South Sudan Investment Benefits from the Nile Basin Cooperation

Current and Future Investment Benefits in Numbers - Highlights

- 1,185.8 MW added to national grid
- 2,674 KM Transmission lines
- 4 sub-stations constructed: Renk, Bor, Malakal, Shukoli
- 48,717 HA Irrigated area

Mr. Lamin Barrow (L) the AER’s Resident Representative in Ethiopia and Dr. Prof. Ibrahim (R) Office in-charge of ENTRO, upon signing a USD 3.5 million Grant Agreement for Baro-Kerio-Sobat (BKS) Multi-purpose Water Resources Development Study Project in May 2022.
With only 5.1 per cent of people countrywide having access to electricity by 2020, 3 per cent of whom are in rural areas, South Sudan is evaluating ways to meet its power demand of 300 MW by way of renewable energy prospects. South Sudan has several major rivers, key among them are the River Sobat, River Jur, Bar el Jebel River, River Lol, River Kuru, River Pongo. All these major rivers are connected to the White Nile. Apart from the Sudd Wetlands, South Sudan has several other major wetlands including Bahr El Ghazal and Bahr El Jebel.

ENTRO was established in 1999 and comprises Egypt, Ethiopia, South Sudan and Sudan. ENTRO supports the countries in preparing cooperative water resources investment programs and projects, capacitating and strengthening institutions and providing secretariat support to its governance. The goal of ENTRO is sustainable socio-economic development through the equitable utilization of, and benefit from the common Eastern Nile Water resources. Since its establishment, ENTRO has played significant role in advancing and enhancing cooperation among the Eastern Nile Countries on water resource development and management. Eastern Nile though linked to and form one hydrologic unit of the entire Nile Basin, bears unique features, making a compelling case for the four countries to form ENSAP. These features include:

**Hydrology:** This sub-basin supplies over 86% of the Nile flow over a 3–4-month period, characterized by seasonal and inter-annual variability.

**Topography:** The cool, high, and rugged Ethiopian highlands offer huge hydropower generation and water saving potential.

**Environment:** Land degradation and environmental problems has resulted in huge sediment load in the Nile.

**Culture:** The four countries share common religions and intricate historical and cultural linkages.

**Demography:** The four countries make nearly two-thirds of the entire Nile Basin population.

**Geography:** The four countries are geographically interlinked making infrastructure interconnection—power, road, rail possible.

**Economy:** Owing to scale, the four countries could make foundation for a viable regional integration possibility.

NELSAP-CU was established in December 1999 by the Council of Ministers of Water Affairs in the Nile River Basin, with a mission to “contribute to the eradication of poverty, promote economic growth, and reverse environmental degradation in the Nile Equatorial Lakes (NEL) region, within the overall NBI’s shared Vision of sustainable socioeconomic development and the equitable use of and benefit from Nile Basin water resources". NELSAP-CU is governed and reports to the Council of Water Ministers from 10 Nile Basin membership states of Burundi, DR Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda. NELSAP-CU within its mandate facilitates jointly agreed transformative in-country projects with regional impact/significance and trans-boundary cooperative investment projects related to the common use of the Nile Basin water resources. NELSAP also builds regional capacity of countries and provides a platform for implementation and coordination of trans–boundary investment projects. NELSAP-CU also renders support to national initiatives and focuses on two investment areas of: (i) power development and trade; and (ii) water resources management and development.
The emergence of the Republic of South Sudan as an independent state in 2011 constituted a new development that ENTRO had to take into account in building and consolidating knowledge in the Eastern Nile. Formerly ENTRO dealt with only the EN sub-basin parts of South Sudan in its Cooperative Regional Assessments (CRAs) on Watershed Management, Irrigation and Drainage and EN Power Trade Investment Study. The BAS Sub-basin was also included in the One-System-Inventory of hydrology, environment and socio-economics of the Eastern Nile. Additionally ENTRO exerted efforts to mobilize resources and prepare the BAS Multipurpose Water Resources Development Project that was identified by the EN countries in 2002 but was stalled due to inaccessibility of project areas for data collection. These efforts promoted upstream work to augment the knowledge base on the BAS sub-basin (with AFD support) as well as approval of two grants by the African Development Bank (AFD and NEPAD-Infrastructure) to implement the first phase of the BAS Project. NBI has developed a world class analytic system, technical capacity and has accumulated wealth of knowledge that can be used to support South Sudan address its priority areas in water resources management.

