

# The Nile Water Crisis

## Policy Analysis



The Organization for World  
Peace

# **The Organization for World Peace**

## **Analysis of the Nile Water Crisis**

### **World Peace IS Possible**

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# Table of Contents

<b>1. Our Aim and Why This Report is Necessary</b>	<b>pg. 3</b>
<b>2. Summary</b>	<b>pg. 4</b>
<b>3. Importance of the Nile River</b>	<b>pg. 5</b>
<b>4. The GERD Crisis</b>	<b>pg. 7</b>
<b>5. The Nile Basin countries: Egypt, Ethiopia and Sudan</b>	<b>pg. 10</b>
<b>6. Nile Basin Issues</b>	<b>pg. 12</b>
▪ <b>Current Internal Political Issues</b>	<b>pg. 12</b>
▪ <b>Environmental issues</b>	<b>pg. 12</b>
▪ <b>Water management</b>	<b>pg. 15</b>
<b>6. Initiatives and Agreements</b>	<b>pg. 19</b>
<b>I. HYDROMET</b>	<b>pg. 19</b>
<b>II. TECCONILE</b>	<b>pg. 20</b>
<b>III. Nile Basin Initiative</b>	<b>pg. 22</b>
<b>IV. UNDUGU</b>	<b>pg. 22</b>
<b>V. CFA/Entebbe Agreement</b>	<b>pg. 23</b>
<b>VI. Nile Agreement on the Principles for the GERD</b>	<b>pg. 24</b>
<b>7. Our Recommendations and Solutions</b>	<b>pg. 26</b>
<b>8. Appendices</b>	<b>pg. 33</b>
<b>A. Nile River Basin timeline of events</b>	<b>pg. 33</b>
<b>B. Map</b>	<b>pg. 35</b>

## **Our Aim**

The aim of this report is two-fold: Firstly, the reports seeks to provide a long-lasting solution to the current crisis over the construction of Ethiopia's Grand Ethiopian Renaissance Dam project (GERD). The dam which is expected to be completed in 2020, has led to significant tensions between upstream Ethiopia, Sudan (which has realigned itself by siding with Ethiopia) and downstream Egypt whose freshwater supply is under increasing threat as the GERD project nears its completion. Secondly, the reports aims to provide a series of strategies and policy approaches to reduce the likelihood of similar water-related conflicts in the Nile River Basin, both in the short- and long-term. Specifically, this report aims to put forward suggestions to reduce the environmental, political and climate-related issues that are currently placing pressure on the Nile River's water.

## **Why This Report is Necessary**

Historically-speaking, disagreements over transboundary water resources have been a source of friction as well as a catalyst for peace among nations. Notable examples of the latter—whereby adversaries turn into partners for peace—include the signing of the Indus River Treaty between India and Pakistan, which has survived three wars, and the Senegal River Treaty. In both of these examples, the competing nations found a way to equitably and reasonably share international waters—and avoid engaging militarily against one another over the water source.

This report delves into a crisis that has been present for many years and is centered, much like the abovementioned situations, around the equitable use of a shared transboundary water resource, the fabled Nile River. While much focus tends to be placed on the Grand Ethiopian Renaissance Dam project itself, there is a need to shed light on the existing issues that have exacerbated the present situation between downstream Egypt and its fellow riparian neighbors. In doing so, this report plays the important role of providing a more global view of the crisis which has the potential to destabilize a historically troubled region of the world (as demonstrated by the current instability in Libya, the post-secession situation in South Sudan, and the insurgency in Egypt's Sinai region). Equally as important, is the fact that such reporting will place greater attention on the wider-issue of how freshwater as a resource can be a source of potential conflict or peace among the various nations of the world.

## Summary

The Nile River is fed by the White Nile (which begins in the southern part of the Equator) and the Blue Nile which originates in the Ethiopian highlands. Tanzania, Burundi, Rwanda, the Democratic Republic of the Congo, Kenya, Uganda, South Sudan, Ethiopia, Sudan, and Egypt all rely on the Nile for survival and economic development.

In the case of a few of these states, such as Egypt, the Nile is the sole source of water. This becomes problematic when the availability of this resource comes under continued stress due to disputes over water allocation, climate change and issues emanating from poor water management. The current water crisis between Egypt, Ethiopia and Sudan highlights this fact.

Ever since Ethiopia launched the Grand Ethiopian Renaissance Dam project in 2012, there has been heightened fears of a potential conflict between itself, Egypt and Sudan. This is largely due to the potential political, economic and hydrological impact (both real or perceived) that it could have on the mid to long-term future of the countries in question: Ethiopia sees the hydroelectric dam as a defining national development project that could boost its political and economic standing in the region; Sudan covets the cheap electricity and expanded agricultural production that it promises; and Egypt perceives the possible loss of water as an existential threat since it relies on the Nile for about 90% of its freshwater needs. The Egyptian government argues that tampering with the river's flow would put millions of farmers out of work and threaten the country's food supply.

Between 2011 and 2017, Egyptian and Ethiopian leaders framed the GERD dispute in stark, hyper-nationalist terms and exchanged belligerent threats. Politicians in Cairo called for sabotaging the dam. Media outlets in both countries compared the two sides' military strength in anticipation of hostilities. A recent rapprochement has quieted the row. Ethiopia's new prime minister, Abiy Ahmed, visited Cairo in 2018 and promised to ensure that Ethiopia's development projects do not harm Egypt. In turn, Egyptian President Abdel Fattah al-Sisi said his country recognizes that the dispute has no military solution. But despite the warming relations, there has been little substantive progress toward a resolution.

Once it is completed and fully operational, the dam is expected to produce 6,000 megawatts of power, equal to six nuclear-powered plants. However, it will also divert much of the water that has historically flowed into the Nile Delta along other routes. With the project 60 percent complete, Ethiopia can begin collecting water and filling up portions of the dam in a process that could take up to 15 years. As a consequence, Egypt's supply of fresh water from the Nile will drop by an estimated 25 percent over the next seven years. Finding a clear path towards allaying Egypt's fears whilst addressing the issues such as the equitable use of water along the Nile has never been more urgent.

# The Importance of the Nile River

The Nile River, the world's longest river, is of unparalleled social, historic and economic importance to the more than 300 million people who inhabit the region and rely on its waters for economic activities and basic human needs. It contains over 10 percent of Africa's landmass and covers an area that includes: Ethiopia, Sudan, South Sudan, Egypt (one of the oldest civilizations in the world), Rwanda, Tanzania, Uganda, Burundi, the Democratic Republic of Congo, Eritrea and Kenya.

However, the basin has a low supply compared to basins of comparable size. This relative scarcity of the water resources given the competing demands for productivity and livelihoods poses a threat to peace and stability as well as food and water security in the basin. The threshold sufficiency of its water and lack of alternative water sources are of vital importance for the riparian states. Due to heavy human extraction and high evaporation, the Nile river basin and its inhabitants are especially sensitive to climate change. The Nile basin traverses the largest number of countries of any basin in Africa; changes in the timing and availability of water under climate change may lead to tension, insecurity and management problems.

Food security is the most important issue in today's Nile River negotiations. Over 80 percent of water withdrawn from the basin is for irrigation. As populations grow enormously (Ethiopia, Congo and Egypt are expected to reach 100 million by 2025, with Uganda leading the smaller countries with 60 million in the same period), fear of demand for food for this growing population has cast a pall on the negotiations about water allocation for Nile riparian states.

Climate change is now becoming a key driver in considerations over food and energy security in the Nile. The appalling consequences of inadequate rains over Eastern Africa during the 2004–2006 period that reduced by half industrial outputs for Uganda, Rwanda and Burundi, with large-scale famines in Kenya, Ethiopia and Eritrea, have created an opportunity for joint investment projects, particularly on hydropower, as a counterbalance to securing water for food.

The Nile also happens to be one of more than 260 so-called “international drainage basins” throughout the world where water, and related, resources are shared between two or more nation states. At the time of writing this, water demand across the region is steadily rising. When coupled with rising populations and ambitious initiatives, arguments in favor of a cooperative sustainable management of the trans-boundary water, and related, resources of the Basin have become more compelling. The Nile is one of more than 260 so-called “international drainage basins” throughout the world where water, and related, resources are shared between two or more nation states.

The table below breaks down the total area of each riparian state, how much of it falls within the Nile and how much water is withdrawn from it:

Country	Total area (km <sup>2</sup> ) (a)	Area within the basin (km <sup>2</sup> ) (b)	Water withdrawal per million cubic meters (c)
Burundi	27 834	13 260	28.7
DRC Congo	2 344 860	22 143	0.0
Egypt	1 001 450	326 751	66054.0
Eritrea	121 890	24 921	unavailable
Ethiopia	1 100 010	365 117	1500.9
Kenya	580 370	46 229	307.5
Rwanda	26 340	19 876	57.4
Sudan	2 505 810	1 978 506	13921.6
Tanzania	945 090	84 200	63.4
Uganda	235 880	231 366	260.3

a and b Source: FAO 1997, World Bank Statistics 2010 tandfonline.com/doi/full/10.1080/0262667.2011.577037

c. Source: Nile Resources Atlas, Chapter 7

The amount of water available to the riparian states of the Nile River water system:

Country	Per capita water availability (m <sup>3</sup> /p/yr) <sup>a</sup>	Projected water availability in 2037 (m <sup>3</sup> /p/yr) <sup>b</sup>
Burundi	2,190	1,233
Egypt	790	534
Eritrea	1,470	916
Ethiopia	1,680	974
Kenya	930	577
Rwanda	610	361
South Sudan	1,880	1,129
Sudan	1,880	1,279
Tanzania	2,420	1,413
DRC Congo	23,580	14,337
Uganda	2,470	1,335

<sup>a</sup> Source: UNESCO, The United Nations World Water Report 2

<sup>b</sup> Estimate based on a population projection

# The GERD Crisis and the Historical Background

The Nile River flows through Rwanda, Burundi, the Democratic Republic of Congo, Tanzania, Kenya, Uganda, Eritrea, Ethiopia, Sudan, South Sudan and Egypt, before reaching the Mediterranean Sea. For centuries, the river has been a major source of water supply to three countries in particular: Egypt, Sudan and Ethiopia. People in these countries have become dependent on the Nile water for economic activities that rely greatly on agriculture, irrigation and fishing. And due to its location and its significance, the Nile River has also been a source of political tensions, which are escalating amid concerns over water flow to Egypt—concerns which have been the subject of discussion (as will be demonstrated throughout this report).

