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Haiti, Water and Sanitation

Helping Haiti: One Step at a Time

You're on a trip with a local organization to visit Haiti, the fifth poorest country in the world. You get to Haiti excited to help like the humanitarian you are. As you step off of the plane and walk into town, you start to look around. You think to yourself, how can people sit and not do anything to help? What you see is devastating. The roads are dirt paths and as you are walking through the streets, you see kids with no clothes. Some buildings are standing while others have completely collapsed or have windows broken, bricks or half of the building are missing along with a multitude of other issues. As you get to the camp where you will be living with a couple of families, you see their houses. They are only made of sticks, leaves, and mud. Their house contains only one room which is the bedroom, kitchen, bathroom, and living room for the whole family. Soon it starts to rain so the family brings in their goat due to not having a place to keep it safe from getting rain rot or other diseases. Soon all of your belongs get wet due to water seeping in and the streets flooding. There is no door to stop it from entering. Now you are in a room where it is wet, contains a goat, and fecal matter. You have just become susceptible to open defecation. This is the daily life of a Haitian.

You soon become aware that Haiti has been battling safe water and sanitation issues since 2010 when a devastating earthquake hit this small island and an epidemic of cholera started short after. While there can be many solutions to this issue, there are a lot of other factors to look at. One of the factors to look at is the geology of Haiti, which consists of a core of igneous rocks. The entire island is made up of these rocks including the mountains which consists of limestones and shales, a type of rock made of mud and tiny fragments of other minerals. Due to these mountains, the karst aquifers are easily contaminated with waterborne pathogens. "Near major rivers and in the large basin occupied by Port au Prince sufficient alluvium has accumulated to form alluvial fans and alluvial aquifers. These aquifers, although more effective at filtering pathogens than karst limestone are prone to contamination from long term sanitation and industrial practices." (The American Society of Tropical Medicine and Hygiene) This shows that the number one source for their water is being contaminated with limestone and waterborne pathogens. Another factor is ecologic, Haiti is very close second in deforestation, soil erosion, and in overall a devastated ecosystem. (Grand Valley State University) Both trees and plants provide a first line defense for groundwater protection but if that system is destroyed or being destroyed then the protection is gone and the groundwater isn't protected from chemicals seeping through the ground making the chance of contamination higher for the water. But that's just the start of some of the issues that Haiti is facing.

An even bigger factor that will be looked at is the economic standing of Haiti, all statistics are provided by World Bank (World Bank). Over 75% of Haiti lives in poverty and the average income for a day in rural areas is \$1 and in urban areas is \$2. The typical family size is four to six household members. Their diets consist of corn, cassava, millet, rice, and fruits; they are a producer of mangos. Due to such a low income Haitians rarely eat meat, fish, or eggs which provides the proteins needed to help grow and maintain health. When going into markets, the streets are often crowded and dirty. Markets are also used more for trading rather than selling due to majority of the families not having any money at all. The country heavily depends on farming, for it employs 60% for labor but only 30% of the land is considered suitable for cultivation. Due to population growth, farmers have had to cultivate the unsuitable land to provide for this demand. Half of the land is actually being cultivated for agriculture. Due to this issue,

farming isn't as easy as it is in other places in the world. Close to 80% of the crops that they get are imported from the US. Some families have better access to schools. For families that live in urban areas it is common for more than one person in the household to be literate. In rural areas it is very common for only one person to know literacy in a household. Literacy is at 53% which has gone up very slowly since the 2010 earthquake but not fast enough. Many families can't afford to send their kids to school since schools are either private or they have tuition, books, and uniforms to be paid for. Haitians don't have very easy access to healthcare but with the help of USAID, United States Agency for International Development, this organization is making it easier for Haitians to be treated and making it more affordable. USAID are teaching women and men in that country to be nurses, doctors, pharmacists, and even surgeons. They are also helping to rebuild the main general hospital that was destroyed during the earthquake and cholera epidemic; this hospital was also their number one training and teaching facility. USAID works with Haitian government to help improve health care for all Haitians. This has been the main goal for years, but it has not been easy.