NBI’s support to South Sudan is a win-win. First, it enhances the capacity of one of its member states and thereby contributes to sustainable water resources management in the Nile Basin. Second, it serves advancing the cooperation agenda as the benefits accrued to South Sudan strengthens the latter’s commitment and contribution to the Nile Basin cooperation. Lastly, supporting activities of NBI in South Sudan is value of money as it leverages NBI’s capacities and products on which considerable investments have already been made through the various programs implemented to date.

**INCLUSION OF THE REPUBLIC OF SOUTH SUDAN INTO ENSAP:**

**SUMMARY OF SOUTH SUDAN PIPELINE PROJECTS**

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The Nyimur/Limur Multipurpose Water Resources Development Project, is being prepared under the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) regional framework. The NELSAP , a cooperative investment program within Nile Basin Initiative (NBI), was established to facilitate the identification, preparation and resource mobilization for cooperative investment projects at a sub-basin level within the framework of the NBI. The Nyimur/Limur Project for which the feasibility studies and detailed designs are being undertaken is one of the three prioritized projects selected by the two countries of South Sudan and Uganda to carry forward in the Aswa Basin.

The Limur/Nyimur Multipurpose Project is going to supply water for irrigation of 1,830 ha. benefiting 12,000 people and 6,000 livestock and include 14,300 ha of Sustainable Land use Management.

There is an opportunity for HP 410kW (1.4GWh) and 800kW (2.4GWh) at the two sites. Total investment costs would be USD 3.8m. The Irrigation Revenue (US$) is 4,514,400. The project will sustainably improve the living conditions and incomes of rural populations in the proposed irrigation scheme and the surrounding watersheds. The project comprises two community-based irrigation schemes, one in Uganda and one in South Sudan. The Nyimur / Limur project has an overall Internal Rate of Return (IRR) of 8% and Net Present Value (NPV) of 89.9 million USD(m USD). Its Estimated Net Direct Benefit will be USD 48 million.

The Nyimur/Limur Multipurpose Water Resources Project (MPP) to Benefit 12,000 People and Irrigate 14,300 Ha

The project is designed to effect a permanent separation between the irrigation modules and cattle in a form of a protection zone (the “cordon sanitaire”) 500m wide that engulfs all irrigation modules and includes watering points for cattle in the periphery.

The project will enhance the regions ability to adapt to potential impacts of climate change by providing enhanced resiliency measures in the way of additional water resources and supply, food security through irrigation, and flood and drought management (aided by the construction of 2 dams). Climate change was specifically included in the detailed design of the dams.

During the previous studies, Feasibility, Detailed Design and tender documents has been done, including Integrated Management and Development Plans including investment projects, ESIA, economic and financial study.

The project adheres with international best practice, including NBI/NELSAP policies/guidelines and African Development Bank (AfDB) safeguards.

The Limur/Nyimur project was developed through a consultative process that involved the line ministries in both Uganda and South Sudan, and local government officials at Districts and Sub-County levels. The Project adheres with international best practice, including NBI/NELSAP policies/guidelines and African Development Bank (AfDB) safeguards.
to the planned interconnections to Uganda-Ethiopia and the Sudan as well as internal backbone transmission lines within South Sudan forming part of the Western arm of the North-South electricity super highway.

The proposed 400kV AC Over Head Transmission Line between Nimule (which is at the Uganda/South Sudan Border) and Juba in South Sudan is an important additional network to facilitate regional integration of electricity networks and facilitate power trade. This transmission line will finally connect to Olwiyo substation in Northern Uganda (which is already on-going under the initiative of the Uganda Government). The proposed transmission line is estimated to cover a distance of 170 km.

The ultimate goal of the project is regional integration by improving the livelihood of the people as well as the quality of the socioeconomic development environment for South Sudan through increased availability and affordability of electricity supply. Outputs of the preparatory activities would enable the NELSAP and the South Sudan to take the necessary steps to have the transmission line constructed.

