

## Role of Renewable Energy in Ensuring Eco-Friendly Environment

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### Abstract

The demand for energy and related services is rising in order to meet social and economic development and improve human welfare and health. Energy services are needed in any civilization to provide basic human requirements (such as lighting, cooking, space comfort, movement, and communication) as well as to support productive processes. Nigeria has a good forestry enabling environment, but it has to expand in scope, coverage, and efficiency to adequately serve other regions that have been disadvantaged by extensive deforestation and environmental degradation in their surroundings. The government will profit from pursuing well-articulated forestry policies programs that will greatly reduce the pressure on large cities and towns, as well as enhance the availability of cheap basic services, making life easier for citizens.

**Keywords:** Renewable Energy (RE); Agriculture; Climate Change; Environment

### Introduction

Renewable energy (RE) has been discussed for more than 30 years, while rising usage of fossil fuels has resulted in negative environmental consequences and a decrease in availability (Joshua & Yang, 2016). Renewable energy is one of the most powerful instruments we have in the fight against climate change, and it has every incentive to succeed. Nothing could be further from the truth than a recent New York Times piece implying that renewable energy expenditures stifle attempts to combat climate change. Furthermore, as fossil fuel emissions are replaced by renewable technologies, customers might save money. The utilization of renewable energy sources will minimize our reliance on fossil fuel combustion. Furthermore, rather than flaring gas in Nigeria, the gases can be converted to methanol and used as a home and industrial fuel (Abdulazeez & Abdulraheem, 2020). The use of fossil fuels for energy will be considerably reduced with good energy efficiency techniques and products. Energy services are required in all cultures to provide basic human requirements (such as lighting, cooking, space comfort, movement, and communication) as well as to support productive processes. Energy services must be secure and have low environmental implications in order for development to be sustainable. The world can become cleaner and friendlier to the environment if governments transition to and support the usage of renewable energy sources.

Nigeria is not immune to the effects of global climate change, since heavy rainfall, flooding, sea level rise, droughts, heat waves, and other extreme weather phenomena are becoming more common and intense in various sections of the country (Abdulraheem, et al. 2017). Nigeria is already feeling the effects of climate change. Weather-related calamities have been more common in recent decades, and the trend is expected to continue. Given its geography, climate, vegetation, soils, economic structure, weak physical infrastructure, population and settlement, energy demands, and agricultural activities, Lagos is particularly vulnerable to the effects of climate change on many fronts (Okali, 2004). Constant deforestation with no reforestation programs or policies poses significant challenges, as do the limits imposed by a lack of sufficient information, the government's failure to provide basic utilities, and the lack of a well implemented environmental protection law (Abdulraheem, 2020). Many people are still living in extreme poverty, with income inequality rising to

the point where there is no longer a middle class, combined with rapid population growth, domestic weakness caused by social-economic and political structures, bad government, poor urban planning, and poor access to basic services such as electricity, kerosene, and cooking gas, as well as a lack of reforestation awareness. Guaranteed and cheap access to the energy resources required to offer vital and sustainable energy services is required for long-term social and economic development. This could imply employing various tactics at various stages of economic development. Energy services must have low environmental consequences and low greenhouse gas (GHG) emissions in order to be environmentally friendly. Nigeria is one of Africa's top emitters of greenhouse gases (CREDC, 2007). The practice of oil companies operating in Nigeria flaring gas has been a major source of greenhouse gas emissions into the atmosphere. This region has some of the highest carbon dioxide emissions in the world (Martinot & McDam, 2002). Every day, 45.8 billion joules of heat are released into the Niger Delta's atmosphere by flaring 1.8 billion ft<sup>3</sup> of gas (Gore, 1993). Deforestation releases roughly a billion tons of carbon into the atmosphere each year, according to the 2010 Global Forest Resource Assessment, albeit the numbers aren't as high as they were in the previous decade. Climate change is caused by the carbon emitted, which results in severe weather conditions such as droughts, floods, and extreme heat.

According to the United Nations FAO, Nigeria had the highest deforestation rate in the world in 2005, at 12.2 percent, equivalent to 11,089,000 hectares deforested, and between 2000 and 2005, 55.7 percent of our primary forest was lost, with the rate of forest change increasing by 31.2 percent to 3.12 percent per year, or approximately 350,000 to 400,000 hectares per year. Every year, Nigeria loses an average of 409,700 hectares of forest, equating to a 2.38 percent annual deforestation rate. According to Ogboru & Anga (2015), Nigeria has eight national parks; among the eight, the damages caused on these parks as a result of human and environmental forces are enormous, and they would continue to increase every day if not treated appropriately. Global warming, insurgency, desert encroachment, overgrazing, and other agricultural activities are examples of human and natural influences.