Several agreements and treaties governing the use of the Nile River's waters were developed to manage this resource efficiently, without affecting water flow in any of the riparian countries. Time, however, has shown that water usage has been highly disproportionate, with Egypt often being seen as having benefited from two agreements that were signed while it was under a colonial British administration. The first of these agreements was signed in 1929, while the other came into force in 1959. Together they ensure that Egypt receives over two-thirds of the water the river contains per year. It is worth pointing out that these were both created when most of the upstream countries of the basin, such as Ethiopia, were under colonial rule, and consequently not consulted about the specifics of these agreements. To this day, Egypt still clings to the conviction that its national security depends on guaranteeing current flow levels, and insist on maintaining its purported rights under to the terms of both agreements.

Post-1959, several events and developments have taken place, both in reaction or as a result of these agreements. The first of these was the Soviet-sponsored construction of Egypt's Aswan Dam—the first of its kind in the basin area. This construction project drew suspicion from Western powers (for geo-political reasons) as well its neighbors, Sudan and Ethiopia. Ever since, political tensions have increased, as each of these countries' water needs have increased—something that cannot easily be met due to changes in both climate conditions and demographics. An example of this is the stress that has been placed on Egypt's water security as a result of a growing population and environmental degradation. The lack of a cooperative approach for water management and development projects among these riparian states, only exacerbates the situation, with each them acting independently within their national territories.

Despite what had appeared to be a more progressive phase in the relation between these states, in a period that witnessed the development of basin-wide projects (Hydromet), committees (TECCONILE<sup>1</sup>) and cooperative frameworks (NBI<sup>2</sup>), the issue of equitable water use remained unresolved. While these initiatives did help to stabilize water tensions up until 2013 (which will be discussed shortly), they are viewed as having failed, mainly due to a lack of commitment and communication between the key riparian states. This and the rivalry that has characterized the relationship between of Egypt and Ethiopia, in particular, led successive governments in these regional powers to act in a manner that served their national interest.

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<sup>1</sup> Technical Committee for the Promotion of the Development and Environmental Protection of the Nile Basin

<sup>2</sup> Nile Basin Initiative



The absence of a shared commitment to addressing these core issues was evident in the NBI—an unprecedented cooperative approach that unfortunately failed to deliver solutions relating to the sharing benefits of the Nile water and long-term ecological sustainability. This has been due in part to the state-centric approach to Nile water development that has dominated much of the discussion within the basin. None of the Nile basin countries has, for example, ratified the Convention on the Law of the Non-Navigational Uses of Watercourses, which stresses that states should use watercourses in an equitably and reasonably, and defines a procedure to follow when planned schemes may have adverse impacts on other riparian states. Furthermore, the basin countries have not taken any measures to reduce their dependence on the Nile River water, increasing political tensions and ignoring the fact of water scarcity by 2025 as the IPCC 2007 reported.

Equally as detrimental to the fostering of greater cooperation has been the role of China, which has been playing an important role as an investor in Africa in recent years. Its economic power and interest in petroleum, raw materials and markets have encouraged China to support Sudan and Ethiopia's water development projects. To some extent, this support has contributed to reducing the comparative economic and political weakness vis-a-vis Egypt. For Sudan and Ethiopia, Chinese financial and technological support is pivotal for their economic growth through hydropower generation—plays specifically into Ethiopia's ambition to be a region leader in the supply of electric power. This also means that the status quo over the Nile water is now being established as well. Egypt, Ethiopia, and Sudan have the same source but different needs. Ethiopia is willing to increase employment, industrial organization, and agriculture through water development projects. This benefits Sudan in their irrigation processes as well in the short term.

But in the case of Egypt, it feels that its water demands cannot be satisfied. At present, it is concerned that Ethiopia's Grand Ethiopian Renaissance Dam (GERD)—which will hold 63 billion cubic meters of water, and produce 6000 megawatts of electricity once it is completed—will have an impact on its water supply. A limited flow of water to Egypt would threaten its crop production and food security. In general, a threat to the Nile is a major threat to Egypt's water security, since it alone accounts for 97% of Egypt's water supply.<sup>3</sup> This would help to explain why Egyptian officials have gone so far as to say that, “building a dam is a declaration of war.”

One study has shown that due to the decreased flow of water Egypt could lose 51% of its farmland if the dam reservoir were filled in three years, while a six-year fill could result in a 17% loss, substantially impacting the agricultural sector. However, the exact impact of the dam is highly contested, especially given that the consultants hired to produce impact studies have not released their technical report yet.<sup>4</sup>

Egypt, like Ethiopia, considers the construction of the GERD dam to be a national security issue. So much so, that in 2013, then-president Morsi warned that all options were on the table if the construction of the dam continued, including military action. Some worried that Egypt would bomb the dam, or that the two countries would become involved in a war.

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<sup>3</sup> “Water security and the Nile Basin” [by Phillip Rossetti on March 2015] on ASP American Security Project

<sup>4</sup> “The Grand Ethiopian Renaissance Dam: Power Dynamics in the Nile River Basin” by Sierra Hicks on Oct 12, 2017 – American Security Project

However, in 2015, Egypt, Sudan and Ethiopia were able to agree to a Declaration of Principles document that included 10 points, including a principle of not causing significant harm to any other basin state and the principle of the fair and appropriate use of Nile waters. Moreover, they included an agreement to contract an independent study of the dam's impact and abide by it as they agree on a plan for filling the reservoir and operating the dam. But the deadline to complete the study has passed, and it has hardly begun, held up by differences over information sharing and transparency despite multiple rounds of negotiations among the three basin countries.

# The Nile Basin Countries

## EGYPT

Egypt is located in the northeastern part of Africa, connecting with the Middle East. Egypt is one of the largest nations in the world, covering 995,459 square kilometers of land and 6000 kilometers of water. Egypt is one of the most populous countries in Africa with an estimated of 101.17 million in 2019. The majority of its population lives in the banks of the Nile River, which amasses an area of 40,000 square kilometers. This is the only arable area in the country making it significant for the Egyptian economy and people's daily lives. People depend on the agricultural sector, which requires extensive irrigation systems.

Around 60% of Egypt's Nile water originates in Lake Tana, Ethiopia. This portion of the river is commonly referred to as the Blue Nile, which is one of two main tributaries along the river—the other is the White Nile which stretches from Lake Victoria to the merger with the Blue Nile in Khartoum, Sudan. Egypt's position as the dominant power in the Nile River Basin is not as firm as it once was, and with the construction of the GERD, it is becoming increasingly clear that Ethiopia is asserting itself as a rising regional power. In a 2015 Declaration of Principles agreement, Egypt, Ethiopia, and Sudan agreed to contract an independent study of the dam's impact and abide by it as they agree on a plan for filling the reservoir and operating the dam. But the deadline to complete the study has passed, and it has hardly begun, held up by differences over information sharing and transparency despite multiple rounds of negotiations among the three.

## Ethiopia

The Nile flows for 6,700 kilometres through ten countries in northeastern Africa - Rwanda, Burundi, Congo, Tanzania, Kenya, Uganda, Eritrea, Ethiopia, Sudan, South Sudan and Egypt - before reaching the Mediterranean, and is the longest international river system in the world. Its two main tributaries converge at Khartoum: the White Nile, which originates from Burundi and flows through the Equatorial Lakes, provides a small but steady flow that is fed by the eternal snows of the Ruwenzori (the 'rain giver') mountains, while the Blue Nile, which suffers from high seasonal fluctuations, descends from the lofty Ethiopian 'water tower' highlands. They provide 86 per cent of the waters of the Nile - Blue Nile 59 per cent, Baro-Akobo (Sobat) 14 per cent, Tekesse (Atbara) 13 per cent - while the contribution from the Equatorial Lakes region is only 14 per cent.

Ethiopia is one of the most populous countries in Africa, with a population of approximately 110.14 million, up from 2015's estimate of 98.9 million. It is the second-most populous country in Africa after Nigeria. This estimate of how many people live in Ethiopia is based on the most recent United Nations projections, and makes Ethiopia the 14th most populous country in the world. The most recent census in 2007 found an official population of 73.7 million.

Unlike Egypt and Sudan, Ethiopia is not bound by an agreement over sharing the waters of their great river, although Khartoum continues to refer to the provisions in the 1902 treaty between the Emperor of Ethiopia and the British Government on behalf of Sudan concerning the Blue Nile, the Sobat, and Lake Tana.

Over the decades, Egypt has been having tension with Ethiopia about its plan to change the flow of the Nile. This has been aggravated by the Renaissance dam project. Once completed, it is

expected to generate 6,400 megawatts of hydroelectricity that will more than double Ethiopia's current production and potentially allow the country to earn hundreds of millions of dollars in energy export revenues. The dam had turned Ethiopia into the power hub of the region, of the continent and it would be used only to generate electricity, and not for irrigation. This dam project is designed to help lift its fast-growing population out of poverty. As a consequence, the new dam puts management of the flow of the Blue Nile in Ethiopia's hands-and that has sparked a power shift in the region.

Over 80 percent of Ethiopia's population still live in the highlands, which constitute just over 40 per cent of the land area of the country, while hosting 60 per cent of the livestock and accounting for 90 per cent of rain-fed agricultural land. The country is in the pursuit of achieving self-sufficiency in food production, and certainly do not want the famines of the 1970s and 1980s to reoccur. The assertion by the government and its people is that there is no other choice but to increase agricultural production by seeking and obtaining a fair share of the waters of the Nile. Given that Ethiopia is projected to have more people to feed by 2025 than Egypt, the government has maintained its sovereign right to develop all resources within its borders.

