environmental concerns in poverty reduction activities.

Finally the Project accords fully with ENSAP's Policy guidelines in particular:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples;
- To ensure efficient water management and the optimal use of the resources;
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
- To target poverty eradication and promote economic integration; and
- To ensure that the program results in a move from planning to action.

### **IV. Scope and Extent**

The Project would fund the establishment and workings of an inter-basin multidisciplinary team of economists, hydrologists and natural resource scientists who would undertake the in-depth study. It would fund peer review, technical assistance and capacity building where required, and support information exchange and knowledge sharing. Finally, the project would support the production and dissemination of the analysis and results.

### **V. Cost Estimate**

The estimated costs of the project are US\$ 950,000 of which the three countries would fund US\$ 190,000 (20%) and international funding sources US\$ 760,000.

Research Contracts	-	US\$ 715,500
Capacity Building, Technical Assistance	-	US\$ 142,500
Knowledge Sharing, Report Production/Dissemination	-	US\$ 95,000

### **VI. Anticipated Benefits and their Distribution**

The collaborative in-depth study would have a number of national and regional benefits:

- increased knowledge of the economic, social and environmental benefits and costs of watershed management interventions in the context of multi-purpose cooperative development of the eastern Nile Basin and thus increasing the scope and effectiveness of impact assessment of such investments;
- increased cooperation and knowledge sharing and confidence building among countries of the Eastern Nile Basin;
- Increased capacity in environmental and social economics and the establishment of a cadre of professionals knowledgeable in the practical applications of this area of economics.

### **VII. Options for Phasing and Timing**

It is possible that the Study be broken down by Sub-basin and then the results aggregated in a similar manner to the Distributive Analysis of the WSM-CRA.

- Formal expression of commitment by the three riparian Governments to establish a collaborative in-depth study,
- Establish a Joint Steering Committee
- Develop Work Plan and responsibilities,
- Implement the Study,
- Information and knowledge sharing: Regional Workshops; technical assistance and capacity building, and
- Dissemination of Study findings.

### **VIII. Relationships to other IDEN Projects**

It would provide technical and economic input to the Joint Multi-purpose Programme and subsequent investment evaluations. It would also link strongly with Project Profile 8: the Comprehensive watershed Management Research Project, most specifically for empirical data on erosion, sedimentation and productivity losses.

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### EASTERN NILE BASIN

