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## **Water Scarcity and Sanitation in Haiti: The Problem and Solution**

### **Introduction**

Water scarcity and sanitation are issues that affects many developing countries around the world, but this crisis is extremely evident in Haiti as 70% of Haitians do not have access to drinkable water. The lack of access can be attributed to the nation lacking infrastructure necessary to bring water to many communities and to make that water clean enough to drink. Without this infrastructure Haitian children and women often have to walk miles to find a source of water. However, the water source may be contaminated with life-threatening bacteria which can cause outbreaks of illness within communities. Sanitation is another issue that impacts life in Haiti. Haiti does not have any sewer systems, leaving citizens to find a stream, open area, or outhouse that must manually be emptied to relieve themselves. The water and sanitation crisis in Haiti are interconnected as the water contamination is partially caused by the lack of sanitation measures and both issues can be solved by constructing infrastructure to bring filtered water to communities and creating wastewater treatment plants.

Water scarcity does not just affect Haitian health and lifestyle, but it affects agriculture as well. The lack of water makes it difficult to make irrigation systems. Without irrigation systems, farmers must rely on the rain which is very unpredictable. Without irrigation systems in times of drought farmers lose their crop and can therefore not feed their families or bring in income for the year. Furthermore, due to Haiti's location it is vulnerable to storms and the lack of agricultural infrastructure causes farmers to be unprepared when natural disasters strike. Again, farmers lose much of their crop and cannot provide for their families. ...

These issues can be solved by providing Haitians with education and resources that will make access to water easier and cleaner. These solutions must be sustainable and cost effective as Haiti lacks money and international funding is scarce. If there was an increase in international support and Haiti's government was not as corrupt then creating solutions that took care of water scarcity and sanitation problems at the source, such as wastewater treatment plants, sewage systems, and systems that transported water from waterways to communities. By bettering Haiti's access to potable water and sanitation the health and wellbeing of Haitians would be increased.

The water crisis and lack of sanitation in Haiti can be attributed to Haiti's past and current economy along with the countries environment, and today the crisis is affecting Haitian lifestyle, and agriculture.

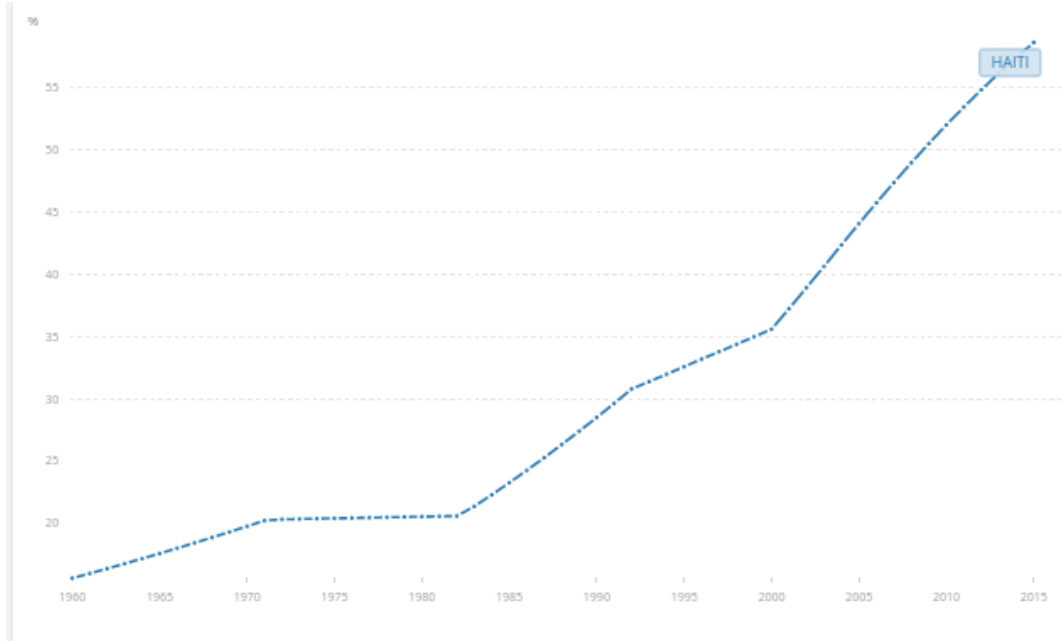
### **History, Economy, and Haitian Lifestyle**

When hearing the name Haiti many people think of a small, impoverished country in the Caribbean located next to the Dominican Republic. Haiti is small, only 27, 750 square kilometers, has a population of approximately 10 million, and is the poorest country in the world with a GDP of \$8.9 billion in 2015. The Taino people were indigenous to this region, and were conquered by Christopher Columbus in 1492 (Kirmayer, 2010). Many of the indigenous people died from diseases brought by the Spaniards. The Haitians were sold into the slave trade until declaring their independence in 1804. The newly formed dependent, Haiti, flourished for a while, but by the twentieth century larger nations led Haiti to become unstable and underdeveloped (Kirmayer, 2010). This decrease in power led to the Haiti many think of today.