The severity of these issues are very important and by doing nothing will not make it any better. A study done by Independent Company in the UK found in 2016 that an average of 37 people are dying from cholera each month, six years after the earthquake due to unsafe water and non-proper sanitation. "According to Amnesty International there are still 60,000 people living in makeshift displacement camps after their homes were destroyed in the earthquake where sanitation is poor. Only 24% of Haitians have access to a toilet, sewage is rarely treated correctly and many do not have access to safe drinking water." (Mortimer, Caroline) These trends have been staying the same even though there have been efforts to make things better. The good news is that experts don't believe that it is getting any worse but they have a long way to go before it gets better. This issue has largely affected the rural population more than the urban. But the urban areas should not be ignored either. While urban areas are becoming easier to help solve this situation, it has been a continued battle for the rural areas. "According to the World Bank and The National Poverty and Social Exclusion Observatory (ONPES), extreme poverty rates have been going down in Haiti - from 31% to 24% between 2000 and 2012, mainly due to progress in cities, where they decreased from 21% to 12% in the same period. In rural areas, however, the extreme poverty rate has remained largely the same for 12 years." (World Bank) This trend has affected a multitude of people but the ones truly affected from this open defecation is mainly children and women. So what can we do to help this issue?

One way to help combat the sanitation issues is by building outhouses. They are very simple and easy to make along with effective. Outhouses decompose the fecal matter through a natural process. Not only are they easy to build but building them would help the economy by providing jobs to Haitians and helps contain the diseases in one area, reducing open defecation. Organizations such as Me for We helps get third world countries on their feet. For example in Nicaragua, they have groups and other volunteers help the countries in need by building outhouses and helping out with the work needing to be done. This particular organization promotes communities by selling jewelry that local women make that donors can buy online. At a local school Me for We have built outhouses that last for a period of time. Once the outhouse is full they stop using it and build another. While this other one is left alone, the fecal matter decomposes into the ground naturally. The most important aspect of building outhouses is that the hole into the ground is deep enough to provide sufficient use to all people. The cost can be anywhere from \$30 to \$300 possibly more depending on the type of wood and if the concrete is already poured or if any other additional plumbing needs are needed. In the United States, many families used to have their own outhouses before indoor plumbing became possible. Cost will be lower if concrete is not used and the hole is left as just dirt. Haiti already has some outhouses in urban areas but not in rural areas. The only cons with this is that there would need to be a lot of wood that could protect the inside from the outside as these outhouses are just concrete with a hole in the middle. Also it would need to withstand the weather conditions in Haiti. Outhouses typically do start to smell bad which could lead to wildlife issues. The pros to this project is that fecal matter would be contained and Haitian's living space wouldn't have the high

risk of open defecation. This could lead to healthier, non-sick families which would then help with other poverty issues this country faces. The wood could be fundraised or donated, it would more than likely have to be shipped by sea. There is a trend that researchers are seeing and it is this; more third world countries use outhouses to help combat open defecation and non-proper sanitation. Outhouses may be considered cringe worthy to most people but for Haiti it is one solution for many issues.

Outhouses could also be a project that groups can provide jobs to the Haitians by teaching them just like Many Hands for Haiti does for Bundled Bottoms. They are currently working in Haiti. Like Me for We they have it set up to where group volunteers can go down and help out in Haiti like pouring cement floors in the huts so they are no longer dirt. Currently this organization has huts with wells that families can access at certain times during the day. The wells have their own systems to become uncontaminated but the issues with the wells is that they are locked when people need to use them and they are not easy to access. They are long distances from communities and often times take many trips to get enough water to last the family for a day. This organization is a model organization because they help local farmers by providing them with education at a university in the capital of Haiti. They also provide them with crops like corn from Iowa. They also have a program called Bundled Bottoms. Bundled Bottoms is a program where groups from anywhere can take old t-shirts and cut them into patterns that will then be made into diapers. You also cut washcloths a certain length and width as well that go with the t-shirts. The group then ships the t-shirts and washcloths to Haiti where women are provided an education on how to sew and then a job where they make a \$1 a day sewing the t-shirts and washcloths into diapers for kids to have for free. The only issue is that the sewing machines use electricity which is not easy to obtain in some of the communities where they help out at. These diapers are cloth which needs water to clean therefore the next solution contains information on how to obtain clean water to properly sanitize these diapers and clean enough to drink.

