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Egypt, Water Scarcity

Egypt: Water loss and water pollution

From sanitation to hydration, water is used for all aspects of our lives. With a material so essential, water scarcity can undermine an entire society. In recent years, several events have limited the amount of water available to the citizens of Egypt. Through a combination of GERD (Grand Ethiopian Renaissance Dam), faulty water pipes, and pollution, living has gotten extremely rough. These conditions affect everyone from everyday people by making them have to live with limited and polluted water to farmers who aren't able to support their crops due to inefficient irrigation practices and the aforementioned limited water. By fixing the water piping we have, using more sustainable farming practices, and cleaning up the Nile, we can make a better tomorrow for future generations.

Egypt is an arid country located in the northeastern corner of Africa. It has about 1 million square kilometers of land, but 97% is desert (Brookings). The only major river they have is the Nile River, which 95% of people in Egypt live within 20 kilometers of (World Factbook). Along with the 95% of people living near the Nile, 90% of people rely on the Nile for water (APNews). Along this river is the most amount of arable and fertile land in Egypt. In Egypt, around 43% of people live in urban areas while the other 57% of people live in rural areas (World Factbook). Depending on where you live in Egypt, living can have unique challenges. People in urban areas commonly have areas to buy food, use the bathroom, and use electricity while rural areas have most of the same, but are more limited in each category. The materials that get exported from Egypt are potatoes, cotton, rice, steel, natural gas, and medicine (Intracen). Due to this, families in rural areas typically work in the primary sector and have several jobs to do. They work with agriculture, animals, and off-farm jobs. Many families in these rural areas also have water buffalo or cows. Rural areas in Egypt also tend to not have much in terms of industrial activities or services (Brookings). In urban areas, the patterns have much more of a European influence. People wake up, go to work, come home, and sleep. The main difference between Egypt and other major European cities is their clothing and architecture. Egyptian men tend to wear long tunics, or djellabas, around their waist, and for the women to wear long robes. It's common for people to live in apartment buildings (Brittina).

To start looking at the current situation in Egypt, we have to look at the past of water use in Egypt. The Nile River allowed life to flourish in the arid regions of Africa. People have been using the Nile River for agricultural, recreational, and religious purposes for thousands of years. The main thing to focus on is the historical use of the Nile in relation to agriculture. The start of agriculture in Egypt allowed people to make permanent settlements based around farms. During the Predynastic Period of Egypt (6000 to 3150 BCE), the basis of agriculture was starting in the Nile River Delta and a fertile basin called the "Fayum" (World History Encyclopedia). To start off, ancient Egyptians used their own hands and tools to farm. After about 2,000 years of using only human strength, they developed some of the first ox-drawn plows. The very first plows made weren't very effective. Due to being made out of only wood, they weren't able to dig very far down. Despite not being much of an improvement over human strength, it was the start of modern-day agriculture. Over the next 2,000 years, wood started to phase out as bronze took its place. Bronze was much more capable of striking the earth and reduced a lot of human involvement in the plowing process. Although horns of cattle were used for a while, it was found that the horns caused immense strain on the oxen (Prism). Agriculture was so important to the people of Ancient Egypt that they based their calendar around the Nile River. The calendar was split up into three parts: Akhet (Inundation of Flood), Peret (Emergence of Winter), and Shemu (Harvest). For perspective, Akhet ranged from around September to January, Peret ranged from around January to May, and Shemu ranged from

around May to September. Using this calendar, they knew when to expect flooding and knew when to plant (Ancient Engineering Technologies).

Ancient Egyptians were extremely innovative with how they utilized the land and their surroundings. This can be seen quite clearly with their irrigation systems. Ancient Egyptians used an irrigation system called “basin irrigation”. Basin irrigation used the natural rise and fall of the Nile to prepare fields for planting. During Akhet, the Nile would rise by 45 feet (13.72 meters) at its peak. This flooding would provide new layers of silt and saturate the ground with the rich water of the Nile. After around a month of this water flooding in a field, it would evaporate and leave the ground ready for planting (Ancient Engineering Technologies). They had another system to transport water. That irrigation system is called “irrigation canals”. These irrigation canals allowed water to flow down manmade paths and reduce the distance farmers would need to go to get water for their crops. Farmers would work together with other farmers on how to harness the water. Even though there were no laws deciding who gets what water, everyone still followed one rule: no one interfered with others crops or canals (World History Encyclopedia).