When seeking to understand Haitian lifestyle it is important to look at Haiti's demographic concerning urban areas versus rural areas. Haiti has become increasingly urbanized over the past 55 years. As can be seen from figure 1 which was received from the World Bank, in 1960 only 15% of people lived in urban areas, but 55 years later in 2015 almost 60% of the population lived in urban areas. This increase can be attributed to a common phenomenon occurring in Middle and South America called brain drain. This migration pattern is characteristic of rural areas and is marked by the migration of talented youth leaving their villages and communities in order to have better paying jobs in cities. This leaves communities at a

disadvantage because of the loss of talented workers, but is good for individual families as the children that leave often send money for extra support (Pulsipher, 2015).

Figure 1



Many people are leaving the rural areas seeking better life in the cities, mainly the capital Port-au-Prince. The disparities between those living in the country and those in the cities are quite alarming when looking at differences in poverty and education.

The high income disparity, extreme poverty rates, unemployment rates, and lack of education are all factors that can attribute to the poor economy of Haiti. One measurement of the lack of equal distribution of goods in Haiti is the Gini coefficient which measures the income distribution. In 2001 Haiti had a Gini coefficient of 0.66 which is one of the lowest in the world (World Bank, 2006). The unequal distribution of income can be observed when looking at the average incomes for those living in Haiti's capital, Port-au-Prince, compared to other urban and rural areas. In Port-au-Prince the average yearly income is 7,293 gourdes, while those working in urban areas make 2,265 gourdes, and those in rural areas make approximately 2,035 gourdes (World Bank, 2006). The unequal distribution of income is one cause of the extreme poverty seen in Haiti. In fact, Haiti has the highest poverty rate in the western hemisphere with almost 60% of the entire population living in poverty, and 27% living in extreme poverty (United Nations, 2014). Those living in cities have more opportunities for employment and have better access to imported goods. The disparity between incomes creates a large disparity among poverty levels in rural and urban areas. 75% of people in rural areas live in poverty compared to only 40% who are impoverished living in urban areas (United Nations, 2014). These high rates are quite alarming because it means that many people do not have access to simple necessities. The poverty rates are also a consequence of the lack of jobs available. Many people in Haiti are self-employed or employed by the informal sector. According to the 2013 report by United Nations Development Program, 47% of Haitians that work have insecure jobs (2014). That's almost half of the population of the working class that do not have a regular wage, and whose jobs could easily be put at risk.

Another issue affecting Haiti's economy is the low level of education that many children receive. It is rare to find a person in Haiti who has an education above primary school, which leads to high illiteracy rates. In urban areas 53% of Haitians are literate meaning that a little under half are illiterate, however in

rural areas the illiteracy rates are almost double (Kirmayer, 2010). This can be problematic because along with other factors education and the ability to read is a factor that separates social classes. With many people not attending school and the quality of schools not regulated by the state it creates a society where people are locked in to the position they were born in. People are not able to move up through social classes because they do not have the knowledge to do so. A country cannot flourish when its citizens are trapped into poverty and are not given the means through education to get out. By increasing education Haitian would be able to get better paying jobs and contribute to the economy.

### **Environment and Agriculture**

Haiti's environmental and agricultural sector is adversely affected by deforestation, natural disasters, and climate change. Together, these factors decrease productivity of fields and make living more difficult. Deforestation increases soil erosion, natural disasters cause damage to fields, and climate change affects weather patterns. It is important to understand how these factors affect Haiti's environment and agriculture before assessing the effects of water scarcity and sanitation because these factors are the prominent influencers on this subject.