While experts have been trying for years to have easy solutions to these clean water issues, there have been some that could work. One solution is called SODIS also known as Passive Solar Disinfection (EAWAG and Helvetas). Some pros to this is that it is very cheap and you are reusing bottles that are normally recycled in countries like the US. Some cons to this is that water becomes warm due to it sitting in the sun for 6 hours or more for the proper solar radiation from the sun, you have to wait for the water to become clear or it can be sensitive and not accurate. The cost is low and has a high chance of working at a successful rate. With organizations already down in Haiti doing work, these projects can be funded. The US has been helping Haiti for many years while their own government has been struggling to make it work. So how does SODIS work? The very first and one of the most important steps is cleaning the water bottle with hot water and soap. The next step is to add normal water into the now clean bottle. It is best to use a plastic bottle rather than glass bottle. After adding the water to the bottle and closing it with the cap, place the bottle(s) in full sun from morning to evening or for a minimum of six hours. One of the most important steps is making sure that the water is clean. Therefore using plastic bottles that are normally recycled are easier to tell you if the water has been properly treated. Place the filled bottle(s) on top of a newspaper headlining or something noticeable with big lettering. Then, look from the neck of the bottle to the bottom from the top and if the headline or wording is readable then the water can be used. If the letters are not readable and clear through the water then it will have to be filtered with a biosand filter. Some possible issues/problems can be weather related. If the sky is covered or half covered with clouds then the bottles have to be in the direct sunlight for a minimum of two days, as the strength of the solar radiation becomes less effective. If it is raining then there is no way the water can be treated but people can collect the rain water to use for the next round of bottles. Another issue that needs to be paid attention to is recontamination. Scientist say that the now treated water should be kept in the same bottle and drunk from there or transferred to a clean cup. This lowers the chances of the treated water becoming contaminated again. If water becomes contaminated, the next solution would be a biosand filter.

Biosand Filters can be used as a solution in each household or within a parameter of many households to be shared. The biosand filter is a concrete or plastic box/container that is then filled with a layer of sand and gravel. Water is poured into the top of the filter and collected in a safe storage container. This helps to stop the birth of pathogens, waterborne or not, along with filtering the water and decontaminating it by using physical and biological processes in the filter sand. This is a renewed slow sand filter which has been used for hundreds of years and could be used nonstop. This version is smaller and used for intermittent use, making it perfect for households to use. The container is typically made out of concrete, plastic, or any water-proof, rust resistant and non-toxic materials. If concrete is used, it is cast from a steel mold and made with pipes already designed for the mold. "The container is filled with layers of sieved and washed sand and gravel (also referred to as filter media). There is a standing water height of 5 cm above the sand layer. As in slow sand filters, a biological layer of microorganisms (also known as the biolayer) develops at the sand surface, which contributes to the water treatment. A perforated diffuser plate or basin is used to protect the biolayer from disturbance when water is poured into the filter. Pathogens and suspended material are eliminated (removed or inactivated) through a combination of biological and physical processes that take place in the biolayer and within the sand bed. These processes include: mechanical trapping, absorption, predation and natural death." (Cawst) With solutions there are pros and cons to this. While it helps naturally treat water, provides safe water quick and can be built in any country with the materials. Some cons are that the concrete containers are heavy making them difficult to transport and move, some skills are required when installing and working them, the cost is roughly \$100, the top layer of sand has to be replaced after a certain amount of time of being used, the outlet along with the lid and diffuser also need to be cleaned on a regular basis or bacteria can build up, and plastic containers can easily be broken, cracked or become moldy over an extended period of time. The non-profit organization, Clean Water for Haiti has been working with the biosand filter since 2001 and has only been able to access only 2% of the population. They need about \$100 to build, deliver, and install the filters but they also provide assistance to the family if the filter is having any technical issues for the next year after the filter is installed. Their success rate is that 95% of all of their filters were still in use after the first year of installation. (Clean Water for Haiti) Organizations like this could help pioneer these projects but it is always good to teach the natives how to be independent and show them how the filters work so if they stop working or get clogged the natives would know how to fix the filters. If a biosand filter is not an option in your home then you would want a well close to you.

