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The Baro-Akobo-Sobat Multipurpose Water Resources Development Study Project

General Overview



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THE SUB-BASIN

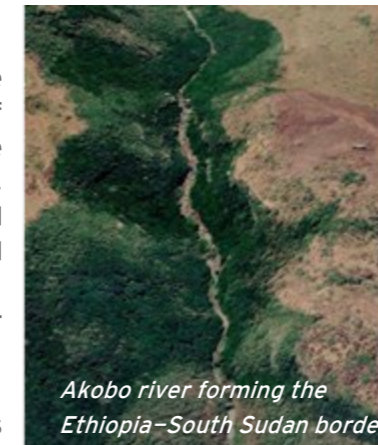
PROJECTS



hydro-environmental functioning. Its status is highly dependent on flows coming from the Baro River upstream which are likely to change over time in the future as upstream development proceeds. It is critical to establish an agreed integrated water resources management plan for the Machar Marshes which makes adequate provision for the sustainable development of livelihoods in this area where there are highly vulnerable communities who rely on environmental and ecosystem services provided by the marshes.

Cingaineta River Multipurpose Development Project

The overall objective of the project is to improve the livelihoods of both agro-pastoralists and pastoralists living in the Kapoeta North, South and East counties (South Sudan) through actions in the Cingaineta River catchment aimed at reversing environmental degradation, increasing the availability of water during the dry season, improving food security and developing opportunities for livelihood enhancement. Project activities will also include reconnaissance and baseline surveys, prefeasibility and feasibility studies, project design and implementation over ten years and capacity building.



Akobo river forming the Ethiopia-South Sudan border

Regional Transport and Navigation Development Project

An important focus of the project is on the Baro River and its connectivity to the Sobat and the White Nile/Main Nile system but the study will i) investigate and evaluate the feasibility of investments to improve navigation in the sub-basin within the context of regional transport and access to markets as a whole, ii) carry out the necessary planning and design work to get the project ready for implementation and iii) implement the project itself. The study will look carefully at the transport needs that will be generated by accelerated development

within the sub-basin, assuming that a major driver in this accelerated development will be the rapid expansion of commercial irrigation in both the Gambella Region of Ethiopia and on the Sobat River in South Sudan.

Transboundary Hydro-Meteorological and Environmental Monitoring System and Environmental Flows Assessment

The basin wide SSEA has shown that there is a critical shortage of hydro-meteorological and natural resources data throughout the basin. In most of the sub-basin there are no data collection programmes. Planning based on a high level of uncertainty is potentially costly. The proposed project will see the sustainable operationalisation of a monitoring system for meteorology, hydrological, water quality, sediment transport and land use. As a second step, making use of the new data collected, the environmental flow requirements at all critical points around the sub-basin will be assessed and agreed.

Boma-Gambella Transboundary National Park

The project aims at building on ongoing activities to designate the Boma-Gambella parks as one contiguous transboundary national parks to strengthen cooperative management and enhance effective conservation and protection. A management plan will then be developed to improve the current understanding of the features of the park and propose adequate measures especially for i) livelihood enhancement through eco-tourism development, fishery activities, shea nuts production, etc and ii) Biodiversity conservation.



Field work, Majang zone, Ethiopia

THE MEDIUM AND LONG TERM PROJECTS

Nine medium/long-term projects have been profiled and are included in the IWRDMPlan, together with many others. These projects are planned for implementation within the next 10 years, but most of them should be implemented without delay. For three of the profiled projects, terms of reference for feasibility studies and Environmental Impact Assessments (EIAs) have been prepared to ensure that they can move forward rapidly.

Akobo – Pibor Transboundary Multipurpose Development Project

There are areas of potential for multipurpose development of water resources in South Sudan which have not been adequately investigated due to the prevailing security situation. The objective of the project is to investigate through reconnaissance to the feasibility study level, the feasibility of a multipurpose project development based on storage on the Akobo River forming the joint border between South Sudan and Ethiopia and the development of hydropower, irrigation, fisheries, water supply and livestock watering. Terms of reference for implementation are available for this project.