However, the dam project has met with stiff resistance from Egypt, where many fear it will cut into the country's already strained supply of Nile water. As a downstream nation, Egypt says the dam will disrupt the flow of the Nile to its almost 100 million people, potentially crippling agriculture and industry. This will also compound other problems threatening the Nile, including climate change, population boom, urban sprawl, and rising sea levels, which lead to saltwater intrusion. However, Ethiopia's Prime Minister Abiy Ahmed has sworn not to harm Egypt's share of the Nile, breaking the deadlock in talks over control of Africa's longest river. Speaking during a trip to Cairo in June 2018, Abiy Ahmed stated that neither his government nor his people have any "intention to harm the people of Egypt and the government of Egypt" and that the Ethiopians "will work with the people of Egypt in any area." Such words should be viewed as being part of a foreign policy outlook in Addis Ababa that aims to build or mend strained ties with countries within the region.

## **Sudan**

Is the second biggest user of Nile water, after Egypt. The country is located in northeastern Africa. The country is bounded on the north by Egypt; on the east by Ethiopia; on the south by Kenya, Uganda, and the Democratic Republic of the Congo; and on the west by the Central African Republic.

Before 2011, South Sudan was part of Sudan, its neighbour to the north. Its population consists mostly of descendants of migrants from the nearby Arabian Peninsula. Sudan has a total area of 1,886,068 square kilometers (728,215 square miles) and has an estimated 2019 population of 42.51 million, a significant increase from the 34,847,910 estimated in 2013. This makes Sudan the 35th biggest country in the world.

The majority of Sudan's population is rural, with an urban population of just 33.2%. The largest metropolitan area, Khartoum (which includes Khartoum, Khartoum North and Omdurman) is quickly growing and ranges between 6 and 7 million, which includes approximately 2 million displaced people from the southern war zone and the drought-affected areas in the west and east

People of the Sudan region have always relied on the Nile River (eg. Kingdom of Kush, c.800BCE-350CE, centred around the confluence of the Blue Nile and White Nile).

## **Nile Basin Issues**

### **Current internal political issues**

Egyptian and Ethiopian geopolitical disputes over the Nile River and more specifically, the GERD construction, are a major concern in the region. The GERD crisis has become a complex issue with the involvement and influence of regional actors.

For instance, the Intra-Gulf tensions between Saudi Arabia and Qatar have travelled to the Horn of Africa. According to Foreign Brief, Qatar and Turkey have increased their ties with Sudan by signing security deals worth more than \$5 billion. While Saudi Arabia maintains close ties with Egyptians and the EUA pledges \$3 billion in aid and investment to Ethiopia. This financial support has created a misperception of intra-Gulf tensions influencing the Nile Basin Crisis, more specifically regarding the GERD construction project and Sudan's switching side in supporting the project.

Furthermore, it is likely to foresee China's financial support to Egypt. As Egypt will require to improve its canal and desalination plants as well as to build dams, China's potential support is in the spotlight. This support can be explained due to Egypt's strategic significance of the Suez Canal and the Belt Road Initiative.

The involvement of other states can determine the future of the Nile Basin Crisis. The use of financial support could put at risk not only the construction of the GERD but also social stability by the use of military force or support of insurgent groups in Ethiopia and Sudan

### **Sudan's Political Turmoil**

Sudan's political unrest has been in the spotlight since the 11th of April of 2019 with the removal of the President Omar al-Bashir by the military and security forces. Even though social and political stability was expected after the removal of al-Bashir's authoritarian regime, Sudan remains politically unstable. The lack of democratic processes to restore the government has deepened Sudan's political crisis.

Considering Sudan's strategic geopolitical location, it is undeniable the importance of its support to the GERD construction. Before the political unrest, Sudan supported Ethiopia's decision on the GERD as it resulted in economic benefits for its country and its people. Although Sudan's standpoint has changed previously, it is not certain whether it will remain backing Ethiopia's GERD's plan construction.

## **Environmental Issues**

### **Climate change**

Africa has the lowest capacity to adapt to projected climate change and is therefore the most vulnerable continent on the globe. Lack of structural capacity to regulate the effects of extreme weather conditions has contributed to the adverse effects that climate change has had on Africa.

The water storage capacity necessary for the mitigation of drought effects and attenuation of floods is generally low compared to the rest of the world. This low capacity to adapt to such changes can be seen across the Nile Basin.

Major flood control hydraulic structures comprise the major dams on the Nile; these are the Roseires Dam and Sennar Dam in Sudan, the Aswan High Dam in Egypt, and Owen Falls Dam in Uganda. The Roseires and Sennar Dams are situated on the Blue Nile and were mainly constructed for irrigation in the early 1900s. The Owen Falls Dam, commissioned in 1954 mainly for hydroelectric power supply, is situated on the White Nile at the mouth of Lake Victoria. The High Aswan Dam is more recent, having been commissioned in 1970 and constructed mainly as a multi-purpose facility to control flooding, supply power and water for agriculture. However, the capacity for soft tools like early warning systems for mitigation measures is also underdeveloped in Africa. There is a lack of long-period and good quality data and models to assess climate change and climate variability impacts in the region, so that so far, it has not been possible to undertake appropriate adaptive actions to mitigate climate change.

There are, however, traditional practices that have been used for adaptability and mitigation of the effects of extreme weather scenarios. These include storage of food in preparation for famine that usually follows droughts. In general, climate issues are interwoven with many elements of our livelihoods and need deliberate and multi-pronged efforts to avert their adverse effects.

### **Impact of climate change on water flow**

Based on current climate warming models which offer diverging projections, it is believed that the Nile may experience either increased or decreased water flows in the future. Saltwater intrusion into coastal freshwater resources (including aquifers) is likely to increase as a result of sea-level rise due to climate warming and would further reduce the availability of freshwater in the delta region.

Global sea level has been rising at an average rate of 1.7 mm per year during the 20th century. This trend is expected to accelerate due to the thermal expansion of the oceans, and the melting of polar ice-caps. Sea-level rise will seriously threaten the delta. The construction of the High Aswan Dam has led to reduced silt supply and subsequent erosion of the seaward front of the delta. The weakening of the protective off-shore sand belt, combined with higher water levels, will increase the frequency of flood events. The problem of flooding is compounded by land subsidence – currently estimated at 1 to 5 mm per year – because of increased groundwater extraction for agriculture, and reduced siltation deposition. It is estimated that a 1-metre sea-level rise could cause a loss of 4,500 square kilometres of cropland, and displace some 6.1 million people in the Nile Delta. Sea-level rise will further speed up saltwater intrusion, which will increase soil salinity and make formerly fertile lands unfit for agricultural use.

Fisheries: climate change will affect both the productivity of fish populations and how they are distributed. A potential reduction in fish production could affect food availability, aggravate poverty and possibly exacerbate political instability in the region. Note: It has been reported that the rainy season has become shorter and more intense, and subject to erratic onset and cessation, making it very difficult for farmers to plan the farming calendar. It is not possible at this point, however, to verify these reports and determine significant long-term trends in rainfall patterns in the Nile Basin because of insufficient empirical data.

Being able to predict the amount of flow variability, and even to forecast likely years of reduced flow, will become ever more important as the population of the Nile River basin, primarily in Egypt, Sudan, and Ethiopia, as populations are expected to double by 2050, reaching nearly 1 billion. According to a recent study, based on a variety of global climate models and records of rainfall and flow rates over the last half-century, the Nile River shall experience an increase of 50 percent in the amount of flow variation from year to year. The study, published in the journal *Nature Climate Change*, was carried out by professor of civil and environmental engineering Elfatih Eltahir and postdoc Mohamed Siam. They found that as a result of a warming climate, there will be an increase in the intensity and duration of the Pacific Ocean phenomenon known as the El Niño/La Niña cycle, which they had previously shown is strongly connected to annual rainfall variations in the Ethiopian highlands and adjacent eastern Nile basins. These regions are the primary sources of the Nile's waters, accounting for some 80 percent of the river's total flow.

The cycle of the Nile's floods has been "of interest to human civilization for millennia," says Eltahir, the Breene M. Kerr Professor of Hydrology and Climate. Originally, the correlation he showed between the El Niño/La Niña cycle and Ethiopian rainfall had been aimed at helping with seasonal and short-term predictions of the river's flow, for planning storage and releases from the river's many dams and reservoirs. The new analysis is expected to provide useful information for much longer-term strategies for placement and operation of new and existing dams, including Africa's largest, the Grand Ethiopian Renaissance Dam, now under construction near the Ethiopia-Sudan border.

While there has been controversy about that dam, and especially about how the filling of its reservoir will be coordinated with downstream nations—Eltahir says this study points to the importance of focusing on the potential impacts of climate change and rapid population growth as the most significant drivers of environmental change in the Nile basin. "We think that climate change is pointing to the need for more storage capacity in the future," he says. "The real issues facing the Nile are bigger than that one controversy surrounding that dam." Using a variety of global circulation models under "business as usual" scenarios, assuming that major reductions in greenhouse gas emissions do not take place, the study finds that the changing rainfall patterns would likely lead to an average increase of the Nile's annual flow of 10 to 15 percent. That is, it would grow from its present 80 cubic kilometers per year to about 92 or more cubic kilometers per year averaged over the 21st century, compared to the 20th century average.

The findings also suggest that there will be substantially fewer "normal" years, with flows between 70 and 100 cubic kilometers per year. There will also be many more extreme years with flows greater than 100, and more years of drought. (Statistically, the variability is measured as the standard deviation of the annual flow rates, which is the number that is expected to see a 50 percent rise). The pattern has played out over the last two years -- 2015, an intense El Niño year, saw drought conditions in the Nile basin, while the La Niña year of 2016 saw high flooding. "It's not abstract," Eltahir says. "This is happening now." As with Joseph's advice to Pharaoh, the knowledge of such likely changes can help planners to be prepared, in this case by storing water in huge reservoirs to be released when it is needed. Already, Eltahir's earlier work on the El Niño/La Niña correlation with Nile flow is making an impact. "It's used operationally in the region now in issuing seasonal flood forecasts, with a significant lead time that gives water resources engineers enough time to react. Before, you had no idea," he says adding that he hopes

the new information will enable even better long-term planning. "By this work, we at least reduce some of the uncertainty."

