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Sierra Leone, Rainwater Harvesting

Sierra Leone: Using Rainwater Harvesting Systems to Harvest Hope

Imagine living a life where water can kill you? Unfortunately, this is normal for those living in Sierra Leone, a country in Western Africa. Where the entire population is frequently exposed to extreme natural disasters and more than half do not have access to clean water. As the issue became more and more prominent, Willamette International, a non-profit organization passionate about sustainability, Christianity, and well drilling, have completed over 94 water projects to benefit these struggling communities ("By Giving" and "Who We Are"). A decade-long civil war and an ebola outbreak has left the entire country in serious disrepair and as more and more people endure poverty and fear, this has become a matter of life and death for Sierra Leone's residents ("Sierra Leone"). Efforts toward more efficient stormwater management will alleviate these serious issues associated with poverty. Which has become a growing influence on food insecurity. These solutions include government regulation, encouragement, and the implementation of sustainable technology like rainwater harvesting systems. Other groups like the Freetown City Council are contributing to this effort by clearing drainages, gutters, and waterways, which is supported by the government but is not being implemented enough to put the country on the road to recovery (Sesay). The Union of Concerned Scientists explains that the government and people must work together and act now before it is too late. They have put forth efforts to push the government to contribute to this issue, which has proven to be beneficial. They have done so by providing facts to put this issue into perspective, as well as sharing different things that could be done. This solution has proven to be somewhat successful in the United States, so it could be in Sierra Leone as well ("Climate Solutions").

Sierra Leone's population as of 2020 was a little under 8 million, with about 43% of these people living in urban areas ("Sierra Leone"). The country has a humid, tropical climate with great amounts of rainfall leaving only about 1% of the land under cultivation as of 2005. This comes as a result of the area being particularly vulnerable to floods and other disastrous weather events and conditions. Despite this much rice is produced in this region, especially during the war years as it was a staple food given its successful growth in rainfed upland areas. Sierra Leone is widely known for its heavy rainfall, especially during the rainy season. This is from May to November when 10 times more rain falls than in the dry season. Yet, other foods like cassavas, sweet potatoes, and legumes are grown here as well, but they all have low yields and heavily degrade the land through the process of cultivation. This has contributed to the growing food insecurity for residents living in the country, 80% of whom are already living in "absolute poverty" ("Sierra Leone"). It is also important to know that the average farm size in Sierra Leone is 1.2 to 5 acres. Say the average was specifically 3 acres, which falls in the middle of this range, this would be roughly the same as 3 American football fields ("Sierra Leone"). In comparison to this the typical farm size in the United States is equivalent to about 444 football fields ("What Does" and "Farming and Farm").

Given that 85% of farmers grow rice in this country, it is an important part of the resident's diet. Many people living in Sierra Leone mine for work, unfortunately, the dangerous job does not pay well. Currently, half of the population lives on less than \$1.25 per day. In Freetown, the capital of Sierra Leone, one cup of rice typically costs about 1000 Egyptian Pounds, which in U.S. currency is about \$64 (Wise and "Prices and Exchange"). This does not leave much or truly any room for families to spend money on other vital necessities. What's even worse is that this is just for rice, for a nutritious and well-rounded meal at an inexpensive restaurant the price can be roughly \$4.31 for only one person ("Cost of Living").

This price is more than three times what some people earn in a day. In Sierra Leone, the typical house is made of stick and mud walls with grass roofs, but these houses contribute to the growing number of families in "imminent danger of death" ("Sierra Leone- Housing") It has been found that 1 in 5 people in Freetown sleep in a single room with 10 or more people ("Housing"). While sharing is an important part of the culture for residents in Sierra Leone, this can continue to be practiced through common dining customs. These customs include all members sitting in a circle and eating from the same large dish which lies in the middle of this circle ("Cuisine and Etiquette"). Organizations like Home Leone have been building quality low-cost homes with the help of members in the community of Freetown, also allowing them the opportunity to earn some money that is desperately needed (*Home Leone*). More efforts like these are needed both inside and out of Freetown to improve the quality of life for all Sierra Leone residents.

