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Ghana, Water and Sanitation
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Ghana: Improving Water Resources and Sanitation Practices

Imagine waking up in the middle of the night and having to use the bathroom. There is no toilet within a ten-minute walk, which means the nearest "toilet" is the empty field or body of water next to the house. Although it is hard for American citizens to believe, people around the world do not have easy access to a functioning toilet and clean running water. In Ghana and many other countries, citizens have to defecate in fields, forests, or bodies of water. Ghana struggles to supply citizens with clean drinking water and important sanitation infrastructure. Ghana's problems stem from its unplanned growing population and illegal mining.

Ghana is located in West Africa. Due to its proximity to the equator and low elevation, Ghana has a tropical warm climate. The temperature stays the same throughout the year, averaging 86 degrees during the day and 68 degrees during the evening. Rain is very common in Ghana, and the two rainy seasons occur from March to July and September to October. "Rainfall is highest in the south, with some areas receiving over 2,000mm annually, while the drier north typically gets around 800mm" (World Travel Guide). The geography of Ghana is extensive. There are beaches and lagoons along the coastline, grassy plains inland, rainforests in the south and west, and savannahs and woodlands in the north. Ghana features large urban populations and large rural populations. In 2026, the urban population is around 21 million people, which is 59% of the total population. The rural population in Ghana is about 14 million people, which is 41% of the total population.

Ghana has a population of 35,539,721 people. As of 2023, Ghana had an average household size of 3.37, with each household containing 3-4 people. Ghanaians value family highly. It is the most important aspect of life, and creates social opportunities. In Ghana, family often refers to more than immediate family; it also includes aunts, uncles, cousins, grandparents, nieces, nephews, etc. In some parts of Ghana, the kids in a family belong to the mom's family, which in certain cases can make a man closer to his sister's children than his own. It is also important to note that property is passed down through the mother's family instead of the father's. Following traditional gender roles, Ghanaian men make the money for the family, and women care for the children and fulfill domestic duties.

Women also gather the food. "Cooking mostly happens over a traditional charcoal stove, though in big cities more and more people have access to a familiar sight: gas stove!" (Flying Fourchette). Ghanaians eat a variety of vegetables, fruits, and grains. They grow some of their own food, but they purchase things they cannot grow in open-air markets. These markets import various necessities. One study of 400 mothers living in the rural Manya Krobo district of Ghana monitored household dietary practices, quality of diets, and family nutritional intake. Data showed that most women consumed three meals a day, but only a few of the women cooked all three meals. The other women commonly bought breakfast and lunch from street vendors. The meals bought from vendors commonly consist of starchy staples, maize, fish, pepper, onion, tomato, and palm fruits. Many of the women had poor nutrition and could have used more calcium and B-vitamins in their diets. Around 12% of the women were at risk for being underweight, 17% overweight, and 5% obese. Many families need education on proper nutrition, and they need to start eating more calcium and B-vitamins. Maize, cassava, plantain, yams, and rice are all accessible crops in

Ghana because Ghana produces an abundance of them. The most nutritious foods in Ghana are the fish and leafy vegetables that Ghanaians commonly eat.

To provide for their families, men commonly work in the mining industry or the agriculture industry. The average monthly salary in Ghana is 2,579 Ghanaian cedi (which is about $210). “Wages are low due to an informal sector with few regulations, low income, limited economic diversification, and a dominant agricultural workforce with low wages” (Remote People). The minimum wage in Ghana is GHS 21.77, which is around $1.75. The mining industry is one of the biggest industries in Ghana, so many Ghanaians work in the mines. While mining is a large sector of work, the biggest sector in Ghana is agriculture. Many men, women, and children work in the fields to supply the world with important crops. The average farm size is about 1.56 hectares, which is similar to about two American football fields.

Ghana is a major production country. The top exports of Ghana are gold, crude petroleum, cocoa beans, cocoa paste, and manganese ore. Ghana produces lots of crops, but its staple crops are cocoa, maize, cassava, plantain, yam, and cocoyam. In all of Africa, Ghana is the largest gold producer and second-largest cocoa producer. It produces and exports several crops, but only 24% of agricultural land is cultivated.