Integrated BAS Hydropower, Irrigation and Multipurpose Development Programme—Phase 1: Baro/Sobat component

The objective of this study is to make ready for implementation of Phase 1 of the project (10 years), which would see the installation of 2,070 MW of hydropower (TAMS and Geba Dams) and around 100,000 ha of irrigation schemes (first package of Baro and Sobat rivers “no regret” irrigation projects as defined in the IWRDMPlan). The assignment will be to assess the overall feasibility of the multipurpose programme and its main components (including associated environmental and social impact assessments) and thereafter prepare detail design and tender documents. Terms of reference for implementation are available for this project.

Livelihood-based Watershed Management – Scaling up for a Basinwide Impact

The IWRDMPlan, although regional in scale, includes the micro-level IWRM-style interventions that are

critical to sustainable water and related natural resources management at the local level. It is important that the IWRDMPlan presents appropriate solutions, not just the planning and prioritizing of large-scale water resources development options. One way of dealing with this is to present a “programme” of local level interventions in the form of small-scale demonstration projects, which, when taken to scale, represent real basinwide solutions to some of the key environmental and socio-economic challenges such as high levels of sediment transport, lack of food security etc. This project will support the identification of small-scale livelihood-based watershed management projects (such as the Majang proposed short term project) followed by the design and implementation of a programme to take the approach to scale. Terms of reference for implementation are available for this project.



Flood-Risk Mapping and Early-Warning System

A major driver of flooding in the low-lying downstream areas such as the Gambella Plains, are the large river flows originating from the highlands in Ethiopia. The project will analyse the relationship between upstream flows and flooding extent in priority risk areas. It will include an analysis of the relationship between rainfall in the source areas of the main rivers and floods generated in these rivers and will investigate the potential impacts of climate change. A real-time or quasi-real-time early warning system will then be developed aimed at providing early warning of high discharge levels in the rivers while these flows are still some distance from the areas susceptible to flooding.

Machar Marshes Integrated Water Resources Management Plan

The Machar Marshes are poorly understood in terms of both the existing socio-economic conditions and

THE PROJECT

The Baro-Akobo-Sobat sub-basin

The Baro-Akobo-Sobat (BAS) River system is a sub-basin of the White Nile and one of its main contributors. The BAS has a catchment area of around 260,000 km² and is shared by Ethiopia, South Sudan and to a lesser extent, the Sudan. The main rivers of the BAS take their source in the Ethiopian and South Sudan highlands and join the River Sobat in the plains. The mean annual outflow of the BAS sub-basin where the Sobat River joins the White Nile is estimated at around 12.6 billion m³ per annum and contributes to half of the White Nile flow at their confluence.

The sub-basin is almost pristine and home to one of the largest mammal migrations in the world, second only to that of the Serengeti. The potential to develop water resources is great, especially for hydropower in the highlands, irrigation and ecotourism. However, the rivers of the BAS sub-basin are currently almost not regulated and the water resources are barely developed. Food and energy insecurity are prevalent in many parts of the sub-basin and water related conflicts are commonly experienced. Many of the BAS's population of around 6 million people are highly vulnerable to floods and droughts and this is likely to be exacerbated by the potential impacts of climate change (increased temperature and more frequent extreme events).

The main aim of the BAS study is to put in place a sustainable water resources development plan to address these key issues, meet priority needs and promote economic development. The main challenge during the study was the lack of data (socio-economic, environmental, hydrological, etc.) which led to the formulation of many assumptions.

The project falls within the Integrated Development of the Eastern Nile (IDEN Project) being implemented by the Eastern Nile Technical Regional Office (ENTRO), one of the three centres of the Nile Basin Initiative (NBI).



Key study outputs

This briefing note presents the key results of the study, more particularly for the following:

- Integrated Water Resources Development and Management Plan (IWRDMP) for the sub-basin: The purpose of the plan is to promote socio-economic development in the basin through implementation of a certain number of projects. The Plan also includes a communication Strategy, Monitoring and Evaluation and a framework for adaptive management
- Strategic Social and Environmental Assessment (SSEA). The SSEA has guided the elaboration of the plan, it has screened the potential projects and assessed their cumulative impacts (environmental and social; positive and negative) to maximise benefits and minimise negative impacts of development in the basin. The main purpose of the SSEA is to inform strategic decisions at the river basin scale. The role of stakeholder consultation has been prominent throughout the process.
- Three feasibility studies aimed at fast-tracking priority short term projects:
 - i. The Kinyeti River multipurpose project (South Sudan)
 - ii. The Majang multipurpose project (Ethiopia)
 - iii. The Akobo-Gambella floodplains transboundary development programme (Ethiopia and South Sudan)
- Terms of references for feasibility studies and Environmental Impact Assessments for three larger (medium and long-term duration of implementation) projects.

