



NILE BASIN INITIATIVE

Eastern Nile Subsidiary Action Program

EASTERN NILE TECHNICAL REGIONAL OFFICE (ENTRO)

EASTERN NILE MULTI-SECTORAL INVESTMENT OPPORTUNITY ANALYSIS



MSIOA – Investment Strategy and Action Plan

March 2015

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ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AHD	Aswan High Dam
BCM	Billion Cubic Meter
BSG	Benishangul Gumuz Region
CC	Country Consultation
COMESA	Common Market for Eastern and Southern Africa
CRA	Cooperative Regional Assessment
CRGE	Climate Resilient Green Economy
EAC	East African Community
ECCAS	Economic Community of Central African States
ECGLC	Economic Community of the Great Lakes Countries
EEPCO	Ethiopian Electric Power Corporation
EIA	Environmental Impact Assessment
ENID	Eastern Nile Irrigation and Drainage
ENCOM	Eastern Nile Committee Of Ministers
ENIMIS	Establishment of Eastern Nile Irrigation Management Information System
ENPT	Eastern Nile Power Trade
ENSAP	Eastern Nile Subsidiary Action Plan
ENSAPT	Eastern Nile Subsidiary Action Plan Team
ENTRO	Eastern Nile Technical Regional Office (NBI)
EWUAP	Efficient Water Use for Agricultural Production
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEF	Global Environment Facility
GERD	Grand Ethiopian Renaissance Dam
GIS	Geographic Information System
GWh/y	GigaWatt hour/year
HCENR	Higher Council for Environmental and Natural Resources
HDI	Human Development Indices
HSU	Hydrological Similar Units
IDEN	Integrated Development of Eastern Nile
IGAD	Inter-Governmental Authority on Development
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ISAP	Integrated Strategic Action Plan
IUCN	International Union for Conservation of Nature and Natural Resources
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
JICA	Japan International Cooperation Agency
JMP	Joint Multipurpose Project
MCA	Multi Criteria Analysis
MEDIWR	Ministry of Electricity, Dams, Irrigation and Water Resources
MoE	Ministry of Environment
MoWI	Ministry of Water and Irrigation
MSIOA	Multi Sector Investment Opportunity Analysis
MW	Mega Watt
NBI	Nile Basin Initiative

NCORE	Nile Cooperation for result project
NELCOM	Nile Equatorial Lakes Council of Ministers
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NELSAP-CU	NELSAP Coordination Unit
NELTAC Nile	Nile Equatorial Lakes Technical Advisory Committee
NGO	Non-Governmental Organization
NIB	National Irrigation Board
Nile-COM	Nile Council of Ministers
NWRMS	National Water Resources Management Strategy
OMM	Operation, Maintenance and Management
PMU	Project Management Unit
PRSP	Poverty Reduction Strategy Program
RATP	Regional Agricultural Trade and Productivity Project
RPSC	Regional Project Steering Committee
RSS	Republic of South Sudan
SAP	Subsidiary Action Program
SVP	Shared Vision Program
UNDP	United Nations Development Program
WB	World Bank
WRMA	Water Resources Management Authority
WRMD	Water Resources Management and Development
WSTF	Water Services Trust Fund
WUA	Water Users Association

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1. Introduction and Background

1.1 THE NBI

The **Nile Basin Initiative (NBI)** is a partnership between the riparian states of the Nile River: Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda. The NBI seeks to **develop the river in a cooperative manner, share substantial socio-economic benefits, and promote regional peace and security**. The NBI started with a participatory process of dialogue among the riparian countries that resulted in an agreement on a shared vision, namely, to “achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources,” and a Strategic Action Program to translate this vision into concrete activities and projects.

The **Eastern Nile Subsidiary Action Program (ENSAP)** of the NBI was launched by Egypt, Ethiopia and the Sudan (with South Sudan joining in 2012) to **initiate concrete joint investments and action on the ground** in the Eastern Nile sub-basin in the areas of power generation and interconnection, irrigation and drainage, flood preparedness and early warning, watershed management, development of planning models and joint multipurpose programs. ENSAP is governed by the Eastern Nile Council of Ministers (ENCOM) and implemented by the Eastern Nile Technical Regional Office (ENTRO) in Addis Ababa, Ethiopia. Funding for ENSAP accrues from Eastern Nile countries and varied bilateral and multilateral development partners.

1.2 NCORE AND EARLIER INITIATIVES

The Integrated Development of the Eastern Nile (IDEN), the first ENSAP project, was agreed in 2002 with a first set of seven sub-projects aimed at tangible win-win gains in the areas of watershed management, flood preparedness, early warning and response, irrigation and drainage, power supply interconnection and regional power trade and later the Joint Multipurpose Program [JMP]. Some of these projects have successfully completed their preparations, and are advancing to implementation.

As part of implementing the projects identified for the 5 year Strategic Plan period, NBI has applied for funding from the Nile Basin Trust Fund/Cooperation in International Waters in Africa entitled Nile Cooperation for Results Project (NCORE) supporting the three NBI centres – the Nile-SEC, NELSAP-CU and ENTRO.

The Nile Cooperation for Results (NCORE) Project is the first phase of the Nile Basin Climate Resilient Growth Program and is part of the overall NBI Strategic Plan. The **development objective of the NCORE is “to facilitate cooperative water resource management and development in the Nile Basin.”** The Project comprises the following three components:

- Component 1: Advancing Nile Basin-Wide Cooperation and Analysis: This Component will support activities at the NBI Secretariat related to its core functions of Facilitating Cooperation and Water Resource Management
- Component 2: Promotion of Sustainable Development and Planning in the Nile Equatorial Lakes Region: This will support the NBI in its efforts to advance investment opportunities in the Nile Equatorial Lakes region
- Component 3: Promotion of Sustainable Development and Planning in the Eastern Nile Region: **This Component will support NBI in promoting cooperative activities, water resource management and sustainable development in the Eastern Nile.**

Component 3, for ENTRO, will support results related to its core function under two sub-programs:

- The first provides a foundation for improved understanding of issues specific to the Eastern Nile sub-basin and aims to improve public domain access to the Eastern Nile knowledge base while
- The second promotes holistic approaches to preparing and operating water investments, to better take into consideration and communicate environmental and social issues.

1.3 THE EASTERN NILE MSIOA

1.3.1 Overview and Rationale

The EN-MSIOA study is one of several specific studies that is being undertaken to achieve the general objective of the NCORE from the Eastern Nile perspective.

Rapid Population growth, severe land degradation, and lack of adequate storage infrastructure are among the key challenges that hindered development in the Eastern Nile (EN). The findings of the Cooperative Regional Assessment studies conducted by ENTRO for the ENSAP Projects reveals the followings:

- Unilateral, uncoordinated planning of expansions and Lack of “no-borders” analysis /basin-wide perspective for irrigation development in the EN could lead to Water Conflict in the EN Region. The projected water requirement per EN country master plans is estimated to be 108 BCM/Year.
- The EN region has huge untapped Hydropower potential. There is a need for a coordinated investment plan in power trade
- Through the Cooperative Regional Assessment (CRA), Power generation and interconnection, irrigation and drainage, watershed management as well as the Joint Multi-purpose Project have provided valuable information. However, the assessments have not been carried out from the wider basin resource optimization and efficiency considerations.

A multi sector investment opportunity assessment (MSIOA) is thus needed **to identify a coordinated water infrastructure investment strategy for the EN, comprising prioritized water-related investments (regional or national with regional significance), that promote shared, sustainable economic growth and development in the EN region.**

1.3.2 Objective of the Study

The overall objective is to develop a regional water investment strategy for the EN region that broadly supports socio-economic development, poverty reduction, and the reversal of environmental degradation

1.3.3 Limitations of the MSIOA Study

It should be stressed that this type of study can be conducted at different levels of detail according to the level of resources available. In this case, both the budget and time available has been limited. Only 12 months were allocated to the study and many of the initial months can be seen as largely unproductive project start up months. The team was relatively small and time inputs were limited.

The following limitations should be highlighted:

- There was a lack of detail available on several thematic areas in South Sudan. Many of the water and development related institutions in South Sudan are either relatively new or not yet in place, as is also the case for the related planning tools including policies, development strategies and plans etc. As a result, some assumptions have been made and updating of some parts of the MSIOA will probably be required when more detailed information on development plans for South Sudan becomes available. This gap was partly addressed during the final workshop due to inputs from representatives from that country, but this was too late for the information and ideas to be properly incorporated into the study.
- Baseline environmental and socio-economic data for many sections of the EN Basin are dated.
- It was not possible to carry out the planned consultations in Egypt. As a result, while impacts on flows and activities downstream have been taken into account in the various analyses, the identification of projects for the future is/will be largely limited to the 3 upstream riparians.

Despite these limitations, it was possible to put a useful MSIOA framework in place. In order to keep this framework above and to improve its accuracy, usefulness and applicability it is important that there is some follow up in a number of areas.

- The proposed studies at the sub-basin level (recently started up for Baro-Akobo-Sobat) will greatly enrich the MSIOA framework and the results will permit the analytical framework to be refined. They will also allow more concrete planning decisions to be made and reflected in the MSIAO Investment Strategy and Action plan.
- An important area where work will be required is to expand beyond the limitations of the water sector. As will be stated on several occasions in this report; managing the water resources of the basin will require significant changes in the future outside of the water sector. Management of the Agriculture Sector will have to take up lessons from the Power sector in terms of regional cooperation and this will have major implications for the Transport, Industry and Trade sectors.
- It is important that follow up work continues as soon as possible while the various stakeholders are still involved and enthusiastic. The MSIOA approach can play a major role in addressing the challenges of the not so distant future.

1.3.4 Approach and Methodology

1.3.4.1 Introduction

The EN-MSIOA study has been carried out over a 12 months period, comprising the key tasks or steps as outlined in :

1.3.4.2 Task 1: Inventory and Situation Analysis;

The Situation Analysis was aimed at collecting the necessary information on the current situation in the form of:

- An overview of the social and environmental context.
- An overview of the water resources of the eastern Nile basin and the catchment characteristics of each sub-basin

- A sectoral review aimed at providing the necessary background and identifying the various development and management projects, both existing and planned, especially those of regional significance
- A comprehensive atlas for the EN basin.

1.3.4.3 Task 2: Strategic Scoping of EN Multi-Sectoral Investments;

This task was concerned with the scoping of investments and looked at the different types of interventions that may be considered and what sort of scoping criteria can be used to identify and evaluate potential interventions for inclusion on the MSIOA. Based on these criteria, a number of water resources developmental and management interventions under thematic and sectoral headings were briefly described and put forward for further consideration.

1.3.4.4 Task 3: Multi-Sectoral Analysis of Investment Opportunities;

In Task 3, the "Analytical Framework", which includes two core components, the *EN Basin Simulation Model (ENBSM)* and the *multi-criteria analysis (MCA)*. The ENBSM produces both water resources-related and socio-economic outputs which can then be used together with other indicators in the MCA. These were used to evaluate a total of 12 basin-wide development scenarios looking into the impacts and benefits of each one basin-wide.

While it was not possible to home in one "preferred" scenario for adoption, it was possible to move towards a narrower range of options for the future and to get a clearer and quantified idea of each one of the different alternatives. This is useful in guiding the development of the investment Strategy.

1.3.4.5 Task 4: MSIOA Investment Strategy and Action Plan

The MSIOA Investment Strategy and Action Plan is the subject of this report. Based on the findings of the Task 2 and Task 3 Reports, this step of the plan aims at defining an MSIOA Investment strategy that can guide decision-makers at the regional and national levels in deciding which projects should be excluded or included and what the priorities should be.

The methodology, as already presented in the Inception report is shown in Figure 1-1.

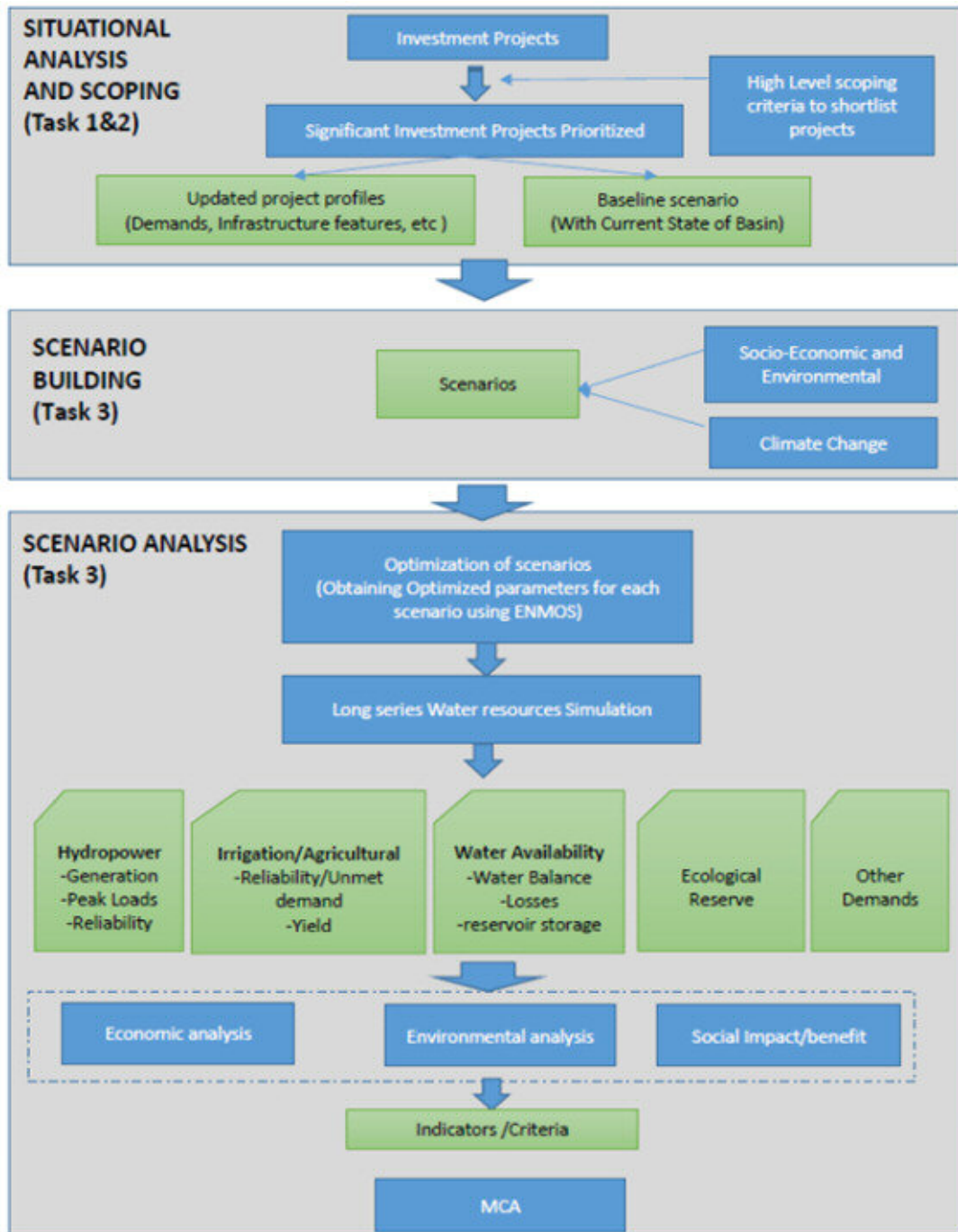


Figure 1-1: Methodology as set out in the Inception Report

1.3.5 This report: MSIOA – Implementation Strategy and Action Plan

1.3.5.1 Objective of the report

The objective of this report is development and Investment Strategy and Action Plan for water resources development and management in the Eastern Nile. While it is essential that the strategy is adopted (and adapted as necessary) over time by EN countries it is important that this is done in a coordinated and transparent manner and that ENTRO play a leading role. A secondary objective of the report is to provide a clear indication

of the role of ENTRO with respect to the Strategy and the implementation of the Action Plan.

