Covenant University Journal of Politics & International Affairs. Vol. 9 No. 2, December 2021
ISSN: p. 3639-3646 e. 2354-3493 DOI: xxxxxxxxxxxxxx

Open Access Journal Available Online

Egypt's Water Problems and Solutions: The Hydro-Politics of The Nile River

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Received: 17.11.2021 Accepted: 11.12.2021
Date of Publication: December, 2021

Abstract: *The Nile River dictated Egypt's fate for thousands of years. It lets life grow at its banks. The journey down the River Nile starts in Assuan-Assouan from the Nile Island of Elephantine to the Camel market in Daraw and unto Louxor with its famous temples and the Valley of the Kings which has been a major source of tourism and exploration for the nation of Egypt [Weeks, Hetherington, Bakhoum; 2014]. Near Amarna in Middle Egypt, the locals proudly preserve their traditions. The river then turns into a delta after Kairo (Le Caire) and enters the Mediterranean Sea after 6,853 kilometers. While some may perceive Egypt's attempt to monopolize the Nile as Cairo's quest for Hegemony, to others, it is merely a struggle for survival. As the Nile is Egypt's primary source of water. Furthermore, the dilemma of an increasing population and the continuous decline of the water supply has altogether made the survival of the region questionable. The middle east has experienced numerous environmental concerns and these concerns are so sensitive that they threaten the very survival of the region. Hence, beyond the Egyptian State, water resources have become increasingly scarce and the prospects of possible importation of water as a natural resource have become even more likely than ever. The majority of the countries in the middle east lack access to sanitary water; and in addition to its both strategic and controversial location, it is safe to say however wealthy the middle east is today, many of its member states face some degree of a water crisis. Nations such as Yemen, the United Arab Emirates, Saudi Arabia and Iraq find themselves in more compound conditions as they face distinctive difficulty that require worldwide, instantaneous consideration. For this research, I will look to interrogate the dynamics of international relations between Egypt, Ethiopia, and Sudan with an appraisal as to the implications and repercussions of Ethiopia's Grand Renaissance Dam.*

Key words: Egypt, Ethiopia, Politics, International Relations. And Water,

CUJPIA (2021) 9(2) 3753-3766

Introduction

The Nile River has two separate sources, the White Nile from Equatorial Africa and the Blue Nile from Ethiopia. Egyptian civilization emerged more than five thousand years ago. In a country that receives less than eight inches of rain along the coast, and almost none at all south of Cairo, the Nile continues to fulfill 90% of Egypt's water needs while recent developments have altered the trajectory of sustainability as regards the Nile river, the average Egyptian is said to claim ownership of the Nile river than any other nation within the same geographical location. According to Paul Gemmill, "students of geographical influence have found in Egypt abundant evidence of close relationships existing between the social and economic life of a people and their physical surroundings. As described by political boundaries, modern Egypt occupies the larger part of North-Eastern Africa, extending from 5° to 31° North Latitude" [Gemmill, 1928].

He goes further to explain that Herodotus in no way exaggerated when he wrote over two thousand years ago "Egypt is the Nile and the Nile is Egypt", with the position that it was the Nile that afforded the Egyptians the ability to supply the ancient tribes of Judea with grain in time of scarcity. These perspectives define the rationale behind Egypt's Claim of the Nile [Gemmill, 1928].

The Nile is primarily composed of two tributaries: The White and the Blue Nile. The Nile's river basin spans across the countries of Egypt, Sudan, South Sudan, Eritrea, Ethiopia, Kenya, The Democratic Republic of Congo, Burundi, Rwanda, Uganda, and Tanzania. Bahr Al-Nil, as it is called in Arabic, is arguably the longest river in the world. The major actors and beneficiaries of the Nile are Egypt, Ethiopia, and Sudan. In Egypt particularly, the average annual flow of the Nile has declined at Aswan from 1,100 billion cubic meters during 1870-1899, down to 84 billion during 1899-1954 and 81 billion during 1954-1996; and even till date, continues to deteriorate [Swain, 1997].