Clearing trees to make way for fields or to sell the lumber for money has lasting impressions on the environment. One effect on the environment is an increase in soil erosion which removes nutrients from the soil and causes sediment pollution in waterways. Soil naturally erodes when it precipitates and gets very windy, however, as large areas of vegetation are cleared the roots of plants no longer hold the soil in place. According to Marshall, the first seven to eight inches of soil contain the most nutrients needed by plants (2004). Therefore, in fields that are highly subjected to soil erosion nutrients are depleted quickly and productivity of the field decreases. The other problem caused by deforestation is sediment pollution in waterways. As the soil is taken by the water both flow through the water table and the soil is deposited in bodies of water. This creates cloudy water. Furthermore, any chemicals or substances put on the soil are also deposited in the water. By minimizing deforestation or using soil conservation methods in agriculture these risks would be reduced leading to a more productive crop yield and healthier environment.

One factor affecting the environment that may become more prevalent in the coming years is climate change. Due to Haiti's location in the Atlantic Ocean the country will be very vulnerable to climate change. The changing climate will increase sea levels and change weather patterns. The change in weather may not be good for farmers as they may experience unpredictable rainfall patterns that could result in drought or flooding. The global increase in temperature may also produce more frequent and violent storms, leading to possible hurricanes and other natural disasters.

Natural disasters such as hurricanes and earthquakes can have devastating effects on Haitians. Many farmers have small farms and low public and private investments in agriculture means that farmer are left uninsured (World Bank, 2013). This also means that farmers are left to their own devices when storms or droughts come. The lack of disaster readiness also creates problems because there is no investment in agricultural infrastructure (World Bank, 2013). With the growing population and the decrease in available farmland due to erosion and water loss, Haiti is steadily increasing dependence on imports. If the dependence on imports continue to grow and environmental degradation continues Haitian farmers may face many more problems in the future.

The vulnerability of Haiti's agricultural sector affects the food security of its citizens. In many urban areas markets are plentiful, but the cost of the food varies. Due to the high rates of poverty the amount of food that can be purchased often changes. Nutrition is not only about how much food is consumed but the quality of the food. If families can only provide food that lacks a variety of nutrients children and adults may become malnourished. According to the World Food Programme, 100,000 children under the age of five suffer from acute malnutrition and one third of children have stunted growth (2015). Rural

areas may not have as many markets, but rural families' livelihoods are dependent on growing and selling food. As the health of the environment decays and field productivity decreases the lives for those living in rural areas will only get more difficult.

### **Sanitation**

Sanitation is the access to clean drinking water and proper sewage treatment in a country or community. In Haiti sanitation is severely lacking. Over the span of 18 years, the percentage of people with access to sanitation has dropped from 26% in 1990 to 17% in 2008 (Gelting, 2013). Access to improved sanitation is decreasing, which means that the problem is becoming worse not better. The disparity between urban and rural areas is also alarming. In 2010 24% of Haitians had access to improved sanitation however this dropped down to only 10% access in rural areas (Gelting, 2013). To many Haitians, going to the bathroom means finding a stream or open field. If families are fortunate enough to have outhouses, cesspools are dug underneath and emptied into waterways, burned, or buried.

While the situation is dire there are many organizations that are there to help, but these organizations can only do so much. In order to provide a majority of Haitians with adequate sanitation hygiene plans need to be established to allow for the expansion of sanitation in both urban and rural areas. Haiti's National Directorate for Potable water and Sanitation had attempted to do this by creating a five year plan set to span from 2010 to 2015. This plan sought to improve water quality and sanitation in Haiti by strengthening governance and regulation, and promote hygiene. In order to achieve this the sector had goals to manage of water systems and spread the availability to rural areas (Gelting, 2013). This sector is very small, and has not been very successful. According to Katz, the sector has a staff of nine which oversee the sanitation of the country, funding is dependent on international support, and of the two sewage treatment plants that were open in Port-au-Prince, one has been shut down and the other is running at under capacity (2014). This means that the sanitation of Haiti rests on people called *bayakou* who empty out the cesspools and dispose of the waste. These people whose jobs are cleaning out human waste are essentially the countries sewer system. According to Smith, "...waste management is a major challenge, especially in Port-au-Prince, which is the largest city in the world without a sewer system. Solid waste clogs urban waterways and leads to the spread of waterborne diseases. Landfills are few and do not meet the needs of most municipalities" (2016). This lack of waste management may contribute to the poor water quality in Haiti because the human excrement contaminates the water.