## Water Management

### Egypt

Egypt's dependency ratio is one of the world's highest with 96.9 percent of the total renewable water resources flowing into the country from neighboring countries. The total renewable water resources per capita stands at 700 m<sup>3</sup>/year/capita in 2014, but considering population growth is expected to drop below the 500 m<sup>3</sup> thresholds of absolute water scarcity by 2030.

Considering that Egypt's resources rely on the Nile River, it is important to mention that the government oversees several institutions that directly or indirectly work together to better water management and quality systems. It is important to understand the role that these institutions have in the country to analyse a possible solution at a governmental level around the Nile basin river crisis.

Currently, the Ministry of Water Resources and Irrigation (MWRI) is in charge of water resources research, development and distribution, and undertakes the construction, operation and maintenance (O&M) of the irrigation and drainage networks. Specifications and permits for groundwater well drilling are also the responsibility of MWRI.

The Ministry of Agriculture and Land Reclamation (MALR) is in charge of agricultural research and extension, land reclamation and agricultural, fisheries and animal wealth development. Covers the whole sector of drinking water and wastewater.

The Ministry of State for Environmental Affairs (MSEA) and the Egyptian Environmental Affairs Agency (EEAA) under its jurisdiction mostly concentrate on the quality aspect of water.

The National Water Council (NWC) ensures inter-ministerial coordination by integrating policies and activities at the national and local level, and it is assisted by a technical secretariat and Water & Environment units in the different Ministries and organizations. At the governorate level, a Regional Management Committee (RMC) includes all stakeholders and is chaired by the local MWRI responsible (MWRI, 2005).

Water Users Associations (WUAs) exist in parts of the country and operate at *mesqa* (tertiary) level where farmers on one *mesqa* select a representative to the association, which meets regularly with the district irrigation engineer to determine the major reports that need to be made. The association is also responsible for organization regular *mesqa* maintenance and resolving conflicts.



TABLE 6  
Water management levels and units

	Number of WUAs	Area (feddans)	Number of farmers
Mesqas (tertiary)	100 000	10-100	150
Branch canals (secondary)	4 000-5 000	500-3 000	1 000-5 000
Main canals (or feeder canal)	400-600	15 000-25 000	10 000-20 000
Irrigation district	300	20 000-60 000	40 000-80 000
Governorates	26	200 000-500 000	1 000 000

Source: [fao.org/nr/water/aquastat/countries\\_regions/EGY/index.stm](http://fao.org/nr/water/aquastat/countries_regions/EGY/index.stm)

Irrigation water distribution into the irrigation network is managed by the MWRI and its local representatives (Gersfelt, 2007). Water flow is continuous up to the branch canal (second level). At the *mesqa* or third level, distributaries receive water according to a rotation schedule. Water is pumped from the distributaries to irrigate fields (lift: about 0.5-1.5 m).

Investment especially in land reclamation and irrigation improvement, O&M, as well as rehabilitation costs of irrigation and drainage infrastructures are traditionally financed by MWRI, only the pumping costs from the *mesqa* to the field are paid by farmers. However, in Toshka mega project, proposed water charges combine area and volumetric based charges (MWRI, 2005).

Within the land reclamation programme, the government's investments target irrigation and drainage infrastructure, settlement construction, and provision of potable water, electricity and roads. Very little is invested in social services (education and health), and no investment is made in the provision of agricultural services (technology, water management and rural finance). Consequently, poor settlers face difficulties in settling and farming, and a considerable percentage move back to the old lands and abandon their new land farms.

## Ethiopia

The Blue Nile, which suffers from high seasonal fluctuations, descends from the lofty Ethiopian 'water tower'; highlands. They provide 86 per cent of the waters of the Nile - Blue Nile 59 per cent, Baro-Akobo (Sobat) 14 per cent, Tekesse (Atbara) 13 per cent - while the contribution from the Equatorial Lakes region is only 14 per cent.

Over 80 percent of Ethiopia's population still live in the highlands, which constitute just over 40 per cent of the land area of the country, while hosting 60 per cent of the livestock and accounting for 90 per cent of rain-fed agricultural land. The country is in the pursuit of achieving self-sufficiency in food production, and certainly do not want the famines of the 1970s and 1980s to reoccur. The assertion by the government and its people is that there is no other choice but to increase agricultural production by seeking and obtaining a fair share of the waters of the Nile.

Given that Ethiopia is projected to have more people to feed by 2025 than Egypt, the government has maintained its sovereign right to develop all resources within its borders. However, the dam project has met with stiff resistance from Egypt, where many fear it will cut into the country's already strained supply of Nile water. As a downstream nation, Egypt says the dam will disrupt the flow of the Nile to its almost 100 million people, potentially crippling agriculture and industry. This will also compound other problems threatening the Nile, including climate change,

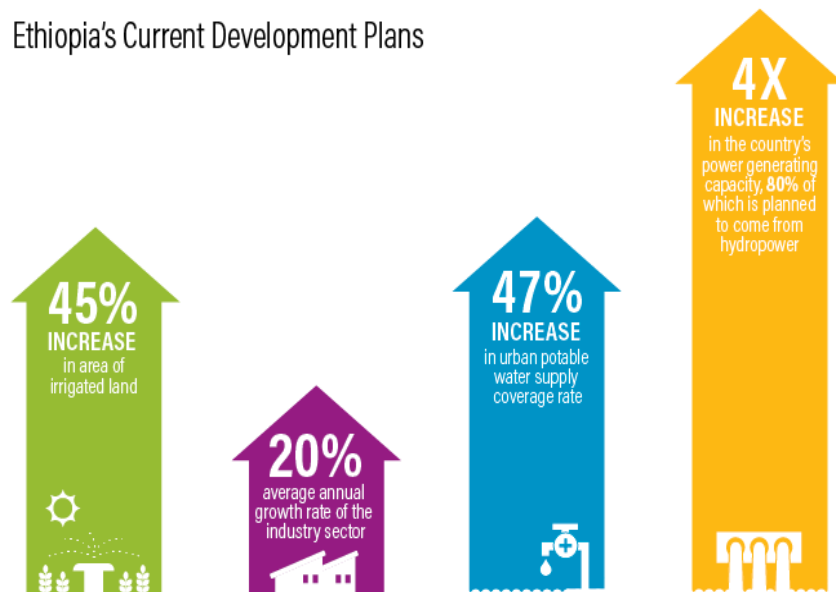
population boom, urban sprawl, and rising sea levels, which lead to saltwater intrusion. However, Ethiopia's Prime Minister has sworn not to "harm" Egypt's share of the Nile, breaking the deadlock in talks over control of Africa's longest river. In his words: "My government and my people have no intention to harm the people of Egypt and the government of Egypt."

Furthermore, it is necessary to highlight that Ethiopia's economic prosperity has been heavily driven by rainfall and water availability. According to the World Resources Institute (2017), "recent periods of GDP growth and poverty reduction also coincided with periods of more reliable rainfall and greater public investment." The impact that rainfall has been significant for its population, especially for the growth and development of its children. There is an undeniable relationship between water scarcity and food security, which affects Ethiopia in different sectors such as education, health, development, growth, etc.


In this regard, Ethiopia's plans for economic growth aims to expand its irrigated agriculture, manufacturing, hydropower and municipal water supply. The construction of the GERD, in this case, seems to have a significant impact as it will contribute to Ethiopia's development.

Water management has been one of the main weaknesses of Ethiopia. According to a report developed by the Overseas Development Institute (2015), "Ethiopia's water sector continues to be characterised by little integrated planning, so that water resources are being allocated in ways that neither take into account competing demands nor are based on a systematic understanding of 'how much water' is available." For instance, the case of the Awash River Basin, which is generating conflict between upstream and downstream irrigators as well as irrigators and hydropower operators.

### Ethiopia's Current Development Plans



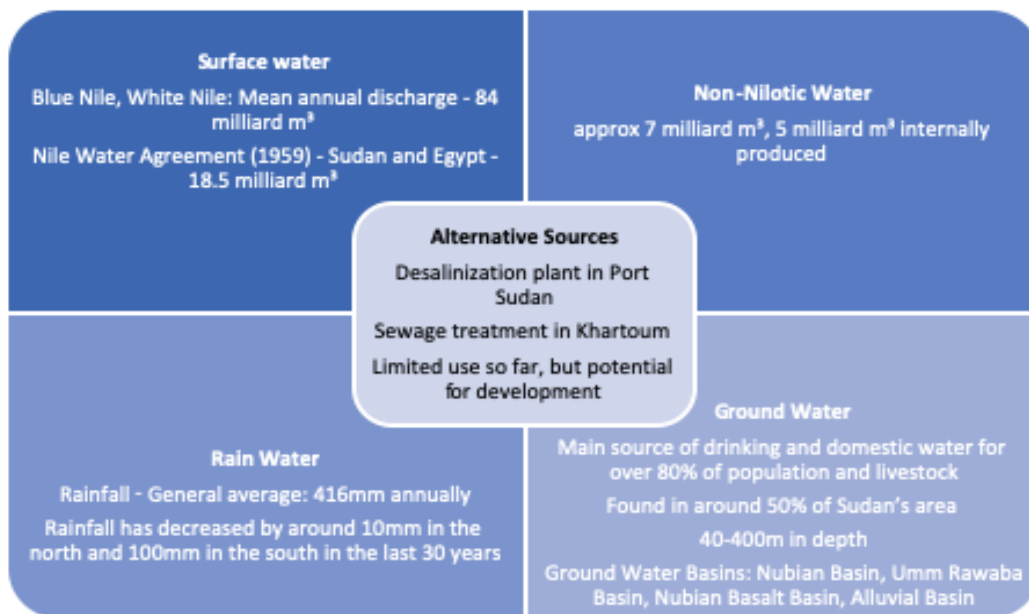
Source: Ethiopia's Growth and Transformation Plan II

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In this sense, Ethiopia’s lack of policy and institutional framework for WRM (water resource management) will restrain the country of both economic growth and development. Even though Ethiopia has a legal and policy framework of WRM, it does not fully cover the needs of the country as it is based upon basic principles that are not aligned to the country’s context. Moreover, it requires greater involvement from the River Basin Authorities in a way that planning is designed by highly knowledgeable and skilled people, to later on, start creating IWRM institutions to create medium and long-term solutions to Ethiopia’s water crisis.

