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Renewable Energy: The New Pollution-Free Solution

Honduras is one of the many underdeveloped third-world countries in the world. It is home to 9.265 million people as of 2017 (World Bank, 2017) and is the second-largest nation in Central America, after Nicaragua. Although rich in natural resources and biodiversity, a large number of people in this country live through rough and difficult lives. From worrying hunger to extreme violence and unemployment, the overall quality of life in Honduras is definitely on the opposite spectrum of the term “good”. While it may not be the worst it could be, Honduras is one of the poorest countries in Latin America and— along with neighboring country, El Salvador—has one of the highest crime and murder rates in the world (Central Intelligence Agency, 2018). More than half of the population of this country lives in poverty (Central Intelligence Agency, 2018), with unemployment outside of agriculture being increasingly worrisome. In recent events, hordes of Hondurans have moved out of their home country, for diverse reasons, in a numerous caravan and made their journey to the United States border, in hopes of a better life and to live the infamous “American Dream”. Although some succeed, most do not and opt to search for shelter in Europe, most commonly: Spain. The people who *do* stay, though, have to worry every day about getting to work without being mobbed or if they’re going to make enough money at the end of the month to support their ever-growing family. Unfortunately, seeing young children clad in rags on the streets performing dangerous stunts during red lights for some spare change or simply begging for money isn’t a rare occurrence. Most people roll their tinted windows up at them and lock the doors, afraid to get carjacked.

In the rural areas of Honduras, where technology is a lot scarier and unfamiliar, poverty is a lot more evident. People go to church every Sunday morning before going to work in the agriculture fields and pray to have enough money and food to last through the month. You see barefoot women with hardened soles walking on the unpaved roads, carrying polluted water from nearby rivers on their shoulders back to their homes to drink the closest thing they have to purified water. Then you see the men working hard under the harsh sun in the immense agriculture fields, faces sunburnt and shirts soaked with sweat. Even though, historically, Honduras has been economically dependent on the export of bananas and coffee (Central Intelligence Agency, 2018) most fields are usually used for the production of what could be considered local “necessities”, such as beans, sugarcane, sorghum, rice and corn (Nations Encyclopedia). Because agriculture accounts for close to 14% of GDP (Nations Encyclopedia), the farming system is inefficient and more than half the time, not environmentally friendly. The reason farming is so inefficient in Honduras is simply because most farmers don’t have the technology required to manage their usually small properties of land, especially since most of them barely have electricity in their own homes. This is where the idea of renewable energy, and renewable resources in general, comes to play.

Renewable energy in a big scale is usually expensive, which is why most of the time the government or big companies own them, but in small scales, it can be quite affordable. Farmers in rural areas definitely can’t afford to lose any money, in which case owning a small non-expensive wind turbine or investing in a solar panel can be quite handy. In recent years, Honduras has been making an effort in integrating itself into the world of renewable energy and currently has the biggest wind farm in Central America. Honduras may not be one of the largest countries in Latin America, renewable energy-wise, not even in Central America, with Costa Rica being number one, but it *is* a pioneer in wind energy (Energía16, 2017). Honduras has amazing potential for the world of renewable energy, with its abundance of windy mountain-tops and big rivers. It has special

potential with the modernized wind turbines that have been placed in recent years all around the country. Even though wind turbines and wind energy have many positive aspects to them, it is debatable whether or not it is the “best” type of renewable energy. Many other types of renewable energy can be just as effective and possibly have less negative consequences than the contemporary wind energy i.e. dams (hydroelectricity), solar panels (solar radiation) or geothermal energy.

Honduras is a relatively small country with 43,433.4 mi² of area and a population of nearly 10 million people. In 2016, the World Bank reported that 44.68% of the total population lives in rural areas with a lot of agriculture and farming (World Bank, 2016). These people living outside the city in a third-world country such as this are likely to use little to zero electricity in their daily lives, depending on how isolated they are from urbanization or what their economic status is. Most elderly people from rural areas like to live simple lives and don't like to use anything they aren't familiar with, including electricity. 87.58% of the population have access to energy, meaning the rest live electricity-less lives (Energypedia, 2018). While the rural areas use small amounts of electricity, in the urban areas it is drastically different. According to World Bank, 55.32% of Honduras' population lives in cities (World Bank, 2016) like the capital, Tegucigalpa and the second biggest city, San Pedro Sula. Both these cities utilize a large amount of the country's electricity, sometimes leaving rural areas in a blackout. As of 2014, Honduras has a total fossil fuel energy consumption percent of 52.48%, which means a little less than half of Honduras' energy comes from more renewable sources i.e. wind energy. The main sources of energy in Honduras are petroleum (53%), combustible renewable and waste (44%), and coal (3%) (Energypedia, 2018).