The Project is not only an in-country project, but will form part of a transmission interconnector for a number of countries and also because of the numerous generation projects planned for development by South Sudan. This interconnector will evacuate approximately 2 GW of hydropower potential from four potential dam sites along the Nile; i.e Bedden (570MW), Grand Fula (1080MW), Lakki (420MW) and Shakoli (240MW) to other states of South Sudan and in the NBI and EAPP countries through various interconnections. Once developed, these generation projects will see more power being wheeled through the transmission network.

This project increase the productivity of the fisheries sub-sector through promotion of sustainable management of fisheries, water resources, and the ecosystems surrounding the Jebel Aulia Dam. Jebel Aulia Dam and Renk project has an overall Internal Rate of Return (IRR) of 637% and Net Present Value (NPV) of 3081.5 million USD(m USD). Its Estimated Net Direct Benefit will be USD 8,000 million.

This project increase the productivity of the fisheries sub-sector through promotion of sustainable management of fisheries, water resources, and the ecosystems surrounding the Jebel Aulia Dam. This will also enhance pro-poor macroeconomic growth for poverty and food insecurity reduction. that ca. 2 million in the vicinity of the White Nile River from Malakal and Renk (in South Sudan) to the Jebel Aulia Dam near Khartoum in Sudan could potentially benefit from this project.

The impacts of climate change will affect and change the industries of fisheries and aquaculture, and therefore affect food security and livelihoods in the Region. With the adoption of an ecosystem approach to fisheries, the project can be used to address the impacts of climate change on fisheries.

Key features of this approach include maintaining ecosystem integrity while improving human well-being and equity and promoting enabling governance.

Three objectives that must be at the core of the approach are: ensuring ecological well-being, ensuring human well-being, and ensuring the ability to achieve (governance and external factors).

Concept Note developed, Feasibility, preliminary designs reports complete.

The Project will result in:

- Establishment of a knowledge base to enable a good, science-based, understanding of the situation of fisheries in the Jebel Aulia Reservoir
- Development the Reservoir/Lake Management Plan
- Fisheries Management Plan
- Integrated Capacity Building and Stakeholders’ participation Plans
- Scoping of investments (project profiles) to facilitate decision making by both the public and private sector
- A joint fisheries and water management framework put in place, and
- Pilot identified project profiles implemented.
The Parajok Water Resources Development Project will result in a 520 Mm³ dam, 10MW electricity, 21,800ha of irrigation, and up to 36,000m³/d water. By which will benefit 135,000 South Sudan peoples from Acholi State. USD 3m has been included in NEL-IP for studies. A preliminary estimate for implementation is USD 41.6m.

The Parajok MPP Water Resources Development will enhance the regions ability to adapt to potential impacts of climate change by providing enhanced resiliency measures in the way of additional water resources and supply, power generation, and food security through irrigation, flood and drought management project has an overall Internal Rate of Return (IRR) of 39% and Net Present Value (NPV) of 148.2 million USD(m USD). Its Estimated Net Direct Benefit will be USD 576.7 million.

**Financing Requested and Economic viability**
The area is located along Aswa or Achwa River, which is a tributary of the Nile, originating in North Eastern Uganda and joining the Nile a short distance downstream of Nimule in South Sudan. The Aswa basin covers just over 31 thousand square kilometres in Northern, Eastern and North-eastern Uganda and in the Magwi county of Easter Equatoria state of South Sudan

The next step for the project is Feasibility, ESIA & RAP, detailed design and Implementation.

Parajok is, as designed at this stage, profitable only with a rather high unit price of electricity of 0.15 USD/kWh. However, the project and particularly the dam have been conservatively sized due to the complete absence of discharge data and the desirability to achieve high reliability of power production due to the absence of other power sources. If, following some discharge data collection and rainfall-runoff model fitting, it becomes apparent that the head dam could be smaller; the breakeven unit price for electricity would reduce.