## Sudan

In the case of Sudan, the Ministry of Water Resources, Irrigation and Electricity is the central ministry responsible for all water issues. Village Development Committees are responsible for land allocation for agriculture and grazing as well as water supply and development including the running and maintenance of water yards in rural areas. Local non-governmental organizations (NGOs), such as the Sudanese Environment Conservation Society, and some international NGOs, such as the Environmental Network of the Horn of Africa, play a pivotal role in local community development, and water is an entrance point for all development initiatives.



In the light of climatic changes, the Nile basin initiative and the secession of the South Sudan Republic, the conventional water resources of Sudan need to be accurately assessed for: proper utilization; sustainable development and management; storage facilities volume should be developed and increased; Modern techniques should be adopted in using sound rainwater harvesting methods and conservation tillage (as recommended by Ali Widaa Mohammed Elamin, Department of Agricultural Engineering at the University of Khartoum).

# Initiatives and Agreements

## I. HYDROMET (1967-1993)

Water management is often highly complex and extremely political. Balancing competing interests over water allocation and managing water scarcity requires strong institutions, regardless of the region in question. To this end, various attempts have been made over the last half century to establish a strong institution that could govern the Nile River's water and its utilization by the countries it crosses through. One of these was HYRDOMET, which was launched in 1967. Formally known as the Hydro meteorological Survey of the Catchments of Lakes Victoria, Kyoga and Albert, it was the Nile Basin's first regional project. Initiated by the Great Lakes states immediately after they achieved independence in the 1960s, its central objective was to help those states to collect hydro meteorological data and to study the hydraulics, hydrology and the meteorology of the Upper Nile Basin. This would help these states to better prepare and handle heavy flooding—a regular occurrence which caused untold human calamities.

A Council of Ministers of Water Affairs was established within the HYRDOMET, to oversee the project, with a technical committee acting as a steering committee—steering committees decide on the priorities or order of business of an organization and manage the general course of its operations. To aid them in this effort, both the World Meteorological Organization and the Food and Agriculture Organization were called upon to provide financial and logistical assistance. However, the initiative did not include all riparian states: the DRC (Zaire), Ethiopia and Kenya participated as observers. Two of these, Ethiopia and the DRC, could not be motivated to become actively involved, as the project failed to deal with the main issues of fair and equitable allocation of the Nile.

This was not the only issue that beset the HYDROMET, as demonstrated in one instance in 1970, when a majority of the member states rejected proposals presented to them by Egypt and Sudan which aimed to establish the Nile Basin Commission under the auspices of HYRDOMET. The other Nile riparian states refused to cooperate, since the two downstream states failed to provide their fellow riparian states with any real incentives to join in them in that endeavor. Moreover, they felt that joining a body for the allocation of Nile water could have potentially cost them their rights to withdraw that very same resource. What ended up happening instead was that countries like Rwanda, Burundi, Tanzania and Uganda formed their organization called Kagera Basin Agreement, which enabled them to develop and manage the River Kagera which flows into Lake Kagera (on the sideline of the HYDROMET).

Ultimately, HYDROMET's legacy was defined more by failed to do, instead of what aimed to do. Although it managed to help to address the specific issue of flooding in the Great Lakes, it nevertheless failed to provide a clear and specific legal regime for the utilization of the Nile River basin. This, in turn, led to a further exploration of possible modalities to deal with challenges. TECCONILE—as its successor became known—was in many ways a product of that endeavor. Initially, it focused on issues such as the environment and water quality control. However, the main issue dealing with equitable utilization of the Nile River waters became part of the agenda for discussion by the Ministers of Water Affairs in the riparian states culminating in the establishment of a document focusing on the Nile River Basin Action Plan in May 1995

(Abdalla, 2000). The Tecconile process was replaced by the NBI, which has since its establishment in Dar es Salaam, Tanzania, in 1999, is still putting in place acceptable rules for the utilization of the Nile basin, its central objective.

## **II. TECCONILE (Technical Cooperation Committee for Promotion of Development and Environmental Protection of the Nile Basin, 1993–1999)**

TECCONILE, which succeeded HYDROMET, came into existence in January 1993. It was signed by Ministers from Egypt, Sudan Rwanda, Tanzania Uganda and the DRC. Burundi, Kenya, Eritrea and Ethiopia meanwhile, took part in the activities of initiative solely as observers—they considered the organization was still too deficient to tackle the several issues around the Nile Basin Ethiopia and the DRC Zaire opted against full membership since rejected their inclusion as it failed to take into account the long-standing issue of water redistribution in the Nile River Basin (or in other words, equitable utilization of the Nile water) was not taken into account in the organization’s mission. In doing so, they demonstrated their rejection of the Egyptian-dominated water regime dating back to the 1929 and 1959 agreements..

TECCONILE was divided into two main objectives (UNEP/UNDP/DUTCH, 1999: 101):

(1) a short-term plan that focused on a transitional period. The objective was to assist participating member states in developing national water master plans and their integration into a Nile Basin Development Action Plan (?). Also, to assist participating member states in developing the infrastructure, capacity-building and techniques required for the management of the Nile Basin water resources.

(2) A long-term plan to assist participating countries in the development and cooperation in conservation and use of the Nile Basin water resources in an integrated and sustainable manner. Also, determine the equitable entitlement of each riparian state to the use of the Nile waters.

During the meeting, 22 projects for technical assistance and capacity building were identified as part of a Basin-wide action plan for development and use of the Nile waters. These projects had five main components:

- Integrated water resources planning and management (5 projects)
- Capacity-building (8 projects)
- Training (1 comprehensive project)
- Regional Cooperation (5 projects)
- Environmental Protection and Enhancement (3 projects)\

In terms of cooperation, it is important to mention that without TECCONILE—which was more focused on technical cooperation relating to environmental issues and water quality—the creation NBI would have not been possible (Baitwa, 2014). TECCONILE and its increased level of basin-wide cooperation are what led to the NBI. It was also better developed and more advanced than the HYRDOMET project.

During the development of this agreement, different aspects were taken into account and despite the differences that each of the riparian countries present it was certainly a step further to achieve a more cooperative setting. In this regard, the TECCONILE concluded with the establishment of the Nile Council of Ministers (Nile-COM), which comprised of ministers with responsibility for water affairs. The Council, in 1997, requested World Bank coordination of financial support for TECCONILE, leading to the signing of a 1998 strategic agreement among the Nile countries for the establishment of a more inclusive cooperative process and a greater focus on regional development outcome.

In spite of what it represented in terms of increased cooperation among riparian states, it was ambiguous how the cooperation framework was going to be achieved. In other words, there was a lack of clarity regarding specific strategies outlining how each participating country was going to collaborate/cooperate. Some analysts state that it lacked focus on issues pertaining to the exchange of information and mechanisms for dispute settlement (UNEP/UNDP/DUTCH, 1999: 101). This was certainly something that left the project fragile and vulnerable to any kind of conflict between the participating countries.

Also, according to the World Bank Group, there were several significant constraints that pushed back the implementation of the cooperative framework. Firstly, there was the issue of distrust among the riparian states, which was largely rooted in their cultural and language differences. Some of the states in question felt that previous deals left them at a significant disadvantage in relation to their fellow riparian states. Another stumbling block was the lack of communication on technical information that could have brought greater cooperation on the Nile waters.

Second, before the NBI there was no control in the development of water-related projects (dams and irrigation systems). This means that countries were able to build water systems according to their national interests, disregarding how these may affect their neighboring countries.

Third, some Nile basin countries lacked the necessary institutional capacity and the skills and knowledge of transboundary water resource management to engage in regional discussions. There were few people specialized in water management or had technical expertise in the matter considering that the Nile basin River was an essential resource for many countries and that its socio-economic aspects are depending on it.

Finally, it is relevant mentioning that there was a lack of inclusivity, as not all the riparian states were represented in the cooperative framework, making it hard to arrive at a more comprehensive institutional setting (Baitwa, 2014). In this context, the World Bank, FAO, and UNDP intended to reconcile the regional actors through the funding of \$140 million from donor countries to the 22 projects (Okbazghi, 2008: 54). In 1999, the TECCONILE became the NBI.

### **III. NBI (1998-present)**

The NBI was formally launched in February 1999 as a partnership between nine riparian states “to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile basin water resources.”

Water ministers from Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda; and Eritrea as an observer are the states behind the development of the NBI. Uganda, Kenya, Tanzania had the leading role. Although the NBI’s main objective is to achieve an improved water management system between the riparian states that relies in the Nile River, it is considered a transitional arrangement until the member countries agree on a permanent legal and institutional framework for sustainable development of the Nile basin.

Considering previous agreements, as well as the context the NBI includes other objectives that include:

- to establish a basin-based water management institution
- to ensure cooperation and joint action among the riparian countries, seeking win-win gains;
- to target poverty eradication and promote economic integration; and
- to ensure that the programme results in a move from planning to action.

The NBI succeeded in bringing all members on the table, which showed the high willingness and commitment from riparian countries. Moreover, it is relevant to mention that the NBI counted with the support of development partners, such as the World Bank. which whom had also worked as a funding agency.