The Investment Strategy aims to answer the question “how do we prioritise our investments, for what reasons?” On the “upstream” side, this strategy is about responding to the strategic “orientations” that have been identified in previous steps of the study. On the “downstream” side it then dictates the “priority investments” and the Action Plan

1.3.5.2 Structure of the report

This report is divided into 8 chapters and includes an important annex. The report is structured as follows:

- Chapter 1 provides a very brief introduction to the NBI, ENTRO and the associated programmes that provide the context for this study. It also introduces the MSIOA study, how it is being tackled and how this report fits into the study.
- Chapter 2 provides a brief summary of the main orientation coming from the previous steps of the study and provides the point of departure for the Investment Strategy and Investment Plan.
- The proposed Investment Strategy is introduced and described In Chapter 3. This is an important part of the report and aims to clearly state the strategic priorities in the basin.
- Chapter 4 presents the priority investments under each of the thematic areas and includes a brief description of ENTRO's role for each project.
- Chapter 5 provides a discussion of the various issues and challenges around the institutional and financing arrangements.
- Chapter 6 presents a simplified Action Plan. This is based only on the priority interventions summarised in Chapter 4.
- Chapter 7 presents a potential project evaluation framework.

2. Key Orientations and Principles

2.1 SHARED VISION AND NILE BASIN SUSTAINABILITY FRAMEWORK

The objectives of the Nile Basin Strategic Framework (NBSF) provides a suitable high level strategic context for the MSIOA. The aspects which are most central to the SOIA are highlighted below:

- To **facilitate and contribute to socio-economic development, poverty reduction and improvement of livelihoods** of riparian communities through **equitable utilisation and sustainable development of the common Nile basin water resources**;
- To **facilitate and contribute to efficient management of the Nile water resources drawing on principles of integrated water resources management (IWRM), and good practices in trans-boundary water resources management**;
- To facilitate and contribute to wise use of **sustainable management of the environment and water-related natural resources** of the Nile Basin;
- To facilitate the **main streaming of climatic change adaption and mitigation measures in the development and management of Nile water resources, and support Nile Basin countries in dealing with issues of climate variability and change**.
- To augment the efforts at achieving basin sustainability through facilitating selected cross-cutting activities that support the sustainable management and development of water and environmental resources of the Nile Basin.

2.2 ORIENTATIONS COMING FROM PREVIOUS STEPS OF THE STUDY

2.2.1 Strategic Scoping of EN Multi-Sectoral Investments (Task2)

2.2.1.1 Introduction

There were two main outputs from the *Strategic Scoping of EN Multi-Sectoral Investments*

- The scoping of all the potential regionally significant projects, by sector and by sub-basin. These projects were evaluated against various criteria and a large number taken forward for inclusion in the scenario analyses (see Section 2.2.2). these were listed in the report.
- Insight into the environmental/water resources impact of the increased development of water resources basin-wide. This was done through the use of some exploratory scenarios which were designed to "increase the load" on the system. The impacts of this provided some strategic orientations some of which are briefly summarised in Section

2.2.1.2 Strategic Orientations

BASIN-WIDE PERSPECTIVE

One of the objectives of the MSIOA study is to put aside consideration of national borders while at the same time taking into account national priorities and concerns.

Three of the critical areas affecting all four countries are food security, a growing deficit in the availability of electricity and the degradation of land and water resources.

It is undeniable that the both irrigation expansion (coupled with improved efficiency) and a more productive rainfed sector will be required to meet food security needs for growing populations. In view of the dwindling water resources it is also clear that improved irrigation efficiency and expansion must be carefully planned and that it **should take account of the relative advantages offered by the different parts of the basin** rather than unilateral development along national lines.

The rapid expansion of hydropower and the continued development of regional interconnection is a critical component of poverty reduction strategies and is also important in the fight against environmental degradation.

Prioritising the development of hydropower projects should not only take into account the economic aspects, but also the **efficiency of the projects in terms of water consumption**. Developments with low associated evaporation losses (run-of-river and efficient reservoirs) should be prioritised.

ABBAY/BLUE NILE SUB-BASIN

The Abbay Basin has large hydropower potential. Much of the irrigation potential to be developed would be dependent on the storage and regulation provided by the hydropower reservoirs and indeed the development of irrigation contributes to the economic viability of the hydropower projects.

The extent of the impact of the proposed irrigation consumption in the Abbay sub-basin on hydropower production should be more carefully assessed in the next step of the study. Given that full irrigation expansion decreases the mean annual runoff available at GERD by over 10%, the impact of irrigation on hydropower will not be insignificant.

The strategic development focus in the Abbay basin should clearly be on the development of hydropower. Some observations can be made:

- Regulation of flood events and increase of the low season flow,
- Trapping of sediment, which improves efficiency of large scale irrigation schemes in Sudan,
- Improved water security by storing water in narrow, deep reservoirs at higher, cooler altitudes, therefore reducing overall evaporation losses
- Major opportunity for hydropower generation further downstream, making use of regulated flows

BARO-AKOBO-SOBAT WHITE NILE SUB-BASIN

The impact on flows in the White Nile of **major irrigation expansion in the sub-basin is subdued by the presence of the Machar Marshes**. This is effectively because a significant portion of the water consumed by irrigation would have been "lost" to evaporation from these wetlands in any case.

While the maximisation of irrigation upstream of the Machar wetlands has a relatively lower impact on the overall water resources of the Blue Nile system the potential negative impacts on the Machar wetlands should be carefully investigated and mitigation measures proposed. Given the potential value of economic development, both in terms of hydropower production and irrigation, a large-scale and detailed environmental impact assessment is required, not on a scheme by scheme basis, but for the possible combined development options.

Operation rules for the reservoirs associated with hydropower in the upper parts of the sub-basin should be optimised and synchronised in order to allow some degree of mimicking of the natural seasonality of flows entering the Machar wetlands, while at the same time providing adequate water for irrigation.

Continued and improved monitoring of levels and discharges is important throughout the EN basin and recommendations in this respect are included in Section 4.6. However, given the environmental sensitivity of the Machar Mashas and the Twalor wetlands, it is considered very important to improve hydrological monitoring both upstream of the wetland and within the wetlands themselves.

TEKEZE-SETIT-ATBARA SUB-BASIN

In its current state, the Tekeze-Setit-Atbara sub-basin, is the smallest of the three upstream basins in terms of its contribution to the main Nile. Irrigation and hydropower potential are also relatively limited. Full development of potential would see the flow reaching the main Nile reduced by around 5 billion m³.

Development in this sub-basin is currently limited and there is likely to be pressure for development to bring both employment opportunities and food security and in general to alleviate poverty.

MAIN NILE SUB-BASIN

Little new development is planned in the Main Nile. Levels of irrigation development are already high with nearly 60 million m³ consumed by irrigation.

The mean annual flow in the Main Nile will reduce as a result of upstream development. At the same time the flow, although reduced, will be much more regulated providing opportunities for some additional hydropower production in the upper part of the sub-basin.

Interventions in the main Nile should be orientated toward making the most of a more regulated flow. Irrespective of the levels of development that proceed in the upper part of the basin, the flows will be considerably more regulated as a result of the GERD and other reservoirs for hydropower.

- Implementation of hydropower projects in the upper part of the sub-basin in order to take advantage of the more regulated flow
- Improved efficiency of irrigation schemes in the sub-basin in order to maximise crop per drop from a potentially reduced volume of water availability.
- The phasing out of inappropriate crops, grown largely to satisfy local, national Demand is essential.

Consideration of options to reduce evaporation losses from the Aswan Dam. Increased upstream regulation of the upstream flows will mean that the volume of water required in the reservoir of the High Aswan Dam for regulation is considerably reduced. Of course, while a reduced storage will reduce evaporative losses, hydropower generation will also be reduced. The optimum operation rule for the Aswan High Dam will therefore be a trade-off between reducing evaporation and reduced hydropower generation.

2.2.2 Multisector Opportunity Analysis of Investments (Task 3)

2.2.2.1 Introduction

As already briefly mentioned, the previous step of the study was centred around the setting up and application of an analytical framework. **The** analytical framework was designed to look at the overall impacts of different combinations of water resources management and development trajectories (known as “scenarios”) in different sectors in the different sub-basins. **These impacts include the impacts on water resources (availability), on poverty reduction (economic returns, employment creation) and on the social and biophysical environments.**

2.2.2.2 Scenarios Investigated

A total of 12 scenarios, including the current situation (CS), were investigated. The 12 scenarios were built in a logical and step-wise manner so that the impacts of incremental changes from one scenario to another can be investigated and explained.

The twelve scenarios were analysed using the **EN Basin Planning Model** (monthly time step) and the **annual water balance and economic assessment model**. A multicriteria analysis was then used to compare the scenarios (see Section 2.2.2.3).

The scenarios are described in Table 2-1 to Table 2-3 below. An overview of the findings is also provided and most importantly the strategic implications of these findings are summarised. These will be useful as inputs to the Investment Strategy.

Table 2-1: Overview of Scenarios 1 to 5

ID	Scenario Title and Description	Overview of findings	Strategic Implications
1	CS Base Case. The level of development in all of the sectors correspond to the current situation in all four sub-basin	Under current conditions the mean annual runoff (MAR) in the Blue and White Niles at their confluence are 44.3 BCM and 25.5 BCM respectively. The MAR just upstream of HAD is 77.9 BCM. Most significantly the MAR at the outflow into the Mediterranean Sea is only 12.6 BCM.	<ul style="list-style-type: none"> A major increase in consumptive abstraction (including evaporation from reservoirs) will very rapidly result in a deficit of water downstream, essentially in Egypt, and in particular the Delta.
2	IS Improved Situation. Improved situation corresponds to a near future scenario that will on all likelihood occur. It included HP schemes under construction (GERD, Atbara) and for development of irrigated agriculture it reflects a combination of the rehabilitation of current irrigation schemes and the completion of schemes under construction.	The improved situation, representing as it does, the near future, does not have a major impact on the water resources but doubles hydropower production basinwide and increases production from irrigation by nearly 20%. Flow into the Mediterranean would reduce by 4.1 BCM	<ul style="list-style-type: none"> This scenario shows how the development of hydropower and efficient irrigation can result in significant benefits without having a major impact on the water resources further downstream
3	IS+Full Hydro Potential Basin Wide. In addition to irrigation and hydropower at the IS level, all identified hydropower schemes were included.	This scenario results in a large increase in hydropower production. The availability of water downstream is not significantly affected. Revenue generated by this scenario rises from 4,946 million USD (Baseline) to 10, 103 million USD.	<ul style="list-style-type: none"> Hydropower can be developed at all potential sites without having a major impact on the availability of water downstream. This may not be the case where reservoirs are jointly developed for HP and irrigation.
4	IS+Full Irrigation Potential Basin Wide. Instead of focussing on maximising hydropower, this scenario looks at maximising irrigation development, while maintaining HP at the IS level. The main aim of the scenario was to get a clear idea of the impact on the available water resources	The implementation of full irrigation potential basinwide has a major impact on the availability of water downstream. Flow upstream of the HAD is reduced to 45.6 BCM. This reduces to only 15 BCM upstream of the delta meaning that there is a deficit of 19.3 BCM for irrigation supply in the delta. Revenue generated by this scenario rises from 4,946 million USD (Baseline) to 9,440 million USD. Revenue generated per cubic metre is 13.36 c/m ³ for HP and 5.29 c/m ³ for irrigation (cf	<ul style="list-style-type: none"> Unchecked or unilateral expansion of irrigation would lead to major water shortages and/or the abandonment of some irrigation schemes. Unilateral expansion of irrigation should be excluded from the investment strategy.
5	IS+Large Hydro Potential Basin Wide. This scenario is closely related to Scenario 3. The only difference is that the less viable storage-based schemes on the Main Nile have been excluded.	Planned hydropower developments in the EN region has minimal impact on the regional water resources compared to other scenarios. The total flow at HAD is reduced by about 6.1 BCM (from 78.5 BCM base case to 72.4 BCM). Although less power is produced than under Scenario 3, the level of profitability is much higher.	<ul style="list-style-type: none"> The implementation of all feasible hydropower potential (as identified in the scoping report) should be implemented. Investigation into the re-design/conversion of the less viable HP schemes on the Main Nile into run-of-river schemes should be investigated under the Investment Strategy and Action Plan

Table 2-2: Overview of Scenarios 6 to 7b

ID	Scenario Title and Description	Overview of findings	Strategic Implications
6	IS+Large Irrigation Potential Basin Wide. Scenario 4 aimed at implementing all identified irrigation schemes and resulted in a significant deficit. This scenario includes implementation of a large level of irrigation (LDI). The aim was to see whether such a level of irrigation could be sustainable. Hydropower is maintained at only the IS level of development	<p>It was found that the large-scale expansion of irrigation throughout the basin is unlikely to be sustainable. The deficit within the Delta is about 9 BCM (compared to a deficit of 19 BCM for the full development of irrigation potential in Scenario 4).</p> <p>Due to the low level of HP development, the total revenue generated is low, despite the amount of water consumed</p>	<ul style="list-style-type: none"> • Even a step back from the full development of irrigation potential will lead to a shortage of water in the Nile Delta..
7a	IS+Large Hydro+Large Irrigation (BAS+TZA). This scenario combines the large development of hydropower and the large development of irrigation in only the BAS and TKZ sub-basin. The scenario aimed to address principles of equitable use and sustainable use for upper riparian countries while causing no significant harm to downstream water users. This is the first of the scenarios which aims at finding an optimal solution on the basis of the results if the earlier scenarios	<p>By including the large development of hydropower and maximising irrigation (within the limits of the water available) total revenue rises to 9,417 million USD. Revenue generated per cubic metre is 21.36 c/m³ for HP and 4.15 c/m³ for irrigation (cf scenario 4 above). The focus on maximising irrigation</p> <p>As with 7a, Scenario 7b includes the large development of hydropower and maximising irrigation (within the limits of the water available), but focuses on the Sudanese part of the basin rather than BAS and TZA). As expected the profitability of the irrigation basinwide rises as a result.</p>	<ul style="list-style-type: none"> • In view of the limited water resources and the need for cost-effective irrigation, the choice of which irrigation projects to implement should be carefully made. • A combination of the most economically viable schemes in BAS/TZA (Ethiopia/South Sudan/Sudan) with the most efficient (crop per drop) in the lowland areas of Sudan/ South Sudan should be at the centre of the strategic planning • Choice of crops should become a part of a regional approach to the planning of irrigation development.
7b	IS+LDI (Sudan)+Large Irrigation development in Sudan and IS (BAS+TZA). This scenario is an alternative to 7a. Instead of large development in BAS and TZA, the large development is in Sudan. In other respects the scenarios 7a and 7b are the same.	<p>However, as also expected, more water is consumed, resulting in a deficit of 3 BCM compared to only 0.8 BCM in the previous scenario</p> <p>Revenue generated per cubic metre is 21.65 c/m³ for HP and 4.59 c/m³ for irrigation (cf 7a).</p>	

Table 2-3: Overview of Scenarios 8a to 9

ID	Scenario Title and Description	Overview of findings	Strategic Implications
8a	IS+Large Hydro+Moderate Irrigation: This scenario proposes a more moderate expansion of irrigation, assuming implementation of the countries' top priorities, combined with large hydropower development.	Scenarios 8a, 8b and 8c all result in the same amount of revenue generated per cubic metre of water with 21.65 c/m ³ for HP and 4.59 c/m ³ for irrigation.	<ul style="list-style-type: none"> • One of the ways in which water can still be available for irrigation downstream in Egypt is to review the different crop choices and replace inappropriate ones with those more suitable to the agro-climatic zones that the schemes lie within. This should be a key element of the strategy but must be developed in tandem with: <ul style="list-style-type: none"> • A regional approach to food security • A regional approach to markets and the entire logistic chain getting produce to principal regional market centres.
8b	IS+Large Hydro+Moderate Irrigation+cropping pattern changes on Main Nile: This scenario is a variant of Scenario 8a, but assumes a change of cropping patterns on the main Nile, resulting in a small reduction in water demand as less appropriate crops are replaced with more suitable ones.	However, the introduction of cropping patterns in the main Nile (8b) that are more compatible to the agro-climatic zone results in some water savings. The effect is that the deficit in the delta of 3.3 BCM in Scenario 8a reduces to only 0.7 BCM for Scenario 8b.	
8c	IS+Large Hydro+Moderate Irrigation+cropping pattern changes on Main Nile+ HAD reduced operating level: This scenario is a further variant aimed at reducing evaporation losses from the HAD and freeing up water for downstream demand. The need for the HAD to regulate flows has been reduced by GERD and other dams upstream.	With the lowering of the HAD operating level (8c), a further 1 BCM is gained, resulting in a small flow into the Mediterranean sea of 0.3 BCM.	
9	IS+Large Hydro+Managed Irrigation Growth: This scenario aimed to find a hybrid approach where both opportunities for growth in Energy and Agriculture sectors could be managed within the constraints of limited water availability in the region. It is therefore built on the knowledge developed in the analysis of the other scenarios	Scenarios 9 was built on Scenario 8 and had the aim of reducing the water deficit at the Delta through a small reduction in hydropower generated and the area put over to irrigation. Scenario 9 results in lower (compared to Scenarios 8a, 8b and 8c) revenue generated per cubic metre of water with 18.44 c/m ³ for HP and 4.20 c/m ³ for irrigation	

Figure 2-1 below compares again the scenarios in terms of hydropower production and irrigated areas, but also with the net annual revenue generated. The diameter of the circle depends on the return from the total investments in each scenario. The larger the circle is, the larger the NPV will be.

