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Bringing Energy to Sierra Leone to Fight Hunger

Dag Hammarskjöld once said, “I cannot do everything, but everyone can do something” (“Global Hunger Index”). Global hunger has been a massive problem for longer than anyone can remember, but if everyone could do their part, one day a solution will be reached. Every country deals with hunger to some extent. Unfortunately, there are so many countries that are in dire need of assistance; Sierra Leone is an intriguing place to start in solving the hunger problem. It is a small country with a large problem considering the poverty rate is 77.5% of Sierra Leone’s six million people. (“Human Development Report”) (“World Factbook”). Sierra Leone’s history and conditions have contributed to the problems the country is facing but can also help offer solutions the country can implement.

The first step to finding solutions would be to examine the typical living conditions of a Sierra Leonean family. On average, each woman has five children (“Global Hunger Index”). This would not be a problem if there was enough food to go around, but with a majority of the citizens living below the poverty line of \$1.25 a day, most families cannot support one child, much less five (Now This World). Furthermore, the typical house consists of bricks made of dried mud, and a roof made of grass or bamboo (Davidson). The aforementioned old fashioned housing structures might be the least of their worries when taking a look at other conditions the citizens face.

Most developed countries produce a wide variety of crops and have a diverse diet, but in developing countries quite often this is not yet the case. In Sierra Leone, the main crops are rice, palm kernels, coffee, and cocoa (Davidson). The country’s rice is primarily consumed locally, while the remaining crops are exported and sold (Davidson). However, Sierra Leone does not export a large enough amount of its cash crops to stabilize the economy. The main component to their diet is rice, which is also their largest agricultural crop (Davidson) (“World Factbook”). Citizens do not have an extremely diverse diet because of the lack of food and the difficulty of finding the resources to cook in a modern way.

Due to the lack of modern technology in Sierra Leone, the way the citizens cook is quite different than how people in developed countries do. Most families cook using an outdoor fire because only five percent of Sierra Leoneans have electricity (“Overcoming Poverty”) (Children). In fact 80% of families in Sierra Leone depend on burning wood as their main source of energy (“Country Environment Profile”). The high amount of demand on firewood puts a tremendous amount of stress on trees, causing mass deforestation across the country. Sierra Leone has lost approximately 70% of its forest (“Country Environment Profile”). This leaves the country with less than 5% of its original wooded areas remaining (“Country Environment Profile”). With this fuel source quickly diminishing, the importance of finding a new energy source is becoming even more urgent. Compared to developed countries, who have houses made out of modern building materials and cook a wide variety of food in ovens and microwaves, the living conditions in the developing country of Sierra Leone are like a time machine sending these people back many years.

In order to understand how to help the people of Sierra Leone, it is important to understand the war and disease this country has faced. In 1961, Sierra Leone became independent from Britain, making the

country one of the youngest in the world (“World Factbook”). From 1991-2002, civil war raged through Sierra Leone (Dorpinghaus). To say the least, it left the country in shambles. Over 320,000 children were orphaned and many people died (Children). Moreover, the war left a quarter of the population displaced and homeless (Now This World). The death toll continued to rise long after the war ended because the fighting tore the country's infrastructure apart. For example, the limited access citizens have to health care due to the broken infrastructure means many people die from curable and treatable diseases and injuries daily (Children). The Ebola outbreak, occurring in 2014, killed 4,000 of the infected 14,000 citizens (Now This World). In addition, Sierra Leone has one of lowest life expectancies in the world (Davidson). Between war and disease this country has been torn almost to its breaking point.

The culture and daily life of the people are equally as important as its complex history in determining how to solve hunger. In Sierra Leone, schooling is not highly valued or easily accessible (Children). On average, children attend school for nine years before returning to family farming and agriculture, which makes up 50% of the country's jobs (“Overcoming Poverty”) (“Human Development Report”). Therefore, Sierra Leone has one of the lowest literacy rates in the world and it only has one college, the University of Sierra Leone (Davidson). As for religion, two-thirds of the citizens are Muslim, one-fourth are Christian and the remainder practice native African religions (Davidson). The official language is English which is used in schools, media, and in government (Now This World). The majority of citizens also speak Krio, which is a mixture between English and multiple African native languages (Now This World). These interesting pieces of Sierra Leone's culture, history and values all contribute to determining pieces of the country's hunger solution.

When looking for a solution to a problem such as the one Sierra Leone is facing it is important to consider what exactly is causing the problem. The background information, such as culture, history, and living conditions, provides insight into what these problematic factors may be. The civil war is one of the largest reasons for the high poverty levels, causing the economy to basically fall apart. Sierra Leone lost a large amount of its income due to the loss of iron ore and diamonds which were mined and exported during the war to help pay for supplies that have since become worthless (Davidson). The infrastructure also took a turn for the worst due to the destruction caused by the war. One of the main obstacles Sierra Leone faces is the aftermath of a civil war that ended over a decade ago.