According to World-Systems Theory, Ghana is labeled a periphery country. Ghana’s economy relies heavily on its exports to core countries. Ghana’s level of industrialization is low and has little to no influence on global economic policy. Most periphery countries have a corrupt government. Ghana has a “multiparty constitutional democracy”. Ghanaians aged 18 and over can vote, and the president has to be 40 years or older. The president can be elected for two four-year terms, similar to the U.S. Ghana is considered one of the more stable countries in Africa, but it still faces some corruption. The police and judiciary are the most corrupt parts of the government in Ghana, but the Office of the Special Prosecutor in Ghana investigates wrongdoing by the government. Until the 1980s, Ghana provided free universal health care and free basic and tertiary education. The population of the country grew enormously, and Ghana faced huge economic losses. Ghana took major economic reforms to salvage the economy, which made it cut back on spending in social programs such as healthcare and education. As a result, in recent years, Ghana has had to work on improving its healthcare and education systems. Since the 1980s, Ghana’s healthcare and education have become less affordable and less accessible because of population growth. In recent years, the country has worked on making these systems more affordable and accessible. So, Ghana’s healthcare and education systems are not fully affordable and accessible, but they are actively working to improve both

Compared to other countries in Africa, Ghana is peaceful and stable, but it still faces challenges. There are around 12.5 million people in Ghana who are food insecure. This means that 12.5 million Ghanaians have limited access to nutritious food. Ghanaians struggle with eating nutritious food. Ghana also faces issues with access to basic infrastructure, but it is improving. As of 2023, 89% of the population has access to electricity. Throughout the country, there is access to mobile phones. Through the years, Ghana has improved its access to clean drinking water, and as of 2021, 96% of the urban population has access to basic water services, but only 74% of rural households have access to basic water services. The country faces problems with sanitation, and many families do not have access to a toilet at their homes. They share community toilets. Urban areas of Ghana have good access to roads and markets, but rural communities often lack access to roads and markets. Urban areas of Ghana have good access to basic infrastructure, but rural areas of Ghana lack access.

While Ghana has been improving its access to water and sanitation, it still faces major issues. As much as 88% of people in Ghana have access to basic water services. For reference, the global average is 90%. Meanwhile, 42% of Ghana’s population has access to safely-managed water. This is well behind the global average of 74% but is much higher than the Sub-Saharan average, which is 30%. Ghana faces few

issues with water services but faces major challenges with sanitation. Only 25% of the population has access to basic sanitation services. A startling 57% of the population has to use shared and public sanitation facilities, and 18% of the population lacks access to any toilets at all. In many parts of rural Ghana, the population's main sources of water are small ponds and unprotected wells, both of which are easily polluted and responsible for serious public health risks.

“Ghana’s efforts have shown the country is ahead of the SSA (Sub-Saharan Africa) average by over 10% in providing safe drinking water services to citizens. However, persistent challenges, such as inadequate infrastructure in rural areas and limited access to improved sanitation and hygiene facilities, indicate the need for targeted interventions” (Science Direct). This means that Ghana’s water systems are improving, and more people are drinking clean water. However, the sanitation systems are not improving. Ghanaians are still facing unsanitary practices that lead to sickness and diseases.

Rural and urban areas in Ghana are struggling with WASH (water, sanitation, and hygiene), but rural areas are struggling with WASH more severely. Only 50% of Ghana’s rural population has access to water. In Ghana, access to sanitation in urban areas can be as low as 42%, and in rural areas it can be as low as 11%. Both rural and urban areas of Ghana are being affected by poor water and sanitation systems. Water and sanitation systems are different for different demographic groups. “Despite significant progress in WASH coverage in Ghana, inequities remain entrenched, particularly for rural and poorer households. Targeted interventions addressing structural inequalities in wealth, education, and infrastructure are essential to accelerate Ghana’s progress toward universal WASH access and Sustainable Development Goal 6” (National Library of Medicine). Richer urban areas in Ghana have better access to sanitation and clean water, which results in the urban areas being healthier. Rural areas are facing disease, diarrhea, and stomach issues because of the poor sanitation and unclean water. Water and sanitation problems especially affect marginalized populations. They are the people who live in rural areas or poorer areas, and these are the areas in Ghana that face the worst problems with WASH. Marginalized populations are mistreated and experience significant inequalities and poverty. Because they often live in rural areas, they also have to deal with harsh WASH problems.