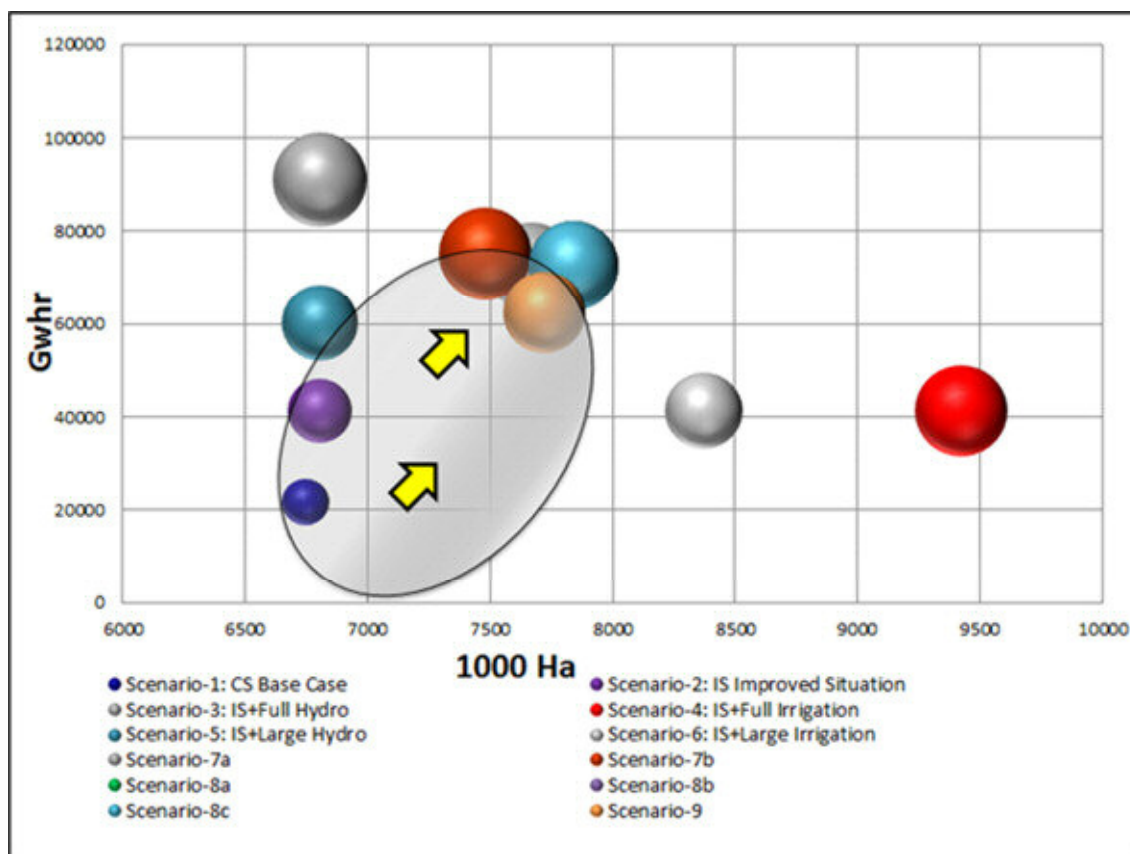


Figure 2-1: Hydropower production, irrigation and Net Return by scenario

Not surprisingly in view of the fact that investments are being made, both an increase in the total area under irrigation or in hydropower will increase the NPV. However, if the EIRR was compared, only scenarios with increased hydropower show a high EIRR.

The shaded oval provides an envelope of water availability. Scenarios outside this oval are affected by the constraint of water availability.

- The two red circles are the two scenarios of large and full irrigation potential. Full irrigation development is clearly unrealistic in terms of water constraints.
- It is interesting to note the steep gradient in moving from CS to scenario 9 which is deemed to be one of the most viable options. This is mainly attributed to the large return from hydropower. The average water productivity from hydropower generation is estimated to be about 0.21 US\$/m³ while the average water productivity for irrigation agriculture is about 0.06 US\$/m³. Hence the gradient along the shortest path from CS to scenario 9 is of the same order.

2.2.2.3 Multicriteria Analysis

The scenarios have provided a step by step movement from the current situation to an envelope of reasonable ultimate development options. As summarised in the table

above, a simple analysis of the scenarios' results has already provided good insight into the strategic development directions.

The results of the scenarios analysis can provide these strategic orientations but as part of the Task 3 work, a multicriteria analysis (MCA) was also carried out in order to analyse the scenario results in a bit more depth and with a degree of objectivity. The MCA took into consideration some additional criteria to those (impact on MAR downstream and economic indicators) that were discussed in the table above. The criteria taken into consideration by the MCA were:

- Economic Benefit / Net Present Value-Hydropower (MUSD)
- Economic Benefit / Net Present Value-Irrigation+fisheries+livestocks (MUSD)
- Economic Benefit / Water Productivity - Irrigation (USCents/ha)
- Social / Employment (x1000)
- Social / Number of person resettled (x 1000)
- Environment / Water Balance (BCM at Delta - Egypt)
- Equity/Reduce Unequally from Benefit from water uses (Gini Index)
- General / Total evaporation losses from artificial reservoir (BCM)

The findings were not as conclusive as might have been hoped for. Scenario 7b scored highest, probably due to the heavy weighting placed on benefits economic benefits associated with irrigation (productivity efficiency in USCents/ha). This is because of the much cheaper implementation costs for irrigation expansion in the flatland Sudanese portion of the basin.

Otherwise, the MCA generally supported the conclusions that there are elements of (or lesson learned from) all Scenarios 7a, 7b, 8a, 8b, 8c and 9.

Also important, coming out of the MCA was the choice of criteria and the highlighting of the importance of

- Socio-economic development and poverty reduction
- Food security
- Efficient management of NB (EN) water resources
- Sustainable management of the environment and water-related natural resources

These four areas will be kept in mind when presenting the Investment Strategy in Chapter 3 and priority investments in Chapter 4.

2.3 CONCLUSIONS

It was clearly not possible to recommend the choice of a single scenario as the preferred scenario to be brought forward to the Investment Strategy. However, the scenario analysis did permit a number of strategic planning orientations to be concluded and these will be taken forward for incorporation into the Investment strategy in the next chapter of this report.

In tables Table 2-1, Table 2-2 and Table 2-3 above a number of strategic implications were highlighted in green. These are the positive implications coming out of the scenario analysis (and confirmed by the MCA) that are seen as providing important inputs to the investment strategy. They are summarized as follows:

- Hydropower can be developed at all potential **sites without having a major impact on the availability of water downstream**. This may not be the case where reservoirs are jointly developed for HP and irrigation.
- In view of the limited water resources and the need for cost-effective irrigation, the choice of which irrigation projects to implement should be carefully made. A combination of the most **economically viable** schemes in BAS/TZA (Ethiopia/South Sudan/Sudan) with the most **efficient (crop per drop)** in the lowland areas of Sudan/ South Sudan should be at the centre of the strategic planning
- Choice of crops should become a part of a regional approach to the planning of irrigation development in order to ensure that the **crops most suited to the relevant agro-climatic zone** are grown, rather than basing crop choice on prevailing local market demand.
- One of the ways in which water can still be available for irrigation downstream in Egypt is to review the different crop choices and replace inappropriate ones with those more suitable to the agro-climatic zones that the schemes lie within. This should be a key element of the strategy but must be developed in tandem with:
 - A **regional approach to food security**
 - A regional approach to markets and the **entire logistic chain** getting produce to principal regional market centres.

3. Investment Strategy

3.1 INTRODUCTION

It became clear during the course of the study and from discussions with stakeholders that it is not possible to get consensus on the definitive prioritization of all infrastructure projects around the basin even if the MSIOA could provide some reasons for preferring one set of development choices over another.

While the MSIOA has made a contribution to this discussion, the choices are not straightforward since even if the goal of the MSIOA is to find the best basinwide or regional solution, it is clear that national priorities must also be satisfied. Ultimately, some of the choices may be politically motivated, they should still be based within an envelope of what is realistic and sustainable for the basin going forward.

Deciding on which projects should be prioritized is also complicated by the lack of reliable baseline data and the need for more detailed studies. **Making progress with these studies should be a priority of the Investment Strategy and Action Plan.**

3.2 THE HIGH LEVEL INVESTMENT STRATEGY

3.2.1 Overview

The aim of the Investment strategy at the basin-wide level is to provide a strategic framework for deciding which are the investments that have to be made over the next 25 to 30 years. While the analysis so far has shown that it is **not possible for definitive choices to be made to cover all areas, in particular the extent and location of irrigation development, it is clear that the investment strategy must be comprehensive so that these areas are not left open indefinitely.** Given the rate of economic development and population growth in the EN basin, it is clear that development pressures will continue to ask questions on the availability of resources and that coherent and logical answers should be available.

The framework for the Investment Strategy is outlined in Sections 3.2.2 to 3.2.6

3.2.2 Overarching strategic objectives

The objectives of the Nile Basin Sustainability Framework (see Section 2.1) already provide the context for the overarching strategic objectives that must underlie the investment strategy. The NBSF objectives include reference to:

- **“socio-economic development, poverty reduction and improvement of livelihoods** of riparian communities through **equitable utilisation and sustainable development** of the common Nile basin water resources”
- **efficient management of the Nile water resources** drawing on principles of integrated water resources management (IWRM), and good practices in trans-boundary water resources management;
- wise use of sustainable management of the environment and water-related natural resources of the Nile Basin;

Not surprisingly, to a large extent these objectives were echoed in the selection of criteria for the MCA used to evaluate the scenarios investigated in the Task 3 work. Consideration of all of these has led to four overarching objectives to which the Investment Strategy should aim at achieving:

- Socio-economic development and poverty reduction
- Food security
- Efficient management of NB (EN) water resources
- Sustainable management of the environment and water-related natural resources

3.2.3 Comprehensive approach:

Although the Strategy is not able to point to a comprehensive set of prioritised infrastructure projects, it is important the approach is comprehensive:

- The Investment strategy should ensure that **the infrastructure hydropower and irrigation projects on which there is consensus are prioritised and prepared for implementation** to meet the identified needs (electricity demand projections) etc.
- Decision support framework for remaining infrastructure interventions (making use of existing DSS and other tools) comprising:
 - For the areas where decisions or choices have to be made the strategy should **prioritise and execute the necessary studies** (sub-basin development plans and other studies (**see also points below**) in order that the most deserving (economically feasible, environmentally and socially sustainable) projects are identified.
 - In order to support the point above it would be useful to develop a much more comprehensive and **agreed** (at the level of senior decision-makers) multi-criteria analysis and to ensure that the input data for the MCA are available.
 - Develop a user-friendly interface aimed at a simple presentation of the principles of the MCA and how choices are made so that political buy in can be ensured at an early stage.

3.2.4 No or Low regret projects

There are many **“no or low regret” projects** and programmes that have been scoped and briefly described in the Scoping Report (Task 2). These will greatly contribute to the comprehensive approach outlined above and **should be taken forward as a matter of urgency**. Those in which ENTRO has a key role to play should be highlighted and measures should be taken to ensure that ENTRO has the capacity to move them forward in cooperation with the EN countries.

3.2.5 Findings of scenarios

Scenarios 7a, 7b, 8a, 8b, 8c and 9 provide good insight into the way forward for water resources development around the basin, in particular with respect to the expansion of hydropower and irrigation. Some of the strategic orientations that they imply should form important components of the investment strategy. The key ones are highlighted as follows:

- In view of the limited water resources and the need for cost-effective irrigation, the choice of which irrigation projects to implement should be carefully made. A combination of the most **economically viable** schemes in BAS/TZA (Ethiopia/South Sudan/Sudan) with the most **efficient (crop per drop)** in the lowland areas of Sudan/ South Sudan should be at the centre of the strategic planning

- Choice of crops should become a part of a regional approach to the planning of irrigation development in order to ensure that the **crops most suited to the relevant agro-climatic zone** are grown, rather than basing crop choice on prevailing local market demand.
- One of the ways in which water can still be available for irrigation downstream in Egypt is to review the different crop choices and replace inappropriate ones with those more suitable to the agro-climatic zones that the schemes lie within. This should be a key element of the strategy but must be developed in tandem with:
- **A regional approach to food security.** A regional approach to markets and the **entire logistic chain** getting produce to principal regional market centres.
- While it is difficult for the Consultant to make firm recommendations on which infrastructure projects should be prioritised from a regional perspective, it should be possible (on examination of the scenarios above) to agree on certain core infrastructure projects, essentially those which feature in all the better(performing scenarios).

3.2.6 Continuous improvement/updating of models and tools

There is now a useful suite of planning tools in place to support the making of the best choices in the future. The detail and applicability of these tools will be enhanced by water sources models that will be set up at the sub-basin level as part of planned studies. It is important that ENTRO retain the capacity to use and update these models so that new scenarios can be investigated as and when required.

3.3 SHORT-TERM INVESTMENT STRATEGY AT THE PROJECT LEVEL

While the Investment strategy at the high level as introduced in Section 3.2 will be aimed at implementing strategic decisions, such as in which parts of the basin and the sub-basins to prioritize irrigation development in such a way that it is acceptable to all the EN countries, there will be a need to have a part of the Investment strategy which relates to the short-term prioritization of project implementation. This is particularly important for the interventions in which ENTRO is going to be significantly involved.