Likewise, examining a different aspect of Sierra Leone's government, such as Sierra Leone's health care system, is important when looking into how to solve the country's problems. The whole country only has forty hospitals for its six million people (“Health System”). With this few facilities and doctors to go around, it is easy to understand why the life expectancy is so low. As mentioned earlier, only five percent of the population has electricity which makes performing activities such as health care extremely difficult. A hospital cannot perform modern medicine and provide life saving treatments without the use of modern technology and energy. It is hard for those in modernized countries to fully grasp how many lives are lost due to the lack of modern technology that exists but is not available in developing countries. For example, in the United States, people with diabetes can live long and healthy lives because citizens can refrigerate life-saving insulin. In Sierra Leone, where energy to run a refrigerator is not readily available, citizens with diabetes can live a completely different and much more dangerous life. Problematic factors such as health care contribute to the amount of hunger and poverty in Sierra Leone.

With the background and causes for the extreme hunger and poverty covered, it is time to focus on possible solutions in Sierra Leone. When people first think of solving hunger they immediately think of sending food or money to the countries that are struggling, but just sending supplies will only provide a

temporary solution for a long term problem. Sierra Leone needs multiple permanent ideas to implement so that the country can be self sustaining. Only when the country is able to provide enough for its own citizens will the problem be solved. Energy can provide the foundation on which other solutions can be built upon.

Overall, Sierra Leone needs to improve its healthcare system, agricultural production techniques, education, and industry. If affordable, reliable energy could be spread throughout Sierra Leone, many areas such as these could be improved. The majority of the citizens of Sierra Leone sustain themselves with agriculture. Agriculture can be made so much more efficient with the many uses of energy. For example in developed countries, dairy farmers use electricity to milk cows and store milk. A modern rice farmer uses energy to effectively water, fertilize, and harvest his crops. Approximately half of Sierra Leone's citizens work in agriculture but the country still does not produce enough food. The country's outdated farming techniques could be greatly improved with electricity and the country could produce much more, hopefully enough to feed themselves. Also, the healthcare system would benefit because hospitals would have the energy they need to be effective in modern medicine. The lack of electricity could be what is keeping the number of hospitals so low. In addition, electricity could power factories allowing Sierra Leone to produce much more. For example, energy could power modern equipment to rebuild the infrastructure of the country significantly faster after their civil war. Electricity can provide opportunities for students to increase the time they spend on their studies as they further their education. Energy could definitely be the key to getting Sierra Leone back on its feet by improving healthcare, education, industry, and agriculture.

Electricity could be the solution to the hunger problem but there are other factors to consider. To do this in an effective way, it will be a strategic and long process. For starters, Sierra Leone should focus on getting electricity to the points in the country where the energy could do the most good, such as hospitals, factories, government facilities and schools. These public places could reach many people each day. If reliable energy was provided for hospitals the life expectancy could increase and many unnecessary deaths could be prevented. Factories could increase how much they are making and bring more money into the area. Energy could power water pumps in community places bringing clean water to the citizens. By getting reliable energy to public places such as hospitals, factories, government facilities, and schools the country can make major improvements with minimal investments.

The next logical question is *how* Sierra Leone can get this much needed energy to its citizens through public places. What first came to mind with this idea was to utilize solar panels. Upon further reflection, creating energy using solar technology would prove extremely expensive with limited results due to how new the technology is and how much equipment is required for a substantial results. Considering Sierra Leone is bordered on its west coast by the Atlantic Ocean using the ocean to their advantage would be in Sierra Leone's better interest. Sierra Leone could use a wave energy convertor which is currently being tested by Okinawa Institute of Science and Technology. Although this technology could be a helpful solution for the country, the technology behind it is not completely developed and it would only help if it can be an affordable solution. Neither of these methods will work efficiently in Sierra Leone due to issues such as underdeveloped technology or the technology being too expensive for the country in the early stages of implementation. Because of these problematic factors other solutions of providing energy will need to be explored.

A more plausible solution could be Sierra Leone utilizing the waste of its largest crop to create the energy the country needs. Sierra Leone's main crop is rice. The rice husks that are already produced there and

currently left to rot, could find a use using High Pressure High Temperature technology. This technology uses the combustion of rice husks as a biomass to create energy in the forms of electricity and heat (DP CleanTech). Not only does this create energy while providing for the disposal of the abundant rice husks, the process also produces rice husk ash the benefits of which will be discussed later. If Sierra Leone started with bringing electricity to certain public areas throughout the country using this technology, those areas could help advance electricity into homes and the rest of the country.

