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Mali, Renewable Energy

Mali: Powering Tomorrow

Walking through the streets of nearly any Malian village will reveal the true citizenship and pride the people of Mali have for themselves and their neighbors despite the many challenges these people face daily. Throughout this landlocked sub-Saharan country, over 19.5 million people can be found living under the differing conditions their environment challenges them with (Mali Population (LIVE)). A single railway connects Mali's industry to the coast, supplemented with an incomplete, and at points, hazardous highway system. One of the largest dilemmas these citizens meet is the lack of sustainable and reliable energy. Without energy, industry halts, cities shut down, and food production ceases. For a country already limited to resources, how will increasing food production while solving the energy crisis for powering tomorrow ever become a reality?

Mali's geographical position in Africa allows the country to possess three distinct climate zones. The northern portion of Mali is occupied by the vast Sahara desert, stretching from the eastern and western border, and as far south as the Niger River. In the northern climate zone, the air is very arid and hot with temperatures reaching a high of 115 degrees Fahrenheit in the summer months and dipping to a chilling 52 degrees Fahrenheit in January. Precipitation is rare in this desert portion of the nation, recording a maximum of 3 inches per year. Due to the poor rainfall and high temperatures, few settlements can be found in the north, except for those surrounding the occasional oasis. Farther south, Mali hosts the climatic transition from desert to tropics in the semi-desert climate zone of the Sahel. In this intermediate central zone, rainfall averages seven inches, mainly falling during the rainy season spanning from June to September. Temperatures remain scorching for a majority of the year, above 95 degrees Fahrenheit, but dip below 90 degrees only in January. Uniquely in this climate zone, a strong wind called the *Harmattan* blows from the northeast, spewing dust and sand in the air year-round, causing the sky to appear whitish. Finally, the Southern sector of Mali contains a rather tropical climate. Rainfall here exceeds 40 inches annually and sees the mercury rise above 100 degrees Fahrenheit only for a few days in April ("Climate - Mali"). In response to the amount of rainfall and lower temperature, the landscape of southern Mali is covered in the classic African savanna grasslands which fade into the rolling plateaus of the southern portion of the Sahel.

Though 65% of Mali is plagued by desert and desert-like climates, one naturally occurring phenomenon has been called the "life-blood of Mali", the Niger River. A majority of all major cities in Mali rest close or on the Niger River, supplying their populations with water, transportation, food, and irrigation abilities. Forty-one percent of the 19.5 million people in Mali reside in the few urban settlements along the Niger ("Mali Percent Urban Population"), leaving the remaining 59% of the population living in rural villages and towns scattered across the nation ("Mali - Rural Population"). Having such a high percentage of the rural population results in 80% of Malian people working in agricultural activities. Despite the high amount of agricultural involvement, only 7% of the possible 108 million acres of arable land is currently cultivated and 14% of the 5.4 million acres of irrigatable land are being used for food production ("Agriculture and Food Security"). Of the land cultivated, cereal grains such as millet, sorghum, rice, and corn (Kouressy) are grown next to the widely exported cotton crop, making up 11% of Mali's exports and serving as Mali's number one agriculture export (Economywatch).

While walking down the roads of a Malian rural village, a tourist may ponder the odd-looking mud domes scattered along the roadside and off in the distance. To the ill-informed eye, these structures may appear as smokehouses or storage sheds, but instead, are the homes of Malian families. In recent years, Malian

villagers have adopted the Nubian mud vault as a more sustainable home alternative to the traditional timber built homes with grass thatched roofs. The Nubian mud brick home has served as a more practical alternative as timberlands used for home production are readily disappearing, grass roofs need frequent replacement, and the complexity of construction requires the entire village's assistance (Diarra). When built to proportion, these homes can accompany the large extended family which classically live under the same roof ("Mali." *Student Life*). For these rural populations, mud brick vaults do not come accessorized with electricity and plumbing. According to *Mali - Lighting Africa*, less than 1% of the rural population has access to electricity and 70% of the entire population has no toilet. As seen, basic comfort commodities are luxuries in Mali.

As the dinner bell rings, every Malian child runs inside to sit next to their aunts, brothers, and grandparents to eat the meal prepared by their mother. Before them on the table will be a bowl of chicken or lamb served over rice and vegetables topped with a peanut sauce. This is the typical meal for the rural population of Mali. Malian cuisine uses rice and millet as staples in every meal with an assortment of sauces used to vary the taste of the prepared dish ("Mali." *World Travel Guide*). All meals are cooked over timber or charcoal fed fires held outside of the home ("Mali." *Lighting Africa*). Special dishes such as Riz au gras and Jollof rice are served alongside the main protein when desired.

Rural Malian citizens have grown into a way of life sustained not by the national grid, but by carbon-emitting, non-renewable resources. Mali's current solution for energy is found in the depleting forests scattered across the nation. *Mali Energy Situation* reports that 80% of the country's primary energy is supplied through the nation's natural and imported biomass. For greater power and efficiency, Mali relies solely on imported kerosene, gasoline, and oil, consuming 16% of the national budget. As these imported fuels only account for 18% of the primary energy production, imported fuels make-up 42% of all Malian imported goods. The remaining 4% of national energy production is produced through renewable energies, primarily hydropower (*Mali Energy Situation*).