THE SSEA...

Study approach

The Strategic Social and Environmental Assessment (SSEA) aims at integrating strategic environmental and social considerations into the preparation of the IWRDMP and has therefore been carried out in parallel with development of the IWRDMP. It can be seen as a tool to guide decision-making, while providing stakeholders and decision-makers with a preferred water resources development and management pathway for developing the IWRDMP and related recommendations.

Key findings

This assessment has reaffirmed that the BAS sub-basin is endowed with a powerful hydrological system¹, confirming the anticipated major and currently untapped potential for water resources development.

However, the analysis has also shown that this potential is not unlimited and that these developments are associated with a number of potential environmental and social risks. A high level of water resources development might indeed lead to competition between water uses and the various activities they support. For instance, the BAS sub-basin is home to globally significant wetlands. These sensitive ecosystems, rich in biodiversity are barely known due to the lack of data and assumptions were used to assess

the impact of development on these environments.

Because some projects are located in densely populated areas (eg. hydropower dams in the highlands) or because they involve considerable surface areas (eg. large-scale irrigation schemes in the lowlands), the development of water resources is associated with further environmental and social risks including displacement, loss of sources of subsistence means, reduction of wetlands areas, encroachment into environmental sensitive areas such as wildlife migration corridors, etc.

A range of development options were studied. It highlights the main positive & negative, social & environmental impacts for different components. For instance, hydropower production in the sub-basin ranges from 4,000 to 12,300 GWhrs/annum depending on the development pathway.

The results of the economic analysis are consistent with the findings of the SSEA, mainly showing that the maximum profitability from the societal point of view is reached through compromise approaches, which propose a significant development of the water resources of the BAS, while mitigating the main negative impacts via enhancement and mitigation measures.

particularly important as this remote area is not going to be connected to the national electric grid.

- Small scale irrigation and development of 220 ha for maize, sorghum, potatoes, soybeans, dry beans, avocados and vegetables.
- Aquaculture: an initial development of 20 ponds is proposed
- Watershed management: livelihood based watershed management activities are proposed such as bee keeping, reforestation and fruit production.

The Akobo-Gambella project

The Akobo-Gambella floodplains transboundary development programme has been designed to reduce extreme poverty and improve livelihoods in an area of the BAS sub-basin which is highly vulnerable (conflicts over the resources, food insecurity, no access to a safe source of water, etc.). This area of the sub-basin is shared between Ethiopia and South Sudan and currently receives humanitarian aid. The programme focuses on the transition between aid and development and is ready for implementation when the security situation allows.



Hydropower site

Programme overview

The Akobo-Gambella area is not easily accessible and there is currently no infrastructures (roads, electricity, etc.). The proposed programme is straightforward to implement and aimed at replication. It is articulated around solar pumping of groundwater and includes generic components such as potable water supply, sanitation, livestock watering, capture fisheries, aquaculture, small scale irrigation and capacity building. The implementation of the programme will include field work to select pilot areas, identify specific needs and refine these generic components.