It also got the attention of the African Union and different Regional Economic Communities (RECs). Its shared regional projects such as the Regional Power Trade and power grid interconnectedness got the attention of the regional organization, as they fed into the Continent’s plan to regional integration through infrastructure and energy.

Even though, the NBI was expected to foster socio-economic development in the basin by bringing the joint benefit sharing of the Nile water and taking adequate long-term ecological sustainability into account, very little has been done on the ground. The state-centric perspective of Nile water development still dominates the basin. Finally, it is also important to mention that individual riparian country financial contributions have unfortunately been late and/or below the level needed to adequately and properly fully fund the NBI and its activities.

**Countries with a leading role in the NBI:** Uganda, Kenya, and Tanzania

### **IV. UNDUGU (1983-1992)**

In 1983, the UNDUGU group replaced Hydromet, with broader objectives of achieving regional cooperation in the areas of environment, infrastructure, trade and culture. UDUGU, (“Brotherhood” in Swahili), was formed at Egypt’s request.

UNDUGU included all riparian states except Ethiopia, Kenya and Tanzania, which opted to have observer status. Egypt occupied the leading role in the UNDUGU.

The achievements of these institutions remained very limited; first, because they did not include all the Nile riparian states and, second, because they merely focused on technical issues and avoided the legal challenges. However, it showed that countries were starting to look at options for working together for development based on a shared use of the Nile water.

The initiative lacked a comprehensive institutional setting in which to engage. It was reported that while many of the riparian states were interested in fostering “self-reliance and African inter-dependence,” for Egypt, UNDUGU was ‘an exercise in hegemonic influence.’

## V. The Nile Basin Cooperative Framework Agreement (CFA)/Entebbe Agreement

The CFA was developed under the framework of the NBI and it was adopted and signed in 2010 by Tanzania, Rwanda, Ethiopia, Uganda, Kenya, and Burundi, almost immediately after the establishment of the NBI in 1999.

The main objective of the CFA was to “*to affirm certain international shares of Nile waters, outlining principles, rights and obligations for co-operative water resource management among member states*”. It also allows all Nile Basin countries to conduct projects along the river without Egypt’s prior consent. For the CFA to enter into force, it requires a total of six instruments of ratification. Ethiopia, Rwanda, and Tanzania have ratified it, while Egypt and Sudan continue to reject it, fearing it will affect their historical allotment of the water.

**Disagreements over water security:** Article 14 of the CFA required the Basin states to work together to ensure that all states achieve and sustain water security. However, this paragraph did not satisfy Egypt and Sudan who wanted to ensure, through an additional clause, that their existing uses and rights are fully protected under the CFA. Consequently, Egypt and Sudan demanded and insisted that Article 14 of the CFA should include a specific provision, to be added at the end of the article that would oblige the Basin states “not to adversely affect the water security and current uses and rights of any other Nile Basin State.” This demand was rejected by the upper riparian states who saw it as a denial of the basic principle of equitable and reasonable utilization, and a breach of the vision of the NBI itself.

**Disagreements over the concept of notification:** Both Egypt and Sudan have demanded this (being notified prior to construction and water-related projects along the Nile River). The other riparian this, as they feel it would serve as a means for Egypt and Sudan to invoke colonial treaties (*see 1929 and 1959 agreements*) and their claim of veto power

**Egyptian opposition to the CFA/ Entebbe agreement:** Opposed by Egypt, which has for quite some time, lobbied for its own renegotiated and updated version of the CFA that, it says, addresses its concerns. Specifically, the Egyptian government feels that the current agreement, as is, reallocates water shares without the need to seek its approval.



Egypt had, until recently, the backing of Sudan but a fallout between both countries over alleged political interference and territorial disputes have left it on its own.

**What exactly did Egypt propose?** Egypt's alternative proposal—meant to be signed by the other riparian states—seeks to put in place an agreement that ensures maximum utilization of Nile resources, while maintaining the 1959 agreement that gives it a lion's share of the Nile. It will also look to set up the main lines of co-operation and decision-making mechanisms in relation to any project on the river.

**Recent History of the CFA Agreement:** A June 2017 summit of Nile Basin countries—meant to resolve differences around the contentious 2010 Entebbe Agreement—saw the attendance of only two head of states out of the 10 riparian states that were invited. These were Egypt's Sisi and Ethiopia's Hailemariam Desalegn. They were hosted by Uganda's President Museveni. In June 2017, Egypt pushed for riparian countries to replace the CFA with a new agreement, but most members were reluctant to accept it. This has led to a major impasse in the CFA process.

## **VI. Nile Agreement on the Principles for the Grand Ethiopian Renaissance Dam (2015–present)**

Ethiopia, Egypt, and Sudan came to reach an agreement on the principles of utilization of Nile. The principles in the March agreement included giving priority to downstream countries for electricity generated by the dam, a mechanism for resolving conflicts, and providing compensation for damages.

The states that led and participated in this agreement were Ethiopia, Egypt and Sudan. This agreement initiated on 23 March 2015. The other countries did not participate, as these states were involved and to some extent affected by the construction of the GERD. For some this agreement reaffirms the past colonial agreements on the Nile (1929 and 1959 agreements).

The agreement has been an instrument for attempting the three countries to cooperate and work together during and after the construction of the GERD. This includes the participation of an International Panel of Experts that will research better ways to manage and operate the dam. Note: 15 months from the start of preparing the required studies on the dam for the conclusion of this agreement.

One of the major achievements has been the commitment from Ethiopia to avoid causing significant harm to Egypt and Sudan, which are very reliant on the Nile waters. Also, in case any harm is done, Ethiopia will take the necessary actions to mitigate and discuss compensation 'whenever convenient'. In this regard, the agreement has been an instrument to avoid escalating conflicts between the three countries, and to reassure that any harm will be Ethiopia's responsibility. However, at the same time this is deemed as an achievement it has also been a failure for some, especially on Ethiopia's side.

**Failures:** According to Bayeh (2016), the agreement "reaffirms the past colonial agreements by compromising the sovereign power of Ethiopia, recognizing Egypt's right on the management of

the dam, vaguely obliging Ethiopia to give priority to downstream countries, granting Ethiopia a very restricted utilization of the Nile water, and including the tributaries of Nile river in the ambit of the agreement.”

To state that the agreement has been a completely positive outcome is not possible. The technical aspects of this agreement can build a lack of trust between Egypt and Ethiopia, making it hard for the states to share the dam benefits and reducing its potential negative impacts on downstream countries.

One of the main arguments for this is that Egypt has been historically the dominant state due to its power over the Nile waters. However, this has changed after the construction of GERD, which 86% of it has been controlled by Ethiopia. Moreover, it is important to consider that there has been threats and mistrust over the decades that reached a point in which both countries were willing to use force. Despite these issues and the attempt to address them in the agreement, there are some legal concerns regarding the principles covered in the agreement:

***Principle of cooperation:*** It leads to misunderstanding. It states that in case downstream countries need additional water, upstream countries will give up their development opportunities. In this regard, if Egypt’s population continues growing, Ethiopia must stop with the construction of the damn.

***Principle of equitable and reasonable utilization:*** Countries need to take into consideration certain guiding factors. These factors might include:

- a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character.
- b) The population is dependent on the water resources in each Basin State.
- c) Existing and potential uses of water resources.
- d) The availability of alternatives, of comparable value, to a particular planned or existing use.

Considering these factors with each of the states, Egypt will be the only one to benefit from this treaty. This will be an instrument to secure and maintain the water needs of Egypt.

***Principle to cooperate on the first filling and operation of the dam:*** The agreements subject the damn to the joint management of the three countries. Therefore, the countries have the power to decide over the damn and to some extent compromises Ethiopia’s sovereign power to decide over its natural resources.

***Principle of confidence building:*** The agreement fails to put the duties/parameters to be met by those downstream countries to enjoy the aforesaid privilege: energy demand.

***Principle of sovereignty and territorial integrity:*** The fact that the declaration empowers Egypt on the management of the operation of the dam also seems to fork over power from Ethiopia on its national project.

# **Recommendations and Solutions**

## **Solutions to the GERD crisis**

Considering the current political situation in Sudan, their involvement is unlikely at this stage. Previously, Sudan has not taken a standard position in regards to the GERD construction. The economic and social benefits that the dam could bring Sudan might give them enough basis to take a pro-GERD position. However, the inability of the state to restore democracy does not provide sufficient evidence on the position the country will take.

Furthermore, the recent increase in women's participation in public policy could give a positive input to solving the GERD crisis. The recent election of Sahle-Work Zewde, as the President of the Federal Democratic Republic of Ethiopia could represent a significant change in policy decisions, more specifically in the ones that requires diplomatic management, such as the GERD management. Even though Sahle-Work Zewde, does not have a chief executive power in the country, she still has a significant influence in international agreements/negotiation matters. In this regard, her participation in future agreements with Egypt can be pivotal. Considering her interests in fostering women's participation in policy development and implementation, this could mean that a more gendered perspective could be given to the GERD crisis and possible future arrangements could be negotiated, such a possible financial aid to Egypt's most affected areas during and after the filling of the dam.

## **Solutions to Environmental issues**

In light of escalating effects of climatic change, the Nile basin initiative and the separation of South Sudan Republic, the conventional water resources of countries like Sudan need to be accurately assessed for proper utilization, sustainable development and management. This includes the development and increase in the volume of water storage facilities; the adoption of modern techniques in areas such as rainwater harvesting and conservation tillage. Climate change will likely result in greater variability in seasonal flows. As the population is growing, there is higher water consumption, which leads to reduced water flows downstream. Considering these aspects, Egypt is in a vulnerable situation where food and water security are at stake. The fact of having devastating consequences for downstream countries, will give opportunity and even more, a justification for rebel groups to be active and to foster political destabilization.

Certainly, population growth is one of the most concerning issues, Egypt and Ethiopia will experience a rapid population growth by 2050, which will lead them to water stress in term of distribution and utilization of water resources in the Nile River Basin. It is relevant to take into account that the population growth involves inter-state migration from rural to urban areas that will also affect the future water demand. The issue will consequently intensify disputes among different users of water. As constant population growth is projected, newly harvested areas will be developed resulting in more water demand and consumption.