### **Water Scarcity**

Many people in the United States take water for granted. One just has to go to their kitchen and turn on the faucet and clean, safe water comes out. Many people in Haiti do not have this luxury; only 30% of Haitians have access to potable water (Sentlinger, 2016). Children have to miss hours of school to hike miles and miles to get to a well and fill up their buckets and head back home, others who are fortunate enough to have a well or river in their community are oftentimes using dirty water.

The water in Haiti is often contaminated with bacterium *Vibrio cholerae*, and typhoid. *Vibrio cholerae* is the bacterium that causes cholera, an often deadly virus. Cholera causes extreme vomiting and diarrhea which leads to dehydration (LaRocque, 2016). However in Haiti when access to clean water and/or a hospital are not viable options thus the odds of cholera ending in death are even more common. According to LaRocque, in 2012 approximately half of the recorded cholera cases occurred in Haiti (2016). Another troubling issue with cholera is that it can be passed by contact with an infected person's stool. In an area like Haiti that lacks proper sanitation this can lead to the widespread outbreak of *Vibrio cholerae*.

*S. typhi* is also a common contaminant in water sources in Haiti. This organism causes typhoid fever, which is an illness characterized by high fever, abdominal pain, and in advanced stages intestinal bleeding (Hohmann, 2016). If access to medical care is not sought the patient is expected to live only a few weeks

to a few months. Typhoid is preventable with a vaccine. This vaccine is not 100% guaranteed to prevent typhoid, but in an area that is so prone to typhoid being vaccinated is important in order to decrease the chances of contracting this disease (Hohmann, 2016).

The issue of water scarcity needs to be addressed in Haiti in order to provide a better quality of life for Haitians. People should not have to walk hours each day just to get dirty water for their family to use. The time that children and women spend walking could be used for education and work. Families should not have to worry about their children getting sick because of illnesses contracted from the only source of water they have, and children should not have to worry about becoming orphans because their parents died due to water borne illnesses. However, water scarcity and contamination is an issue that can be resolved by funding projects target at alleviating these issues.

## **Solutions**

Even though water scarcity and sanitation are huge problems in Haiti there are many solutions. These solutions are focused at providing long term assistance to communities and families in Haiti that lack the resources and money that would allow them to build wells or pipelines that would bring water to them. Many of the solutions listed below deal with ways to capture and store rain water to be used for household purposes, drinking, sanitation, and agriculture. All methods include parts that filter and clean the water so that it is safer to drink, decreasing the amount of people who are affected by water borne illnesses. The five solutions include education, rain water collection systems, rain gardens with water reservoir, portable water filters, and international aid. By using these methods on their own or even together would increase the availability of water to many Haitians.

### 1. Education

In order to combat the issues of water scarcity and sanitation, children and adults alike need to be educated about the dangers of drinking dirty water and proper sanitation. In communities where there are accessible water sources, people need to be educated about water conservation so that the water is not wasted. All over Haiti information about the importance of personal hygiene needs to be taught and practiced. While many Haitians do not have access to toilets, established spaces for relieving oneself needs to be established. Women need to be taught about proper hygiene when menstruating and supplies should be provided to them.

Through education, a wide range of people can be reached on a variety of topics that involve water. Agricultural programs can also be provided in order to help teach farmers about water conservation methods and other practices that can lead to increased productivity of their fields.

### 2. Rain Water Collection Systems

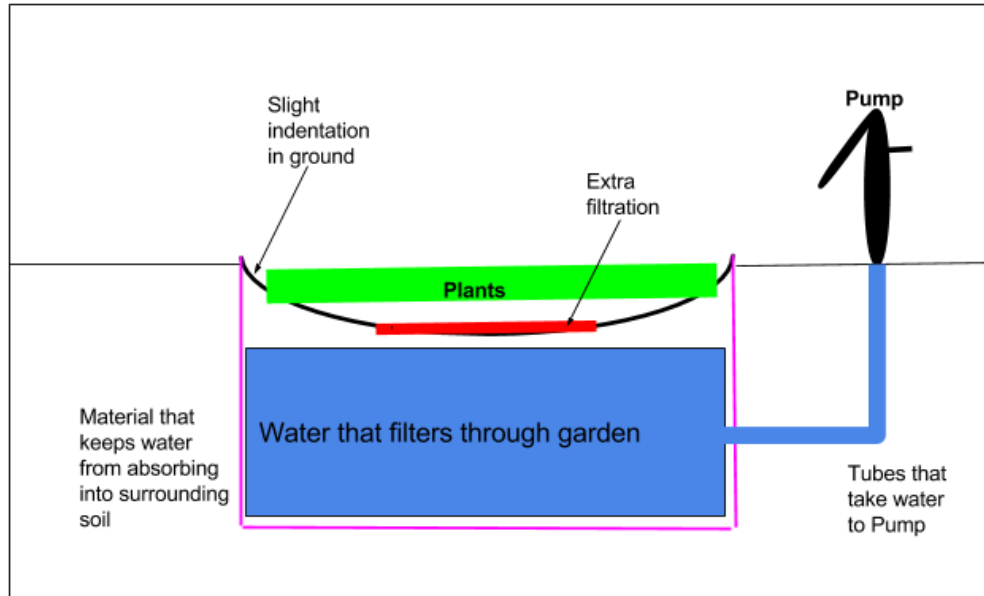
Another way to combat water scarcity is to provide families with rain collection systems. These systems would allow families to collect water to use in their homes for cooking, drinking, and bathing. In order to purify the water there would be filters attached to the opening of the barrels used so that when the spigot is turned on the water flows through the filter first. These collection systems would have to be large enough to store water during the drought months, but also small so that each family could get one.