Ever since gaining independence from Britain in 1961, almost all residents have been living a life plagued with war and poverty ("Factors of President"). Fear is a normality in the lives of many innocent people in Sierra Leone as war threatens everyone, but most especially women and children. Almost 40% to 50% of kids, some as young as 7 years old, have been forced to become soldiers, human shields, and even sex slaves. This percentage has been growing as well. The story of a young student was shared in the New York Times to show just one of the many gruesome and traumatizing events that these residents are being put through. This fourth grader, at just 10 years old, was abducted by the Revolutionary United Front, put in front of children and people of all ages he knew, and was told, with a gun against his head, "Kill them. If you don't I will kill you." The people all now haunt him, both in his dreams and every second of the day. The scar from this event will be everlasting for this victim. Aminatta Forna, another victim of this war-torn country highlights more of the emotional truths of this country. In her family's village alone, rebel forces invaded and raped every single woman in the area in a day. These two stories not only demonstrate the realities of war in this country but how the corruption within the military-ruled government has and continues to completely neglect the people of Sierra Leone ("Ancestor Stones:"). While poverty significantly contributes to food insecurity, the lack of appropriate government control also weighs heavily on the people of Sierra Leone.

Unfortunately, there are a great number of challenges from which these people need relief. As of 2019, only 2% of the population in Sierra Leone had access to clean and available water. This has put these people at high risk of numerous infections and diseases, most commonly Hepatitis A, Malaria, and Typhoid fever. All three are killers. In Freetown, Yebu Bare, a 12 year-old girl, slowly makes her way up a steep hill all to fill a 5-gallon cement bucket prone to spills due to deep cracks. Despite these troubles, the water collected is still too dirty to drink, forcing her family to buy water from the local shops with the little money they have. This struggle is a daily occurrence. Sometimes, Yebu has to fill the bucket 5 times to get enough water for her family ("The Daily"). However, the country has a rainy season of about 6 months a year. Nonetheless, the government claims to not have enough resources to sustainably "maintain and distribute clean water" ("Water in Crisis-"). This proves to be rather ironic given that from 2012 to 2018 the government of Sierra Leone spent a total of 241,500,000 US dollars on military expenditures ("Sierra Leone"). With 53% of people living in poverty, this amount of money would allow every average impoverished family in Sierra Leone to receive a donation of a little over 340 US dollars ("Sierra Leone"). This is equivalent to 7,357 Egyptian pounds, which should be substantial for families. However, this money would only allow for a purchase of about 7.3 cups of rice. Imagine the things families can buy with this money to improve their quality of life if goods reflected values not so bloated by a poor economy.

Everyone needs water, along with food, shelter, and clothing. They are basic necessities. To solve many of the issues residents of Sierra Leone face, from food insecurity to water-related problems, rainwater harvesting can be a beneficial solution. While families need clean water, so do crops, but the copious

amount is posing a burden on the entire population of this country. Only about 2.2 pounds of rice need roughly 4,000 to 5,000 liters of clean water to be grown ("Rice does"). Envision how many times children and families like Yebu Bare's must travel and carry to meet this substantial amount. Rainwater harvesting systems are an appropriate and perfectly fitting solution given the conditions of the country itself, the most important being their significant rainfall.

These systems work by collecting rainfall from roofs which run into a gutter, then into a drainage pipe that advances into a rainwater diverter. This is the first step in filtration, the diverter can be placed right into the pipe and filters out any large debris. Once the water makes its way into the collection tank it can be stored for later use or pumped right through the main filter for personal use. Any rainfall used for other purposes, like gardening, does not have to be through the second filter. These systems can be as simple as or complex as necessary. All around the world, people are putting together their own systems, using even garbage cans for storage tanks. Philip Clark from Heronbrook Farm, in the UK, collected over 44,900 gallons of rainwater for use on his farm (Heronbrook Farm).

In 2013 the Pernix Group began constructing similar systems on a large scale, which proved to be extremely efficient. Despite these successes, the group has not made any updates since 2015. The last news being that the project in Sierra Leone had been awarded a 10.8 million dollar contract by the United States Department of State Bureau of OBO. Meaning that the initiative is now under United States authority and any information is disclosed, which has been confirmed by the group itself (Pernix Group, Inc.). These systems however, in comparison to other basic infrastructure improvements, can be relatively inexpensive. On top of that this practice reduces water waste through the form of runoff which developments like a highway or road system can ultimately hinder. Meaning that the government in Sierra Leone, does not necessarily have to reach out to other countries for loans and other means of money to pay for the project like they did with the Pernix group. Thus, the project can be monitored closely in one area before being implemented into another to potentially make improvements in between. Transparency International encourages open governance stating that it enables an environment for citizen participation ("OPEN GOVERNANCE"). The residents have little control over many aspects of life so much so that they should be the stakeholders and forefront of positive change. This project could be obstructed without government aid, but without the support of the people it would be impossible.