The main issues many Egyptians face are water scarcity and pollution. In rural areas, about 12% of houses don't have access to water systems. In urban areas, 4% of houses don't have access to water systems while only 77% of informal settlements have access to water systems (UNICEF). For some families, illegal water pipes are necessary to get water into their homes. These pipes are very makeshift and commonly leak water. Not only that, but the pipes increase the amount of strain on a single water source. This high demand in one area can cause the source to deplete far faster and leave people with less water. Despite the scarcity and struggle it takes to get water, it's often unsanitary. In a study conducted along 24 sites of the Nile River, the WQI (Water Quality Index) ranged from 55 (marginal) to 27 (good) (Abdel-Satar 21-29). For context, a WQI score below 69 “indicate[s] poor water quality that often exceeds guidelines by a wide margin” (EPA). Even at its absolute best, the WQI still falls short by 14 points. This pollution is caused by multiple sources that include, but are not limited to, pesticide runoff, industrial wastewater, radioactive waste discharge, and human waste. Due to all of these pollutants, diseases like hepatitis, cholera, and typhoid are likely to spread. Reports have shown that 38 million people drink from this water and farmland is irrigated with this water too (SaveTheWater). The situation has gotten so bad to the point where it is recommended that tourists only drink bottled water and never drink tap water.

A majority of the pollution comes from industrial waste. In fact, about 4.5 million tonnes (4.96 million tons) of industrial waste gets dumped into the Nile River in Egypt each and every year (Bangkok Post). For perspective, that amount of trash would weigh about as much as 3/4ths of the Great Pyramid of Giza (5.9 millions tonnes) each and every year (Newstack). Despite dumping so much waste into the Nile, the max fine for littering in the Nile is 5,000 Egyptian Pounds (\$258.74 USD), and an industry found guilty of dumping can be imprisoned for up to 6 months and/or get a fine of up to 500,000 Egyptians Pounds (\$26,500 USD). Despite being a decent fine, only 60,000 of the 177,000 cases have actually been completed as of July 10th, 2022 (Al Monitor). As I've mentioned before, 4.5 million tonnes of industrial waste is being dumped into the Nile each year. The current fines Egypt is dishing out doesn't put a dent in the industrial sector. If every single one of those 177,000 fines gets the maximum penalty, the industrial sector would only lose 0.00419% (4.6905 billion USD) of its profit. To help fix this, I propose we deal out heavier fines for heavier offenses. If we remove the maximum fine for dumping into the Nile and take them on a case-by-case basis, we can achieve a fairer verdict and get more money out of it. The amount of money fined should be equal to 150% of the cost of fixing the damages to the Nile. Repeat offenders will have the percentage and additional fine amplified. This may slow down how fast Egypt can get through these cases, but it can guarantee that every case is fair to the crime committed. To help speed this up, I also propose we increase the grace period to switch to drip irrigation. Currently, farmers can get a fine of up to 3,600 Egyptian pounds (\$230) every year for not switching to drip irrigation (Reuters). Although I believe switching to drip irrigation is extremely beneficial to Egypt, most farmers aren't able to pay for it.

The benefits of drip irrigation will be seen in the paragraph below. Although Egypt has started cracking down on people dumping in the Nile, more needs to be done to protect the little water they have.