In regards to Egypt, Egyptian enlightenment and culture was aided by the River Nile; till date, much of Egypt is still dependent on the Nile River. The unsteady fluctuations in the height of summer floods influenced both flood plain geomorphology much of which has drastically declined over the years. Thus, agricultural yield oscillated as a result of pronounced interannual variability, as well as episodic variations in response to and a reaction of abrupt climatic changes. These transitions in the watershed of the Nile tributaries are outcomes of unsteady fluctuations. This situation thus created a zestful topography and a variety of cultural feedback which of course is contingent on the specific cultural and historical

circumstances concerning the dynamics of a marine sophistication from a paleontologists viewpoint on the Nile river and Egypt makes it evident that the alluvion of the floodplain has also fashioned the convalescence of archaeological remains. In Egypt, the evolution of agriculture cannot be sufficiently understood without an understanding of Nile hydrology and the geomorphic dynamics of the Nile floodplain, since these dynamics influence subsistence activities, settlement location, and social relations [Hassan, 1997].

In weaving together, the history and dynamics of the Nile river we will rely on an array of geoarchaeological methods, from drill cores in the Northern Delta [Hassan, 1997].

It is imperative to first understand the economic and political role of the Nile River and its role in the development of the entire region [Swain, 2008].

The Management of Water Resources in Egypt

The concept of management deals with the process of organizing, influencing, and controlling people, things, time, resources, and institutions. It entails a series of processes such as the mannerism to which something is handled, supervised, and carefully treated. There are various approaches to management, one of which includes Management by experiment. This is a way in which scientists adopt a scientific approach in the consolidation of managerial principles which is the fundamental premise underlying adaptive management [Rogers, 1998].

Peter Drucker is often credited with "inventing management by objectives", although he has never claimed the distinction. Management by objectives is simply a strategic management model that seeks to ameliorate the performance of an organization by establishing clearly defined objectives that are agreed upon by both parties (management and employees).

In the context of this paper, the management of water resources pertains to how water resource is being preserved, treated, used, and distributed within the Egyptian state. There is the need for such resources to be adequately and strategically managed, seeing there is one primary source of water for Egypt and that is the Nile.

For several decades, the Nile Delta between Cairo and the Mediterranean Sea has been marked by intensive agricultural use. Today, about 86% of Nile water that flows to Egypt is still used to grow food with an agricultural sector estimated at 28 billion dollars which makes up to 12% of the Egyptian economy. This makes agriculture the cornerstone of food security in Egypt as its government relies on domestic production to avoid over-dependence on foreign aid. Egypt's dependence on the Nile says enough about the virtual national interest at stake. This is so sensitive to

the extent that Egypt transferred responsibilities for Nile disputes with its African neighbors from the Ministry of Water Resources and Irrigation into the hands of Egypt's Intelligence and Security Chief in 2010. Despite being a national priority, the agricultural sector is one of the hardest-hit victims as Egypt runs out of water. Since 1991, employment in the agricultural sector has dropped from 44% to less than 27 percent in part due to farmers abandoning their unprofitable land to seek jobs elsewhere. Historically speaking, this has not always been the case. "The integration of Egypt into the international capitalist economy in the 19th century transformed rural social relations, the agricultural labor process, and agricultural technology. Muhammad Ali introduced cotton into Egypt to increase revenue, which he needed to pursue his goal of an independent dynasty. Since cotton requires large quantities of water during the summer, when the Nile is at its Nadir, large-scale cotton production necessitated the transformation of the old basin irrigation system" [Richards, 1980].

