

Strategic Analysis Paper

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The Grand Ethiopian Renaissance Dam: Power for Ethiopia, Disaster for Egypt?

Mervyn Piesse

Research Manager

Global Food and Water Crises Research Programme

Key Points

- The Grand Ethiopian Renaissance Dam (GERD) is an integral part of the Ethiopian economic and political development strategy. It is hoped that it will provide much needed electricity for industrial development and give the country greater control over the flow of the Nile.
- Despite Cairo's concerns regarding the dam, water flow in the Nile River is likely to become increasingly erratic and Egypt will become increasingly reliant on overseas food markets regardless of the GERD.
- The electricity generating potential of the GERD is unlikely to live up to the lofty claims originally presented by the Ethiopian Government. It is also unlikely to threaten Egypt to the extent that its government initially feared and could even help to augment the flow of the Nile in dry years.
- There has been a shift away from outright threats of sabotage and towards conciliatory negotiation since construction began in 2011. The likelihood of a "water war" occurring as a result of the GERD is very low.

Summary

Ethiopia seeks to diversify its economy away from agriculture, which was the mainstay of its economy only a decade ago. It has pursued a state-led development model that combines public investment in infrastructure and education with foreign aid and investment. Meles Zenawi, the Prime Minister from 1995 until his death in 2012, hoped to follow the success of the "Asian Tigers", which followed a similar developmental framework. Over the past

decade agriculture's share of the economy has fallen to [below 40 per cent](#), but farmers and agricultural workers still make up about 75 per cent of the labour force. It is hoped that the hydropower potential of the Nile River will generate sufficient electricity capacity to power industry and create new, non-agricultural jobs. That developmental strategy has raised water security fears in Egypt, which relies almost entirely on the Nile. While Egypt faces considerable food and water security challenges that could be exacerbated in the near future, it is unlikely that the dam will be primarily responsible for those difficulties and it is possible that it could actually help to increase water flow during dry years.

Analysis

The Grand Ethiopian Renaissance Dam is a major component of Ethiopia's economic diversification plan. Once the construction of the dam is complete in [2022](#) (after a series of delays linked to political uncertainty and [allegations of corruption](#) in the military-run conglomerate that was the lead domestic contractor), it will be the largest dam in Africa; capable of generating up to 6.4 gigawatts of electricity. Ethiopia hopes that the additional electricity capacity will help to spur further economic development and allow it to export more to neighbouring countries to increase its foreign exchange earnings. There is a major shortage of electricity generating capacity in the country - it recently [announced](#) that it would reduce electricity exports to Djibouti and suspend export to Sudan due to lower electricity generation. That shortage is partly caused by a reliance on hydroelectricity, a lack of diversification that Addis Ababa would like to address in the future. For now, however, it is more focused on harnessing the untapped power of the Nile, which it has historically been discouraged from doing.



Source: Stratfor.com

The GERD is a source of tension with Egypt, which is concerned that it could reduce the flow of water downstream. With 98 per cent of its population living in the Nile Valley and Delta and 90 per cent of its water supply coming from the Nile River, Egypt is vulnerable to any changes in the water flow upstream. Other sources of water, such as rainfall or groundwater, are limited. Its groundwater reserves are estimated to total [5.5 billion cubic metres](#) and are slow to replenish. Annual rainfall in Cairo is around 25 millimetres per year; while the Mediterranean coast can receive up to 200mm annually, most of the country receives negligible rainfall. Agriculture consumes approximately 80 per cent of the water in country making it particularly vulnerable to changes in the flow of the Nile.

The Sudanese agricultural sector is less reliant on the Nile – only [20 per cent](#) of its agricultural land is watered by the river. Sudan has built a series of dams on the Nile and its tributaries, beginning with the Roseires Dam in the 1960s. The Roseires Dam became operational in 1966 and was originally designed to provide irrigation water to [millions of acres of desert](#). It was later expanded to generate hydroelectricity for use within Sudan. A second dam, the Merowe, was built in 2009 to generate 1,250 megawatts of hydroelectricity. Its reservoir is able to hold 12.5 cubic kilometres of water, equal to about 20 per cent of the Nile’s annual flow. As Sudan does not impound more water than allowed under the 1959 Nile Water Agreement (it only uses about 12 billion cubic metres of the 18 billion cubic metres, to which it is entitled, annually), there is no complaint from Egypt.

Grand Ethiopian Renaissance Dam



Source: World Bank

The GERD is much larger than those dams, however, and will hold back a much larger volume of the Nile's water. It is anticipated that its reservoir will be capable of storing up to 74 billion cubic metres of water, which is equal to almost twice the average annual flow of the Nile at the Sudanese-Egyptian border. Cairo believes that the biggest threat to its water security will occur during the filling of the reservoir, when some of its share of the Nile's water will be impounded behind the dam.

While the GERD could further weaken food and water security in Egypt, it already faces considerable food and water challenges that are only partly related to the development of infrastructure further upstream. With limited agricultural land and water resources, Egypt will never be self-sufficient in grains or animal proteins, and climate change and population growth will only exacerbate demand for those commodities. Water flow in the Nile River is expected to [become more variable](#) over the course of the 21st Century, regardless of infrastructure development on the Nile. The annual flow of the river could increase by up to 15 per cent by 2050, but it is also equally likely that rainfall will become more erratic from year to year due to stronger La Niña and El Niño cycles. Overall, however, climatic trends suggest that the region is likely to become hotter and drier.