It would also be in Sierra Leone's best interest to further these efforts and take advantage of the over 19 inches of rain per month in the typical rainy season, to make it through the dry season and any droughts ("U.S. EMBASSY"). Given numerous factors the use of these systems in Sierra Leone prove to not only be successful but sustainable. While these systems for a single-family home typically cost anywhere from 1,000 to 3,000 US dollars, which with support from the figures the government has already spent on war costs, would not be a hefty bill (Caballero). In addition to that, the 2020 through 2024 Sierra Leone Budget Report from the Ministry of Finance reports that the poverty related expenditure budget is roughly 2.1 million dollars. Despite this amount, the government still claims it is not enough for new projects. A solution to this problem could be found within the existing COVID Response financial plan of \$34,000. With Covid-19 on a decline in Sierra Leone, with new case reports decreasing from an all time high of 1,428 to 9, money could be taken from this budget and used to fund the rainwater harvesting systems ("World Countries-"). The implementation of this project could also provide relief on a few of other money spending categories covered by the Government of Sierra Leone in their budget plan, such as energy subsidies ("Budget Execution").

The Constitution of the Republic of Sierra Leone states in its basic principles that their "primary purpose and responsibility" will be to protect and maintain "the security, peace, and welfare of the people" ("FUNDAMENTAL PRINCIPLES"). So why aren't these promises being upheld? The time for change begins today so that Sierra Leoneans can have a better tomorrow. This simple solution can give people like Yebu Bare and Aminatta Forna a chance to flourish and prosper.

Works Cited

- "Ancestor Stones: Life and War in Sierra Leone." *Npr*, 2 July 2007, www.npr.org/templates/story/story.php?storyId=11615790. Accessed 7 Jan. 2022.
- "By Giving Them Clean Water, our Teams Go Further To Give The Living Water." *Water 4*, water4.org/solution/sierra-leone/. Accessed 15 Dec. 2021.
- "Climate Solutions." *Union of Concerned Scientist*, www.ucsusa.org/climate/solutions. Accessed 16 Dec. 2021.
- "Cost of Living in Sierra Leone." *Numbeo*, www.numbeo.com/cost-of-living/country_result.jsp?country=Sierra+Leone. Accessed 4 Jan. 2022.
- "Cuisine and Etiquette in Sierra Leone." *Peace Corps*, www.peacecorps.gov/educators/resources/cuisine-and-etiquette-sierra-leone/. Accessed 4 Jan. 2022.
- "The Daily Weight of Water Weighs On The Poorest in Sierra Leone." *Npr*, 18 Sept. 2021, www.npr.org/sections/goatsandsoda/2021/09/15/1036927903/the-daily-weight-of-water-weighs-on-the-poorest-in-sierra-leone. Accessed 7 Jan. 2022.
- "Factors of President Poverty in Sierra Leone." *E-International Relations*, 28 July 2011, www.e-ir.info/2011/07/28/factors-of-persistent-poverty-in-sierra-leone/. Accessed 7 Jan. 2022.
- "Farming and Farm Income." *Economic Research Service*, www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/farming-and-farm-income/. Accessed 3 Jan. 2022.
- "FUNDAMENTAL PRINCIPLES OF STATE POLICY." *CommonLii*, www.commonlii.org/sl/legis/const/1991/2.html. Accessed 16 Jan. 2022.
- Home Leone*. homeleone.org/. Accessed 4 Jan. 2022.
- "Housing." *Home Leone*, homeleone.org/impact/freetowns-housing-situation/. Accessed 4 Jan. 2022.
- "Prices and Exchange Rates in Freetown." *The Sierra Leone Web*, 24 July 2012, www.sierra-leone.org/prices.html. Accessed 3 Jan. 2022.
- "Rainwater Harvesting FAQ." *texascooppower*, Aug. 2012, texascooppower.com/rainwater-harvesting-faq/#:~:text=A%20complete%20rainwater%20harvesting%20system,its%20size%20and%20construction%20material. Accessed 15 Jan. 2022.
- "Rice does not need water." *Down to Earth*, 15 Sept. 2005, www.downtoearth.org.in/coverage/rice-does-not-need-water-10108#:~:text=Rice%20consumes%20about%204%2C000%20%2D%205%2C000,and%20aeration%20to%20the%20ground. Accessed 2022.