One of the major environmental problems in Honduras is deforestation, simply because around 47% of the national energy consumption is residential consumption, of which 86% is provided by biomass, primarily firewood, mostly in rural and peri-urban areas. This firewood is mostly used for cooking and occasionally heating and lighting. It is estimated that a household that uses firewood as a replacement for electricity uses up to 525 kg of firewood per year. The primary source for this firewood is nearby forests. Due to this, the extraction of firewood from the forests is considered one of the main reasons, apart from agriculture and wildfires, for deforestation. The poverty of the population and density of population in rural areas makes firewood one of the main sources for energy in Honduras. This means that the usage of firewood as a source of energy is going to persist for a long time (Energypedia, 2018).

Recently, improved firewood stoves have been trending amongst rural citizens. They reduce up to 70% of the firewood usage that traditional stoves had used, making much more efficient use of the firewood and thus, reducing deforestation. A study showed that women with these new improved firewood stoves had 90% lower carbon monoxide levels than women with traditional stoves (Energypedia, 2018). So, these stoves are not only good for the environment, but for the people who use them, as well. These stoves could be a temporary solution with minimal deforestation and better health until the entire country can get ahold of renewable energy.

Most of the electricity in Honduras is generated by the ENEE (Empresa Nacional de Energía Eléctrica). The ENEE, the national electricity company, owns four thermal power plants with a capacity of 28.9 GWh and seven hydropower plants, also operated by the ENEE, with a total capacity of 2,539.6 GWh (Energypedia, 2018). Although the ENEE is the main company for electricity in the country, it is not the only one. There are several others, including the AHPPER (Asociación Hondureña de Pequeños Productores de Energía Renovable), which is an organization that gives specialized technical assistance to small renewable energy project developers (Energypedia, 2018). Companies like AHPPER are an important element in every country. All big ideas and movements start small with the kind of people that go to AHPPER for help, small project developers. Slowly, but surely, the AHPPER will become a larger organization as more and more

people get interested in renewable energy and start utilizing and installing renewable energy technology and tools.

Even though most of the non-renewable energy is only used in urban areas, of which there aren't too many, Honduras is already looking into other possible ways of producing and generating generous amounts of energy without damaging the environment as much. Although 59% of Honduras is still covered in forests, deforestation is slowly becoming a more serious problem (Energylopedia, 2018). In 2011-2013, the then Honduran president, Porfirio Lobo, inaugurated "Cerro de Hula", Central America's largest wind farm. The site is 24 km south of the capital, Tegucigalpa and consists of over fifty large wind turbines. It boosts Honduras' installed wind capacity by 7% (Anonymous, 2013). Wind turbines are the next big step for Honduras in terms of renewable energy.

Along with solar energy, wind energy is the fastest-growing energy source in the world (Conserve Energy Future, 2017). It is an amazing clean source of renewable energy that doesn't generate any greenhouse gases. Operational costs are close to zero since wind doesn't cost anything to run. It works best in areas with lots of wind, where you can simply install a turbine, turn it on and wait for the energy to start accumulating. Winds are caused by rotation of the earth, heating of the atmosphere by the sun, and earth's surface irregularities. We can harness wind energy and use it to generate power as long as the sun shines and the wind blows (Conserve Energy Future, 2017). Wind energy is also able to give energy to numerous homes and with enough turbines and wind, perhaps it could also give enough continuous energy to an average-sized city. Another pro of wind turbines is they're pleasing to the eye. A project developer doesn't have to worry about them becoming an eyesore on their land. Their sleek, modern-looking design is attractive to many. Wind turbines, also, don't require any deforestation if installed on an already existing farm or clear plot of land. They don't require a lot of space, depending on the size. A small project developer could place numerous small turbines on their farm without an issue.