Not only do water and sanitation issues impact people in Ghana, but they also impact the environment. “Poorly managed human excreta causes environmental hazards, polluting settlements, groundwater, and surface water bodies” (National Library of Medicine). Pollution negatively impacts the biodiversity and fisheries in Ghana. Because the communities in Ghana do not have water systems, they rely on natural resources. These natural resources then face environmental deterioration because of the misuse and overuse of these resources.

Ghana needs an effective solution to clean water and sanitation issues. The first step to solving these problems is installing clean water infrastructure that is accessible for whole communities. The best solution is a solar-powered mechanized borehole system featuring storage tanks and a distribution system involving pipes. Solar borehole pumps are effective for saving energy and pumping water in off-grid places in need of clean drinking water. Boreholes are important pieces of infrastructure that provide clean water to households and farming, while water pumps are pieces of equipment attached to boreholes that extract the water from the well/borehole and bring it to the surface. Water pumps are traditionally powered by diesel or grid-connected pumps, but this can be expensive and energy-wasteful. Solar-powered water pumps are the perfect solution to Ghana’s access to clean water because they are appropriate for remote locations without access to grid power.

Solar-powered water pumps are unlike surface water pumps. Surface water pumps pull water from big bodies of water, whereas solar-powered water pumps are installed below the water level and push water

up to the surface. The pump system includes solar panels that are mounted above ground, near the MPPT pump controller. The MPPT controller is a solar charge device that harvests the energy from solar panels into a battery bank, and it has an electrical cable that is attached to the controller and a pump. The pump is submersible and is installed in the borehole underground. Additionally, there is a water pipe that runs from the borehole to above ground. The water pipe pushes the water above ground into a large tank for storage.

These pieces of equipment play a vital role in operating a running borehole. The process starts when sunlight hits the solar panels. When the sun hits the panels, electricity is created. The electricity is then wired to the MPPT controller, which stores the energy so the pumps can function. The electrical cable attached to the controller then runs the electricity through the ground to the submersible pump located in the borehole. This electricity kick-starts the motor in the submersible pump. The motor draws the groundwater from the borehole into a water pump, which is pushed up through the pump into an elevated storage tank that holds the water until civilians need to access it.

Although the whole country is facing the same issue, it is important to combat clean water problems in the regions that are struggling the most. It is important to start small. I want to ensure that the borehole system is effective in one region before expanding into the rest of Ghana."The northern regions of Ghana (including the savannah region) are particularly susceptible to water scarcity, often facing prolonged dry spells and insufficient water resources" (ScienceDirect). One study investigated water scarcity and accessibility in a new regional capital in the savannah region, Damongo. "The study showed that the area faced evident water scarcity, with a daily per capita water consumption as low as 0.128 m^3. Mechanized boreholes emerged as potential solutions, particularly for the 61.2% of respondents experiencing waiting times exceeding 15 min" (ScienceDirect). Based on this research, I believe it is important to provide Damongo with the first solar-powered mechanized borehole system.

The town of Damongo has roughly 18,000 people. To fulfill daily needs, humans commonly use 50 liters of water each day, and the solar-powered mechanized borehole system will produce about 6,000 liters of water each day. Each citizen needs 50 liters of water, and there are 18,000 people living in Damango; therefore, 900,000 liters of water are needed each day. Because the solar-powered mechanized borehole system will produce about 6,000 liters each day, there need to be 150 borehole systems to provide enough water for the town.