The investment strategy in the short-term should be guided by the following guidelines:

- Invest in the urgent, no/low regret and win - win
- Invest in projects that support the strategic orientations
- Invest in projects with high economic return and low impact
- Focus on studying and better understanding areas of key potential and or impacts on social and environmental hotspots so that the right choices can be made

4. Priority Investments

4.1.1 Introduction

In this chapter of the report the priority investments are briefly presented by sector or thematic area. For each of the priority investments the following information is provided:

- Project **Name / title**
- A brief **description** of the project and a clear statement of the project's objective
- Project location in terms of sub-basin and (if relevant) the specific location within the sub-basin. In these tables, "transboundary" projects are those which cut across more than one national border, even if they may be located within one sub-basin.
- The potential **implementing agency** is identified. Where this is possible, the specific institution is also included.
- The envisaged **role of ENTRO** is described for each project. This is important since it will be ENTRO that will review and update the Investment Strategy and Action Plan and who will monitor and evaluate progress with its implementation.
- The status of preparation is stated.
- The contribution of the intervention to four key areas is indicated in the four columns of the table headed as follows:
 - **S-E:** Socio-economic development and poverty reduction
 - **FSec:** Food security
 - **Env:** Environmental sustainability, slowing/stopping environmental degradation
 - **Syst:** Efficient management of NB (EN) water resources

A colour-coding system is used as follows:

Level of contribution to each of the four areas	
	Project/Intervention will contribute very much
	Project/Intervention will make significant contribution
	Project/Intervention will make some limited contribution
	Project will make no contribution and lay have an adverse impact

4.1.2 Conservation and water resources management

4.1.2.1 Introduction

This includes a wide range of interventions including those aimed

- addressing environmental issues such as pollution, land and water resources degradation, habitat destruction and threats to biodiversity;
- better understanding of the status and availability of the basin's water resources through improved monitoring programmes
- better managing the available water resources through the development and application of models and tools
- others...

4.1.2.2 Proposed priority Interventions

The identified priority projects for inclusion in the Action Plan are briefly presented in Table 4-1

Table 4-1 : Conservation and Management Interventions

ID	Project / intervention			Implementing Agency(ies)	Role of ENTRO ¹	Status of preparation	Contribution to priority areas				Details (annex No)
	Name	Description and Objective	Location				S-E	FSec	Env	Sys	
Transboundary Parks											
EP1	Gambella Machar Trans-boundary National Park (GMTBNP)	Establishment of Transboundary National Park, Conservation and management of internationally important biodiversity area, establish new Ramsar site, establish Integrated Catchment and Wetland Management Programme, establish water resource management projects, promote scientific research, develop skills and capacity, promote tourism and regional economic development, reduce resource conflicts between local communities, pastoralists and farmers and promote regional co-operation	Ethiopia and South Sudan, BAS sub-basin	Environmental authorities Ethiopia and South Sudan	Initiate and facilitate consultation & assist preparation of funding proposal for international donors) Conceptual and pre-feasibility					1c

ID	Project / intervention			Implementing Agency(ies)	Role of ENTRO ¹	Status of preparation	Contribution to priority areas				Details (annex No)
	Name	Description and Objective	Location				S-E	FSec	Env	Sys	
EP2	Dinder Alatish Trans-boundary National Park (DATBNP);	Establishment of Transboundary National Park, Conservation and management of internationally important biodiversity area, establish Ramsar site, establish Integrated Catchment and Wetland Management Programme, establish water resource management projects, promote scientific research, develop skills and capacity, promote tourism and regional economic development, reduce resource conflicts between local communities, pastoralists and farmers and promote regional co-operation	Ethiopia and the Sudan, Abbay-Blue Nile sub-basin	Environmental authorities Ethiopia and the Sudan	Initiate and facilitate consultation & assist preparation of funding proposal for international donors	Conceptual and pre-feasibility					1c
Environmental and Social Management Programs											
EP3	Transboundary Environmental and Social Development and Management Programme, including the establishment of a Social Development and Communications Unit	Establishment of Transboundary Environmental and Social Development and Management Programme, Conservation and management of the EN Basin's natural resources and biodiversity, improved co-operation between EN Basin countries, development of a standardised approach to assessing transboundary impacts associated with major projects, scientific research and collection of reliable baseline data, development of biodiversity and conservation management skills and capacity, tourism and regional economic development, reduction in natural resource conflicts between local communities, pastoralists and farmers	EN Basin, BAS, Abbay-Blue Nile and Tekeze-Setit-Atbara and Main Nile sub-basins	Environmental authorities Ethiopia, Egypt, South Sudan and the Sudan	Initiate and facilitate consultation & assist preparation of funding proposal for international donors	Conceptual and pre-feasibility					1c
EP4	Transboundary Water Quality Monitoring Programme	Establishment of Water Quality Monitoring Programme, reduce water pollution risk from urban, industrial and irrigation activities, reduce risk of conflict between EN Basin countries due to deterioration in water quality, improve access to clean water for drinking, sanitation and irrigation, reduce infant mortality rates and human health impacts, reduce water treatment costs, conserve aquatic environments, protect fishery resources, reduce surface water salinization, control eutrophication in lakes and reservoirs and spread of alien water species, and promote regional co-operation	EN Basin, BAS, Abbay-Blue Nile and Tekeze-Setit-Atbara and Main Nile sub-basins	Water, Agriculture and Environmental authorities Ethiopia, Egypt, South Sudan and the Sudan	Initiate and facilitate consultation & assist preparation of funding proposal for international donors	Conceptual and pre-feasibility					1c
Water Resources Management and Development Planning											
MS1	Abbay and Blue Nile Water Resources Management Programme and Projects	Identify and develop water resource management projects to improve water and food security, promote sustainable use of natural resources, reduce resource conflicts between local communities, pastoralists and farmers, improve animal health, address water related gender issues, improve sanitation and health conditions, promote scientific research, develop local skills and capacity and promote infrastructure development	Ethiopia and the Sudan, Abbay-Blue Nile sub-basin	Water Management, Agricultural and Environmental authorities Ethiopia and the Sudan	Identify potential projects and assist preparation of funding proposal for international donors	Pre-feasibility					1a

ID	Project / intervention			Implementing Agency(ies)	Role of ENTRO ¹	Status of preparation	Contribution to priority areas				Details (annex No)
	Name	Description and Objective	Location				S-E	FSec	Env	Sys	
MS2	Baro-Akobo-Sobat Water Resources Management Programme and Projects	Identify and develop water resource management projects to improve water and food security, promote sustainable use of natural resources, reduce resource conflicts between local communities, pastoralists and farmers, improve animal health, address water related gender issues, improve sanitation and health conditions, promote scientific research, develop local skills and capacity and promote infrastructure development	Ethiopia and South Sudan, BAS sub-basin	Water Management, Agricultural and Environmental authorities Ethiopia and South Sudan	Identify potential projects and assist preparation of funding proposal for international donors	Pre-feasibility					1a
MS3	Tekeze-Setit-Atbara Water Resources Management Programme and Projects	Identify and develop water resource management projects to improve water and food security, promote sustainable use of natural resources, reduce resource conflicts between local communities, pastoralists and farmers, improve animal health, address water related gender issues, improve sanitation and health conditions, promote scientific research, develop local skills and capacity and promote infrastructure development	Ethiopia and Sudan, TZA sub-basin	Water Management, Agricultural and Environmental authorities Ethiopia and South Sudan	Identify potential projects and assist preparation of funding proposal for international donors	Pre-feasibility					1a
MS4	Dinder and Rahad Water Resources Management Programme and Projects	Identify and develop water resource management projects to improve water and food security, promote sustainable use of natural resources, reduce resource conflicts between local communities, pastoralists and farmers, improve animal health, address water related gender issues, improve sanitation and health conditions, promote scientific research, develop local skills and capacity and promote infrastructure development	Ethiopia and the Sudan, Abbay-Blue Nile sub-basin	Water Management, Agricultural and Environmental authorities Ethiopia and the Sudan	Identify potential projects and assist preparation of funding proposal for international donors	Pre-feasibility					1a
Water resources Monitoring											
MS3	Water resource monitoring rehabilitation and intensification programme		Especially in key tributaries in ABN, BAS and TZA, around key wetlands.								1a
Watershed Management Programs											
WS1	Transboundary Watershed Management Programme	Establishment of Transboundary Watershed Management Programme, improve water quality and quantity, improve environmental sustainability and use of natural resources, reduce poverty, flood and erosion control, conserve and protect biodiversity and sensitive habitats, scientific research, develop skills and capacity, promote local and regional economic development	EN Basin, specifically BAS, Abbay-Blue Nile and Tekeze-Setit-Atbara sub-basins	Water, Agriculture and Environmental authorities Ethiopia, South Sudan and the Sudan	Initiate and facilitate consultation & assist preparation of funding proposal for international donors	Pre-feasibility					1b

ID	Project / intervention			Implementing Agency(ies)	Role of ENTRO ¹	Status of preparation	Contribution to priority areas				Details (annex No)
	Name	Description and Objective	Location				S-E	FSec	Env	Sys	
WS2	Baro-Akobo-Sobat Watershed Management Programme	Identify and develop watershed management programme to improve water and food security, promote sustainable use of natural resources, reduce resource conflicts between local communities, pastoralists and farmers, improve animal health, address water related gender issues, improve sanitation and health conditions, promote scientific research, develop local skills and capacity and promote infrastructure development	Ethiopia and South Sudan, BAS sub-basin	Water Management, Agricultural and Environmental authorities Ethiopia and South Sudan	Identify potential projects and assist preparation of funding proposal for international donors	Pre-feasibility					
WS3	Dinder-Rahad Watershed Management Programme	Identify and develop watershed management programme to improve water and food security, promote sustainable use of natural resources, reduce resource conflicts between local communities, pastoralists and farmers, improve animal health, address water related gender issues, improve sanitation and health conditions, promote scientific research, develop local skills and capacity and promote infrastructure development	Ethiopia and the Sudan, Abbay-Blue Nile sub-basin	Water Management, Agricultural and Environmental authorities Ethiopia and South Sudan	Identify potential projects and assist preparation of funding proposal for international donors	Pre-feasibility					

Notes: 1: Green indicates high level of involvement, orange indicates significant involvement and yellow indicates limited involvement

4.1.3 Hydropower and interconnection

4.1.3.1 Introduction

The priority projects are limited to the preferred projects upstream of the GERD in Ethiopia. It is clear that there are many other projects which could also be considered but these choice will only be specified once integrated water resources management studies have been completed for the sub-basins concerned.

4.1.3.2 Proposed priority Interventions

Table 4-2 summarises the priority investments under the hydropower sector. These include the Regional Interconnection Projects which sources its electricity from hydropower.

Table 4-2 : Hydropower and Interconnection Interventions

ID	Project / intervention			Implementing Agency(ies)	Role of ENTRO ¹	Status of preparation	Contribution to priority areas				Details (annex No)
	Name	Description and Objective	Location				S-E	FSec	Env	Sys	
Interconnection											
HP1	Regional Interconnection Projects	export from Ethiopia of capacity of 1200 MW to Sudan, and 2000 MW to Egypt through high voltage transmission lines 500 kV AC (570 km) and 600 kV DC Lines (1650 km). Estimated cost \$ 2160 M (2006) The payback period is 8 years and the Benefit to Cost Ratio is above 3.	Eastern Nile Countries (Egypt, Ethiopia and Sudan)	The EN countries Ministries of Electricity and Energy	Consultation	FS					1e
Hydropower											
HP	Karadobi Hydropower Development	Hydropower Generation of total Installed Capacity 1600 MW & average Energy 8700 GWh/y. Estimated Project Cost: \$ 2,576 M (2012)	On the Blue Nile (Abbay River)	Ethiopia, Ministry of Water, Irrigation and Energy	Consultation	Pre- FS					1e
HP	Beko Abo Hydropower Development	Hydropower Generation of Installed Capacity 935 MW & Average Energy: 6632 GWh/year and Estimated Project Cost: \$ 1260 M (2012)	At Blue Nile (Abbay) river	Ethiopia, Ministry of Water, Irrigation and Energy	Consultation	Pre- FS					1e
HP	Upper Mandaya Hydropower Development	Hydropower generation of Total Installed Capacity: 1700 MW & Average Energy: 8597 GWh/year and Estimated Project Cost: \$ 2436 M (2012)	On the Blue Nile (Abbay River)	Ethiopia, Ministry of Water, Irrigation and Energy	Consultation	Pre-FS					1e
HP	Lower Didessa Hydropower Development	Hydropower generation of Total Installed Capacity 550 MW & Firm Energy: 976 GWh/year and Estimated Project Cost: \$ 619 M (2012)	On Blue Nile (Abbay River)	Ethiopia, Ministry of Water, Irrigation and Energy	Consultation	Pre-FS					1e

Notes: 1: Green indicates high level of involvement, orange indicates significant involvement and yellow indicates limited involvement

4.1.4 Agriculture

4.1.4.1 introduction

Agriculture projects could include a wide range of interventions in all of the sub-sectors (rainfed, irrigation and/or livestock). Since the “livelihood-based watershed management projects” have been included under the Conservation and Water Resources Management thematic, this effectively means that the regionally significant rainfed agriculture-related interventions are generally included within these types of projects. The same is often true of livestock projects. As a result, the interventions presented in Section 4.1.4.2 are mainly focussed around the irrigation sub-sector.

4.1.4.2 Proposed priority Interventions

Table 4-3 summarises the priority investments under the agriculture (mainly irrigation-related) sector. It should be noted that projects where implementation/construction has already started (Megech, Upper Atbara etc) have not been included. The table only includes projects for which construction has still to start and for which there is basin-wide support.

Table 4-3 : Agriculture Interventions

ID	Project / intervention			Implementing Agency(ies)	Role of ENTRO ¹	Status of preparation	Contribution to priority areas				Details (annex No)
	Name	Description and Objective	Location				S-E	FSec	Env	Sys	
Irrigation Modernisation and Rehabilitation											
A1	Rehabilitation and Modernization of the existing Irrigation schemes	Improving the water use efficiency, productivity and the overall performance of the Existing Irrigation Schemes	Throughout EN sub basin	Countries	Assist countries in securing finance, Capacity building, consultation, etc	At various stages (from study to implementation) in each country					1d
A2	Establishment of the EN Irrigation Management Information System	Establish a network of computerized weather stations in the EN sub basin and provide real time information on daily weather data and potential evapotranspiration (ETo) values to enhance/assist proper irrigation water management	Throughout EN sub basin	ENTRO and Countries	Secure finance, hire consultant, procure and install equipment, establish system, give trainings	Concept Note					1d
Irrigation Expansion											
A	Transboundary Irrigation development and Food Security Strategy and Action Plan	Study followed by implementation strategy and action plan into regional/transboundary approach to food security based on a shift from unilateral to regional planning of sustainable irrigation expansion. Agriculture led multi-sectoral study (transport and trade sectors etc)	Throughout the EN sub-basin	ENTRO and countries	Coordination and management	To be initiated					

ID	Project / intervention			Implementing Agency(ies)	Role of ENTRO ¹	Status of preparation	Contribution to priority areas				Details (annex No)
	Name	Description and Objective	Location				S-E	FSec	Env	Sys	
A3	Negesso Irrigation Scheme	Project will include a 28m dam on Negesso and Goji rivers and a 68.2km lined canal encircling a command area of 13,800ha with aim of growing groundnuts, maize, onion, potato, sesame and wheat	Dedessa sub-catchment in ABN	MoWIE and private sector		Feasibility Study complete					1d
A4	Anger Irrigation Scheme	Dam on Anger River to command area of 14,450ha with aim of growing groundnuts, maize, onion, potato, sesame and wheat.	Anger River in Dedessa sub-catchment in ABN	MoWIE and private sector		Feasibility Study complete					1d
A5	Upper Beles										1d
A6	Upper Atbara Irrigation Scheme										1d
A7	West Delta										1d
Capacity Building											
A8	Capacity building in Irrigation sector	Improve the planning, design, implementation and OMM capacity of personnel and institutes involved in the irrigation sector –Through short term trainings, study tours, experience sharing, etc	Throughout EN sub basin	ENTRO and Countries	Identify training themes and target groups, organize regional trainings and study tours	Concept Note					

Notes: 1: Green indicates high level of involvement, orange indicates significant involvement and yellow indicates limited involvement

4.1.5 Navigation

Although no specific interventions have been included, it may be useful to look at the potential role of navigation in supporting a more regional approach to food security. Is there a (potential) place for navigation in the transport sector once that sector has been reviewed to understand what role it may play in moving produce around the basin. A study may be required to support proposals on a regional, transboundary approach to food security.