Replicability

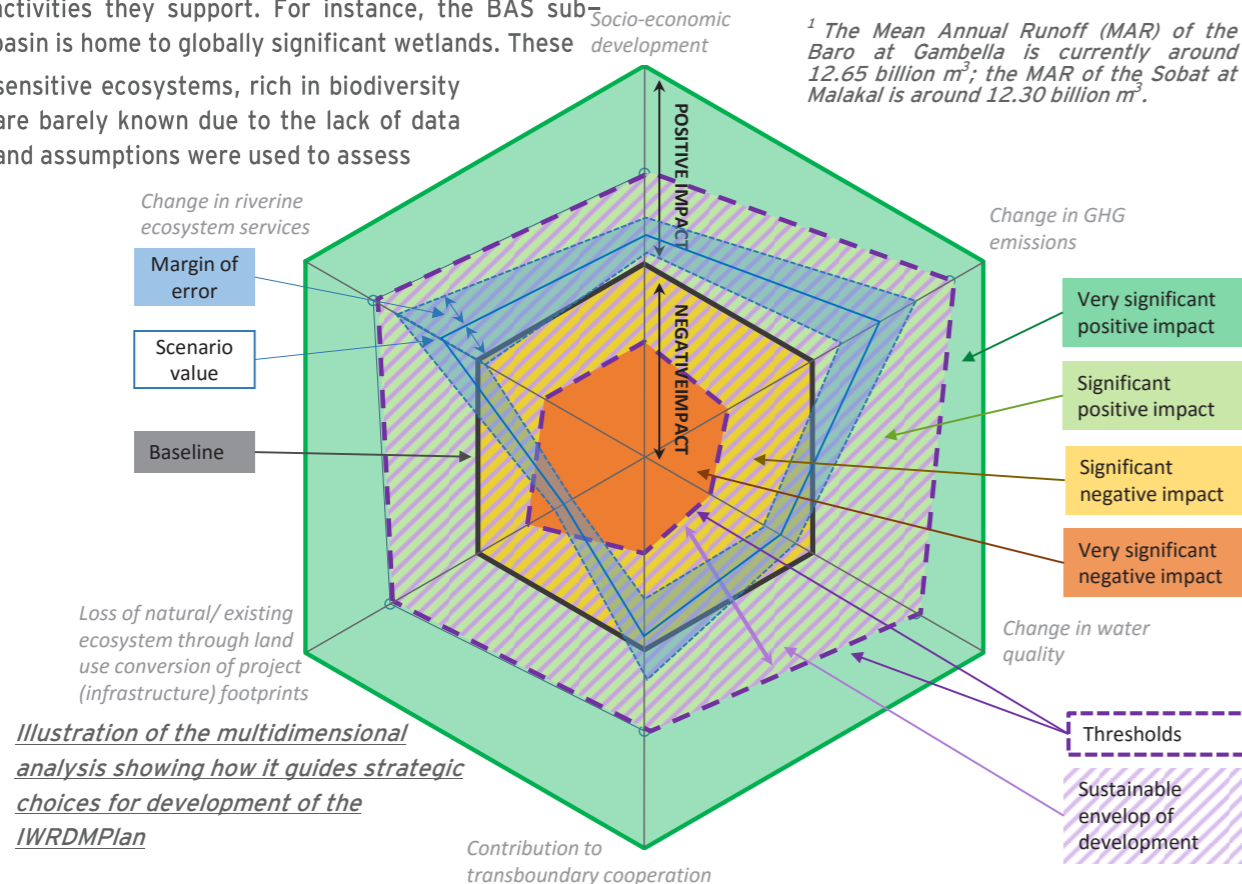
The proposed project can serve as an excellent demonstration of a multipurpose integrated water resources project applied at the small scale with direct and sustainable socio-economic and livelihood benefits for the communities. There are opportunities for replicability through experience sharing with neighbouring communities. There are opportunities to increase the economic feasibility of the proposed project through agro-processing and other value-added activities. It would also be possible to intensify aquaculture.