- Sesay, Bai-Bai. "Sierra Leone's Cocktail: Mudslide, Flooding and Disaster Politics." *Africa 21*, www.africa21.org/wp-content/uploads/Sierra-Leone-article.pdf. Accessed 15 Dec. 2021.
- "Sierra Leone." *LandLinks*, land-links.org/country-profile/sierra-leone/. Accessed 3 Jan. 2022.
- "Sierra Leone." *World Food Programme*, www.wfp.org/countries/sierra-leone. Accessed 10 Jan. 2022.
- "Sierra Leone- Housing." Nations Encyclopedia, www.nationsencyclopedia.com/Africa/Sierra-Leone-HOUSING.html. Accessed 8 Dec. 2021.
- "Sierra Leone Is No Place To Be Young." *The New York Times Magazine*, 14 Feb. 1999, www.nytimes.com/1999/02/14/magazine/sierra-leone-is-no-place-to-be-young.html. Accessed 7 Jan. 2022.
- "Sierra Leone Landscape Analysis." *Feed The Future*, file:///home/chronos/u-585b0acf86e1900fcb1c9854a01e6cd5a30695c5/MyFiles/Downloads/ING%20Landscape%20Study%202017%20Sierra%20Leone%20-%20published%202017_07_07.pdf. Accessed 3 Jan. 2022.
- "Sierra Leone Military Expenditures." *Trading Economics*, tradingeconomics.com/sierra-leone/military-expenditure#:~:text=Military%20Expenditure%20in%20Sierra%20Leone%20avera,ged%2019.57%20USD%20Million%20from,5.70%20USD%20Million%20in%201987. Accessed 10 Jan. 2022.
- "Strengthening Water, Sanitation, and Hygiene Workforce in Sierra Leone." *Centers for Disease Control and Prevention*, www.cdc.gov/ncezid/stories-features/global-stories/strengthening-wash-in-sierre-leone.html. Accessed 10 Jan. 2022.
- "U.S. EMBASSY RAINWATER CAPTURE & STORAGE SYSTEM." *Pernix Group*, www.pernixgroup.com/project/us-embassy-rainwater-capture-storage-system/. Accessed 15 Jan. 2022.
- "Water in Crisis- Sierra Leone." *The Water Project*, thewaterproject.org/water-crisis/water-in-crisis-sierra-leone. Accessed 10 Jan. 2022.
- "What Does an Acre Look Like?" *Wagrown*, wagrown.com/what-does-an-acre-look-like/. Accessed 3 Jan. 2022.
- "Who We Are." *Wislnewton.com*, wislnewton.com/who-we-are/. Accessed 14 Jan. 2022.
- Wise*. wise.com/us/currency-converter/egp-to-usd-rate?amount=1000. Accessed 3 Jan. 2022.
- Pernix Group, Inc. "Pernix Group, Inc. Announces New Contract Award in Sierra Leone." *GlobeNewswire News Room*, 21 Oct. 2013,

www.globenewswire.com/news-release/2013/10/21/581866/24667/en/Pernix-Group-Inc-Announces-New-Contract-Award-in-Sierra-Leone.html.

"Budget Execution Report For Quarter 1, 2022." *Ministry of Finance*, mof.gov.sl/wp-content/uploads/2022/06/FY2022-24-MTEF-Budget-Profile.pdf. Accessed Sept. 2022.

Caballero, Nieves, editor. "How Much Does It Cost to Install a Rainwater Collection System?" *FIXR*, 29 Nov. 2021, www.fixr.com/costs/rainwater-collection-system#:~:text=The%20national%20average%20cost%20ranges,be%20as%20low%20as%20%24150. Accessed 9 Sept. 2022.

"World Countries- Sierra Leone." *John Hopkins University of Medicine*, coronavirus.jhu.edu/region/sierra-leone. Accessed 9 Sept. 2022.

Heronbrook Farm. "ALL our water is FREE- how does our rainwater harvesting systems work?" *Youtube*, 2 May 2020, www.youtube.com/watch?v=kMII1iYu9l8. Accessed 9 Sept. 2022.

"OPEN GOVERNANCE: HELPING CITIZENS ENGAGE WITH GOVERNMENT." *Transparency.org*, www.transparency.org/en/projects/open-governance-helping-citizens-engage-with-government#:~:text=Throug%20open%20governance%20citizens%20are,all%20key%20to%20fighting%20corruption. Accessed 9 Sept. 2022.