4.1.6 Tourism and Recreation

No specific interventions have been identified but it is recognised that the development of tourism and recreation will be an integral part of the transboundary park projects described earlier.

5. Institutional and Financing Arrangements

5.1 INSTITUTIONAL ARRANGEMENTS

5.1.1 A Regional Public Good for a successful implementation

During the country consultations, discussions were held with stakeholders in all the key sectors in each country (except Egypt). During the workshop organised in November 2014 in Khartoum, it has become clear that the MSIOA will bring out challenging development programs and that for it to succeed will require each of the Member States to move from unilateralism to cooperation.

On the other side, water investment projects have frequently been managed as national projects with little considerations to their regional impacts. The IS and AP (Investment Strategy and Action Plan) of the EN-MSIOA needs to be implemented as a **Regional Public Good**. For that, all the countries need to have a common understanding of the objectives of the strategy, and share the benefits of the Regional Public Good.

Critical factors for successful implementation include the following:

- Moving **forward rapidly** to an commonly accepted database on water resource availability and sectorial abstractions in each country ;
- The definition of projects with a high potential of real common interest of riparian countries, not only in the long term, but also meeting short term needs and aspirations. This is coupled with the full understanding of relative platforms of interests and objectives of riparian countries in such projects.
- **The intensification of focus on technical and managerial questions** producing clear and convincing technical concepts to problems of real and also immediate interest of the riparians, for instance, on floods, droughts, available water for sectoral uses per sub-basin etc.
- The **acceptance, trust and commitment of Member States to give importance and back-up to the proposed interventions**. ENTRO can there play an important role in promoting the plan and providing high level expertise when required.
- The majority of the projects will be nationally driven and therefore require total support of the relevant national institutions. In principle this should not meet obstacles since the selected projects generally come from the national strategies and Masterplans or from an ENTRO portfolio that has been agreed by all countries.
- **Building confidence** by promoting transparency. ENTRO can evaluate and communicate on the regional impacts, costs and benefits, related to the project implemented. The development of such a communication strategy aimed at obtaining the acceptance, trust, commitment and involvement of the EN region States should be seen as a priority.
- **Maintain dialogue** between EN countries by assuring regular discussions on issues that are critical to the socio-economic growth and to poverty eradication.

- The IS and AP should be seen as a point of departure for the integrated development and management of water resources at the regional level. It has been built on the current understanding of issues and priorities within the EN region, both within each sector and across them when looking at general socio-economic development priorities, poverty reduction and putting a stop to the environmental degradation that threatens sustainable economic growth.

5.1.2 Principles for implementation

There are a number of principles for implementation that should be adhered to strictly

- **Managing projects as a regional Public Goods.** Some of the under-construction projects in upstream countries are seen as competing with current water uses by downstream countries. Most of the projects to be implemented will be also seen as such. Emphasis on regional benefits, Direct and Indirect benefits, from projects and added value for all countries, has to be emphasised and evaluated.
- **Regional coordination on water uses.** The maximum engagement of regional expertise and institutions for programme management and implementation, which should further enhance capacity and local ownership. Implementing Agents, i.e. institutions at regional or national level (depending upon the program scope) that are given responsibility for implementation of individual programmes.
- **Stakeholder consultation.** Implementation of the IS and AP should be based on broad participation and consultation, in order to engage as many stakeholders as possible, to create ownership for the outputs, and to internalise the principles upon which it is based
- **Subsidiarity.** Management of programmes in the context of the IS and AP should adopt the principle of subsidiarity, whereby all programmes and activities are undertaken at levels where they can be best handled. This will ensure that sufficient responsibility resides at the country level to attain the confidence and trust required to implement and sustain program activities and to avoid overloading scarce administrative capacities and resources at either the national or the regional level in the pursuit of coordinated actions.
- **Detailed implementation plans.** While the strategy provides a broad framework; detailed implementation plans should be drawn up for each intervention area/programme, clearly spelling out issues such as who the different actors are, implementation and management roles, benchmarks, and sustainability.

5.1.3 Challenges towards implementation of the IS and AP

Some of the main challenges include the following:

- **Financing.** Financing is a critical issue. Significant resources will be required for the implementation of the proposed projects within the IS and AP. A list of financing instruments is given (See Summary list of financing instruments end of note).
- **Synergies with other initiatives.** Promoting cooperation relying complementarities to maximise synergies with other initiatives
- **Enhanced Involvement of Member States.** Involvement of Member States at the outset is critical to the success. Every effort has to be made to ensure that constraints that hinder the enhanced interaction and involvement of Member States are anticipated and addressed

5.1.4 Sustainability

The regional cooperation among EN countries remains a risk. ENTRO should focus on outcomes in the IS and AP which enhance cooperation at regional levels. Several attributes will have to be taken into consideration including:

- Sustainability of the IS and AP should be planned from the outset to establish how countries will assume responsibility for continued activities if the program succeeds, including collective responsibility for any continuation of regional level activities.
- Planning should take account of the changing roles of national and regional institutions over the different phases of program operations.
- There must be a substantial political or economic interest for countries to take on financial responsibility for continued regional-level activities.

5.1.5 Institutional arrangements

The institutional framework for coordinating the implementation of the IS and AP is of fundamental importance. Programme specific arrangements, including the roles, rules of procedure, and interrelationships of the various layers will have to be defined.

5.2 FINANCING MODALITIES

5.2.1 Introduction

The MSIOA IS and AP covers a broad range of possible investments – from capacity building to implementation of infrastructure projects. Investments in general research and investigations, not necessarily related to specific infrastructure projects are also included and are in fact some of the most critical and often most difficult to finance.

In order to finance the IS and AP a range of financing sources and mechanisms will be necessary. Securing finance is still distant for many of the investments considered under this plan. However the financing modalities need to be carefully considered now as they provide hypotheses to be tested as part of the feasibility studies (for example whether the use of public private partnerships is a realistic prospect for a certain type of, project) and help identify which financing institutions should be approached to assist with project preparation.

5.2.2 Type of financing modalities

Factors to be considered evaluating different types of financing modalities include:

- Thematic of the project –Irrigation, Hydropower, capacity building, ect.
- The technical complexity of the action/project,
- The size of the project, be it a small-scale irrigation project or a large hydro electric plant,
- Economic and financial returns generated by the project,
- Ability of the project, once implemented, to cover its operation and management costs
- Existing Institutional capacity

- The level of revenues generated from pricing the output
- Availability of commercial financing in the relevant sector in the country concerned,
- National regulatory and policy frameworks in place,
- The level of public goods and externalities involved in the project (for example integrated catchment management will benefit many stakeholders in a way that is difficult to quantify or internalise),
- The anticipated attractiveness of project to funding agencies, particularly with respect to achieving the Millennium Development Goals and other development objectives,
- The applicability of the project to targeted financial mechanisms such as carbon financing,
- Private or public output of the project and the level of private investor interest in sectors concerned.

With this in mind, the types of financing modalities to be considered include:

- **Public sector financing** – Through the national budgets, government on-lending to district-level agencies or institutions, government guarantees (contingent liabilities) on development partner financing, sector-specific; More than one government could be implicated in transboundary projects
- **Development partner financing** – Grants, concessional loans, or market interest loans from bilateral donors, multi-lateral donors, and non-government organisations;
- **Private investor financing** – Commercial lending on a project-finance basis, public private partnership delivery models such as management contract, design build, and built operate transfer, investment under sector-specific support mechanisms such as feed-in tariffs and carbon financing;
- **Beneficiary financing** – Including community owned and operated models through cash contributions, micro-finance, and commercial finance, can potentially be used in conjunction with Output-Based-Aid from development partners.

With these available kinds of financing modalities, they can be combined under different financing mechanisms. The financing mix of public sector with private sector interest can also enhance the efficiency of operating the project. This include blending loans and grant as well as private sector finance. The advantage with blending is that concessions can be gained through combining loans and grants and financing with different terms and characteristics. This can contribute to maximising private sector input and will be directly linked to the general level of sustainability of the overall project. Practical considerations

Some initial observations on the practical factors to be considered are as follows:

- It is essential to separate, in water catchment management programmes, plans, and projects, the part that should be handled by the public sector and those that could be managed by the private sector. For example, hydropower generation could be managed by a private company while regulating the flow should stay under public regulation.
- Private investor's perception of investment risk influences the way they will assess projects particularly looking for those projects with low project-specific risks and relatively high equity returns. Clear institutional and regulatory rules can make private sector more confident and assure visibility so that it brings down the risk perception.

- Market finance is available in most of the countries but it is also expensive and lenders will impose strict terms before lending on a project finance basis.
- Development agencies, including bilateral and multi-lateral donors, will be extremely wary of any project that has a significant environmental impact or social resettlement, which is an issue for some of the projects being considered
- Of the possible infrastructure projects, those in the power sector are likely to generate most international investor interest, with perhaps irrigation, agro-processing, and fisheries also attracting some national private investors.
- Projects in the water and sanitation sector are rarely operated on a purely commercial basis and if not publicly managed, they would likely be community owned and/or operated.
- Multi-objectives projects provides public good services and private good services. The private services have the potential to increase the financial viability of these projects by contributing to the cost sharing. A cost sharing key need to be evaluate with details in order to secure viability of the private services supply.
- For projects to be eligible for public sector financing they will usually need to align clearly with sector policy and any sector plans or strategies.

5.2.3 Matching investments and modalities

Table 5-1 provides a simplified initial assessment of the financing modalities and the types of investments/projects that are applicable.

Table 5-1: Summary of possible financing modalities.

Type	Possible financing mechanism	Possible component(s) to finance	
1	Government)	Through the budget	Water and sanitation
		Watershed management	
		Resettlement and compensation	
		Land acquisition	
		Payment for management	
	Government and Donor	Shared financing through grants and loans	Dams - donors finances the detailed engineering of the dams and their tendering processes
			Electricity connections – through Output Based Aid
			Shared and social infrastructure
			Water and sanitation
			Irrigation
Government and Private	Build, Operate and Transfer (BOT)	Dams and Irrigation	
		Power generation	
2	Private	Through budget	Associated infrastructure- Government ensuring part of the finance for the public goods. Private sector also supporting the more commercial aspects of the project
		Consortia of companies	Power generation
3	Donors	Bilateral aid consists of concessional loans (ODA loans, etc.), nts (grant aid and technical cooperation)	Dams, power generation and social infrastructure - Multilateral support to public-private partnership as well as other innovative financing initiatives
			Shared financing
4	Communities	Own savings and loans	Individual farm irrigations

Table 5-2: Types of instrument of financing

Source	Type of Instrument
1. Bilateral instruments	<ul style="list-style-type: none"> • Regular loans • Soft (concessional) loans • Grants for public and civil society organisations • Debt relief • Funds to promote private investment in developing countries • Tax incentives (for firms in developed countries)
2. International organisations and agencies (UN system, regional and other international organisations)	<ul style="list-style-type: none"> • Regular grants (from thei • Special purpose grants
3. International financial Institution a. Multilateral Development Banks (World Bank, regional and sub-re-gional banks, and their associated institutions)	<ul style="list-style-type: none"> • Regular loans • Soft (concessional) loans • Grants (mostly to public institutions) • Risk mitigation and risk management instruments • Equity participation • Debt reduction • Other (e.g. resource mobilisation)
b. IMF and regional monetary funds	<ul style="list-style-type: none"> • • Short-term financial assistance • • Concessional funds • • Debt management and debt relief • • Issuing special drawing rights (SDRs; IMF) • • Other (e.g. trust fund management)
Privates sources	
a. Corporations	<ul style="list-style-type: none"> • Foreign direct investment (FDI) • Concessions • Grants, donations, social responsibility activities
b. Commercial and investment	<ul style="list-style-type: none"> • Loans • Risk mitigation and risk management • Portfolio flows • Debt relief
c. Private foundations, not-for-profit and non-governmental institutions	<ul style="list-style-type: none"> • Grants and donations
d. Individuals	<ul style="list-style-type: none"> • Donations • Foreign worker remittances
e. Global and international lotteries	<ul style="list-style-type: none"> • Lotteries and games of chance to fund development programme
5. International capital markets a. Bonds and other debt instruments	<ul style="list-style-type: none"> • Bonds and related instruments
b. Equity investments • Equity investments through stock markets	<ul style="list-style-type: none"> • Equity investments through stock market
6. International taxes, fees and charges	<ul style="list-style-type: none"> • Creating international tax arrangements • User fees, charges and assessed contributions
7. Market creation	<ul style="list-style-type: none"> • For the provision and financing of regional and global public goods
8. Global and regional partner-ships	<ul style="list-style-type: none"> • Special purpose official funds (international, multilateral and bilateral) • Public–private funds and partnerships for specific purposes

6. Action Plan

The Action Plan is based on the identified priority investments presented earlier in this report. It is summarised in the figures overleaf.

The Plan does not include infrastructure projects which are already under construction. The Plan should be seen as a first draft and could be both updated and further detailed refined as ENTRO takes the process forward.

A	Agriculture (Irrigation)
ENA	Enabling (non-sector specific)
HP	Hydropower
P	Power
MS	Multi-sectoral
CWR	Conservation and water resources management



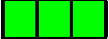
	Activities leading up to implementation (investigation, planning, design, capacity building, consultation etc)
	Construction or implementation
	Operation

Figure 6-1: Key to colour codes and abbreviations in Action Plan

7. Project Evaluation Framework

7.1 OVERVIEW

Monitoring and evaluation is required to ensure that the various components of implementation of the MSIOA Action Plan are **on track** and that they will lead to the **desired outcomes**, essentially progress towards meeting the specific objectives of the NBI:

- To develop the water resources of the Nile River 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,
- To ensure that the program results in a move from planning to action

A monitoring and evaluation system is only effective if the understanding of the desired outcomes is clear and measurable in some way, hence the development of indicators is critical.

The overall aim of this task can be seen in two distinct parts:

- To develop a monitoring and evaluation framework with suitable indicators to track the progress towards the achievement of **the specific objectives of the NBI (and hence of the MSIOA Action Plan)** and
- to provide feedback on the implementation process in terms of whether actions are being carried out according to the planned timeline and on budget.

The first of these concerns the monitoring and evaluation of "success" indicators. If application of the monitoring and evaluation framework shows these success indicators are not being met, this would imply

- either that there may be problems with the basic design of some of elements of the MSIOA Action Plan or the implementation strategy **OR**
- that the plans is not being executed timely or according to specification

the second level of monitoring and evaluation is designed to check the second of these two bullet points. The process is summarised in Figure 7-1.

In the rest of this chapter we distinguish between "success" indicators, which relate to progress towards achievement of the strategic objectives and "process" indicators, which relate to progress with the correct and timeous implementation of planned actions and activities.

- It should be noted that the monitoring and evaluation programme is an integral part of the MSIOA Action Plan and not something outside of it. This chapter serves merely to explain how it will operate.

