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Egypt, Water Scarcity

Egypt: The Dawn of The New Century

Egypt is a country of rich history and beautiful landscapes. Most families in Egypt work as farmers, the Nile River giving them irrigation for their crops. This has been the case since 3100 B.C, when the first civilizations in Egypt began, worshipping the Nile River for its great gift of civilization. With the gift of this great river they constructed a civilization still awed millenia after, the pyramids of those ancestors still standing stalwart amongst the people of Egypt to this very day. Most farmers grow wheat, maize, or sugar cane, the Nile providing rich silt which gives invaluable nutrients to the growing crops, as it has for centuries. The Greek historian Herdotus even famously said: "Egypt is the gift of the Nile." However, the Nile's prominence in Egypt is waning, teetering on a knife's edge, along with the Egyptian families' access to water.

Egypt is located in the Northeastern part of Africa, on the border of the Middle East. The Nile River is a 4,132 mile river stretching from Ethiopia, Sudan, and ending in Egypt before depositing into the Mediterranean Sea. Egypt relies on the Nile for 90% of its fresh water supply (Polakovic, 2021), using it for irrigation and to support cities, as it has for centuries. Today, around 26% of total employment in Egypt is dedicated to their agricultural sector, contributing around 12% of the country's GDP of around \$1.223 trillion (CIA, 2022). Agriculture alone takes 86% of their fresh water supply (Cohen, 2021). Egypt's agricultural products grown on the fertile banks of the Nile consist of sugar cane, sugar beets, wheat, oranges, and onions just to name a few (CIA, 2022). However, agriculture does not make up all of Egypt's economy. Their second largest economic sector is their industry. Taking up roughly 25% of Egypt's labor force, Egypt's industry contributes an astounding 34% of their total GDP (CIA, 2022). Most industries in Egypt produce a wide variety of goods such as textiles, pharmaceuticals, hydrocarbons, and cement to name a few (CIA, 2022). However, their largest industry is Egypt's service industry, taking up close to 49% of their workforce (CIA, 2022). Services account for 54% of Egypt's total GDP, eclipsing both their agriculture and industry combined (CIA, 2022). Egypt is an economic powerhouse, exporting close to \$54 billion worth of goods in 2019 (CIA, 2022). However, in 2020 Egypt exported \$40 billion worth of goods, down roughly \$13 billion from 2019 (CIA, 2022). There is a similar correlation with imports as well, with \$72.48 billion worth of imported goods in 2020 compared to around \$79 billion worth of goods in 2019 (CIA, 2022). This may be attributed to the Covid-19 pandemic that occurred that year, however, it is unclear whether Egypt will be able to recover. In addition, many Egyptian citizens suffer from extreme poverty with roughly 32% of the population below the poverty line (CIA, 2022). Egypt also has many issues relating to their public debt, at a staggering 89% of their GDP (CIA, 2022).

However, there is an outside threat that can further destabilize Egypt's food security, Ethiopia. Ethiopia is a country further upstream of the Nile River, bordering both Sudan and Somalia. Ethiopia constructed the largest hydroelectric dam in Africa in July 2020 known as the Grand Ethiopian Renaissance Dam (GERD) on the Blue Nile, a tributary of around 85% of the Nile's total water supply (Water Technology).

The GERD is expected to generate close to 6,000 MW of energy when it is filled, or equivalent to 6 GW of energy (Water Technology). Currently, only 47% of Ethiopia's total population of 111 million has access to electricity, consuming roughly 9 billion kwh worth of electricity per annum (CIA, 2022). This dam has been a pivotal political focus between Egypt, Sudan, and Ethiopia for years, with negotiations regarding the filling of the dam still ongoing. Egypt is concerned with the filling of the GERD due to it lowering Egypt's share of the Nile during the filling. Many of the disputes regarding the filling of the GERD are over the time period in which it will be filled. Egypt demands for the filling of the dam to take place over an extended period of time, to mitigate the effects it will have on the further downstream countries. Ethiopia wants it to be filled quickly, to reap the benefits of the dam's energy production to further their economy and better the living standards for their citizens.

Negotiations between Egypt and Ethiopia have stalled, with Ethiopia beginning the filling of the GERD in July 2020, without the permission of Sudan or Egypt. Ethiopia has begun planting anti air defenses around the GERD in preparation for a potential war with Egypt. Egypt cites the 1959 Nile Waters Agreement which gave Egypt and Sudan full control over the Nile River which Ethiopia was not privy to. Ethiopia wants the water that the Blue Nile has due to them suffering from water scarcity as well and lack of electrical power.

A solution to this issue would be to continue with the filling of the dam at a slow rate to minimize the effects it would have on Egyptian agriculture and access to water. Egypt would gain the benefits of cheaper energy imports which they could use to fund social projects to better the Egyptian people such as the current social and economic reforms present in Egypt's current Egypt Vision 2030 initiative which is currently successful (Ministry of Finance of The Arab Republic of Egypt). One of those goals being clean and affordable energy which the GERD can help achieve with cheaper energy exports which can lead to cheaper overall goods to the Egyptian market which also leads to a reduced poverty level and better paying jobs. However, due to the agricultural sector in Egypt being heavily reliant upon the fresh water produced by the Nile, filling the dam must take place over a slow period of time. Agriculture employs 55% of their total workforce and having limited access to fresh water would be a colossal disaster for both Egypt's economy and their people (Cohen, 2021). This would also cause a food shortage and increased prices for basic food products which could lead to increased food insecurity amongst the Egyptian population. Egypt has little choice but to compromise on the GERD being filled due to these reasons.

