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Benin, Renewable Energy

Energy Crisis in Benin

Benin is a 44,000 square mile country bordering the Gulf of Guinea in Western Africa (“Google (n.d) Google”, 2022). Roughly 48% of Benin’s 12 million population live in urban areas, while the other 52% of its residents live in rural areas (“Data Commons Place”, 2020). Their government consists of a presidential representative democratic republic (Joyce Chepkemoi, 2017, para. 1). Currently, Patrice Guillaume Athanase Talon is the 8th president of Benin and has been for 6 years (Zuber, 2022, para. 1). Approximately 3,950,000 hectares, about 15,000 square miles, of the land is currently cultivated, which is about 35% of the land area (“Agricultural land (sq. km) - Benin”, 2018). Their major crops consist of yams, corn, rice, and more. Seventy-percent of their earnings from exports comes from cotton while other exports include palm products, cocoa, and coffee (Agricultural Situation, 2014). Benin’s climate in the north consists of a dry and wet season with 200-300 millimeters of precipitation in the wet season. Its average temperature ranges from 27-29° Celsius (80-84° Fahrenheit) year round (“World Bank Climate Climatology”, 2022). The south has 2 wet seasons with a variety of precipitation. Elevation wise, Benin ranges from 0 to 938 meters (“Benin topographic map”, 2022).

The typical family of Benin consists of, on average, 5.2 people (Papadopoulos, 2020). The dwellings in which they live differ in rural and urban areas. In rural areas they live in a hut of beaten mud with thatch roof. Housing with stilts are often seen along the coast (“U.S Department of”, 2022, para. 2). Food included in a family diet includes yams, corn, fish, chicken, fruits, beef, and pork (“Benin cuisine”, 2022, para. 2). Families get their food from nearby markets several times a week due to bereft of refrigeration and electricity. They preferably cook outside if the weather allows (“Benin. Countries and”, 2011, para. 20). Seventy-percent of the population works in agriculture. Other jobs include administration, arts, banking, and more. The average wage is 936,086 XOF a year which translates to about 1500 USD annually (“Salaries on positions”, para. 1). School is compulsory and free for seven years but a lot of families either cannot afford supplies or need their children for work (“Benin. Countries and”, 2011, para. 57). As of 2012, 24.1% of children from age 7 to 14 were employed in Benin (“Children in employment”, 2012). As for healthcare, there are only four hospitals within the borders of Benin. A survey in 1999 reported that only 0.1 doctors and 0.2 beds were available for every 1,000 patients that came to receive treatment (Thelwell, K., 2020, para. 3). Only about 30% of the population has access to clean water and there is a lack of plumbing. Electricity is scarce as only around 40% of the entire Benin population has access to it, 63% urban and 9% rural. There are about 6,800 kilometers of road in the country, 1,350 kilometers of which are paved (Ritchie, H., & Roser, M., 2020). Major barriers that the typical families face include the lack of money, power, and education.

There are many issues in Benin and finding quick solutions to all of them would be impossible. A good place to start would be finding a way to give everyday citizens power. This could be done through renewable energy, energy created through naturally occurring sources. Renewable energy also means that the fuels can be replenished at a quicker rate or at the rate that they are consumed.

Benin relies on biomass and imported petroleum products for 97% of their energy (“Power Africa in Benin”, 2021, para. 2). Biomass is renewable, but depletable and harms the environment. Petroleum is a fossil fuel and, furthermore, nonrenewable. Eighty-five percent of its energy imports come from Nigeria, Togo, and Cote d’Ivoire (“Benin Energy Situation”, 2020, para. 4). This can be improved upon. Benin shouldn’t have to be dependent on other countries to have a flourishing economy, people, or country as a whole.