Many different aspects go into installing and budgeting the solar-powered mechanized borehole system, as each system needs to include a borehole. There are currently 37 functional boreholes in Damango, so 113 additional boreholes will need to be installed. The submersible pumps, solar panels, elevated storage tanks, and storage tank stands also will need to be bought and installed. Furthermore, Damango will need to purchase and install water testing and treatment to ensure that the system is working properly and that citizens are drinking clean water. All of these products will also need to be transported to Ghana. After buying, transporting, installing, and testing, the 150 solar-powered mechanized borehole systems with storage tanks and a distribution system involving pipes will cost roughly $1.75 million.

While it's true that $1.75 million is an enormous amount of money, it would be funded by organizations, corporations, or the government. The U.S. Agency for International Development (USAID) is a great

option to fund the borehole systems. USAID is a U.S. government agency that focuses on providing foreign aid and development assistance to foreign countries. USAID has funded multiple projects similar to this in the past, including the Kenya Integrated Water, Sanitation, and Hygiene Project (KIWASH). KIWASH has provided improved water and santion to 900,000 Kenyans in nine different counties to improve household irrigation and nutrition services.

Eventually, it is important to implement the borehole system across the whole country of Ghana. The first borehole systems will be introduced in Damango; if the systems have a positive impact on the town and work properly, then they can be introduced to other parts of the country. These solutions would eventually help Ghana's entire population. It would have a larger impact on rural communities because they are the most unsanitary part of the country, but it will also help with urban areas that struggle with sanitation. The country of Ghana as a whole is facing issues with water supply and sanitation, so implementing infrastructure throughout the country will help the whole country.

Solving these problems will have a positive impact on Ghana. Having clean water systems will help Ghana by preventing illness. If Ghanaians start drinking cleaner water, they will be less prone to sickness. Having these water systems easily accessiblewill also save time for the people in these communities. For example, the Millennium Challenge Corporation of the United States of America funded a series of clean water systems in Ghana. "The intervention reduced time spent collecting water by 13 minutes and reduced travel time to collect water by 3 minutes" (Millennium Challenge Corporation United States of America). Although 16 minutes each day may not seem like a big deal, that is almost two hours each week, and about 97 hours a year. If Ghanaians are provided with better water systems, they can spend 97 hours a year working or doing other things to provide for their families.

Ghana is already in the process of working on these issues. There are local and international organizations that are working to improve WASH in Ghana; WaterAid Ghana, World Vision Ghana, Global Communities Ghana, and the Coalition of NGOs in Water and Sanitation are all working in Ghana to provide safe drinking water, improve sanitation infrastructure, and improve hygiene. Several other countries in West Africa are also facing water and sanitation issues similar to those in Ghana. "West and Central Africa is the only region with an increasing number of people who practice open defecation – one of the most unsanitary hygiene practices where people use the bush, stream, local river or outside area as a toilet. Progress toward increasing access to improved sanitation has been very limited in the region" (UNICEF). People across West and Central Africa are facing the same issues. There is limited clean drinking water, and the communities have terrible sanitation. Parts of West and Central Africa have been working on fixing their water and sanitation issues, as many governments and aid agencies work to install safe infrastructure. This includes solar-powered boreholes, rehabilitating hand pumps, and the implementation of programs to teach communities about sanitation. It would be appropriate to implement a similar solution in Ghana, which is struggling with the same problems as other West and Central African countries. Inserting safe water infrastructure is exactly what Ghana needs to be a more sustainable and successful country.

Ghana is in need of clean drinking water and better sanitation. There are multiple steps of action required to fulfill this need. Installing solar-powered mechanized borehole systems featuring storage tanks and distribution systems involving pipes will help solve the clean water problem in Ghana. After there is progress in Damango, it is important to implement these solutions into other districts in Ghana, starting with the poorest districts. The poor districts of Ghana lower the economic power of the country because they limit overall production of exports in the country.

Ghana is a struggling country. For Ghana to become more economically stable, it needs to improve the health of its people. To improve Ghanaians' health, they need to have access to clean drinking water and functioning sanitary infrastructure. This will help Ghanaians be less prone to disease and sickness, allow women more time for an education, and lead to overall happier lives.

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