Current electric availability and accessibility in Mali are nothing short of absent. *Mali Energy Situation* reported that in 2018 only 35% of the 19.5 million people living in Mali had access to electricity. In urban areas, electric access reaches farther, providing 57% of people with energy, but falls to 18% once in rural areas. These percentages approximate that 13 million citizens of Mali have no access to electricity. Due to the lack of availability, trends over recent years have shown readily able electricity growing in demand. These trends given by *Mali Energy Situation* show a 10% growth of energy demand annually. Civilian households are held responsible for the majority of the growing energy demand, consuming 86% of the current energy production. Agricultural needs only account for 1% of energy consumption ("Mali Energy Situation").

Women play a large role in food production, making up 49% of agricultural workers and are responsible for 70% of all food production ("In Mali, Renewable Energy Boosts"). As women are seen responsible for food production, the burden of being responsible for the family's energy production and use comes with. Women spend large portions of their day felling trees and collecting wood for simple tasks as heating stoves and boiling water. When not scavenging for the life-sustaining fuel, women are producing the needed food to support her large family. Possessing the capability to harness more reliable and ready energies would relinquish large amounts of time to be used instead for mass food production. Renewable energy options would also open the opportunity for improved equipment for food production and heating abilities. These options also positively affect the environment by protecting the remaining forest in Mali. The number one cause for deforestation in Mali is for the purpose of fuel production ("In Mali, Renewable Energy Boosts").

Electric energy needs and demands are heard louder from the rural and industrial population than that of the urban population. Mali's leading export and industry is gold production (*Mali Exports*). Gold mining

currently consumes 3% of all electric and fuel energy produced but is hungry for more. In recent years, the gold industry in Mali has been booming, with industry leaders looking for expansion (“Mali Expects Industrial Gold”). As a result, energy resources are being taken from the already limited pool of resources set aside for agricultural use to support an increasing amount of exported gold.

Malian government officials struggle to cut funding in areas of the unstable national budget to compensate for the growing energy demand to import additional foreign fuels. Although cuts could not be made, the Malian government has productively invested in alternative sources of energy, primarily renewable energies. From 2008 to 2010, the Malian financial investment for renewable energy increased from \$3.3 million to \$6.7 million, reflecting the 8.1% annual energy production increase. Malian officials have devoted much of these investments towards solar and hydropower energies. Mali receives 7-10 hours of sunlight daily all year round, creating a large potential for off-grid solar parks (Mohammed). In terms of hydropower, Mali is wasting no time. In 2016 Malian officials signed off on a \$125 million hydroelectric dam to be built along the Niger River, supplying approximately 175,000 homes with reliable energy (“Hydroelectric Power: Mali”). The additional supplied electrical power to the grid loosens the tight distribution of imported fuels, providing now unused fuels to be used in agricultural fields. In summary, the more fuel that can be devoted towards agriculture will promote greater cultivation of arable land and further secure Mali’s food needs.

In Mali, women hold the role of food preparation and a majority of agricultural labor. Two organizations have come together, to work jointly to provide women opportunities for an easier life, through the *Support for the Economic Independence of Women in Rural Mali Facing Food Insecurity and Climate Change*. Through the efforts of UN Women and the Food and Agriculture Organization, renewable energy options are being more available for rural Malian women. This project supplies food preparation equipment such as blenders, mills, freezers, and dryers all solely run off solar power (“In Mali, Renewable Energy Boosts”). Providing women these assets allows them to focus their time in other needed areas of her life, not entirely on collecting fuel for equipment and spending hours performing tasks these solar powered machines can do in a fraction of the time. Renewable energy is thus providing an opportunity for women to expand their societal roles beyond food preparation, and providing the potential for a greater amount of food to be processed, contributing to a villages food security.

Piet-Willem Chevalier, an engineer for Siemens Energy in Den Haag, Netherlands, has taken initiative in this West African country to spearhead the use of rural wind power through turbines. Beginning in 2008, his program, *I Love Wind Power*, trains Malian civilians to construct and operate wind turbines built from locally available materials. These locally built turbines will be used for pumping water out of deep wells, making the daily journey to fetch water obsolete. The prospect continues further, having these civilians eventually form their own businesses as wind turbine repair shops and charging stations (Runge). Chevalier's program operates in the Sahel region, central region, of Mali, as winds here reach from 3-7 meters per second from the *Harmattan* winds, enough to turn generator blades (“Mali Energy Situation”). *I Love Wind Power* has largely contributed to the accessible off-grid energy source for rural villages by providing inexpensively constructed wind generator plans and furthering to liberate women’s time trekking for water.

As of January 1, 2015, Mali was selected to be one of six African nations to benefit from the *Scaling-Up Renewable Energy Program in Low-Income Countries* (SREP) grant. The mission and expected outcomes from the SREP grant is to grant electrical access to rural areas, the implementation of solar parks, put sustainable biomass and biodiesel programs into place, and productively use these energies in agriculture. For these anticipated outcomes to become a reality, Mali has been granted \$2.5 million and three years of program aid (“Project for Scaling Up Renewable”). This program will assist the Malian government with their renewable energy investments by providing additional funding and resources for “up-scaling”

renewable energy in Mali. The SREP grant has made a point to provide energy for agricultural uses, promoting food security for the country.

The sub-Saharan nation of Mali faces many challenges, but the Malian people remain strong in their will to make it through the day as a family, and as a community. Recent government investments and foreign aid for renewable energy resources have stimulated the growth and practicality of increasing the nation's dependence on self-sustaining energy sources. These aids for conquering the current high demand for electricity in Mali are laying the foundation to feed a nation and power tomorrow.

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