Although wind turbines have many positive aspects to them, one could think they are perfect and have no flaws, they *do* have a few negative aspects to them. One of the primary negativities to wind turbines is their reliability. Even if a wind turbine works perfectly well, the wind doesn't always have the strength enough to truly power the turbines. This means that a household or town shouldn't depend solely on wind turbines. Even with the wind, turbines usually function at 30% capacity anyways (Conserve Energy Future). Wind turbines might also be harmed during strong winds or storms due to their vertical design, much like trees and lampposts. The most dangerous negativity to wind turbines is their threat to wildlife (Conserve Energy Future, 2017). Several studies in Honduras have been reporting the bird and bat species and individuals harmed or even killed by the wind turbines. On especially cloudy or foggy days, it is difficult for flying creatures to spot the wind turbines and could smash into one during the process of their migration or simply while going to their roost. Bright red lights, along with red stripes at the ends of the ginormous white blades are ways that designers have attempted to avoid this problem. In foggy days, the bright red lights can be seen through the mist, yet birds and bats still crash into them. It is possible that these animals, especially bats, don't even notice the flashing bright lights since they tend to hunt using echolocation. Although, contrary to popular belief, bats aren't blind and sometimes prefer to hunt using their sight (Pappas, 2016) which means that if truly necessary, they *would* be able to see the flashing lights, making the entire problem a tad bit confusing. The animals are possibly too immersed in hunting and aren't looking where they are going.

The reality is that these animals aren't only harmed if they crash into the rapid-moving blades of the turbines. The power and intensity the blades radiate is enough to hurt fragile-bodied animals, like bats, for example. This condition is known as barotrauma (Hutchins, 2017). Not only

do the turbines themselves kill, but the power lines and cords that transfer the energy to power plants can kill bats and birds through collision and electrocution accidents (Hutchins, 2017). The dangerous negative aspects tend to apply mostly to the bigger wind turbines, but turbines nonetheless.

If small farmers were to have small wind turbines in wide-open spaces, they wouldn't pose as big a threat as the big intimidating ones do. Small wind turbines wouldn't be in the way of large groups of migrating birds. The other sidetrack to wind turbines, in general, is they take up space, although not a large amount, and contribute to destroying the habitat of several animal species. In a way, it's ironic since renewable energy is supposed to be green and environmentally friendly, yet we don't think about what it's doing to the surrounding habitat. In cases, such as hydroelectric energy, the aquatic habitat could potentially become seriously damaged. The dam wall can obstruct the path of migration of several fish species and can even separate populations from each other (International Rivers). The dams also alter natural properties of the rivers, such as temperature, water-flow, chemical composition and dissolved oxygen levels, making the river no longer suitable for some resident species (International Rivers).

Although, there may be people who may be skeptical about renewable energy and how much it's really going to support us- people have to think ahead to the future and what it may hold. If big countries like the United States and Russia detain the use of fossil fuels and petroleum and start overtaking that with renewable energy sources, the world climate might take a turn for the best. For now, small countries like Honduras can help lead that effort towards the renewal of our planet using renewable energies. It may not seem like much to people living in these small countries, but every effort, no matter how small, matters. Not only would it help the climate and our Earth—it would also help the small farmers using and taking advantage of the free resources given to them. By producing their own energy, they don't have to rely on expensive technologies and energy that have more negative aspects than positive ones. If people in agricultural communities begin self-sustaining their energy and food, their profit will be much higher. The governments and/or small organizations could go out there, to the rural areas and talk to people as well as educate them on the advantages and importance of renewable energy for our future. Even if they start building small wind turbines or dams in their nearest creek, once they start using these renewable energies, they will be able to teach each other how they work and why they should use them. Sustainability for our future is extremely important, both food and energy-wise. Not everything in this world is renewable and sustainable and we should take full advantage of what *is* and leave in the past what isn't. If countries that seem so damaged, full with violence and poverty, like Honduras can do something helpful for the future of our planet, then so should the big and powerful countries.

Even though Honduras has become more interested in renewable energy in recent years, there is still room to grow. Although Costa Rica has a higher number of renewable energy sources (solar panels), Honduras has the largest wind farm in Central America. Hopefully, Honduras will continue to expand the use of renewable energy sources and might also experiment using hydroelectricity, geothermal energy and solar energy more. Honduras's National Energy Policy has an ambitious goal of 95% of generation from clean energy by the next decade (Deetken Impact, 2018). In 2017, already 60% of the energy was coming from renewable sources, especially from hydroelectricity, which takes a whopping 34% of the energy production (Deetken, 2018). Interestingly enough, only 1% of the energy production comes from geothermal sources, when, at the start of the decade, nearly 60% of the energy was geothermal (Deetken, 2018). At the moment, only 6% of the energy produced is wind energy (Deetken, 2018), but that number, along with the others, will slowly increase as the general public and rural areas become more educated on the subject. Perhaps in the future, Honduras will be one of the pioneers of renewable energy in Latin America, if not in the world. By 2050, Honduras might be able to reach out to all the people in rural

areas without electricity and provide them with renewable energy sources. Until that day comes, Honduras should keep striving towards their goal.

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