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Madagascar, Water and Sanitation

Installing Sanitation Techniques to Improve Food Insecurity in Madagascar

Introduction

Poor sanitation in countries worldwide heavily impacts the food and water quality that a typical citizen has access to. Unhygienic facilities and contaminated water can be considered a last resort in some places; however, in Madagascar, many individuals solely drink contaminated water because that is their only option. This leads to acquiring different illnesses due to the bacteria and contaminants present within the water, and a disconcerting lifestyle because of the current conditions.

Geography

Madagascar - an island country located off the southern coast of Africa - has a population of 28.4 million and one of the highest percentages of individuals that do not have access to clean drinking water. Approximately 58% of Madagascar's population does not have access to clean drinking water or sanitation facilities, which takes a big toll on their daily life (USAID, 2021). Although this percentage has decreased over the years to 58%, most individuals still do not have access to proper sanitation facilities and water to ensure their health and survival (The Borgen Project [TBP], Apr 2020).

Government

The structure of Madagascar's government is a Republic with President Andry Rajoelina at the center of Madagascar's politics. The first hand-off of political power occurred in 2018 with the election of Rajoelina who had won 55.6% of the votes, however, the government still faces instability (USAID, 2021). Madagascar accepts funding and aid from other countries due to the poverty that the government is struggling to combat. For instance, the new government's power is recent and lacks a political and economic basis to solve problems for the population, including combating water scarcity and poor water quality (TBP, Apr 2020).

Economy

The occupation of Madagascar by France ended when Madagascar gained its independence in 1960; however, poor autonomy and self-leadership have caused corruption and economic instability over the years (USAID, 2021). Even though economic instability exists, the economy is heavily dependent on the production of crops and trade because of the location of Madagascar. Madagascar's economy remains heavily dependent on agriculture including vanilla, sugarcane, and rice, which are exported due to greater demands for these products outside of Madagascar's home borders (Beck, 2017). Additionally, frequent natural disasters in Madagascar as a result of the surrounding bodies of water negatively impact the environment and economy. This can be seen in 2017 when \$400 million was lost due to these natural disasters, with the main one being cyclones (Beck, 2017).

Climate

The climate of Madagascar directly relates to its altitude and location near the sea. Natural storms and disasters occur frequently in Madagascar because it has a tropical maritime climate. There have been drastic changes in the weather due to global warming, and because of this more droughts have occurred.

Madagascar already has poor agricultural conditions when compared to other countries, and droughts worsen these effects and leave people with less access to water (How Climate Change Is Impacting Madagascar, 2021).

Family and Nutrition

In Madagascar, the average household size has remained at 4.5 individuals over the past few years (Madagascar Multiple Indicator Cluster Survey [MMICS], 2019). Additionally, malnutrition is a very serious issue in Madagascar, where approximately 42% of children under five years old are stunted in their growth. Malnutrition affects school attendance because if children do not have enough to eat, they are too weak to attend school. Recently, the government has begun to establish nutritional policies to address this problem, such as the National Food and Nutrition Plan and the Health Sector Development Plan (Madagascar: Nutrition Profile). Although nutrition for families has improved, the majority still do not have access to clean water. As a result of the ever-changing climate and past droughts, water is a scarce and unhygienic source for many of the different communities (Clean Water: Key in the Battle against Malnutrition in Southern Madagascar, 2017). Furthermore, education about hygienic practices in Madagascar is limited (Education in Kenya, 2015).

Due to the political and economic state of Madagascar, agriculture is a main source of employment. Approximately 70% of the workforce is strictly dedicated to producing crops like cotton, coffee, tobacco, spices, vanilla et cetera (Working and Getting a Job in Madagascar). Other than farming, accessible jobs for Madagascans include engineering, IT, telecommunications, and teaching (especially English). Over three-quarters of the teachers in Madagascar do not have a professional teaching diploma, which significantly drops the level of education (Madagascar Education). However, there are schooling systems in place for children to attend school until they are 18 years old and then higher education opportunities. The schooling system, though, is not enforced so many children drop out to help support their families.

Sanitation and Cleanliness

Approximately 57% of the population in Madagascar does not have access to clean drinking water or basic sanitation services (MMICS, 2019). For this reason, diseases are relatively common in Madagascan communities. According to a multiple indicator cluster survey performed in Madagascar in 2018, four out of five people drink water that is contaminated, with the main bacteria being E. Coli (MMICS, 2019). Preventative measures should be taken to ensure that more individuals have access to clean drinking water because not only is it a necessity for survival and the prevention of diseases, but also ensures proper sanitation for women during their menstrual period.

Causes of Food Insecurity

Madagascar is one of the world's poorest nations. As a result of the high poverty rate in Madagascar, food insecurity is extremely prevalent as many struggles arise for the Madagascan population. Limited access to clean water and sanitation dramatically impacts the quality of food that individuals eat.