The once former breadbasket of the Roman empire has turned into the World's Largest wheat importer. Egypt imported 12.5 million metric tons (13.8 million US tons) of wheat and flour from April 2018 to April 2019; this is 50% more than it produced. The cause of this could be attributed to the innovative economic and of course, somewhat political endeavor of its neighbor (Ethiopia). "Egypt is a land of a single resource - a soil made fertile by Nile silt, but rigidly limited in extent. Minerals, water powder, forests, fisheries - these are negligible. Even at best, the finest soil in the world is ineffectual without water, and Egypt is practically without rain. Alexandria, on the coast, has an annual precipitation of 8 inches, Cairo,1.3 inches, and south of that city a shower is rare [Blanchard, 1937].

The Egyptian government thus far has done a brilliant job in maximizing the resource of the Nile. Agricultural production and the distribution of food in Egypt always has and still is subject to extensive government intervention [De Janvry, Siam, Gad, 1983].

The Implications and Repercussions of Ethiopia's Grand Renaissance Dam (Gerd)

"As early as the 4th Century B.C, Herodotus observed that Egypt was a gift of the Nile. That observation is no less true today than in the distant past because not only the prosperity of Egypt but also its very existence depends on the annual flood of the Nile. Of its two sources, the Blue Nile flows from Lake Tana in Ethiopia, while the White Nile flows from Lake Victoria in Uganda. Some 86 percent of the water that Egypt consumes annually originates from the Blue Nile River, while the remainder comes from the White Nile. Since concern with the free flow of the Nile has

always been a national security issue for Egypt, as far as the Blue Nile goes, it has been held that Egypt must be in a position either to dominate Ethiopia or to neutralize whatever unfriendly regime might emerge there. As the late President Sadat stated - Any action that would endanger the waters of the Blue Nile will be faced with a firm reaction on the part of Egypt, even if that action should lead to war [Kendie, 1999].

Many scholars have postulated that future wars and conflicts will be over water resources due to climate change, water shortages, and scarcity. While the flow of the Nile River has been somewhat affected by the various ecological effects in the region, the raging desertification in the country of the Nile and the abject poverty that characterizes the lives of the majority of the people there call for a pause and rethinking of the strategies that aim at an equitable and reasonable sharing of the Nile's resources [Deng, 2007].

As for Ethiopia, the Grand Renaissance Dam has brought about boundless opportunities from political stability to both internal safety and economic growth. But contrary to popular beliefs as well as to the perception of Ethiopia's neighbors, the Grand Renaissance Dam is also beneficial to her neighbors. The benefits of the Grand Renaissance Dam can benefit both Sudan and Egypt by removing up to 86% of silt and sedimentation. Much of its potential guarantees the perspective of regulating annual stable water flow as it would serve as an apparatus to prevent unforeseen surges to downstream countries. Although Egypt and Sudan may not particularly agree with this perspective, seeing that water is of utmost importance in the region, it goes without saying that the current situation, built-up tensions, and the construction of the Grand Renaissance Dam have altered the trajectory of international affairs in the region. More importantly, if Ethiopia decides to fill the reservoir between the periods of five to seven years intervals, Egypt's water allocation would be drastically reduced from somewhere around 12 to 25% to percent during the filling period. This could also change depending on natural supplies such as rainfall. For Ethiopia, the dam has become an infrastructural power to which could be used as political leverage against Egypt and Sudan [Verhoeven, 2021].

Series of undertakings have been drafted one the course of time with the aim to attain resolution of the Nile water dispute. The cooperative framework agreement was the latest effort under the aegis of the NBI with the intention of providing the basin with a permanent legal and institutional framework. Despite this milestone, resolution of the Nile waters dispute is predicated on ridding the CPA of "Water Security" - a convenient cloak for the inequitable status quo and sharing, amongst all the riparian countries, the Nile waters hitherto shared exclusively by Ethiopia, Egypt,

and Sudan [Mekonnen, 2013].

The $4 billion Grand Ethiopian Renaissance Dam (GERD) was announced in early 2011, as Egypt was in political upheaval. It is the centerpiece of Ethiopia's bid to become Africa's biggest power exporter, with a projected capacity of more than 6,000 megawatts.

