

## Roseires Dam, Sudan, North Africa



Original Roseires Dam



Roseires Dam 2013

### History of the Nile:

The Nile is famous as the longest river in Africa, as well as in the world. The River Nile is about 6,670 KM (4,160 miles) in length. The Nile and its tributaries flow through 10 distinct African nations: Egypt (22% of the flow), Sudan, Burundi, Ethiopia, Democratic Republic of Congo (formerly Zaire), Kenya, Uganda, Rwanda, Eritrea, and Tanzania.

The Nile got its name from the Greek word, Neilos, which means valley. The vast river system of the Nile includes two main tributaries: the White Nile (so named for its milky, silt-filled appearance), and the Blue Nile, which joins the White Nile in Sudan on its way to the sea. The source of the White Nile is the springs of Mount Biguguin Rwanda. The source of the Blue Nile is Sakala Springs above Lake Tana in Ethiopia, which contributes to more than 50 percent of the river's flow. The Nile floods the lands in Egypt, leaving behind black sediment, especially during the monsoon season, from July to September. The Nile flows from south to north. Its average discharge is 3.1 million liters (680,000 gallons) per second.

### Roseires Dam:

The first dams were built on the Nile in 1861 in order to raise the river levels for easier navigation and increased irrigation. Major dams on the Nile today include Aswan Dam, Roseries Dam, Sennar Dam and Owen Falls Dam.

The Roseires Dam, also called Rosseiris Dam, is on the Blue Nile at Ad Damazin, just upstream of the town of Er Roseires, in Sudan. The original dam, built in 1966 for irrigation purposes, consists of a concrete buttress dam 1 km wide with a maximum height of 68M, and an earth dam on either side. The earth dam on the eastern bank is 4km long, and that on the western bank is 8.5 km long. The reservoir is about 290 km<sup>2</sup>.

In 1971, a power generation plant, with a maximum capacity of 280 megawatts, was added.

A heightening and expansion of the Roseires Dam was completed in January, 2013. The project added 10 m in height and 12km in length to the existing dam, increasing its storage capacity to 7.4 billion cubic meters. The power supply capability of the dam increased by 50% to 1800MW, ensuring power supply to several Sudanese states which previously experienced frequent power outages. The project was Arab-funded and Chinese built, cost \$460 million, and will help boost agricultural production for the area. The Al-Roseires Dam now reaches 25 km long.

The dam re-opened during a turbulent time in Africa. The dam is hopeful of developing one of the country's poorest regions where insurgents are fighting the government since September 2011. The dam is a major power generator for the economy, since South Sudan separated last year with the most of the country's oil production. Sudan opened the \$2 billion Merowe dam north of Khartoum in 2009, and is also building the connected Atbara and Seteet hydroelectric projects in Gedaref and Kassala states.



**Republic of Sudan**  
**Heightening of Roseires Dam**  
**(Phase II)**

<b>Loan No.:</b>	521	<b>Interest Rate:</b>	3.0%
<b>Beneficiary:</b>	Ministry of Irrigation and Water Resources, and National Electricity Corporation	<b>Grace Period:</b>	6 years
<b>Project Cost:</b>	KD 142.3 million	<b>Maturity:</b>	25 years
<b>Amount of Loan:</b>	KD 58.0 million	<b>Repayment:</b>	39 semi-annual installments
<b>Date of Loan Agreement:</b>	06/01/2008	<b>First Installment:</b>	6 years following the first disbursement
<b>Date of Effectiveness:</b>	08/04/2008		

**Objectives:**

The project aims at improving the regulation of the Blue Nile River water through the increase of the storage capacity of the Roseires dam by approximately 4.4 billion m<sup>3</sup>, and using the additional water to intensify agriculture in 4 million acres (1.7 million hectares) of irrigated land from Roseires and Sennar dams, as well as increasing annual hydropower production by 565 GWH.

**Description:**

The project, which is expected to be completed during the first quarter of 2012, consists of heightening the existing Roseires dam by 10 m to raise the reservoir normal water level from 480 to 490 m above sea level, and to increase the crest length of the dam from 13.5 to 25 km, in order to increase the design storage capacity of the dam from 3 billion m<sup>3</sup> to 7.4 billion m<sup>3</sup>. The dam heightening includes the following major works:

1. **Civil Works:** This includes the following:
  1. **Heightening of Concrete Dam:** This includes concrete works and all complementary works to raise the concrete dam crest by constructing a 4 m wide and 10 m high gravity wall to increase the height of the concrete dam from 68 to 78 m, as well as heightening the concrete buttresses and increasing their length by 7 meter and their thickness from 3 to 5 m.