In addition to this, further pressure could be alleviated off of Egypt through aiding Ethiopia with their water scarcity issues. Ethiopia currently suffers from severe water scarcity issues due to a rapidly growing population and poor water infrastructure. Currently, 93% of Ethiopia's water withdrawals are used for agricultural purposes with only 4% of that originating from a renewable source (USAID, 2020). Agriculture currently employs 72.7% of the Ethiopian workforce (CIA, 2022) which currently is comprised of 52.82 million people according to a 2017 estimate (CIA, 2022). Ethiopia's agricultural sector accounts for 34.8% of Ethiopia's total GDP and is their second highest contributor towards their GDP, just behind their services sector (CIA, 2022). Ethiopia is a very water dependent country and must conserve what little water they currently have access to. One solution that can benefit Egypt is the widespread adoption of drip irrigation in Ethiopia. Drip irrigation is a new method of irrigation which

uses thin pipes that trickle water directly into the plant's base, saving 60% more water and increasing crop yield by 90% compared to other irrigation methods (Chu, 2017). However, drip irrigation can be expensive to implement for off-grid farmers where it can cost more than \$3,000 (Chu, 2017). Drip irrigation would benefit Ethiopia by cutting agricultural water consumption by more than half, allowing more water from the Blue Nile to flow to Sudan and Egypt. Many NGOs (Non-Government Organizations) are working to implement drip irrigation in Ethiopia with a notable one being The Hunger Project. The Hunger Project is an NGO that dedicates itself to ending world hunger and poverty through sustainable grassroots efforts (THP). They are currently working in Ethiopia to implement drip irrigation through their Epicenter Strategy which aims at improving the livelihoods of people through the community (THP). Supporting The Hunger Project and other similar NGOs could help alleviate water scarcity in Ethiopia and in effect ease tensions between Egypt and Ethiopia.

However, the GERD is not the only threat to Egypt's availability of freshwater. Egypt is currently a developing country and is thus suffering from rapid population growth. Egypt's population has risen dramatically over the last couple of years, going from twenty seven million people from 1960 to over one hundred million in 2020 (Cohen, 2021). By 2025, Egypt's water supply is expected to drop below 500 cubic meters per capita, hydrologists label this as absolute scarcity (Cohen, 2021). Egypt's agricultural sector is already struggling to support the booming population, with Egypt importing around 40% of its total food which is mostly made up of wheat and corn making it one of the most food-import-dependent countries on the globe (Cohen 2021). Thus, global price shocks to staple crops can lead to severe starvation for Egypt's population and prices can skyrocket for these basic commodities. A declining agricultural sector can make these effects more severe in the near future for Egypt.

Egypt's perilous situation is not hopeless for a solution. Pressure from the GERD on top of already strained water scarcity issues on their rapidly growing population, Egypt must handle these issues with utmost haste. With the Nile River strained to support their population, Egyptians must conserve their use of the water it provides. A 2009 publication by the Egyptian government estimated that fixing leaks in water systems and switching from surface irrigation to drip irrigation techniques could help save water, as the current water conveyance and irrigation is at 70% and 50% efficiency respectively (Cohen, 2021). The Egyptian government has not been idle in their efforts to boost water conservation with a second National Water Resources Plan in 2017, planning to invest a total of fifty billion dollars into water conservation efforts by 2037 of which they have currently invested a third of the funding already (Cohen, 2021). Although not all of their efforts have borne fruit, with recent authorities attempting to force change upon farmers with fines for inefficient irrigation systems (Cohen, 2021). These have enforced more economic strain upon farmers and widespread skepticism for change away from centuries practiced irrigation methods.

Another way to increase the amount of water available to the masses of Egypt is to treat wastewater. Most experts point to desalination as the best method to increase the production of drinkable water, however, these methods are incredibly expensive with most 2.5 MGD seawater desalination plants costing thirty two million dollars (Texas). Egypt is currently investing 2.8 billion dollars in desalination efforts to

increase their desalination capacity 0.88 BCM/yr (billion cubic meters per year) by 2025 on top of an incremental increase upon its renewable water 57.5 BCM/yr (Cohen, 2021).

However, there is no solution that is 100% effective and Egypt will face trying times in the near future and must prepare to mitigate the effects water insecurity will have on the Egyptian people and economy. Egypt must prepare for agricultural unemployment and rural/urban migration by creating more jobs for their industrial and service sector (Cohen, 2021). Agricultural unemployment means that the supply for agricultural crops will lower which increases demand and along with it, prices for food. The most effective risk mitigation for food price shocks is insurance. Food price hikes can be insured using many techniques such as by creating a national food reserve, an emergency fund used for subsidizing food imports, or trade agreements with other countries in order to secure food imports at fixed prices (Cohen, 2021). However, all efforts to domestically control Egypt's water supply is futile if they can not secure the Nile upstream. Compromising with Ethiopia on the GERD is paramount for the continued existence of Egyptian sovereignty. Egypt must agree to the filling of the GERD soon and must agree to an agreement which fills the GERD over a slow period of time to mitigate the effect the fillings will have on their agricultural sector which is already strained. Ethiopia has many issues similar to Egypt and cannot hold off on filling the GERD any longer than it must. Egypt's agreement with Sudan for 55.5 BCM/yr Nile inflow a century ago is being challenged by Ethiopia's construction of the GERD (Cohen, 2021).

Many fear that a war over the Nile River is destined for the near future between Ethiopia and Egypt if talks still falter and fail. The sovereignty of both of these historic nations going to war over a shared historical resource. Egypt's water instability is a culmination of over reliance on the Nile for centuries as had their ancestors before them. The dawn of a new era of civilization has brought with it new ideas and technological innovations. The Egyptian people must leave behind the tools of those who have carved their history and worshiped the Nile River for their prosperity and instead, forge a new path for the centuries to come.

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