One last solution for safe water would be an In-Stu Filtration (ISF) wells (Geological Society of America Abstracts with Programs. Vol. 46, No. 6, p.613). This idea is fairly new, this idea started for the first time in 2014. Wells are very common in Haiti except in rural areas and mountainous areas where natural springs are common. The majority of rural Haitians will send a family member such as women and children to gather water from the springs two to three times a day using buckets and other plastic containers. The biggest problem with them gathering water like this is that the springs have bacterial contamination caused by surface contamination along with the karst aquifers, and non-proper sanitation. Promise to Haiti and CBP (US Customs and Border Protection) have been working together to implement wells closer to communities so that families don't have to travel as far to access the water. With installing ISF wells, they won't completely solve the contamination problem with one step, there will need to be an at home common practice with using biosand filters or choline tablets, a water-soluble vitamin-like nutrient. When first tested in 2013, this didn't actually show signs of working but that was without using the at home treatment. Within the next year, scientists believed this could be the best way to help with unsafe water. With multiple pros there are some main concerns such as maintenance from locals that will be required and they will have to be trained/educated in the specific area. "In 2011, Jaden Nivo spring had 56.9 e. coli /100 ml MPN; and Bachemir's well had greater than 2420 e. coli/100 ml MPN. Monitoring immediately after ISF well completion indicated increased e. coli for Jaden Nivo (2420 e. Coli /100ml MPN); and slightly decreased e. coli for Bachmir's well (1553 e. coli/100 ml MPN). Within 90 days both well installations had e. coli of 1 e. coli /100 ml MPN or less. The spring adjacent to Jaden Nivo continued to have elevated e. coli in the 10's of e. coli/100 ml MPN. Two additional wells were installed

in 2014. The cost of each well conversion was approximately \$400-500 U.S., roughly one-tenth the cost of a traditional well.” (Geological Society of America Abstracts with Programs. Vol. 46, No. 6, p.613) The 100 ml MPN stands for the most probable number of viable or usable cells in one milliliter of collected water. (Microbeonline) Due to this study found, the scientists insisted that at home water treatments were started but since then they have been working to prevent these outcomes.

Even though Haiti has survived years of living in these conditions, it is time they stop having to fight this battle alone. Many of these solutions could help Haiti as these non-profit organizations have already started: Me for We, Many Hands for Haiti, Clean Water for Haiti, Promise to Haiti and US Customs and Border Protection. It starts with one step at a time by donating money or volunteering your time to help these non-profit organizations to continue to be successful in Haiti. We could get the fifth poorest country to become the twentieth poorest country. So what’s stopping us? Your trip to Haiti is finally over, while at times it was nerve racking, you came to realize life in Haiti isn’t easy. With not only social, economic and political factors; there are a lot more issues that need to be resolved. When you get back to America, you start to think what can I do? It’s simple, take a stance. Start a project that is realistic and reasonable. Donate and get involved with these non-profit organizations or other organizations that are helping in Haiti to help improve the lives of Haitians. Don’t have apathy, you know what is happening so do something because if not you then who? If not now, when?

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