**Background, Expected Results / Outputs**
From 2012 reports
- Reservoir storage capacity – 25 MCM
- Hydropower installed capacity – 6 MW
- Energy generation – 33 GWh/year
- Irrigated area – 565 ha

From NELSAP spreadsheet
- Reservoir storage capacity – 520 MCM
- Hydropower installed capacity – 10 MW
- Energy generation – 88 GWh/year
- Irrigated area – 21,800 ha

**Project Summary**
- Problem Definition:
- Previous studies: Pre-Feasibility
- The next step: Feasibility, ESIA & RAP, detailed design and Implementation
- Countries: Uganda, South Sudan
- Priority: Very high national priority
- Anticipated beneficiaries: 135,000, mainly Acholi state

Preliminary estimates of revenue:
- HP revenue 13,149,000
- Irrigation Revenue 23,544,000

Parajok is, as designed at this stage, profitable only with a rather high unit price of electricity of 0.15 USD/kWh.
NEL-IP Projects in the Pipeline with Direct Benefits to South Sudan

**ETHIOPIA - SOUTHERN SUDAN INTERCONNECTION LINE PROJECT (PHASE 2: DEDESA-TEPI-JUBA)**

The Ethiopia - South Sudan (Dedesa-Tepi-Juba) power Transmission Line will benefit 350,000 people. The project has an overall Internal Rate of Return (IRR) of 12% and Net Present Value (NPV) of 56.8 million USD. Its Estimated Net Direct Benefit will be USD 1,400 million.

The Dedesa-Tepi-Juba project is a 700km 400KV/500HVDC transmission line from Ethiopia to South Sudan. It is anticipated that with a connection between Ethiopia, South Sudan, and on to Uganda, ultimately five or more countries could be supplied with electricity from Ethiopia. This project is at identification stage, and NELSAP proposes to conduct studies on the same. The project is a high national priority for South Sudan. The project has been identified by the countries in their development plans as well as NELSAP through the Hydropower Expansion Plan and Regional Integration Plan of South Sudan into Regional Grid (2015).

For this phase of NEL-IP, NELSAP is mobilizing resources to conduct Feasibility Studies (USD 3m) to determine and confirm its feasibility / viability. Depending on outcome of this feasibility, detailed design, Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) studies (ESIA & RAP), tender documents and construction could potentially follow in future phases if the project is feasible.

**Importance:** The project will bring much needed power to unserved areas and communities in and around Juba and Malakal in South Sudan.

**Current status:** The project has been identified by the countries in their development plans as well as NELSAP through the Hydropower Expansion Plan and Regional Integration Plan of South Sudan into Regional Grid (2015).

**Countries:** Ethiopia and Southern Sudan

**Anticipated beneficiaries:** 350 000 people in Tepi, Juba and surrounding areas will benefit from 88 MW.

**Time frame:** 2 years for studies

**Regional Importance:** With power connection between Ethiopia and South Sudan, and South Sudan and Uganda, electricity could reach more than five NEL countries.

**Pre-investment costs:** USD 3m over 2 years for feasibility studies, detailed design, independent ESIA and RAP studies.

**Estimated implementation costs:** USD 420m (2016 preliminary estimate to be refined in feasibility studies).
Baro-Akobo-Sobat Multipurpose Study Project
Small scale farmers and pastoralists in the Baro-Akobo-Sobat sub basin and Ethiopia in general will also benefit from the completed Baro-Akobo-Sobat Multipurpose Study Project which identified short-, medium- and long-term projects e.g. Akobo-Gambella, Kinyeti, Majang projects. These projects have been identified based on a Strategic Social and Environmental Assessment, which will balance conservation of the relatively pristine environment of the sub-basin with the effort to address poverty and deprivation. Other projects include hydropower generation for implementation in South Sudan and Ethiopia.

This pertains to studies on dam safety and coordinated operation of dam cascades in the Eastern Nile. These studies are critical for ensuring the safe and optimal operation of large dams (>15 meters height or >3 million cubic meters storage capacity) located across stretches of the Eastern Nile in the three countries. Ethiopia will also benefit from implementing the dam safety guidelines and the recommendations from the Eastern Nile Coordinated Operation of Dams Cascade Study. This study is critical for safe, efficient, and synergized management of water infrastructure in Ethiopia and across Sudan and Egypt. The country will also benefit from domesticating the wide range of NBI policies and guidelines, particularly those with transboundary implications. Other initiatives that have been conducted include capacity building of dam operators under the auspices of ENTRO and NELSAP.