Increased rainfall variability in the Nile river basin could also present a risk to the operation of the dam itself. The GERD is only likely to be able to operate at peak capacity during the few months of the year when rainfall is highest in the Ethiopian highlands. It is likely that the plant will only reach its maximum generating capacity [28 per cent of the time](#) – which is relatively low compared to other hydropower plants and is inappropriate for meeting Ethiopian electricity demand. Lower rainfall will only serve to further reduce the efficiency of the plant, a problem that is [already occurring](#) at many Ethiopian hydropower facilities.

The per capita share of water in Egypt has declined to 570 cubic metres per year, below the international standard of 1,000 cubic metres per year. Cairo has begun to take steps to reduce its water use and reform its water sector in an attempt to rectify that situation. A number of steps were taken in 2018 to [reduce domestic rice production](#) and reduce the amount of water withdrawn from the Nile. The [National Water Resources Plan](#), which was adopted in 2017, outlines a series of water projects that could be implemented over the next 20 years. Desalination plants, wastewater recycling and increased groundwater use are presented as possible means to increase the water supply. Reducing water consumption by using more efficient agricultural equipment and adopting water saving industrial processes is also part of the plan.

Those adjustments to the water sector are unlikely to reverse the Egyptian food trade balance. The country already imports around [60 per cent](#) of its food needs and is one of the world's largest importers of wheat (between 2008 and 2017 it was the largest importer of wheat although [Indonesia surpassed it in 2018](#)). It is likely that its demand for food imports will continue to rise, regardless of any infrastructure development on the Nile.

Arguably, Egypt is also concerned about its political standing in the region. Historically, Cairo effectively had sole control over the flow of the Nile thanks to two colonial era treaties. The 1929 Nile Water Agreement was signed by Egypt and Great Britain. The agreement granted Egypt an annual water allocation of 48 billion cubic metres and Sudan four billion cubic

metres out of an estimated average annual flow of 84 billion cubic metres. Most importantly, it also gave Cairo veto power over construction projects on the Nile and its tributaries.

Following Sudanese independence in 1956, the allocation and control of water from the Nile was divided between Egypt and Sudan by the 1959 Nile Water Agreement. That agreement increased water allocations to both countries, but left the other conditions of the 1929 agreement unchanged. Other countries in the Nile River basin, including Ethiopia, Kenya, Rwanda, Tanzania, Burundi and Uganda, argued that the agreement was unfair as it did not take their interests into account and gave them no say in the allocation of water. Political leaders in those countries argued that the Nile Water Agreements unfairly subjected their national development plans to the mercy of Egypt.

Those six countries signed the Entebbe Treaty in 2011, which effectively allowed them to construct dams and other projects without Egypt's permission. Addis Ababa was instrumental in securing water rights for the upper riparians, leading some analysts to [suggest](#) that it aims to become the hegemon in the horn of Africa through the integration of the Nile basin through energy and water infrastructure. Those hegemonic ambitions will be difficult to realise, however, as Prime Minister Abiy Ahmed's recent attempt to [act as a mediator in Sudan](#) (which was of questionable utility) demonstrates. Ethiopia also has its own internal difficulties (such as [widespread ethnic discord](#)) that are likely to militate against the reforms pursued by Abiy.

There are potential benefits that could be realised by the construction of the GERD. The Nile carries a lot of sediment along its course, which has to be regularly cleared from irrigation canals. The construction of the Aswan High Dam reduced sedimentation in the Egyptian Nile by more than [90 per cent](#). The GERD could also help to reduce the flow of sediment in the lower riparian countries of the Nile. Of course, canals still need to be de-silted every few years and the sediment trapped behind dam walls will eventually need to be removed. That is, however, a less time consuming task than clearing irrigation canals every few months. More dams could also help to stabilise the amount of water available to communities along the length of the Nile. As the evaporation rate is lower in the highlands of Ethiopia than in Egypt, the amount of water lost from the GERD will be lower than that lost from the Aswan Dam. It is unclear whether the GERD will be best placed to stabilise water flows in the Nile, given that it is designed primarily to generate electricity and not store water. Its turbines will require a large throughput of water if they are to operate anywhere near capacity, however, and it is unlikely that the flow of water will be seriously curtailed.

Egypt refused to rule out sabotaging any Ethiopian efforts to construct a dam, there have been several meetings and considerable diplomatic progress on various issues since construction began in 2011. Cairo is resigned to the fact that the dam is likely to eventually become operational and negotiations have shifted to determining how long the process of filling the dam should take. Ethiopia wants to fill it within three years while Egypt would prefer to stretch it out over 15. One [option currently under discussion](#) would see 15 billion cubic metres of water stored behind the GERD each year for three years, so that 45 billion cubic metres will be stored by the end of the third year. That volume of water would be

deducted from the Egyptian and Sudanese water quotas. Presumably further negotiations will occur during that time period to determine the amount of time and flow rate that will bring the dam to its full capacity of 75 billion cubic metres.

The smooth operation of the 1959 Nile Water Agreement shows that water sharing arrangements are possible between the major countries of the Nile River basin. Since the construction of the GERD began in 2011 there has been a steady move away from sabre rattling and outright threats towards conciliatory negotiation. Provided that there is compromise on the filling of the GERD reservoir and annual water quotas, there is every chance that a co-operative water sharing agreement will develop in the region. If it does, that will give the region the greatest opportunity to secure its food and water resources.

Any opinions or views expressed in this paper are those of the individual author, unless stated to be those of Future Directions International.

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Suite 5, 202 Hampden Road, Nedlands WA 6009, Australia.
Tel: +61 8 6389 0211
Web: www.futuredirections.org.au