Additionally, climate variability is another predictor of the high rates of food insecurity. With around 50 natural disasters in the past 35 years, crops can be wiped out, which limits not only food that individuals can get access to, but food production (Working in Crises and Conflict: Madagascar, 2016). Since the economy of Madagascar is mainly focused on agriculture and that is how the population gets fed, these natural disasters are often catastrophic. For instance, many of these storms in the past have caused droughts throughout the entire nation. In 2020 it barely rained in Madagascar, which caused water-borne illnesses to increase and food availability was scarce as farmers could not produce enough to feed their families or others in need (Madagascar: Severe Drought Causes Hunger Crisis).

Due to government instability and lack of resources, the government in Madagascar has not been able to resolve these problems. In fact, due to increases in natural disasters and limited government relief, the people have experienced worsening effects of food insecurity, water scarcity, and disease. (Madagascar Needs to Change the Plot, 2021). As a result of political instability, people are left on their own to cope with these problems.

Impacts of Food Insecurity

Not only are the people of Madagascar left hungry and without proper sanitation facilities, but many must resort to other strategies to provide for their families. According to UNICEF, families are selling their kitchenware, farm gear, and other necessary items to stay alive. Recent studies have shown that approximately 9 million people (32% of the population) are affected by humanitarian crises and over 1.5 million people (5%) are currently experiencing food insecurity (Madagascar, 2022). Additionally, around 500,000 children under the age of five experience malnutrition, which can lead to death and birth defects (Madagascar, 2022).

Solutions

Urgency is required to solve the problems in Madagascar that cause food insecurity and to ensure the healthy survival of all Madagascans. Solutions to improve water quality and sanitation facilities are vital. Ceramic filters in the home can actively reduce harmful contaminants in river water and make it safer to drink. There are many benefits to using this water filtration system including the reduction of diarrheal diseases, the long life span of the pot and filter, and a low cost for a most likely one-time purchase (Ceramic Filtration [CF], 2022). Ceramic filters cost much less (\$7.50 - \$30 per household) than other water sanitation technologies, making them more accessible for individuals in poorer communities (CF, 2022). Ceramic filtration uses a ceramic pot or container and allows water to flow through a filter that contains tiny pores (Jccarmody, 2020). The accessibility and easy use of these filters would provide more water cleanliness to many communities in Madagascar at the household level. This would greatly decrease diseases caused by contaminated water and improve the overall health of Madagascans. Additionally, food insecurity would be decreased by installing ceramic filters because access to clean water will allow for healthier and less contaminated food to be made and digested.

This sanitation system has been implemented worldwide in poverty-ridden countries, such as Cambodia. Many individuals both in Cambodia and Madagascar lack access to clean water and sanitation facilities (Cambodia's Water Crisis). With a population of 16 million, around 2 million lack access to clean water today. This number has been improved upon throughout the years as Cambodia has one of the largest ceramic filtration programs. Non-governmental organizations have partnered with Resources Development International to distribute these filters throughout Cambodia (Ceramic Water Filters Cut Disease in Cambodia [CWFCDIC], 2016). These filters have decreased rates of illness due to feces in the water by 50 percent in areas where the ceramic filters were introduced (CWFCDIC, 2016). As proved by the success of ceramic filters in Cambodia, the same can be done in Madagascar where diarrheal illness affects many. Similarly, the World Health Organization can aid in the production and distribution of these filters, as was done in Cambodia.

Although ceramic filters have many positive aspects that can improve lives in regional areas, there are still limitations as to what the filter can accomplish. Due to the small size of the filter, small amounts of water can be filtered through at a time – anywhere from 1-3 liters per hour (CF, 2022). The CDC additionally states that because these ceramic pots are small and due to the limited size of the filters, not all contaminants can be removed from the water (CF, 2022). However, these filters are mainly effective

and are a cheaper option that can make access to clean water more readily available in Madagascar, as there have been positive outcomes in other countries.

Water scarcity, as previously noted, also leads to food insecurity in Madagascar due to agricultural and crop failure. With rainwater harvesting, water is captured and collected in a single water tank through gutters or even just when it rains. This solution is cost-effective and the system of networks leading from the main tank can be developed and improved over time (How Rain Catchment Systems Works [HRCSW]). As the unpredictable climate and long periods of drought shape the time in which people have access to dirty river water, rainwater harvesting provides another solution. Rainwater harvesting gathers water for farming from rain and even from ponds (HRCSW). This strategy would help communities on a large scale when there are long periods of drought by saving up water and it being utilized later. Furthermore, filters can also be installed within the tanks to make sure that the water is safe for drinking, and this can solve two water problems in Madagascar with one solution. Being able to manage the water supply and the quality of the water will improve food security in Madagascar as crops can be grown in periods of drought and cleaner water can be used to produce sanitary meals. Rainwater harvesting has already been implemented in several countries in Africa, as well as in India and Australia through more government funds being allocated to water quality or through non-governmental organizations like the Water Project (HRCSW).

One potential disadvantage of rainwater harvesting is waiting to collect rainwater through long periods of drought. However, if Madagascar could use this system for water in community rivers and the surrounding ocean, it could be effective in providing water for crops and fresh water for drinking. Rainwater harvesting is a more costly solution, especially for larger storage tanks, but this would be a one-time purchase. The biggest challenge with this system is the local maintenance of the rainwater tanks in an already challenging subsistence economy.