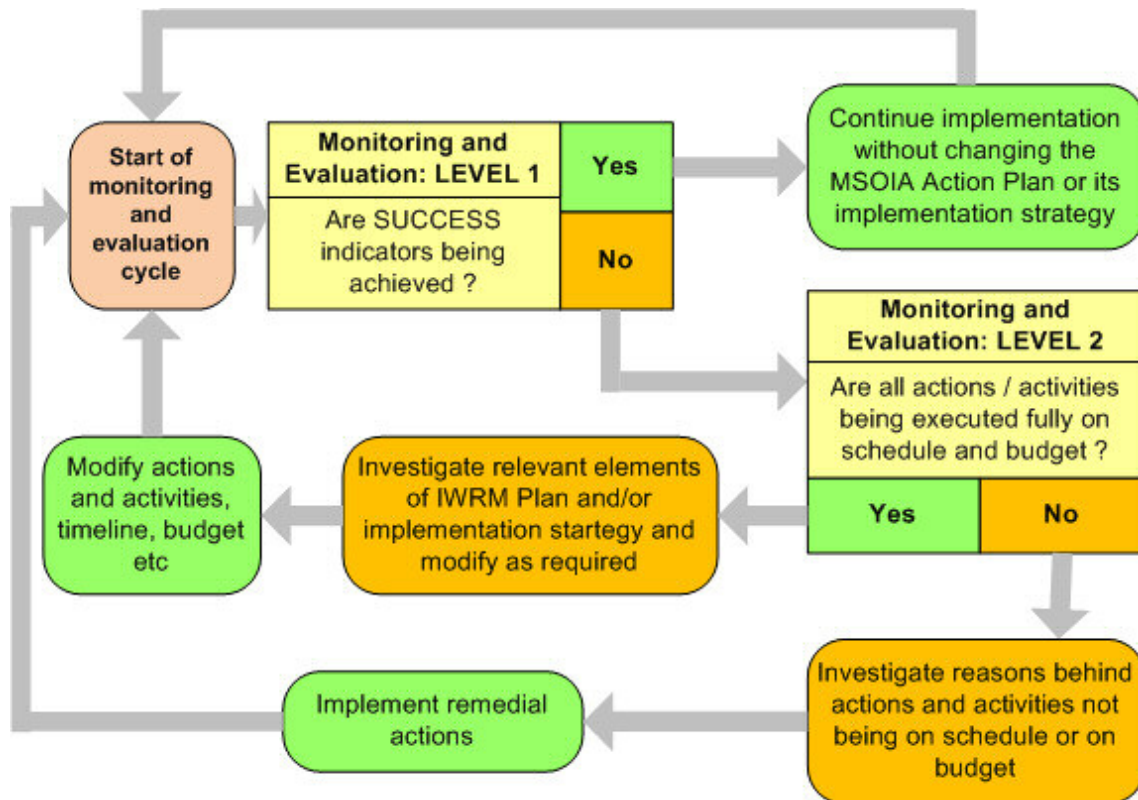


Figure 7-1: Monitoring and evaluation process for the MSIOA Action Plan

7.1.1 Monitoring and evaluation framework

7.1.1.1 Success indicators

This relates directly back to the NBI strategic objectives listed earlier. It is not possible at this stage to clearly define a complete set of indicators of progress towards realization of these objectives, since some of the groundwork for doing this will only be done as part of some of the Plan early actions. What follows in the remainder of this section of the report is the identification of a guideline set of indicators. In some case the proposed indicators could be used immediately, in some cases further work is required to properly define and/or measure them adequately. This will happen as some of the early actions and activities of the plan are implemented.

The detailing of indicators of progress towards the achievement of strategic objectives (success indicators) should take into account the action areas under each strategic objective.

Table 7-1: Potential Indicators of progress towards achievement of strategic objectives

<p>1.Ensure that the water resources of the Nile River basin are developed in a sustainable and equitable way to ensure prosperity, security and peace for all its peoples AND 2. To ensure efficient water management and the optimal use of the resources</p>	<p>3. •To ensure cooperation and joint action between the riparian countries, seeking win-win gains</p>	<p>4. •To target poverty eradication and promote economic integration</p>
<p>KNOWLEDGE BASE</p> <ul style="list-style-type: none"> • % of basin for which hydrological assessments < 10 years old • % of basin (or potential runoff) for which climate change has been taken into account <p>PLANNING/MODELLING TOOLS</p> <ul style="list-style-type: none"> • We need indicators of how fully, completely, frequently the various models are being updated • Frequency of transboundary planning meetings involving > ½ of the countries <p>WATER QUALITY</p> <ul style="list-style-type: none"> • Levels of concentration of a set of key water quality variables at key monitoring sites basin-wide. (to be related to agreed basin-wide water resources water quality objectives) • Fuller incorporation of salinity modelling into the water resources modelling system to allow m & e of salinity levels at key locations against those predicted <p>LAND DEGRADATION</p> <ul style="list-style-type: none"> • % implementation of basin-wide integrated watershed management “action” plans • Areas of land actively applying integrated watershed management “best” practices; • Average crop yields for selected representative rainfed areas. • Levels of sediment transport in some selected streams; • Rate of sedimentation in selected dams • Base flows in some selected streams in source areas. • Area of wetlands basinwide and by country in good condition; <p>ENVIRONMENTAL FLOW REQUIREMENTS</p> <ul style="list-style-type: none"> • Indicators of whether recommendations are being implemented (how to specify) • Indicators of effect – is the EFR regime having the desired effect? <p>FLOOD/DROUGHT MITIGATION - DIRECT EFFECT OF MEASURES</p> <ul style="list-style-type: none"> • Monitoring of peak flood magnitude and minimum discharge at key stations (trends) • Magnitude of seasonal minimum and maximum discharge. • Number of people killed by floods per year basinwide and in each country/district • Cost of flood damage per year basinwide and in each country/district • Population (or %) affected with water supply restrictions > 1 month basinwide and by country/district 	<p>SECTORAL COOPERATION</p> <p>To be workshopped</p>	<p>GENERAL OVERALL INDICATORS</p> <ul style="list-style-type: none"> • UNDP Human Poverty Index albeit that it may not be possible to distinguish the role of the Plan in improving or reducing the index) • Sustainable yield (m3/a) available per capita for the basin as a whole and within each country (includes imported water) • Water demand / Consumption m3/a per capita <p>SECTORS AND SERVICES</p> <ul style="list-style-type: none"> • % of people with access to potable water basin-wide and by country/district; • % of people with access to sanitation basin-wide and by country/district • Number of MW installed capacity and GWh/year generated in the basin, disaggregated by type (HP, thermal etc) • % of people connected to the electricity grid basinwide and in each country/district • Number of ha/ Mm3 delivered to irrigation basinwide and in each country/district; • Number of people employed in the irrigation sector basinwide and in each country/district ; • Annual production of irrigation schemes disaggregated as appropriate; % of irrigation water demands supplied • Value of irrigation produce per annum basinwide or by country/district • Number of visitors to each key tourism site

7.1.1.2 Progress Indicators

The other side of monitoring and evaluation refers to evaluation of progress of implementation of planned actions and activities, irrespective of whether they are achieving the desired progress towards realization of the strategic objective. These are much more straightforward to design at least in terms of whether activities are being performed according to the programme or not. More complicated is the design of mechanism to react to the delays that monitoring and evaluation system may highlight. It is the ability of programme management to react to an identified problem that will ensure the sustainability of the programme.

ANNEXES

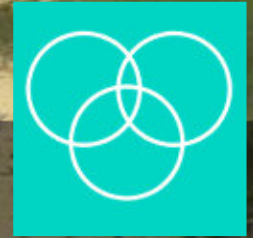
Annex 1: Project Profiles for Priority Interventions

The project profiles have been prepared using a standard ENTRO format and organised under the following headings:

- Multi-sectoral
- Watershed
- Environmental Protection
- Socioeconomic
- Agriculture
- Hydropower
- Climate Change
- Flood Management
- Soft Investment

There is some overlap between these headings and the choice on where to categorise an intervention is not always clear.

Annex 1a: Multi-sectoral Projects



MULTI-SECTORAL

ABBAY-BLUE NILE INTEGRATED WATER RESOURCES DEVELOPMENT PROJECTS

1. GENERAL INFORMATION

The Abbay River originates in the Ethiopian Highlands and flows west before becoming the Blue Nile when it enters the Sudan. Population pressure in the catchment area of the Abbay River has resulted in loss of natural habitat and erosion. As a result sediment levels in the Abbay River and Blue Nile are high. The livelihoods of rainfed farmers in the catchment of the Abbay River are vulnerable to climatic changes. The area to the south and north of the Blue Nile has been modified by the establishment of large irrigation and mechanised rain-fed irrigation schemes.

CURRENT CHALLENGES

Deforestation and poor farming practices in the Ethiopian Highlands has resulted in increased sediment levels and reduced water quality in the Abbay River. The development of large irrigation schemes and mechanised rain-fed agriculture in Sudan has resulted natural resource related conflicts between farmers and pastoralists. The development and implementation of appropriate IWRM projects, which reduce the pressure on natural systems and improve access to water for local communities, can address poverty and contribute to the achievement of MDGs

2. KEY ACTIONS AND ACTIVITIES

The approach to identifying appropriate IWRM projects must focus on understanding local conditions and identifying and addressing the needs of the local communities. Key activities include:

- Desktop review of local and international examples of IWRM projects and lessons learnt;
- Develop community based participatory approach for identifying community needs and potential IWRM projects;
- Collect baseline information of current water needs and challenges;
- Design and establish IWRM projects. Local communities should be involved in the design and construction of projects;
- Develop Monitoring and Evaluation programme to assess effectiveness of projects. The programme should provide for input from communities;
- Develop and implement maintenance programme to maintain and up-grade projects

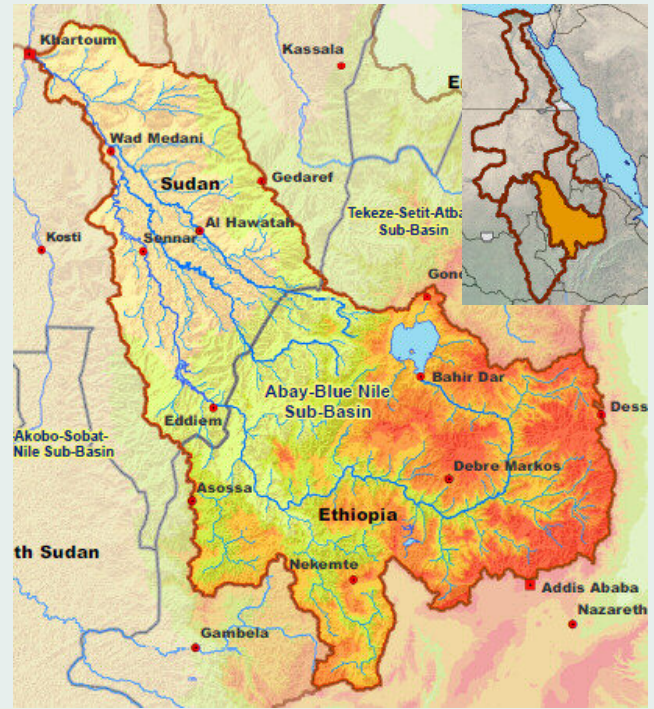
The timeframe for the participatory process would be 18-24 months.

TRANSBOUNDARY CONTEXT AND BENEFITS

Development and implementation of appropriate IWRM projects can effectively address a number of transboundary challenges facing the EN Basin, including poverty and sustainable management of natural resources. In so doing they can contribute to the achievement of the Millennium Development Goals (MDGs) in Sudan and Ethiopia. The benefits include:

- Improved food security and income;
- Reduction in natural resource conflicts between local communities, pastoralists and farmers.
- Improved animal health due to improved access to drinking points;
- Improved sanitation and health, and improved environmental sustainability and use of natural resources;
- Scientific research, skills and capacity development of local communities
- Infrastructure development and local and regional economic development;

3. LOCATION



THEMATIC AREA

BUDGET

GEOGRAPHIC LOCATION

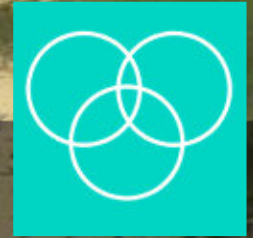
CONTACT INFORMATION

- Integrated Catchment and Watershed Management;
- Conservation and Environmental Management;

The process of developing a participatory process for identify appropriate IWRM projects would require funding. I would

Ethiopia and the Sudan, Abbay-Blue Nile sub-basin.

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Fax: +251 (011) 6450407



MULTI-SECTORAL

ABBAY-BLUE NILE INTEGRATED WATER RESOURCES DEVELOPMENT PROJECTS

1. GENERAL INFORMATION

The catchment of the Baro and Akobo Rivers is located in the south western part of Ethiopia. These rivers join to form the Sobat which originates in South Sudan as the Pibor before joining the White Nile. The Gambella National Park (GNP) is traversed by the Baro and Akobo Rivers and is the largest protected area in Ethiopia. The park consists of a vast collection of savannahs, rivers and associated flood plains, riverine forests and grasslands and is regarded as one of the richest wildlife areas in Ethiopia. The Sobat River flows through the Machar Marshes, mainly located in South Sudan. The marshes consist of vast areas of swamps and seasonal flood plains. The Ethiopian highlands to the east and the low lying areas to the west, including the Machar wetlands, play a key role in the livelihood strategies of local

CURRENT CHALLENGES

Population pressure related deforestation in the catchment of the Baro and Akobo Rivers has resulted in loss of natural resources and increase in sediment levels. There are also a number of hydropower dams and associated irrigation schemes proposed. Oil exploration in the Machar Marshes poses a potential threat to the natural resources in the area. The development and implementation of appropriate IWRM projects, will reduce the pressure on natural systems and improve access to water for local communities, can address poverty and contribute to the achievement of the MDGs

2. KEY ACTIONS AND ACTIVITIES

The approach to identifying appropriate IWRM projects must focus on understanding local conditions and identifying and addressing the needs of the local communities. Key activities include:

- Desktop review of local and international examples of IWRM projects and lessons learnt;
- Develop community based participatory approach for identifying community needs and potential IWRM projects;
- Collect baseline information of current water needs and challenges;
- Design and establish IWRM projects. Local communities should be involved in the design and construction of projects;
- Develop Monitoring and Evaluation programme to assess effectiveness of projects. The programme should provide for

3. LOCATION



TRANSBOUNDARY CONTEXT AND BENEFITS

Development and implementation of appropriate IWRM projects can effectively address a number of transboundary challenges facing the EN Basin, including poverty and sustainable management of natural resources. In so doing they can contribute to the achievement of MDGs in Sudan and Ethiopia. The benefits include:

- Improved food security and income;
- Reduction in natural resource conflicts between local communities, pastoralists and farmers.
- Improved animal health due to improved access to drinking points;
- Improved sanitation and health and improved environmental sustainability and use of natural resources;
- Scientific research, skills and capacity development of local communities
- Infrastructure development and local and regional economic development;

THEMATIC AREA

BUDGET

GEOGRAPHIC LOCATION

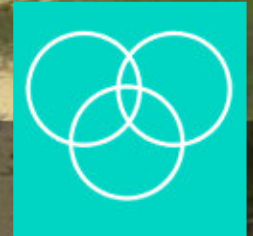
CONTACT INFORMATION

- Integrated Catchment and Watershed Management;
- Conservation and Environmental Management;

1 million \$US for developing a participatory process for identify appropriate IWRM projects.

Ethiopia and the Sudan, Abbay -Blue Nile sub-basin.

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Fax: +251 (011) 6459497



MULTI-SECTORAL

TEKEZE -SETIT - ATBARA: INTEGRATED WATER RESOURCES DEVELOPMENT PROJECT

1. REGIONAL SIGNIFICIANCE/RATIONALE

Cooperative, transboundary approaches to water management and utilisation have the potential to i) allow integrated water resources management and development ii) reduce investment costs through economies of scale on infrastructure construction (and massively so where one dam could do the job of two or more) and iii) increase irrigation benefits through regional trade and iv) enhance regional cooperation and integration, etc.