Renewable energy impacts the environment differently than nonrenewable energy. Nonrenewable energy largely uses fossil fuels, which, when combusted, releases carbon dioxide and other greenhouse gasses into the atmosphere, furthering climate change. It also uses a lot of mining to get those fuels. Biomass, a renewable but depletable resource, is harvested through deforestation and agriculture. These both lead to land depletion and the use of machinery also emits carbon dioxide. About 80% of the population depends on the use of biomass for cooking. Biomass consumption increased between 1997 and 2002 at a rate of 5% and forests were reduced by 22.8 % (1.2 million hectares) from 1990 to 2010 (“Benin Energy Situation”, 2020, para. 10). Some ways to harness renewable and non-depletable energy include wind, solar, hydropower, and geothermal.

Over the years electricity access has increased as seen in 1996 with 14.5% national access and in 2019, with 40% national access (Ritchie, H., & Roser, M., 2020). There have been increases and decreases throughout, but for the most part it is increasing. This is most likely due to new technology and the development of the country. The ability to receive electricity brings along access to refrigeration to keep food fresh longer, longer working hours, the ability to have plumbing for toilets, healthcare, and much more. This improves life for women, who usually work from home, and men, who typically work outside the home. It also gives children more opportunities to be a kid and, additionally, go to school.

Having electricity leads to access to refrigeration and other food preservation appliances. When food is kept fresh, it gives all the members of a household the capability to have a healthier and more fulfilling diet. It would also reduce the amount of time that is needed to go to a market for food, therefore opening up time that can be spent doing other things. These other things could be working, teaching, training for a job, or finding other ways to benefit their community.

Electricity allows people to continue to work while it is still dark outside. It can also give way to new technology that can be helpful in quickening or simplifying tasks. It can provide light and technology to barns, houses, businesses, markets, and schools. This reduces the need of child labor as more work can get done with less people. With children not busy at work, they would have the opportunity to go to school.

Having power leads to an approach to plumbing for dirty water. Without power, it is difficult to dispose of waste. This would increase access to safe, clean water because water sources closer to communities would experience as much pollution if wastewater was properly disposed of.

Healthcare would greatly improve with energy. It would allow more areas to gain electricity, opening up more hospitals. Those hospitals would also be more efficient with new technology and having better the ability to stay lit. Improving hospitals and other medical facilities would improve the overall health of Benin citizens.

Energy solutions include wind and solar energy. These could all be managed and led by volunteers, the government, organizations, or even surrounding countries. Surrounding countries may be willing to help if it meant that they wouldn't have to give up fuel for electricity generation with little payment back. It could also be funded by the same groups. The government would save money from imports, and community members would gain new jobs and power in return. Policies needed for this include sectioning off areas for the industries as well as regulating the jobs themselves. The solutions are sustainable as they are renewable, non-depletable, and can happen gradually. The global average amount of energy used per person everyday is 58 kWh (Freude, R. S. and D, para. 3). This means that 2.54×10^{11} kWh (2.54×10^8 MW) is needed to sustain every resident in Benin for a year.

In Kenya, 700,000 home solar power systems were installed with a pay-as-you go type payment (“World Bank Group”, 2018, para. 10). This made electricity accessible to more people, as it is easier to afford. Solar is also a renewable way to get electricity. Implementing this in Benin or anywhere would cost money. You would also have to train workers to keep them maintained. Much of the materials needed to make or maintain solar panels would need to be imported from other countries, costing even more money. Benin is already pretty poor with a GDP of only about 15.7 billion USD and a GDP per capita of about 1,200 USD (“Gross domestic product”, 2020). On average, a single 10 kWh solar panel would cost around 27,700 USD (Marsh, J., 2022, para. 2). That means to produce enough energy for a year, Benin would need 23,200,000 solar panels costing about 6.4×10^{12} , or 6.4 trillion USD. Even though they wouldn't generate 100% of their electricity and these calculations aren't perfect, it still would be astronomically expensive for Benin to independently install and maintain such solar panels.