The Grand Ethiopian Renaissance Dam formerly known as the Millennium Dam is a gravity dam on the Blue Nile river in Ethiopia under construction since 2011. The Dam is in the Benishangul-Gumuz region of Ethiopia, about 45 kilometers or 28 miles East of the border with Sudan. The primary function of the dam is electricity production to relieve Ethiopia's acute electricity shortage and for electricity export to neighboring countries with a planned installed capacity of 6.45 gigawatts, the dam will be the largest hydro-electric power plant in Africa when completed as well as the seventh-largest in the world. Filling began in July 2020, it will take between 4 and 7 years to fill with water depending on hydrologic conditions between the filling period. The second filing was completed on the 19th of July 2021 without the agreement of Egypt and Sudan. Egypt is at the bottom of the river, there are ten other nations upstream of which the largest is Ethiopia. A colonial-era treaty gives Egypt most of the river's flow but since it gives no upstream nation other than Sudan any share at all, those nations don't recognize it. A rival power with an even bigger dam upstream could be disastrous for Egypt which in the past has threatened to go to War if Ethiopia ever barricaded the Nile. The Threat worked until 2011; then at the height of the chaos of the Arab spring when the Egyptian government was preoccupied with its survival, Ethiopia without warning began building what is said to be the world's eighth-largest hydroelectric dam. The GERD will flood 1,700 square kilometers of forest and bush close to Ethiopia's border with Sudan. The dam will more than double the country's electricity generating capacity, leaving spare power to be exported to neighbors on a planned East Africa. The Nile River is also a vital waterway transport, especially at times when motor transport is not feasible - for example, during the flood season. Improvements in air, rail, and highway facilities beginning in the 20th century, however, greatly reduced dependency on the waterway [El-Kammash, Smith, Gordon, Hurst, Edwin, 2021].

At a cost of almost $5 billion, it is a huge national endeavor for a poor country. To make the dream come through, civil servants in Ethiopia are being encouraged to devote at least a month of their wages every year to buying bonds to help fund the project. Climate crisis and water wars are examples of Global environmental imaginaries that dominante the

discussions on African states and their predicament amidst global warming, unrest and unmet demands. The intersecting challenges of water, energy, and food insecurity are providing impetus for the articulation of ambitious state-building projects. In the Nile-basin as elsewhere, that rework regional political geographies and expand infrastructural - How the state can penetrate society, control its territory, and implement consequential policies. The Grand Ethiopian Renaissance Dam should be understood as intending to alter how the state operates. Ethiopia's political leadership and its bureaucratic scientific apparatus, the country's intractable poverty, and international marginalization are a direct result of a failure to harness its hydro potential and build the dams, reservoirs, and irrigation systems required to actualize its water power destiny. However, to millions of people living downstream, the rhetoric of the GERD as the anchorage of a resurgent Ethiopia that determines the flow of the river instills existential concerns about their water and food security. "The hopes and fears engendered by the GERD cannot be understood separately from the global political economy of the environment and Africa's unique, historically contingent place within it [Verhoeven, 2021].

Ethiopia's Grand Renaissance Dam has it's compact largely on Egypt primarily because the Blue Nile which suffers from high seasonal fluctuations, descends from the lofty Ethiopian "water tower" highlands. They provide 86% of the waters of the Nile - the Blue Nile 59%, Baro-Akobo (Sobat) 14%, Tekesse (Atbara) 13% - while the contribution from the Equatorial Lakes region is only 14% percent [Swain, 1997].

Egyptian Concerns

- The first concern is short-term. What happens while the reservoir behind the dam is being filled, the dam will be able to hold back more than a year's flow of the blue Mile as it leaves Ethiopia. In theory, while filling the reservoir for the first time, Ethiopia could cut off the entire flow for that year. Even filling over five years will significantly impact Egypt especially if there are dry years.
- Another Egyptian concern is that the GERD dam will by implication influence Sudan to increase the amount of water it takes out of the river for irrigation. This is because most of the Blue Nile's flow comes in a few weeks of the year after monsoon rains in the Ethiopian highlands. Sudan's dam on the Blue Nile, the Roseair Dam is small and only provides water for a few months but the Ethiopian dam will deliver a year-long flow downstream through its turbines and across

the border. Thus, sudanese farmers will by implication have the capacity to abstract water for a year - round irrigation of crops. The Sudanese government is already selling land leases for farmland that will be irrigated when the Grand Renaissance Dam is completed.