MAJOR FEATURES/POTENTIAL OF CATCHMENT

In Ethiopia:

- **Humera (60,000 Ha)** in Ethiopia, using existing HP dam across the Tekeze River (or Setit River as it is known in Sudan)
- **Angereb (16,500 Ha)** with a dam on the Angereb River a tributary of Atbara River and **Metema (11,600 Ha)** with a dam on the

- **Wolkayit (50, 000 Ha)**, with a dam on Zarima River, a tributary of the Tekeze River
- **Water harvesting, Infrastructure** development and Cross border marketing of agricultural products

In Sudan

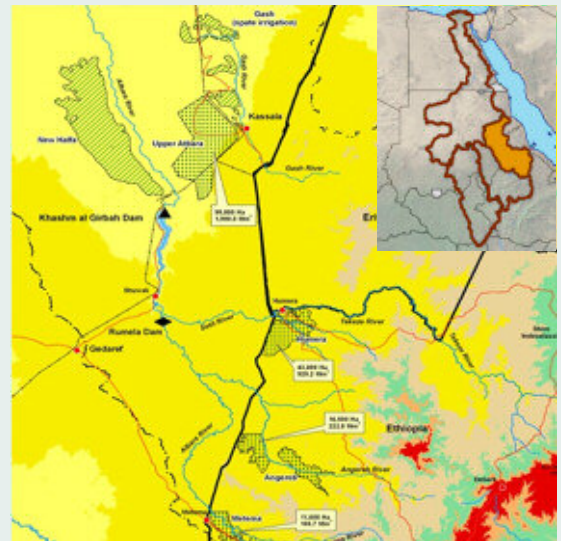
- **Upper Atbara project (200,000 Ha)** and the existing New Halfa project (180,000 Ha) both on Atbara River. The Upper Atbara project includes the construction of two dams, first the Rumela dam on the Atbara river and at a later stage a dam on the Setit river to supply water both for the new irrigation project and the New Halfa project as Khashm El Girba dam is now almost silted up.
- **Water harvesting, Infrastructure** development and Cross border marketing of agricultural products

2. MAJOR ACTIVITIES

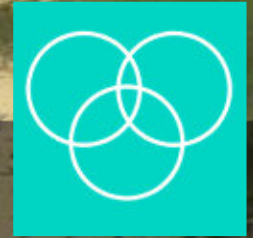
Major activity of the study is undertaking Strategic Social and Environmental Impact Assessment (SSEIA), which among others, include:

- Hydrological studies: Determination of water storage needs and arrangements in each sub basin: construction of dams and/or intervention on existing dams; determination of constraints in terms of minimum annual flow in the dry season for water users other than irrigation (domestic, livestock, industry, environmental flow)
- Assessment of all potentials for water resources development (Irrigation, Hydropower, wild life and environmental conservation, livestock, rainfed agriculture, forestry, fisheries, water harvesting, marketing, etc),
- Assessments of Social and Environmental impacts,
- Undertaking preliminary cost benefit analysis, including distribution of costs and benefits per sector (irrigation, hydropower, etc) and countries,
- Propose institutional development and arrangements including:
 - principles and procedures for joint development, operation, management and maintenance of common infrastructure,
 - procedures and regulations for water quality preservation and monitoring,
 - Mechanisms and legislations for facilitating for cross boarder marketing of products, etc

3. LOCATION



THEMATIC AREA	BUDGET	GEOGRAPHIC LOCATION	CONTACT INFORMATION
Muliti-Sectoral	The study will be undertaken by an international consultancy firm, for a total estimated	Sudan	Eastern Nile Technical Regional Office (ENTRO) P.O.Box 27173 1000



MULTI-SECTORAL DINDER-RAHAD WATER RESOURCES DEVELOPMENT PROJECTS

1. GENERAL INFORMATION

The Dinder and Rahad Rivers originate in the Ethiopian Highlands and flow west before entering the Blue Nile. The rivers traverse the Dinder National Park (DNP) and Alatish Regional Park located in Sudan and Ethiopia respectively. This area is ecologically significant due to its location on the ecotone between the Sahel and Ethiopian Highlands eco-regions. The area of the west of the Dinder Park has been modified by the establishment of large, mechanised rain-fed irrigation schemes. This has resulted in conflicts between the local farmers, pastoralists and agro-pastoralists.

CURRENT CHALLENGES

Deforestation in the Ethiopian Highlands has resulted in increased sediment levels and reduced water quality in the Dinder and Rahad Rivers. The expansion of mechanised rain-fed agriculture has resulted in pressure on the DNP and natural resource related conflicts between farmers and pastoralists. The development and implementation of appropriate IWRM projects can address poverty and contribute to the achievement of the Millennium Development Goals (MDGs).

3. LOCATION



2. KEY ACTIONS AND ACTIVITIES

The approach to identifying appropriate IWRM projects must focus on understanding local conditions and identifying and addressing the needs of the local communities. Key activities include:

- Desktop review of local and international examples of IWRM projects and lessons learnt;
- Develop community based participatory approach for identifying community needs and potential IWRM projects;
- Collect baseline information of current water needs and challenges;
- Design and establish IWRM projects. Local communities should be involved in the design and construction of projects;
- Develop Monitoring and Evaluation programme to assess effectiveness of projects. The programme should provide for input from communities;
- Develop and implement maintenance programme to maintain and up-grade projects

The timeframe for the participatory process would be 18-24 months.

TRANSBOUNDARY CONTEXT AND BENEFITS

Development and implementation of appropriate IWRM projects can effectively address a number of transboundary challenges facing the EN Basin, including poverty and sustainable management of natural resources. In so doing they can contribute to the achievement of the Millennium Development Goals (MDGs) in Sudan and Ethiopia. The benefits include:

- Improved food security and income;
- Reduction in natural resource conflicts between local communities, pastoralists and farmers.
- Improved animal health due to improved access to drinking points;
- Reduced time spent collecting water for domestic use and or animals;
- Improved sanitation and health, improved environmental sustainability and use of natural resources;
- Scientific research, skills and capacity development of local communities
- Infrastructure development, local and regional economic development;

THEMATIC AREA

- Integrated Catchment and Watershed Management;
- Conservation and Environmental Management;

BUDGET

0.5-1 million \$US for developing a participatory process for identify appropriate IWRM projects

GEOGRAPHIC LOCATION

Ethiopia and the Sudan, catchment area of the Dinder and Rahad Rivers, Abay-Blue Nile sub-basin

CONTACT INFORMATION

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Fax: +251 (011) 6450407

Annex 1b: Watershed Projects



WATERSHED MANAGMENT

TRANSBOUNDARY WATERSHED MANAGEMENT PROGRAMME

1. GENERAL INFORMATION

The majority of the sediment load generated in the EN Basin is from the Abbay sub-basin, which accounts for almost 70% of the total sediment load. These have major impacts on agricultural production and thus on peoples' livelihoods. The potential benefit of investing in watershed management project in the EN Basin is that the benefits extend across political boundaries and accrue to the Eastern Nile Basin as a whole.

CURRENT CHALLENGES

Soil erosion by water in the EN Basin and its complement high sediment loads in streams and rivers together with soil nutrient depletion are the two major land degradation processes. Addressing soil erosion at its source, namely in the Ethiopian Highlands, would therefore have significant trans-boundary benefits. In addition, combined with other elements, such a programme would also assist Ethiopia to address rural poverty in the Ethiopian Highlands. The other area for investment is the

2. KEY ACTIONS AND ACTIVITIES

Focus of watershed management initiatives in terms of location and priority should be informed by an understanding of the nature of the problem. The 2007 CAR Report identifies a number of key watershed management issues that have a bearing on the design and implementation of watershed management programmes and projects in the EN Basin. These include:

- Develop a standardised and co-ordinated watershed management data collection and information sharing system for each of the four EN countries;
- Develop a standardised and co-ordinated monitoring and evaluation programme for watershed management activities for each of the EN countries;
- Undertake 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;
- Undertake 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;
- Undertake surveys and studies and developing mechanisms and institutions for cooperative conservation of genetic, species and habitat biodiversity resources;
- Capacity Building in the fields of Watershed Management Planning, Relationships between Land degradation and Livelihoods, Relationships between wetlands environmental, hydrological and livelihoods functions, and undertaking Monitoring, Evaluation and Impact Studies.

The timeframe for the undertaking the above activities would be 12-18 months.

TRANSBOUNDARY CONTEXT AND BENEFITS

Research has shown that 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. The benefits include:

- Reduction in poverty;
- Improved food security;
- Improved water quality and quantity;
- Flood and erosion control;
- Conservation and protection of biodiversity and sensitive habitats;
- Improved environmental sustainability and use of natural resources;
- Scientific research;
- Skills and capacity development of local communities

CONTACT INFORMATION

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Fax: +251 (011) 6459407

THEMATIC AREA

- Integrated Catchment and Watershed Management;
- Conservation and Environmental

BUDGET

The process of developing a participatory process to develop an EN Basin Watershed Management Pro-

GEOGRAPHIC LOCATION

Ethiopia, South Sudan and the Sudan, Abbay-Blue Nile, Baro-Akobo-Sobat and



WATERSHED MANAGMENT

BARO-AKOBO-SOBAT WATERSHED MANAGEMENT PROGRAMME

1. GENERAL INFORMATION

The catchment of the Baro and Akobo Rivers is located in the south western part of Ethiopia. These rivers join to form the Sobat which originates in South Sudan as the Pibor before joining the White Nile. The Gambella National Park (GNP) is traversed by the Baro and Akobo Rivers and is the largest protected area in Ethiopia. The park consists of a vast collection of savannahs, rivers and associated flood plains, riverine forests and grasslands and is regarded as one of the richest wildlife areas in Ethiopia. The Sobat River flows through the Machar Marshes, mainly located in South Sudan. The marshes consist of vast areas of swamps and seasonal flood plains. The Ethiopian highlands to the east, where much of the watershed management interventions are required, and the low lying areas to the west, including the Machar wetlands, play a key role in the livelihood strategies of local groups living in the area, including pastoralists and agro-pastoralists.

CURRENT CHALLENGES

The BAS sub-basin exhibits a complex system of hydrology and ecology that strongly influences the livelihood systems of the peoples of the Sub-basin. In terms of watershed management and seeking to achieve sustainable livelihoods the key challenges include lack of information on complex hydrology-ecology systems in the BAS sub-basin (in both Ethiopia and South Sudan) and the linkages between these systems and livelihood systems.

2. KEY ACTIONS AND ACTIVITIES

The approach to identifying appropriate Watershed Management Programme projects focuses on understanding local conditions and addressing the needs of the local communities. Key activities include:

- Review of current status and quality of baseline data and identification of data gaps and studies required to fill these gaps;
- Desktop review of local and international experience;
- Develop community based participatory approach;
- Review of legal, institutional and capacity related requirements;
- Stakeholder-driven design and establishment of WMP projects.
- Development and application of M and E programme;
- Develop and implementation of maintenance programmes

TRANSBOUNDARY CONTEXT AND BENEFITS

Watershed Management interventions can have a substantial impact on arresting degradation of the natural resource base on both cropland and non-cropland. It 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. Benefits include:

- Reduction in poverty and improved food security;
- Improved water quality and quantity, as well as improved flood and erosion control;
- Conservation and protection of biodiversity and sensitive habitats;
- Improved environmental sustainability and use of natural resources;
- Scientific research, skills and capacity development of local communities
- Local and regional livelihood enhancement and socio-economic development.

3. LOCATION



THEMATIC AREA	BUDGET	GEOGRAPHIC LOCATION	CONTACT INFORMATION
<ul style="list-style-type: none"> • Integrated Catchment and Watershed Management; • Conservation and Environmen- 	1-1.5 million USD	Ethiopia and South Sudan, Baro-Akobo-Sobat sub-	Eastern Nile Technical Regional Office (ENTRO) P.O.Box 27173 1000 Tel: +251 (011) 6461130/32 T: 251 (011) 6452127



WATERSHED MANAGMENT

DINDER-RAHAD WATERSHED MANAGEMENT PROGRAMME

1. GENERAL INFORMATION

The Abbay sub-basin accounts for almost 70% of the total sediment load in the Eastern Nile. The Dinder and Rahad Rivers originate in the Ethiopian Highlands and flow west before entering the Blue Nile, traversing the Dinder National Park (DNP) and Alatish Regional Park located in Sudan and Ethiopia respectively. This area is ecologically significant due to its location on the ecotone between the Sahel and Ethiopian Highlands eco-regions. The Rahad-Dinder wetlands comprise a large number of ox-bow lakes and cut-off meanders along and between the Rahad and Dinder Rivers known as mayas. These wetlands provide a number of environmental services and products and play a key role in local livelihood strategies.

CURRENT CHALLENGES

Erosion in the catchment area of the Dinder and Rahad Rivers poses a threat to biodiversity and the ecological functioning of the mayas. This includes a reduction in their flood buffering capacity. Reducing sediment loads could reduce the siltation of the mayas in Sudan and thus reduce the incidence and extent of flooding and the damage this causes to crop production.

3. LOCATION



2. KEY ACTIONS AND ACTIVITIES

The approach to identifying appropriate Watershed Management Programme (WMP) projects must focus on understanding local conditions and identifying and addressing the needs of the local communities. Key activities include:

- Review of current status and quality of baseline data and identification of data gaps and studies required to fill these gaps;
- Desktop review of local and international examples of WMP projects and lessons learnt;
- Develop community based participatory approach for identifying community needs and potential WMP projects;
- Review of legal, institutional and capacity related requirements;
- Design and establish WMP projects. Local communities should be involved in the design and construction of projects;
- Develop Monitoring and Evaluation programme to assess effectiveness of projects. The programme should provide for input from communities;

TRANSBOUNDARY CONTEXT AND BENEFITS

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. The benefits include:

- Reduction in poverty and improved food security;
- Improved water quality and quantity;
- Flood and erosion control;
- Conservation and protection of biodiversity and sensitive habitats;
- Improved environmental sustainability and use of natural resources;
- Scientific research, skills and capacity development of local communities
- Local and regional economic development.

THEMATIC AREA	BUDGET	GEOGRAPHIC LOCATION	CONTACT INFORMATION
<ul style="list-style-type: none"> • Integrated Catchment and Watershed Management; • Conservation and Environ 	1-1.5 million USD	Ethiopia and the Sudan, Abay-Blue Nile sub-basin.	Eastern Nile Technical Regional Office (ENTRO) P.O. Box 27173, 1000

Annex 1c: Environmental Protection Projects



ENVIRONMENTAL PROTEC-

GAMBELLA MACHAR TRANSBOUNDARY NATIONAL PARK

1. GENERAL INFORMATION

Gambella National Park (GNP) is located in south western Ethiopia adjacent to the border with South Sudan. The park, established 1973, is the largest protected area in Ethiopia (5 060 km²) and consists of a vast collection of savannahs, rivers and associated flood plains, riverine forests and grasslands. A number of species that occur, including Nile lechwe and white-eared kob, are not found elsewhere in Ethiopia. The Machar Marshes to the south west and west in South Sudan consist of vast areas of swamps and seasonal flood plains interlaced by an intricate reticulate system of water courses. The marshes extend over the border into Ethiopia. The whole area plays a key role in the livelihood strategies of local groups living in the area, including pastor-

CURRENT CHALLENGES

Lack of integrated land use plans at state level, population pressure, oil exploration and development of large-scale irrigation schemes in the catchment of the Baro and Akobo Rivers in Ethiopia pose a threat to livelihoods, biodiversity and functioning of the natural systems in the area.

2. KEY ACTIONS AND ACTIVITIES

- Establishment of Transboundary National Park Steering Committee (TNPSC) with mandate to initiate a high level engagement process between South Sudan and Ethiopia to establish proposed Gambella Machar Trans-boundary National Park (GMTBNP);
- Development of Memorandum of Agreement (MoA) outlining time-frames, institutional arrangements, funding, timing, community engagement etc.;
- Development of Management Plan for GMTBNP.