During the last years, the freshwater withdrawals haven't increased leading people to consider the Nile basin as a 'closed' basin. In other words, the river has been exploited at its full potential and no water is left for additional withdrawals. In face of this huge issue, different solutions should be regarded such as analysing opportunities for groundwater resources, intra-basin transfers, virtual water trade, wastewater treatment, minimization of water losses, upgrading of

current hydraulic infrastructures and development of new technologies (such as desalination processes). It is also important that both technical management and institutional governance should be given priority to face the various challenges. Technological innovation and improved water management hold the potential to increase water productivity for food production; however, higher temperatures could reduce the potential land and water productivity.

It is also important to note that more of the Nile riparian countries do not rely merely on irrigation systems but in rainfalls, which have spatial and temporal variations. In this regard, some riparian states will face challenges with agricultural production and hydroelectric power generation and provision of ecosystem services. In such a case, it is important to prepare strategies and planning to cover the future possible absence of rainfalls, consequences of climate change. Nile riparian states need to adopt resilient strategies in order to enhance their adaptive capacity and face a different range of potential climatic outcomes. Moreover, national and regional policy plans must foresee the results of future scenario analyses to develop strategies according to each riparian state. It is extremely important to recognise that each country has its own socio-economic and political history, environmental background and system, which means that each of these states needs a different way of treatment and management. Also, for each case it is important to address whether locally or regionally water demand and supply governance in an integrated and sustainable.

Regarding food security, which is directly related to water security, FAO (2011) suggested the Nile countries need to prioritize two key variables: improved agricultural productivity of water across the basin, and an enhanced cropping system diversity. The first would provide the riparian countries with more efficient agricultural production, minimizing water losses and increasing the productivity per yield, while the second would allow them to diversify their production system, gaining from intra-basin comparable advantages and diminishing the risks of the variability in international trade prices.

Considering the fact that food and water are interrelated, through the improvement of these 2 factors, other economic sectors would benefit by providing more water available for the industrial and domestic uses as well as inputs for agricultural non-food production. To achieve the expected outcomes, the Nile countries must invest in infrastructure, research and development, innovation, water management and enhance their water governance. Finally, they need to strengthen their relationships towards the concretization of joint efforts to coordinate strategies, exchange data, and improve the overall management of their shared water resources.

The combination of growing domestic and regional energy demand (due to population growth and urbanisation trends, as well as to increasing industrialisation and development expectations), with hydropower unexploited potential, increasing foreign investments and national infrastructure improvements, is expected to drive the Nile states' agenda towards the prioritisation of hydropower generation over traditional sources of energy, in particular in Congo, Ethiopia, Uganda and Sudan. In fact, these states have already started developing their energy policy plans, constructing and/or planning hydropower facilities across the Nile River.

There are some hydropower projects, such as the Grand Inga project in Congo (could generate up to 39,000 MW) that could convert the country in the largest African net exporter of energy by

2040, followed by Ethiopia. At the moment, Ethiopia is carrying on the construction of the Great Ethiopian Renaissance Dam (GERD) that could provide 6,000 GW of hydropower. Also, countries such as Sudan, are improving its hydraulic infrastructures to exploit its water potential, for both hydropower generation and irrigation purposes.

Regional integration through energy trade is currently one of the main paradigms advocated in order to supersede the water-related disputes. The utilisation of the Nile flows has spurred over the regional relationships since the past 50 years: exploiting the hydropower potential in areas where the flows are suitable for generating energy more efficiently could indeed provide the other basin states with reliable energy supplies at affordable costs, thus enabling all the riparians to share the potential benefits acquired from common source.

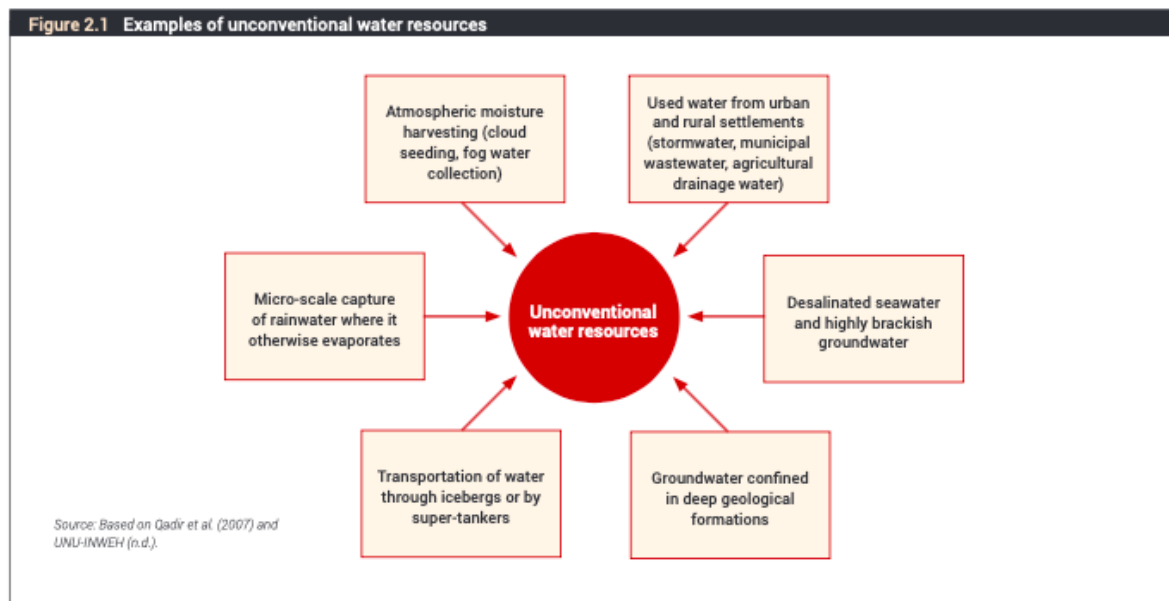
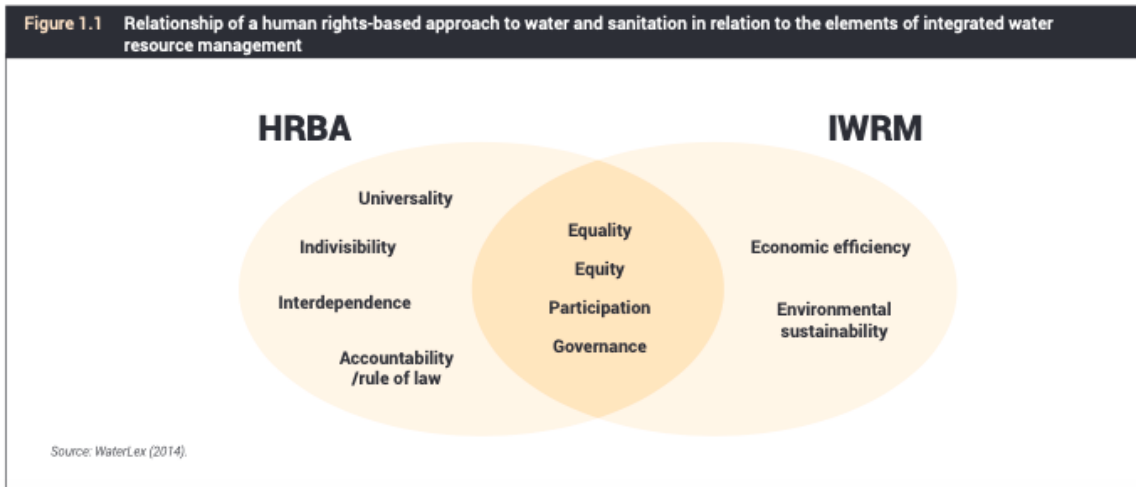
Even if technical management could expand the water supply, ‘managing overall demand through a focus on water productivity rather than concentrating on technical efficiency of water use alone’ is a more viable policy recommendation to tackle potential water scarcity in the Region.

Furthermore, considering the increasing water demand in the riparian states, water demand management (WDM) is something the region should be focusing. WDM aims to manage water ‘in a more efficient, equitable and sustainable way’, and in its broader conceptualisation that implies not only technical solutions and technological transfers, but also political, economic, social, institutional and financial policies. As mentioned earlier, each of the riparian states has its own context. According to Zeitoun et al. (2010), “WDM needs to be supported by socio-economic reforms as well as political engagement, and interventions should include food trade (institutionalisation of regional food market), changing consumption patterns (water conservation and food demand), agronomic interventions (diversification of production and improved rained farmed), environmental interventions (water harvesting and watershed management) and international cooperation (in transboundary water management and climate change adaptation)”

Hence, taking into account other economic sector could lead to a water-driven basin-wide cooperation that could benefit each state and different sectors, fostering relationships between the Nile basin states. If this kind of cooperation is possible more efficient water management, better adaptation and resilient capacity, sustained economic development and, even more importantly, to the overcoming of past and present disputes among upstream and downstream countries could be possible.

Considering the historical political disputes, it is relevant to focus on future threats such as climate change. Over the years, there have been conflicts around the rights over the Nile River but none of them has certainly focused on possible future threats, and how these could affect the access to a fundamental human right such as water. In the last 2019 Water report developed by the United Nations, it clearly states that: “Caution must be taken in order to clearly differentiate between water resources management (including water rights) and the human rights to water and sanitation. The types of approaches that move water towards equity include: treating water as a common good, not an economic resource; making WASH decision-making transparent and participatory; adopting water policies that recognize and address political and economic

imbalances; and ensuring that water is available for future as well as present uses (Wilder and Ingram, 2018).”