2. **Complete Heightening of Fill Dam:** This includes excavation, fill, and all complementary works necessary to raise approximately 4 km of the right fill dam by 10 m, and increasing its length by 4.5 km. It also includes heightening of approximately 8.5 km of the left fill dam by 10 m and increasing its length by 7 km. The total length of the fill dam crest, after heightening, will be 24 km and its width 7 to 10 m.
2. **Hydro-Mechanical and Electrical Works:** This includes all works necessary for rehabilitation of control, emergency gates as well as cranes and hydraulic hoists in the water control structures located within the dam. It also includes rehabilitation and relocation of all hydraulic equipment for the operation of the gates from its present location to the new location after heightening the dam, as well as the rehabilitation of the deep sluices along with all complementary electrical works.
3. **Technical Services:** This includes the consultancy services required to review previous studies and designs, and to assist in prequalification of contractors and bidding of construction tenders, as well as construction supervision.
4. **Land Expropriation and Resettlement:** This includes land acquisition, compensation for properties, and resettlement of the inhabitants affected by the project.
5. **Project Management:** This includes the establishment of a project management unit, within the Dams Implementation Unit, which will administer the implementation of the project.

### **Financing:**

The Arab Fund's loan covers about 40.8% of the total project cost. The Islamic Development Bank, the OPEC Fund for International Development, the Abu Dhabi Fund for Development and the Saudi Fund for Development will contribute to the financing of the project with loans equivalent to KD 21.6 million, KD 8.1 million, KD 6.8 million and KD 10.8 million, respectively. The Kuwait Fund for Arab Economic Development will provide a loan of KD 15.0 million. The Government of Sudan will cover the remaining cost of the project and any additional cost that may arise.

## **Egypt's "Project X" Hydropower Dam**

By Haydar Yousif, A Sudanese hydrologist who has worked for 35 years on water issues on the Nile.

Without greater oversight, Ethiopia's secretive new dam could have disastrous environmental, social and political impacts. While Egypt was undergoing dramatic political changes last year, Ethiopia was secretly moving to unveil "Project X" – a huge hydropower dam it intends to build on the Blue Nile, 40 km from the Sudanese border.

Political commentators, environmental experts and hydrologists have all voiced concerns about the dam's ecological impact, the strain it might place on relations between the three eastern Nile nations, and the financial burden of this mega-dam on Ethiopian citizens.

Now renamed the Grand Ethiopian Renaissance Dam, the project (due for completion by 2015) is set to become the largest hydroelectric power plant in Africa.

The scale of the project is staggering: the plant will be capable of producing almost double the electricity of Aswan High Dam in Egypt, while its 63 billion cubic metre (bcm) reservoir is double the size of Ethiopia's largest natural lake.

Crucially for Ethiopia's Nile neighbours, the filling of this huge reservoir is also likely to greatly reduce the flow of water to Egypt and Sudan for several years, and could even permanently alter the amount of water those countries are able to draw from the river.

### **Details trickling through**

The planning and implementation of this project has all been decided behind closed doors. Its \$4.8 billion contract was awarded without competitive bidding, for example, to Salini Costruttori, an Italian firm favoured by the ruling party; Salini is also building the controversial Gibe III Dam on Ethiopia's Omo River.

Furthermore, the nature of the project was kept under wraps until after site preparation had already begun, to the great surprise of regional governments, Nile planning agencies, and Ethiopia's Western donors. It was especially shocking to Norwegian agencies who were working with the Ethiopian government on a similar project for the same stretch of the Nile, now made obsolete by the Renaissance Dam.

This level of official opacity has worryingly prevailed beyond the initial announcement of the project. Expert analysis that would normally accompany such a titanic project has either not been undertaken or kept characteristically secret.

No environmental assessment is publicly available for the project. And no steps were taken before its launch to openly discuss the dam's impacts with downstream Nile neighbours Egypt and Sudan.

### **Do the environmental and social plans hold water?**

The consequences for Ethiopia's downstream neighbours could potentially be catastrophic. The

Renaissance Dam's reservoir will hold back nearly one and a half times the average annual flow of the Blue Nile.