- Another concern is the impact of GERD on Egyptian livelihood and survival. The agricultural sector would be greatly impacted by the construction of the GERD. In the global context, many large rivers pass through one or more individual sovereign states, setting the stage for potential mechanisms of cooperation or conflict. Although all states are considered equally sovereign, it is perhaps too obvious to state that there is a hierarchy of power within the international system [Meredith, Givental; 2016].
- The most likely of all implications is the reality of the need for military confrontations. There is increased pressure for Egypt to attempt to curtail Ethiopia's infrastructural endeavors concerning the GERD. As it stands, numerous attempts have been made. According to Christopher Booth's article of November 2020, and I quote "Tonight breaking news out of Addis Ababa, with initial reports of the capture of a secret Egyptian commando group near the contentious Grand Ethiopian Renaissance Dam. Below the anchor, the chyron crawled, Egyptian special forces captured, and, over his shoulder, shaky iPhone footage via a green screen showed three blindfolded and cuffed soldiers in camouflage being prodded with Kalashnikovs held by offspring men". Although presumed to be unlikely, military confrontations have become a growing possibility, as a diplomatic solution to the Egyptian-Sudanese-Ethiopian stand-off recedes. In July 2020, Egyptian President Abdel Fattah el-Sisi stated that all options were on the table as he consulted with his military advisors. Similarly, in a televised address to the nation, he told Egyptians that he would do whatever was required to "protect its historical rights and assets" after Ethiopia began filling the Grand Ethiopian Renaissance Dam (GERD) [Booth; 2020].

In regards to these various perspectives and positions, it is obvious that Egypt is most at the receiving end of Ethiopia's infrastructural endeavors (the Construction of GERD). This is by no means a mere dilemma of the Egyptian government but alters the state of affairs in the region. A costlier effect is that the GERD will

threaten the survival of the average Egyptian, especially following its completion

Figure 1: Image of the Grand Ethiopian Renaissance Dam

Managing Risks in the Grand Ethiopian Renaissance Dam

Risk identification is a critical phase that will affect the succeeding phases. If this stage misses any risk, consequent phases will not take it into account. If the risk is not identified it will not be evaluated and managed. The end result of risk recognition is a record of likely threats. Brainstorming is a technique used to identify risks and involves getting subject matter experts, team members, and all who might benefit from the process in one place to identify possible risks. To identify risks of GERD in Egypt, invitations were sent to 42 experts to participate in the brainstorming session. Only 11 exports agreed to participate in the brainstorming session and become a member of the focus group. The center category comprises of engineers with various backgrounds in the administration of water resource. These Specialists are from Zagazig University as well as the Ministry of Water Resources and Irrigation. All experts are from Egypt and their experience ranges from 5 to 15 years' experience, 20% have more than 10 years' experience and 10% have 5 or more years' experience. The list of risks resulting from the brainstorming session consists of the following:

1. Shortening the number of years to fill the storage lake behind GERD.
2. Increase the capacity of the reservoir behind the GERD.
3. The collapse of GERD as an error in the result of the design or construction.
4. The collapse of GERD as a result of earthquakes or volcanoes.
5. A decline in the annual water allocation of Egypt from the Nile river
6. A decrease in the amount of Electricity created from AHD
7. Impact on the quality of NR water.
8. Desertification of agricultural land in Egypt
9. Shortage of groundwater storage in Egypt.
10. Impact on the climate of Egypt.
11. Impact on navigation in the NR.

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12. Decreasing fisheries in the NR.
13. Impact on the population distribution in Egypt
14. The effect on human wellbeing and the spread of diseases in Egypt.
15. A dispute between Egypt and Ethiopia (Walaa, Ahmed, 2018).