Also, considering the high dependence of Egypt on the Nile waters, creating a system of water reuse could diminish any possible negative effects from the damn construction or climate change effects. Treating wastewater to a quality standard that is safe and susceptible to a user not only improves its overall appeal, but also makes water reuse more economically feasible. In this regard, the implementation of wastewater could be implemented through processes such as stream separation, material and energy recovery, etc. However, as this is yet an unexplored area, many governments have considered allocating budget to exploit the full potential of recycling wastewater. In this regard, if the region itself commits to allocating a certain budget to plan and

develop strategies around recycling water could lead to a more cooperative framework that its demand and dependence on the Nile waters could be seen from a different perspective.

Riparian states have been mainly focusing on how much water each state should be allocated for its consumption. But none of them has explored future strategies in the case this resource is no longer available. Most of the disputes one way or another have been raising issues such as dominance, colonialism and power but have been setting aside the importance and relevance of its own people. In past agreements, some of the main characteristics were the lack of participation from all riparian states and the absence of environmental concerns during the discussions. If these patterns could be changed into a more inclusive (participation of all riparian states) and less power dominant discussion, more efficient outcomes could be reached for long-term water management planning.

Considering the dependence on Nile waters of each of the riparian states, treating water not merely as an economic resource but as a human right concern could lead the region to a more equitable and sustainable management. In this regard, a perfect scenario of cooperation would be one in which each riparian state allocate budget for water management based on their needs and contexts. Each states' budget allocated to a riparian states' fund for water management could be a possible solution to tackle present and future problems (i.e. from the image above taken from the UN report). By having this budget for water management, investment in technology and research for implementing wastewater recycling strategies according to each countries' needs could be more efficient and cost-effective. As mentioned earlier, each state has its own local issues and contexts, so by having this fund to invest in different water management projects could benefit the countries in the way they really need.

Despite the existence of several agreements and with the development of new projects, it is necessary that states stop focusing on power issues but to make a joint effort to find practical solutions based on mutual trust.

Egypt, which has already entered into water poverty, needs to have two strategies. One is to seek to ration water and the second is to find additional sources of water either through the Nile or through the desalination of sea water. For the latter this would come in the form of desalinization projects, aquifers and other such solutions. Altogether, these would help to reduce Egypt's high level of dependency on the river.

Civic organizations are hard at work solving the water crisis too. This following sections will highlight specific initiatives that have so far been adopted by these organizations—and in our view should be continued.

In Egypt, where agriculture accounts for 80-85% of freshwater consumption, the *MadForWater* initiative is using technology and water management solutions to recycle wastewater. Operational in Egypt, Morocco, and Tunisia, this project is all about improving agricultural production while decreasing the agricultural sector's heavy reliance on fresh water reserves by recycling wastewater for farming. Efforts should be doubled to ensure that continuation of such projects.

Like in many other countries in its position, water-related crises tend to have a greater impact on the poor and vulnerable segments of the Egyptian population. Poorer communities rely on the Nile water for activities such as irrigation for subsistence crops, as well as for fishing. Water pollution takes its toll on poorer communities' health and the stocks of fish available to them. But the Egyptian Centre for Economic and Social Rights is working to overcome this with an innovation called a 'Water Map'. The crowd-enabled map highlights areas where people struggle with water pollution, and encourages civic action for the improvement of water management.

News from Egypt's Desalination Research Centre is that the technology is already working hard to supplement the country's access to fresh water. Some 135,000 cubic meters of freshwater is already being produced daily in Egypt using desalination technology. The centre says that the goal is to up this production to 1 million cubic meters per day in the next five years (2017).

**Innovations:** trying to control water evaporation to reduce water losses — something Egypt's water research centre is working on, but hasn't yet implemented.

### ***Security***

Egypt needs to de-securitize its policy on the River Nile, to shift it 'into the normal bargaining processes of the political sphere'. This is regarded as the first step toward equitable and reasonable sharing for all the riparian states.

On the part of Ethiopia, the country should recognize Egypt's need for water too and use its large dam for the regulation of the Nile not its blockage.

All the Nile basin states must cooperate for the peace and prosperity of Africa.

On the decisions of the upstream states to sign a new agreement without Egyptian participation, the riparian countries were urged on the importance of all countries concerned 'to bridge the gaps' and 'see what can be done to find a compromise'.

Adopting a *non-governmental approach* by professional organizations to provide a 'relatively free' channel to express views, exchange information and try out new ideas with no preconditions. This route works well for professional organizations dedicated to serving their membership in an unbiased way, free of political, nationalistic and other limitations.

At present, any plans made by one of the riparian states concerning the use of the Nile are being perceived by another as endangering its national interests. Hence cooperation among the three major countries, Egypt, Ethiopia and Sudan, should be the priority, followed by negotiations illustrating the benefits associated with basin-based developments. Without this, the full potential of the entire river system cannot be fully realized.

Egypt and Ethiopia should come up with a water resources policy that promotes the harmonization of policies and legislation on the use, development, protection, conservation and management of trans-boundary or shared water and related resources. They should also develop water protocols for the implementation of this policy. This policy should respond to issues that



arise as a result of sharing the Nile River between countries with different social and economic conditions.

African Union and other African regional economic communities should consider the formal elaboration of an international *African Charter of Waters* that could override colonial-based laws and reduce the threat of water conflicts between states.

# Annex

## A. Timeline of events

**1902** – Egypt’s Aswan Dam becomes the first dam to be built on the Nile

**1929** – The signing of the Nile Waters Agreement between Sudan and Egypt further prioritized Egyptian water needs and purported to give Egypt the right to veto future hydroelectric projects in British colonies (which then included Kenya, Sudan, Tanganyika, and Uganda) along the Nile.

**1959** - Sudan and Egypt replace the 1929 treaty with **the Agreement for the Full Utilization of the Nile Waters**, which essentially allocated the entire flow of the Nile at the Aswan Dam to Sudan and Egypt

**1971** – Egypt’s High Aswan Dam construction project is completed with the assistance of the Soviet Union. The dam led to increased agricultural production.

**June 1980** – Ethiopia charges Egypt with planning to divert the Nile waters to the Sinai illegally.

**1983** - **UNDUGU** (“brotherhood” in Swahili) is formed at Egypt's behest to foster economic, social, cultural, and technical ties. Some argued that while many of the riparians were interested in fostering “self-reliance and African inter-dependence,” for Egypt, UNDUGU was “an exercise in hegemonic influence.” UNDUGU included all Nile riparians except Kenya and Ethiopia, which participated as observers. Its lasting impact was to provide a forum for information sharing. “UNDUGU served as an institutional locus for sharing expertise” and allowed for the riparians to become “accustomed to treating the Nile as a whole, not as less than the sum of its national parts.

**1988** – Egypt blocks a loan from the African Development Bank because it feared that Ethiopia’s Tana Beles project would consume too much Blue Nile water

**1993** – Government ministers from Egypt, Sudan, Rwanda, Tanzania, Uganda and Zaire sign the **Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (“TECCONILE”)**. Ethiopia and Kenya refuse to join as full members, arguing that its framework does not address the fundamental issue of equitable water apportionment. In addition, Egypt was again perceived to dominate.

**February 1995** – the Nile River Basin Action Plan (“Action Plan”) is agreed to by all of the Nile Basin states, including Egypt. It is devoted to a series of development projects and “the establishment of a basin-wide, multidisciplinary framework for legal and institutional arrangements.”

**May 14, 2010** – The \$500mn Tana-Beles hydroelectric power plant is inaugurated

**2010** – Egypt and Sudan reject a new deal—agreed by upstream countries including Ethiopia, Uganda and Kenya—which proposes more water for upstream countries and strips Egypt of the veto over dam development in the Nile.

**2011** – Ethiopia starts work on the Grand Renaissance Dam, which is set to be the biggest in Africa

**December 2013** – sees a shift in the diplomatic power balance in the Nile River basin after Sudan opts to abandon its longstanding alliance with Egypt on the Nile by declaring support for the Grand Ethiopian Renaissance Dam.

**2014** - Sudan claimed neutrality in the negotiations in 2014, offering mediation between Egypt and Ethiopia

**May 2014** – Abdel Fattah el-Sisi is elected president of Egypt. His more diplomatic approach to the issue of Ethiopian dam construction marks a departure from his predecessor’s threatening rhetoric

**March 2015** – Egypt, Sudan, and Ethiopian sign the Declaration of Principles. The document includes 10 points, including: (1) a principle of not causing significant harm to any other basin state, and (2) a fair and appropriate use of Nile waters. Also, included is an agreement to contract an independent study of the dam’s impact and abide by it as the three countries agree on a plan for filling the reservoir and operating the dam. But the deadline to complete the study has passed, and it has hardly begun, held up by differences over information sharing and transparency despite multiple rounds of negotiations among the three.

**June 2017** – Egyptian foreign minister Sameh Shukri speaks of “difficult talks” and complained of delays in the GERD dam impact study

**August 2017** – construction on the GERD is stalled after the Ethiopian government takes the contract for turbine installation away from state-owned company, Metec, in an effort to stamp out corruption.

**December 2018** – GERD’s construction manager says the dam will not be completed until 2022, more than 4 years behind schedule. This has been blamed on possible defects with the hydro-electrical plant’s equipment

**June 2018** – Ethiopia’s Prime Minister Abiy Ahemd visits Egypt and reassures Egyptian Abdel Fattah el-Sisi that he wanted aid development in Ethiopia without harming the Egyptian people.

**July 2018** - Ethiopian and Sudanese troops exchange fire in disputed land on the border of the 2 countries - Ethiopian farmers killed in the dispute

**16 Aug 2018** - Ethiopia and Sudan agree to withdraw troops from both sides of border, deploy joint forces to combat terrorism, human trafficking and to protect the Renaissance Dam

**April 11 2018** - Sudan's President Omar al-Bashir is ousted and arrested following three months of protests. This event is followed by months of uncertainty and wrangling over the political future of the country

**July 2019** - an African Union mediator announces that Sudan's ruling military council and a coalition of opposition and protest groups reach a power-sharing agreement during a 3-year

transition period leading to elections. The two sides would seek to establish a sovereign council by rotation between the military and civilians.

## B. Map of the Nile Basin