Filling the reservoir – which could take 3 to 5 years – will drastically affect the downstream nations' agriculture, electricity and water supply. Evaporative losses from the dam's reservoir could be as much as 3 billion cubic metres per year.

The dam will also retain silt. The Ethiopian government argues that this will be a net positive as it will increase the lifetime of other dams downstream, particularly in Sudan where, for example, the Roseires Dam has been nearly incapacitated by sedimentation. But what about the life expectancy of the Renaissance Dam itself? This is a serious issue for the dam's viability, and there are no known plans for watershed management or soil conservation to address it.

In addition, the retention of silt by the dam reservoir will dramatically reduce the fertility of soils downstream. Sediment-free water released from dams also increases erosion downstream, which can lead to riverbed deepening and a reduction in groundwater recharge. Some have predicted even more calamitous consequences of the dam's construction.

The Grand Renaissance Dam site is in the Great African Rift Valley near the Afar Depression, an area in which tectonic turmoil is so great it could, according to some accounts, eventually tear the continent in two.

The dam could be at risk from damage by earthquakes, yet no one knows if it has even been analysed for this risk, or the largest earthquake it is being designed to withstand. The failure of such a huge structure puts the more than 100 million people living downstream at risk.

On top of that risk is that of 'reservoir induced seismicity'. A dam with a reservoir as large as this is not just vulnerable to seismic events – it can cause them.

Scientists believe that there have been more than 100 instances on six continents of large reservoirs inducing earthquakes. The most serious to date was China's devastating magnitude 7.9 earthquake in 2008, which some experts believe was induced by Zipingpu Dam.

### **Holding back the tide of criticism**

However, some of the most pressing concerns regarding the dam's construction are political. Although its timing coincided with Egypt's political upheaval, the sudden unveiling of the project nevertheless resulted in an outcry. Egypt's primary fears are a reduction of its main water supply from the Nile, and diminished nutrients and sediment essential for agriculture.

Towards the end of the late Prime Minister Meles Zenawi's rule, Ethiopia adopted a more aggressive stance over the Nile, moving swiftly to build a number of large hydropower dams. However, tension in the region regarding control of the Nile waters has not all be centred on Ethiopia.

In May 2010, five upstream Nile states (Ethiopia, Kenya, Uganda, Rwanda and Tanzania) signed a Cooperative Framework Agreement (CFA) to access more water from the Nile. The move was strongly

opposed by Egypt, which brandished a colonial-era treaty from 1929 asserting its exclusive rights to the Nile's water supply.

With the Renaissance Dam, these tensions seemed to be coming to a head. Following its announcement in March 2011, Egyptian authorities were quick to lobby international support and strongly hinted that a military response was not deemed disproportionate to protect such a vital resource. Indeed, Wikileaks recently released documents detailing a planned Egyptian attack on the dam from Sudan.

However, attitudes appear to have since softened, and dialogue was opened last month between Egypt, Ethiopia and Sudan. In a bid to allay Egypt's wrath, the Ethiopian government proposed an International Panel of Experts (IPoE) to review and assess the dam's impacts on downstream neighbours.

The panel of ten consists of two members from each of the three countries eastern Nile countries, plus four international experts. Their names have not been released and their meetings are behind closed doors, but they are expected to announce their findings four months from now.

This seems to have placated Ethiopia's neighbours for now. Egypt has toned down its opposition to the dam, while President Omar al-Bashir of Sudan has even pledged Sudanese support for the project.

Yet whatever the IPoE's findings, the Ethiopian government seems adamant the dam will continue. In September 2012, the Ethiopian Ministry of Foreign Affairs declared that Ethiopia would never halt or slow the construction of the dam due to external pressure, calling into question the significance of the panel. Needless to say, many in Sudan and Egypt still have serious concerns about the project.

Whatever the outcome of political arbitration, it remains irresponsible for Ethiopia to build Africa's biggest hydropower project, on its most contentious river, with no public access to critical information about the dam's impacts – a flawed process which can hardly result in a sustainable project.

If the Ethiopian government is serious about maintaining good relations with its Nile neighbours, and if it truly wishes to develop projects that will carry its people and the broader region into prosperity, it must begin by allowing some light to penetrate this secretive development scheme.

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