Costs estimates

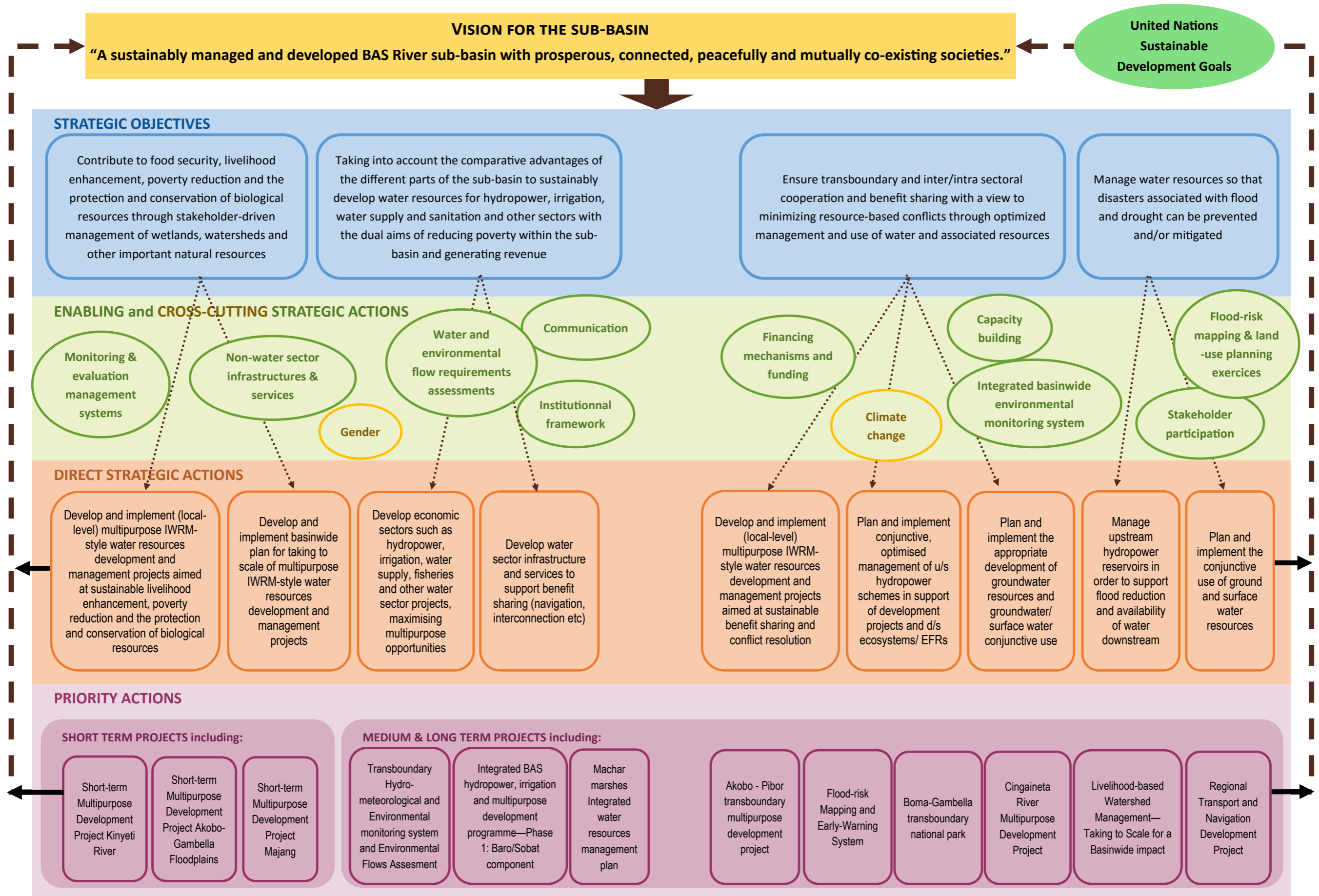
The cost for the demonstration project would be around 2.8 million USD and for all 4 sites around 11 million USD. As emphasized above, there is a great opportunity for further replication in many parts of the basin in both Ethiopia and South Sudan.

Costs estimate

A model was used to estimate the budget. A 250 m³ storage was envisaged with solar water pumping. This would allow to supply 1,000 people with potable water, develop 1 ha of vegetable gardening and depending on the situation, 20 ponds of aquaculture could be developed. With these components, a rapid estimate gives an investment cost of 110,000 to 170,000 USD for the main infrastructure plus around 20,000 to 30,000 USD for capacity building. The costs associated to consulting services will most probably be the major part of the budget. Economies of scale could thus be achieved by implementing the programme in a number of places simultaneously. This would also create the sort of critical mass required to attract trade and infrastructure to the area.



THE PLAN'S STRATEGIC FRAMEWORK AND PRIORITY ACTIONS



THE SHORT-TERM PROJECTS

... AND THE PLAN

Three feasibility studies have been carried out for implementation in the next couple of years.

The Kinyeti project

The Kinyeti River multipurpose development project is centred around the construction of a multipurpose dam and associated reservoir (with a full supply level of 45 million m³) in Eastern Equatoria State, South Sudan, upstream of Torit city. The dam would be the first major infrastructure in an area where food insecurity and conflicts over water resources are prevalent. The main objective of the project is to make water available all year long for key activities such as hydropower production, potable water and irrigation.



- Reliable access to water for the livestock should limit conflicts during the dry season.

Other positive externalities

- Creation of a favourable environment for the development of ecotourism. Torit is ideally surrounded by the Badingillo floodplains, Imatong Mountains and Kidepo game reserve and close to Juba.
- Reduction of gender inequalities as women will no longer have to collect water every day.
- Mitigation against the potential impacts of climate change. The reservoir will secure an access to water in case of drought events.