Overall, water filtration technologies are appropriate for improving the quality of water and sanitation in Madagascar as it is a cheaper alternative and relatively easy to install. With this being said some technologies like Solar Water Disinfection would not be appropriate in Madagascar. This technology would only work on a small water bottle, and it would take hours to cleanse the water. This solution is not suitable because a small water bottle would not be able to sustain a whole family's needs which include drinking water, water for laundry, cooking, and much more. Although it is inexpensive and has been implemented in other countries such as India and Myanmar, it is less suitable for the crisis that Madagascans face (Zinn, Caleb, et al., 2018). Additionally, the creation of new technologies to improve water scarcity in poor countries is extremely difficult as many prototypes will fail. However, an ordinary person could change someone's life if they have a vision worth pursuing. Not only should someone with a great idea try to make it work, but also advocate for the use of new technologies and spreading this information via social media, the news, and nonprofit organizations to reach a broader audience.

A cheaper alternative to improving water quality and food security is plants that go into the water and serve as natural filters. With this solution, soiled river water can be improved in a short amount of time. High nitrate levels in ponds are the reason for murky colored water in the first place, but according to pond experts, water plants can effectively remove nitrate buildup in the water and provide safer drinking water for individuals (Clear Water Pond Plants [CWPP], 2022). Some water plants that can improve water quality are hornwort, water thyme, water iris, and water lilies (CWPP, 2022). A more accessible plant is the Moringa oleifera as this is a native plant to Madagascar, along with other variations of this same plant that can also purify water (Moringa Tree, 2010). This option is not only feasible, but it is also effective. These plants can be purchased by the government as they are inexpensive or by non-governmental organizations that are looking to improve water quality worldwide.

A limitation to placing plants directly into the water is fast-moving currents that can drag the plants away. However, flowers planted along riverbeds also serve the same purpose as those in the water, which include Skunk Cabbage and Yellow Monkey Flowers (Boriyo, 2019). There are many possibilities for the different plants, shrubs, and flowers that can be placed in the water or around riverbeds to increase water quality.

Another solution often overlooked to solve food insecurity and water quality problems is improving education. To not only solve these problems, but also benefit the well-being of children, a potential solution is to expand educational opportunities in Madagascar. Due to the COVID pandemic, nearly 7.2 million children were out of school; however, these numbers were also high previously as children drop out of school to help support their families (Madagascar, 2022). As a result, children are unable to learn how to sustain themselves and common knowledge that could be useful to aid in their survival. Education should be provided for all children, but due to teachers with little training and children not being able to attend school, this possibility is limited in Madagascar. Thelwell and colleagues from the Borgen Project both state that traditional beliefs can hinder the possibility to achieve better water quality and sanitation practices, such as a belief in Madagascar that an outhouse used by mothers will cause the child to be lost. By replacing these myths with facts about correct hygiene practices, the problems of poor sanitation can be more easily solved. With the help of governmental programs allocated to teaching safe hygienic practices, more people will understand how they can access clean water and how this will improve their overall health.

Empowering citizens with more information on technologies they could use to sanitize the water, prevent diseases, and live a healthier lifestyle is a step in the right direction. The data could be shared by nonprofit organizations, such as UNICEF, or taught to the teachers at these schools. UNICEF already advocates for safe sanitation and hygiene practices in African countries, but including information about technologies and how children can spread the information to others would be very valuable. “UNICEF is working with governments to improve good hygiene practices such as handwashing with water and soap in households, communities and institutions” (Sanitation and Hygiene). Although this is a good start, how to use inexpensive technologies that can be methodically placed throughout neighborhoods would help to better prevent the spread of diseases.

Conclusion

With all these solutions, the best way to properly implement them is with the help of the Madagascan government or centralized non-governmental organizations in Madagascar. Government funding to improve the lives of civilians is a viable option, however, the government is in a weakened state as the executive power is stronger than the legislative branch or parliament. Elites in society are also situated in high positions, which in turn means that other officials can also be chosen by them and contain great wealth (Madagascar: Freedom in the World 2022 Country Report). Due to these barriers, the citizens can try to implement a new system for selecting officials as the one in place is corrupt and biased. This would take a long time though, so a more accessible solution would be ordinary citizens persuading the government and similar institutions with petitions, phone calls, and peaceful rallies to solve the sanitation problem that has been around for centuries.

Examples of NGOs that provide both funding and support include the Borgen Project, Water Project, and the World Health Organization. The government of Madagascar should collaborate with NGOs to sustain better sanitation practices and ensure access to clean water for all individuals. These organizations are successful as they can encourage citizen participation and receive outer funding from volunteers, like UNICEF (Funding to UNICEF). Additionally, there are many NGOs already working to combat problems in Madagascar such as Water Aid, SEED Madagascar, Action Against Hunger, and a few others (Project,

June 2020). However, these NGOs are small in size and need additional voluntary contributions or more citizens helping to reach as many Madagascans as possible. Working together, the government and local NGOs can dramatically improve the water quality in Madagascar with citizen participation, which would in turn increase overall health and quality of life.

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