TRANSBOUNDARY CONTEXT AND BENEFITS

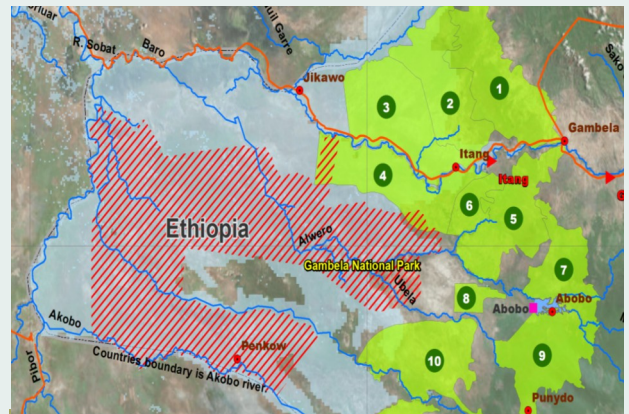
The GNP and Marchar wetlands share a number of common features, including:

- Similar ecosystems and animal populations which migrate between the two parks;
- Similar threats and management challenges and similar indigenous tribal groups.

Establishment of GMTBNP will create opportunity to address several interrelated, transboundary challenges, including:

- Conservation and management of internationally important biodiversity area and establishment of new Ramsar site. Benefits extend beyond EN Basin and have international significance;
- The development of Integrated Catchment and Wetland Management Programme that will benefit environment, and local and downstream communities and water users;
- Scientific research, biodiversity and conservation management skills and capacity;
- Tourism and regional economic development;
- Reduction in natural resource conflicts between local communities, pastoralists and farmers.

LOCATION



THEMATIC AREA

- Conservation and Environmental Management;
- Integrated Catchment and Watershed Management;

BUDGET

2-3 million USD

GEOGRAPHIC LOCATION

Ethiopia and South Sudan, within the catchment area of the Baro and Gilo Rivers, in the Baro-Akobo-Sobat sub-basin.

CONTACT INFORMATION

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32



ENVIRONMENTAL PROTECTION

DINDER ALATISH TRANSBOUNDARY NATIONAL

1. GENERAL INFORMATION

Dinder National Park (DNP) was established in 1935 and in 1979 in south-eastern Sudan adjacent to the boundary with Ethiopia. The area is ecologically significant due to its location on the ecotone between the Sahel and Ethiopian Highlands eco-regions and is also located on a key migratory bird flyway between Eurasia and Africa and has been proposed as the first Ramsar site in the Sudan. The DNP is also critical to the livelihoods of a number of local groups, including local communities and pastoralists and agro-pastoralists that enter the park in the dry season looking for forage and water. The Alatish Regional Park (ARP) located in Ethiopia was only established in 2006 and covers an area of 2 665 km².



CURRENT CHALLENGES

Lack of integrated land use plans at state level, expansion of mechanised rain-fed agriculture in the vicinity of DNP, population pressure and natural resource related conflicts between farmers, pastoralists and park authorities. The ARP faces similar resource related challenges.

2. KEY ACTIONS AND ACTIVITIES

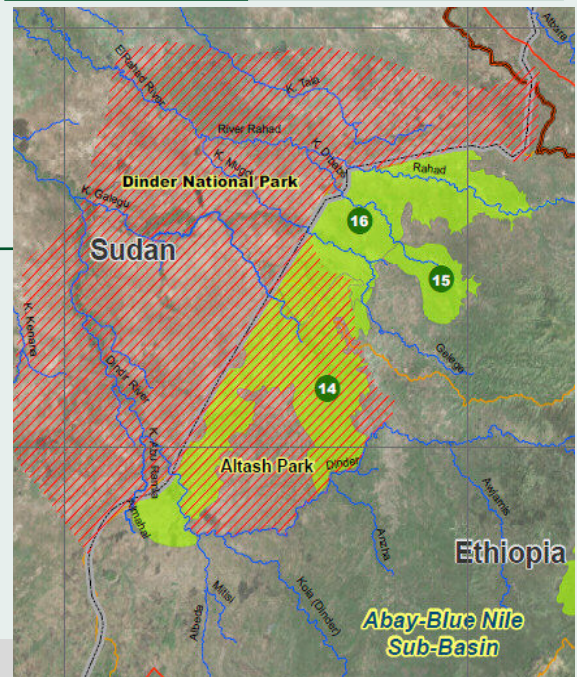
- Establishment of Transboundary National Park Steering Committee (TNPSC) with a mandate to initiate a high level engagement process between the Sudan and Ethiopia to establish proposed Dinder Alatish Trans-boundary National Park (DATBNP);
- Development of Memorandum of Agreement (MoA) outlining timeframes, institutional arrangements, funding, timing, community engagement etc.;
- Development of Management Plan for DATBNP.

TRANSBOUNDARY CONTEXT AND BENEFITS

The DNP and ARP share a number of common features, including:

- Similar ecosystems; and animal populations which migrate between the two parks;
- Similar threats and management challenges;
- Similar indigenous tribal groups.
- Establishment of DATBNP will create opportunity to address a number of interrelated, transboundary challenges, including:
 - Conservation and management of internationally important biodiversity area and Ramsar site.
 - The development of Integrated Catchment and Wetland Management Programme that will benefit environment, and local and downstream communities and water users;
 - Scientific research, Biodiversity and conservation management skills and capacity;
 - Tourism and regional economic development;
 - Reduction in natural resource conflicts between local communities, pastoralists and farmers.

3. LOCATION



THEMATIC AREA

- Conservation and Environmental Management;
- Integrated Catchment and Watershed Management;
- Socio-economic Development.

BUDGET

2-3 million US.D

GEOGRAPHIC LOCATION

Ethiopia and the Sudan, catchment area of the Dinder and Rahad Rivers, Abbay-Blue Nile sub-basin.

CONTACT INFORMATION

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Tax: +251 (011) 6459407
Addis Ababa, Ethiopia

Eastern Nile Climate Change Detection and Advisory Services at Watershed Level

Sector and Sub Sector
SOCIAL DEVELOPMENT AND COMMUNICATION UNIT

GENERAL INFORMATION

The population of the four EN countries (Egypt, Ethiopia, South Sudan and The Sudan) was estimated to be ~ 232 million in 2010. Of this total ~ 160 million (69%) resided in the four EN sub-basins. The medium population growth projections for the EN Basin indicate that the population living in the EN sub-basins will increase to ~ 220 million 2030. The rapidly rising population in the EN is placing increasing pressure on natural resources, infrastructure, and services. In addition, the majority of the population are rural and their livelihoods intimately depend on the agricultural economy – and thus the natural resource base – for their livelihood and food security.

CURRENT CHALLENGES

The design and implementation of the projects identified as part of the MSIOA study, including, Hydropower and Irrigation Projects, Transboundary National Parks, Watershed Management Programmes and Integrated Water Resource Development Projects, all require community engagement and participation. However, there is a general lack of awareness of the importance of and need for involving communities in identifying and implementing projects.

In order to achieve the shared vision of sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources, requires an understanding of the linkages between the environment and livelihoods, specifically traditional livelihoods, and co-operation between the EN countries. This requires an understanding of social issues and consultation with local communities who stand to be affected by projects and development programmes. There is also a need make technical and scientific information available in a format that is accessible to the general public and decision makers.

KEY ACTIONS AND ACTIVITIES

The establishment of a Social Development and Communication Unit (SDCU) would include:

- Identify institutional, legal, funding and staffing requirements associated with the establishment of SDCU;
- Appoint Director and key staff to head up SDCU.

Once the SDCU is established it should:

- Review of current status and quality of baseline data and identification of data gaps and studies required to fill these gaps;
- Review social assessment legislation, standards and guidelines (EN and international) and develop standard set of social assessment, resettlement, conflict management and communication guidelines for the EN Basin, with a key focus on addressing transboundary issues;

TRANSBOUNDARY CONTEXT AND BENEFITS

The transboundary benefits associated with the establishment of a SDCU include:

- Improved co-operation between EN Basin countries and understanding of social issues;
- Improved communication between communities and government agencies;
- Improved communication between communities and technical experts;
- Development of a standardised approach to assessing social issues associated with transboundary impacts associated with major projects;
- Scientific research and collection of reliable socio-economic baseline data;
- Development of social assessment and communication skills and capacity;
- Reduction in natural resource conflicts between local communities, pastoralists and farmers.

BUDGET

Depends on size of the SDCU

THEMATIC AREA

- Communication;
- Social Impact Assessment and Environmental Management;
- Socio-economic Development.

GEOGRAPHIC LOCATION

EN Basin

CONTACT INFORMATION

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Tax: +251 (011) 6459407
Addis Ababa, Ethiopia
Email: entro@nilbasin.org
<http://enasp.nilebasin.org>



ENVIRONMENTAL PROTECTION TRANSBOUNDARY WATER QUALITY MONITORING PROGRAMME

1. GENERAL INFORMATION

The population of the four EN countries (Egypt, Ethiopia, South Sudan and The Sudan) was estimated to be ~ 232 million in 2010. Of this total ~ 160 million (69%) resided in the four EN sub-basins. The medium population growth projections for the EN Basin indicate that the population living in the EN sub-basins will increase to ~ 220 million 2030. The State of the River Nile Basin Report (2012) notes that the rapidly rising population in the Nile Basin coupled with urbanisation will place growing pressure on water quality and the ability of local authorities to provide clean water and improved sanitation.

CURRENT CHALLENGES

Rapid population coupled with urbanisation, industrialisation, aging waste water treatment infrastructure and expansion of irrigation schemes pose a serious threat to water quality in the EN Basin. The conflicts associated with access to water will be heightened by deterioration in water quality.

2. KEY ACTIONS AND ACTIVITIES

The development of a Transboundary Water Quality Monitoring Programme for the EN Basin would include a Study Phase followed by an Implementation and Operation Phase run over 4 years. The study phase is envisaged to extend over a period of 18-24 months and include:

- Review of water quality standards and guidelines (local and international) and development of a standard set of water quality guidelines and standards for the EN Basin;
- Review of current status and quality of baseline data and identification of data gaps and studies required to fill these gaps;
- Identification of physical, chemical and biological water quality parameters to be monitored.
- Review of legal, institutional and capacity related requirements;
- Identification of existing and future pollution sources and pollutants and analysis of associated environmental, socio-economic and health risks

TRANSBOUNDARY CONTEXT AND BENEFITS

The transboundary benefits associated with the establishment of Water Quality Monitoring Programme include:

- Reduction of water pollution risk from urban, industrial and irrigation activities
- Reduced risk of conflict between EN Basin countries due to deterioration in water quality
- Improved access to clean water for drinking, sanitation and irrigation
- Reduced infant mortality rates and human health impacts
- Reduced water treatment costs
- Conservation of aquatic environments
- Protection of fishery resources
- Reduction in surface water salinization

THEMATIC AREA	BUDGET	GEOGRAPHIC LOCATION	CONTACT INFORMATION
Catchment Management; Water quality; Socio-economic Development.	2-3 million US for the Study Phase.	EN Basin	Eastern Nile Technical Regional Office (ENTRO) P.O.Box 27173 1000 Tel: +251 (011) 6461130/32 Tax: +251 (011) 6459407 Addis Ababa, Ethiopia

Annex 1d: Agriculture Projects



AGRICULTURE

IMPROVING THE PERFORMANCE OF THE EXISTING IRRIGATION

GENERAL INFORMATION

Though there are more than 5.3 million ha of land currently under irrigation in the EN, the performance of the existing irrigation schemes is below expectations. Production levels and water use efficiencies are low with high operation and maintenance costs and high risk of environmental degradations. On the other hand all the EN countries are food insecure. Since horizontal expansion of irrigation to cope up with the food requirement of the growing population is limited by water scarcity, most of the increased production will have to come from high yields and high cropping intensity. Moreover, High construction cost of irrigation projects coupled with the need for expensive storage facilities

OBJECTIVE

The specific objective is, based on the recommendations of previous studies in the EN (ENIDS CRA, Pilot study, etc), international/regional best practices, national priorities and strategies; to improve the overall performance of the existing irrigation schemes through:

- Rehabilitation/modernization of irrigation infrastructure,
- Use of improved irrigation and drainage and agricultural technologies,
- Improved credit, extension, marketing, transport, etc. facilities
- Increased participation of the end users and the private sector in the

LOCATION throughout the basin



MAJOR ACTIVITIES

- Identification of poor performing irrigation schemes based on level of performance, national priorities and strategies,
- Undertaking detail studies (feasibility level) to identify soft and hard action plans as well as, cost estimates required to improve the performance of the schemes,
- Secure finance and Implement the action plans

TRANSBOUNDARY CONTEXT

Studies have shown that the available water resources in many parts of the basin will become scarcer in the years to come. The major consumptive user is irrigation and the continued expansion of irrigation, as planned by all four riparian countries will result in water shortages if action is not taken to increase the efficiency of both existing and planned schemes. In terms of sustainable food security the key objective must be " more crop per drop" and this concept is central to the proposed project.

INDICATIVE BUDGET

- USD 1,500/ha for public large Scale Irrigation Schemes in Sudan
- USD 1,000/ha for community managed small scale irrigation schemes in

GEOGRAPHIC LOCATION

All EN countries (Ethiopia, Egypt, Sudan and South Sudan)

CONTACT INFORMATION

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Tax: +251 (011) 6459407
Addis Ababa, Ethiopia
Email: entro@nilbasin.org
<http://ensap.nilebasin.org>

Annex 1e: Hydropower Projects



HYDROPOWER

REGIONAL INTERCONNECTION PROJECT

1. GENERAL INFORMATION

The study has been prepared for Power Trade between the EN countries completed in December 2008. It concluded that an export capacity of 1200 MW to Sudan, and 2000 MW to Egypt, is profitable for the region, with benefit to cost ratio varying between 2.7 and 4.0 and a payback period of less than 10 years

SOCIAL AND ECONOMIC

Demand for electricity is growing very fast throughout the region and generating capacity is currently well below demand in Ethiopia, South Sudan and Sudan. There is therefore an urgent need to support socio-economic growth by making electricity available throughout the region. This project aims to do this.

2. PROPOSED COMPONENTS

Transmission Interconnection:

- AC/DC Mix with tapping station in Sudan
- Ethiopia exports 3200 MW to Sudan, including 2000 MW for Egypt.
- 500/400 kV substation located at Mandaya HHP equipped with four 500/400 kV transformers 510 MVar each.
- Four 500 kV AC circuits between Mandaya HPP and Kosti 500 kV substations (570 km)
- AC/DC 2 x 1075 MW converter station located at Kosti substation in Sudan, and a SVC.
- 600 kV DC bipolar line between Rabak and Nag Hammadi. (1650 Km)

TRANSBOUNDARY CONTEXT

This transboundary project underpins regional cooperation in the support of hydropower development. The project, which has a highly favourable cost-benefit ratio and short payback period can play an important role in support of regional socio-economic development and poverty reduction.

3. LOCATION



THEMATIC AREA

Hydropower and Interconnection

BUDGET

Investment Costs: USD 1 860million
O&M Costs: USD 18 million/a
Social Mitigation Costs: 16 million/a
Payback period: 8 years

GEOGRAPHIC LOCATION

Ethiopia, Sudan, Egypt

CONTACT INFORMATION

Eastern Nile Technical Regional Office (ENTRO)
P.O.Box 27173 1000
Tel: +251 (011) 6461130/32
Tax: +251 (011) 6459407
Addis Ababa, Ethiopia
Email: entro@nilbasin.org
<http://ensap.nilebasin.org>



Annex 1f: Socio-economic Projects

Annex 1g: Climate Change Projects

Annex 1h: Flood Management Projects

Annex 1i: Soft Investment Projects