Costs estimates

The total cost of the project would be between 76 and 92 million USD (around 56 million for the multipurpose dam). This estimate takes into account significant contingencies as it is a pioneer project in this area.

The Majang project

The Majang multipurpose development project has been defined in accordance with the priority needs of Dunchaye Kebele, in Majang zone, Ethiopia. In this remote area, there is a need to improve food security and develop the economy particularly through access to the market. The project also includes extensive livelihood based watershed management activities to protect the remnant forests threatened by deforestation for charcoal making (the project is located within a biosphere reserve). While the detailed feasibility study has been carried out for a pilot demonstration project for the Dunchaye catchment, implementation of the project will be for Dunchaye and three other similar small catchments along the same principles.



Direct benefits

- Micro-hydropower generation with a production estimated to be around 1 GWhrs/annum. This is

Recommendations for the Plan

Given the magnitude of the anticipated impacts, as informed by the SSEA and financial and economic analyses, the level of uncertainty on which they are based and the consensus achieved during the stakeholder consultation process, a number of recommendations have been made for the finalisation of the IWRDM Plan including:

- Detailed design and implementation of a basin wide environmental monitoring programme to rapidly improve the understanding of the environmental and socio-economic functioning of the BAS sub-basin.
- Adoption of a phased and “precautionary” approach for implementation of the IWRDMPlan. For large-scale hydropower and irrigation, this principle means:
 - To further identify project characteristics, design and implementation modalities that maximize multipurpose and transboundary benefits and minimize social and environmental negative impacts;
 - To implement the IWRDM Plan starting with the projects and actions, which in spite of limited knowledge, are likely to have limited negative impact. This would include implementation of large-scale hydropower development on the Baro River and irrigation in both Ethiopia and South Sudan (made possible by the resulting flow regulation). Dam operation rules should be designed to reduce the impacts on riverine ecosystem services.
- Projects with potentially more negative impacts are included in the IWRDM Plan but without a timeline and indicated as “deferred” until the system is better understood.
- The IWRDM Plan should include obligatory enhancement measures as part of the project approval process including requirements for:
 - Hydropower to contribute to rural electrification and electrification of existing and new urban centres in the sub-basin;
 - Irrigation to ensure a balance between cash and food crops that supports local food security;
 - The training and hiring of local staff;
 - Upstream - Downstream benefit sharing at the national and transboundary levels
- The Plan should include strong coordination and institutional strengthening activities.

Even if the IWRDMPlan is properly implemented, the residual effects and risks are likely to be significant. A **tailored Environmental and Social**

Management Plan (ESMP) has therefore been designed to support the implementation of the IWRDMPlan and minimize and offset the residual effects and risks. It includes environmental and social management measures but also strong efforts towards data acquisition and monitoring activities to tackle the data paucity issue of the BAS. An **institutional capacity and strengthening plan** has been also designed to ensure that the relevant institutions will be able to implement, monitor and incrementally adjust the ESMP.



Group work – IWRDM Plan

Design and implementation of the IWRDM Plan

As illustrated overleaf, the purpose of the IWRDMPlan is to have an agreed tool for moving sustainable development forward in the BAS sub-basin. It is built on the same solid vision and strategic objectives as the SSEA so that the actions that comprise the IWRDMPlan will lead to the desired outcomes. As shown, the strategic actions, which are direct, enabling and cross-cutting in nature, are disaggregated into more specific actions and activities with associated timelines and responsibilities. This is essential if the Plan is to be immediately implementable.

The SSEA has clearly shown the importance of the transboundary approach to planning. The institutional design of the Plan requires that the same transboundary approach is taken into implementation. While the majority of activities are implemented at the national level, there are activities which require transboundary coordination and in some cases, implementation. ENTRO will have a role to play to contribute to the promotion of adaptive management. Adaptive management is critical to make use of the recommended monitoring and evaluation and adaptive management systems.



Dam location

Direct benefits

- Hydropower generation with a production estimated to be around 8 GWhrs/annum) could supply up to 80,000 people and significantly reduce the pressure on forest resources used extensively for charcoal making.
- Reliable access to water for Torit to supply up to 100,000 inhabitants (projection to 2041) and reduce waterborne diseases.
- Capture fisheries in the reservoir.
- Development of irrigation (initially 1,000 ha) and aquaculture (100 ponds of 200 m²) for food production and economic development.