Eventually, once the essential public places such as hospitals, factories, and schools are provided with energy, the country could begin focusing on providing it to individual citizens' homes. Providing a more widespread solution, a company called Husk Power Systems also has technology that could work in Sierra Leone. This company created a biomass gasification system, which can turn the easily attainable rice husks into energy using revamped World War II diesel generators ("Power to the People"). The process starts with the rice husk becoming gas using a gasifier system (Pode, Ramchandra). From there, the rice husk gas is put into purification chambers where it is cleaned and cooled (Pode, Ramchandra). After that, the purified gas begins the power production stage, where the gas can be turned into either power or electricity (Pode, Ramchandra). Not only is the Husk Power Systems technology effective, but the company also creates local jobs by recruiting and training local women to work in the plants that would provide electricity for their own community ("Power to the People"). With the help of companies like Husk Power Systems, Sierra Leone could spread its electricity much further.

When suggesting the use of rice husks as a biomass it is important to examine both the benefits and the disadvantages. The main benefit is of course providing electricity and power to Sierra Leone's citizens but there are also many other economically and environmentally positive outcomes as well. Using rice husks as biomass fuel gives farmers a way to dispose of their agricultural waste. As of now, rice husks are left to rot and are not being put to use. Additionally, a byproduct of the rice husk gasification process is steam which can substitute for fossil fuels that would otherwise have to be imported (Zafar, Salman). For example, the steam can be used for activities such as paddy drying applications, which is needed in conjunction with the process of using rice husk as a biomass (Zafar, Salman). As mentioned earlier, the combustion process creates rice husk ash. Rice husk ash is particularly high in Silica which is increasing in value due to its many uses (DP CleanTech). These uses include being a source of silicon, insulation for houses, and aggregates for board and concrete production only to name a few (DP CleanTech). These uses can also help further preserve the dwindling timber resources while also improving Sierra Leone's infrastructure. The benefits of using rice husks as a biomass are numerous, not only creating energy, but other valuable byproducts as well.

When looking at implementing the use of rice husk as a biomass in Sierra Leone, it is important to explore the disadvantages and find ways to mitigate them. The main problem with using rice husk as a biomass lies in its physical properties. During the combustion process, the hard structure of the rice husk remains, creating a "sand-blast effect" in the boiler (DP CleanTech). It is important to plan ahead for this problem by building the walls of the boiler with reinforced materials and using a stronger heater (DP CleanTech). The other main issue with starting a project similar to this one is getting the funding which will be explored more next. Most disadvantages can be overcome with proper planning. After examining and weighing the positives against the negatives, the benefits for using this type of technology to fight energy poverty in Sierra Leone outweigh the challenges.

The biggest problem with implementing technology like the one recommended is finding the funding to go forward with it. Investors would be the best place to start, but the project must be self sustaining in order to work after initial investments. To do so the power plant must be able to make money. The plant can buy farmers' waste, providing the plant with affordable, abundant fuel sources and the citizens with

more money in their pocket. This results in relatively inexpensive and much needed energy for the citizens. From there, the plant can sell the rice husk ash which will in turn allow them to purchase more rice husks. The value of the rice husk ash would encourage investors because they can see a return on their investments. Businesses are willing to invest in developing countries because they are growing faster than developed countries in areas such as population and more people gaining access to education. Already businesses such as Amazon, IBM, and Coca-Cola invest in developing countries similar to Sierra Leone so it shouldn't be too difficult to find investors in the country (The Borgen Project). There are already examples of self sustaining business models that have proved effective in Cambodia using this type of technology (Pode, Ramchandra). If Sierra Leone can get the funding, this project could become a reality, helping an entire nation.

People can propose hunger solutions such as the ideas stated above in Sierra Leone by understanding the conditions the citizens live with and how those situations can be worked with to combat hunger. It was an eye-opening experience learning this much about a country so different from the United States. Sierra Leone ranked as the 179th country in Human Development ("Global Hunger Index"). Over two-thirds of the population is hungry. Sierra Leone's situation with hunger can improve but it will not be easy. Instead of sending over supplies that will not last long enough nor do enough good, this country needs solutions that can last long term, like technology that can help supply electricity throughout the country. Ultimately, it will be the country and its citizens that decide upon and work towards a solution. It will also require help from other countries and private industry to assist with putting the plans in motion. In order to end hunger in Sierra Leone, everyone must do his part in the fight against hunger and poverty. Everyone needs to help make this world a better one to live in for people everywhere.

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