Egypt's Water Problems and Solutions

The prevailing problems of the water crisis in Egypt stem from multiple factors and conditions. First and foremost, Egypt cannot continue to not rely on natural supply of water such as for rainfalls to help fill up the Nile. Conditions such as climate change and global warming have left the terrain and the entire region at large in harsher conditions than they were decades ago.

Solutions

- The first solution to Egypt's water crisis is the treatment of groundwater for re-use. The Egyptian government should invest in technologies that help purify water so that it could be used for various purposes.
- Another solution is that the Egyptian government must make strategic decisions that help mitigate water scarcity such as the implementation of water conservation techniques.
- That also is the need for the Egyptian governments to develop policies that not only control water pollution but also develop plans that would install more efficient irrigation techniques.
- Another pathway to ensure Egypt's sustainability is to try as much as possible to establish diplomatic ties and bridge the mistrust between her and Ethiopia. This will open a window of opportunity for Egypt to establish some sort of bilateral treaty with Ethiopia with the hopes of getting the Nile to flow periodically from Ethiopia's highlands down to Egypt.
- Should the need arise, Egypt must begin to seek alternative sources for the supply of water because the failure to make systemic choices and concrete plans, would result in the importation of water in the nearest future.

Limitation of Study

While some scholars believe that stating the Limitation of Study weakens the value of research, it is imperative to highlight the limitation of all studies with the hopes of understanding the complexities experienced by the researcher to create room for

improvements on future research that are within the issues related to same discipline or topical research. The limitation of study for this research are as follows:

1. Time Constraint
2. Travel Barriers
3. Limited Access to Data

Time Constraint:

The time available for the study of the research problem and to measure change was greatly impacted by practical issues. In the not-so-distant future, the researcher intends to engage in a longitudinal study of the topic.

Travel Barriers:

Amidst a global pandemic (that is a Covid 19) the researcher was unable to travel to Egypt and the site of the Grand Ethiopian Renaissance Dam to feel the pulse of the people and to overall examine the various perspectives as regards the water crisis in the region.

Limited Access To Data:

Because Egypt's water crisis is an ongoing phenomenon, there are limited current materials relevant to the study.

Conclusion

The Egyptian people are indeed facing intense acute challenges due to the rapid population growth. Beyond its water crisis, there exist the evolving challenge of agricultural sustainability. At the increased growth rate of its citizenry, it is projected that the Egyptian agricultural sector will lack the capacity to provide adequate farm produce for Egyptian state. Already, a chunk of Egypt's revenue has been diverted largely into the importation of food and the necessities of the average Egyptian, but, be that as it may, such allocations on the importation of products such as flour is said to skyrocket in the next decade. Also, in addition to this, under President Abdel Fattah al Sisi, the military's influence in governance and administrative procedures has become increasingly rapacious. So that qualified individuals who are grounded in political affairs are not allowed to participate actively in the government especially if these said individuals have little or no ties with the military, rather, his regime has helped military-owned companies to crowd out the private sector of the economy so much to that there is no balance between the public and private sector but rather public institutions posing as private entities.

How does this pertain to Egypt's water crisis? This form of political configuration blocks the governmental paraphernalia from enlisting the aid of political scientists and power brokers that are licensed and knowledgeable to remedy the crisis posed by Egypt’s water dilemma. Without strategic think tanks, innovative and creative policies, administrative laws, and concrete foreign policy, much will never be

achieved as regards enabling visible solutions and taking positive steps towards securing an indelible solution to Egypt's water crisis. Particularly one that transcends generations.

The general outlook remains the reality of the fact that desperate times call for desperate measures; and unless Egypt lobbies with Ethiopia and Sudan, the survival of the state will continually remain threatened as water is a natural resource that man cannot live without.

In retrospect, the proffered solutions in this research are based on the current water crisis in Egypt and are thus subject to improvement over time as time progresses.

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