To fix the water scarcity and pollution, I propose we start using more sustainable operations in Egypt. To do this, we need to tackle several areas. Let's start with farming first because it's responsible for using 61.35 billion cubic meters of water annually. In Egypt, they use the same irrigation system they have since the times of Ancient Egypt. This system is called "basin irrigation" and has around 60% efficiency. Basin irrigation uses the natural rise and fall of a body of water to flood an area of crops. This makes the plant absorb the water it needs. The rest of the water either runs back into the water or evaporates (Oklahoma University). Compared to other modern-day irrigation systems, this is incredibly inefficient. To fix this, using drip irrigation is the best decision. Drip irrigation uses small amounts of water each day for different amounts of time depending on the weather and crop. This process is typically autonomous and uses pipes to deliver water. This method reduces runoff, evaporation, and is 90% effective (Rhode Island University). The cost of switching to drip irrigation is anywhere from 5,000 to 7,000 Egyptian Pounds (\$315-\$445 USD) each feddan (1.038 acres) (Reuters). At most, Egypt would be looking at \$4.069 billion USD to add drip irrigation to every feddan of farmland. Now, that is quite the cost, but several things make this more than possible.

First, the fines from dumping the Nile could be used to help farmers install drip irrigation. As I mentioned above, farmers face a fine each year if they can't install drip irrigation. The issue can be seen by an interview done with a farmer in Egypt named Sharaky. Sharaky told Reuters, "Farmers are already struggling financially and asking them to pay extra money [for drip irrigation] would increase burdens on them" (Reuters). On top of possibly using the fines to pay for drip irrigation, Egypt has expressed interest in investing in "mega-projects" to attract investors. Although what a "mega-project" is can be quite vague, I believe this would qualify. Even if it doesn't, there is one other way to pay for this project. Drip irrigation is known to reduce water and increase yield on several crops. For rice alone, the amount of water used is cut in half while yield is increased by 29% (CSA News). This would increase the production of rice by 358% if the same amount of water is used. Similar effects can be seen on crops like sugarcane. Drip irrigation used on sugarcane can also cut the amount of water used in half. The only downside to this solution is that there is an upfront cost, but that cost should be offset by the amount of water purely saved from evaporation, which is around 18.405 billion cubic meters annually. To put that into perspective, that is enough to cover the municipal (10.75 billion cubic meters) and the industrial (5.4 billion cubic meters) sectors each and every year (World Factbook). That amount saved doesn't take the increase in yields and other water saving systems that come with drip irrigation into account.

While updating the systems Egyptians use, we should fix up the piping. Roughly 29% of all water used in agriculture (17.7915 billion cubic meters) is lost due to faulty piping (Enterprise). This task would be a serious commitment, but almost essential to guarantee the future of Egypt. Conveniently, switching to drip irrigation would actually require the piping to be fixed. It also does not increase the cost at all. As of now, about one-eighth of Egypt's total GDP is due to agriculture (Brittina). If we can save 29% of the water used, more production could happen and increase profits.

The final thing that needs to be done is cleaning up the Nile River. To do this, I'd recommend teaming up with The Sea Cleaners Organization. This is a non-profit organization that uses specialized boats that scoop up trash from rivers, seas, and oceans. The boat that would work best is called the "Manta". The boat works by driving down a river and collecting trash into a conveyor belt. This trash will be brought on board to be sorted manually. Any organic matter that's not riddled with trash will be tossed into the river. Any larger pieces of trash would be picked up by the two onboard cranes. Two smaller boats go closer to the shore and pick up micro/macro pieces of plastic. The boat is 50-75% self-sufficient. Using a combination of hydropower, turbines, solar panels, and the plastic that gets picked up, the boat gets powered. Even the local aquatic life won't be hurt due to the infrasound systems that keep them away

(TheSeaCleaners). The cost of these ships is around 35 million euros (38.66 million USD), but due to the eco-friendly, efficient, and simplistic nature of the machine, it's worth the cost. Luckily, the organization is a non-profit, so money isn't much of an issue.

Water is essential to all aspects of life. We use it for commercial, industrial, and recreational purposes and have for generations. This is no exception in Egypt. To make sure future generations have the right to use water, we should improve Egypt's agricultural techniques, fix the water pipes, and clean up the Nile. If after reading all these points we don't fix things, we are clearly in de-Nile.

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