Another way to increase energy production would be through wind power. Benin could start off with just a few turbines, and gradually increase the amount as they start to save money. Wind power would create new jobs and, consequently, training would be needed for the workers. They could be placed along the coast, where wind speeds are typically higher, to increase energy production. Tang (2017) states “an onshore wind turbine with a capacity of 2.5-3 MW can produce more than 6 million kWh in a year – enough to supply 1,500 average EU households with electricity” (para. 2). Wind turbines too, are expensive and heavily rely on the weather, making choosing what energy production to pursue in Benin difficult.

Wind and solar energy would also impact residential and agricultural land in different ways. Solar panels can be placed on roofs, but much of Benin's rural residential buildings have thatch roofs which would not be able to sustain solar panels. Instead, they would have to be placed on the ground, which would take up usable space. Wind turbines can share residential, commercial, or agricultural land, so there wouldn't have to be land set aside for just wind turbines.

Instead of choosing just one renewable way to produce electricity, Benin should implement both. As time goes on, wind and/or solar power may show to be more beneficial and efficient. Perhaps in the future another production type will dominate, and wind and solar won't be shown to be the best option.

Individual energy production requires less distribution of electricity than larger scale production. Individual production would be defined as each residence using their own power source, like personal solar panels or smaller wind turbines. This type of electricity production requires the individual to know how to operate and maintain the machine. There is also the possibility of it breaking down, which would require an expert to travel to the residence to fix it, emitting fossil fuels into the atmosphere and quickening climate change. The initial transportation of the turbine or solar panel to the individuals' residence would also emit harmful gases. With large scale energy production, the wind turbines or solar panels would be contained in one area for easy access to maintain and fix. On the other hand, the produced energy would have to be distributed to adjoining towns through power lines. The implementation of these would be expensive and every power line would have to be maintained. Benin's coast has recently been experiencing large and destructive floods which would make maintaining this distribution of power difficult and dangerous (“World Bank Climate Vulnerability”, 2022, sec. 4). Benin could try each method and see what works best for each area of the country.

To help implement renewable energy, Benin would need help from organizations. These programs can help by raising money, distributing funds, helping educate the citizens on how energy production works and how to use it, and making sure everyone has received electricity. One organization, West Africa Energy Program (WAEP), provides technical assistance, grant funding, and transaction advisory in West Africa. They hope to “increase power supply and access to reliable and affordable grid connecting

power”. As of March 2021, WAEP, along with international financial institutions, have mobilized over \$800 million for energy projects across the region (“Clean and Efficient”, 2022, sec. 2). The West African Power Pool (WAPP), works towards integrating national power systems into a unified system called Regional Electricity Market (REM) (sec. 3). WAPP has also held many training sessions for staff and engineers who work on the Nigeria-Benin interconnection line. These and many other organizations have and will continue to help Benin become closer to achieving country-wide electricity access.

The everyday citizen needs to persuade and convince the Benin government to make steps towards implementing renewable energy. They can do this through the spread of information, the sharing of ideas, peaceful protests, and organizing conferences to discuss the issue at hand. Peaceful assembly is constitutionally supported in Benin; however, permits are required to hold protests, requests of which are regularly ignored or denied by authorities (“Benin - United States Department of State, 2022, sec. 2.b). Individuals can also talk to their peers and gather specific experiences and issues regarding lack of electricity. They can give these messages to their government through writing or face-to-face lobbying, giving them an everyday citizen perspective. All of these will raise awareness on the issue and educate the public on how the introduction of renewable energy would greatly improve their everyday lives.

Ultimately, Benin, located in Western Africa, would really benefit from renewable energy. Out of their 12,000,000 person population, only about 4,800,000 currently have access to electricity. This impacts their ability to learn, cook, make money, and live a fair life. The best solutions to this include solar and wind power. Renewable energy also helps the environment by decreasing pollutants into the atmosphere. Generating some of its own electricity would allow Benin to be more independent from neighboring countries like Nigeria. Both ways of energy production would create jobs, but cost money and training. Citizens of Benin should advocate for this change to happen as well as support and contact organizations that are able to help. All in all, renewable energy is a good start to help Benin’s people live their life to the fullest potential.

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