These systems could also be expanded so that instead of individual families each having one (which would most likely be more common in urban areas), groups of families could share a system, or even communities sharing one. If communities would all share a system, it would have to be much larger and perhaps multiple would be needed. There could be separate collection bins or bags for household use, agriculture, and sanitation. The system used for sanitation could also be connected to a public restroom with toilets, sinks, and showers for the community to use. Like the small collecting systems, these larger systems would also have filters attached to cleanse the water.

### 3. Rain Gardens with Water Reservoir

Rain gardens are commonly used to filter and collect storm water runoff from non-permeable surfaces. However in Haiti they could be utilized to collect and store storm water. In a rain garden a shallow depression is dug into the ground and then plants are planted on top to filter the debris and contaminants out of the water. This modified rain garden would be dug deeper into the ground, then supports would be added with extra filtration materials, on top of that would be the soil and the plants. The deeper depression would act as a reservoir for the water that flows through the garden. A pump would be added to get the water from the ground up to the surface. This process is illustrated in Figure 2.

Figure 2



### 4. Portable water filters

The final method to help ease the water crisis in Haiti is portable water filters. These would be small filters that can be taken with those who travel long distances to get water. The filters could sit on top of the buckets they carry and filter the water as it goes in. While this does not solve the problem of water not being available to many Haitians it does help by removing many of the contaminants that would make people sick such as the bacteria discussed earlier. These pollutants are harmful and often times deadly, thus removing them from the water would make it safer to drink.

### 5. International aid

Much of the aid that comes to Haiti are individuals and organizations that are nonprofit or privately owned. These organizations provide resources that, like many of the other solutions listed, will benefit communities with measures that relieve the symptoms of the water crisis, but do not attack the problem completely. In order to eliminate water scarcity and give improved sanitation to all Haitians, higher power will need to be involved. Other countries governments who donate millions of dollars each year to be designated to this problem will greatly improve the conditions. Haiti's government must then cooperate with the other countries and help with designated projects. If infrastructure surrounding water, sanitation, and agriculture can be built Haiti will be much more resilient to natural disasters and the quality of life for many of its citizens will be improved.

### **Conclusion**

Haiti is in desperate need of help. The nation is suffering from lack of water and sanitation leaving them sick and living in meager conditions. Those living in rural areas are not given the resources needed

to live healthy lives, and unfortunately the conditions are not much better in urban areas. Children and women walk miles just to fill their bucket each day. This process takes hours and the walk is not an easy one. In communities where water is easily accessible, the water is used as a bathtub, toilet, washing machine, and for drinking. This leads to outbreaks of illness such as cholera that kill thousands of people each year.

These horrible conditions have not been addressed properly by the government of Haiti because the government is so corrupt that there is not any money available to do anything about it. Other nations refuse to work with Haiti because it would be like throwing money out the window. That leaves this crisis up to independent organizations to solve, but even then their measures just slow the symptoms doing little to end the problem at its source. Even the solutions listed above would make it better for many in the short term while larger plans are created and implemented in the near future.

The problem with water scarcity and sanitation is not an easy one. Haiti has many factors not in their favor. However with the cooperation of Haiti's government, other developed nations, organizations, and everyday people willing to help, Haiti can overcome water scarcity and improved sanitation will be readily available.

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