Climate change mitigation goals, the level of required energy services and associated energy needs, as well as their relative significance within the portfolio of zero- or low-carbon technologies, will all influence the future share of RE applications. Any portfolio of mitigation solutions would be thoroughly evaluated in terms of their respective mitigation capacity, as well as the related risks, costs, and contribution to long-term sustainability.

### ***Conceptual Frame Work***

The energy consumption and related services is rising in order to meet social and economic development and improve human welfare and health. Energy services are needed in any civilization to provide basic human requirements (such as lighting, cooking, space comfort, movement, and communication) as well as to support productive processes. Since roughly 1850, the global use of fossil fuels (coal, oil, and gas) has expanded to the point where they now dominate the energy supply, resulting in rapid increases in carbon dioxide (CO<sub>2</sub>) emissions (IPCC, 2012). However, despite the availability of energy and renewable solutions, the world is currently not on track to meet SDG 7, and further improvements will require increased policy commitments, simultaneous with more funding and a willingness to embrace developing technologies widely (IRENA, 2017a).

### ***GHG Emissions***

Greenhouse gases are thought to be the main contributor to climate change (The Greenhouse Effect). They are very efficient in trapping heat into the atmosphere; therefore, it results in the greenhouse effect (Kaddo, 2018). GHG emissions from the provision of energy services are a significant contributor to climate change. "Most of the observed increase in global average temperature since the mid-twentieth century is very likely due to documented increases in anthropogenic GHG (greenhouse gas) concentrations", the AR4 stated. Since the AR4, CO<sub>2</sub> concentrations have risen to about 390 ppm, or 39 percent above pre-industrial levels, by the end of 2010. Since roughly 1850, global use of fossil fuels (coal, oil, and gas) has expanded to the point where they now dominate energy supply, resulting in rapid increases in carbon dioxide (CO<sub>2</sub>) emissions. The emission of greenhouse gases has accelerated the progress of climate change and made our weather more intense. However, the world's dependence on fossil fuel for energy, transportation, and manufacturing have created a major obstacle for us to switch to renewable energy (Kaddo, 2018).

The solar energy is absorbed by the earth's surface and then reflected back to the atmosphere as heat. Then as the heat goes out to space, greenhouse gases absorb a part of the heat. The heat is then radiated back to the earth's surface, another greenhouse gas molecule, or space (The Greenhouse Effect). According to Daniela Burghila et al. in "Climate Change Effects- Where to Next?" the largest concern scientists have is CO<sub>2</sub> emissions, which account for around 75% of total global greenhouse gas emissions.

Setting a climate protection goal in terms of the allowable change in global mean temperature broadly defines a corresponding GHG concentration limit, as well as an associated CO<sub>2</sub> budget and subsequent time-dependent emission trajectory, which then defines the allowable amount of freely emitting fossil fuels. The 'scale' of the required energy services influences the complementary contribution of zero- or low-carbon energies to the primary energy supply.

Because we rely on fossil fuels for our energy needs, scientists believe that human activities contribute to climate change (Riebeek). "A huge amount of climate change occurs because we are using fossil fuels, which raises gases such as CO<sub>2</sub>, methane, and other gases in the atmosphere", Wuebbles added (phone interview). According to the Australian Greenhouse Office, 80 percent of the world's energy demands are met by fossil fuels such as oil, coal, and natural gas. As a result, switching from fossil fuels to other types of energy is extremely difficult because we are so reliant on them. Since the industrial revolution, greenhouse gas emissions have risen considerably, owing primarily to the burning of fossil fuels for energy, agriculture, industrial processes, and transportation (Ecological Impacts of Climate Change). The graph on the following page depicts the increase of CO<sub>2</sub> and methane over the last 250 years.

### *Deforestation*

As a developing country, a lot of development is taking place on a daily basis, such as roads, rails, houses, dams, and oil explorations, and most of this falls into urbanization, which contributes to deforestation due to a lack of proper reforestation planning that should have been going on simultaneously with all of these developments (Mba, 2018).

It shows that a considerable proportion of the country's population relies on forest resources for survival, putting forest reserves at risk and several tree species at risk of extinction. Ogundele et. al., 2016, Odjugo (2010) and Ebe (2014) confirmed the despite the fact that income, fuel wood pricing, and replacements are all key predictors of fuel wood use, all agreed that the majority of the population continues to rely on this source of energy for the majority of their home needs.

Policy and resilience, cautious prioritization, smart forest management, and including the private sector, combined with proactive measures and policies, are all solutions to Nigeria's deforestation concerns. Nigeria's current and future authorities should make it a priority to educate the young generations about the dangers posed by the crazy activity taking place in all of the country's main forest reserves. The poor are the most exposed to environmental threats, and will bear the brunt of the consequences of deforestation due to the country's unequal distribution of wealth. Temperature rises, erosion, flooding, and other sorts of degradation occur. The only approach to maintain general growth and eliminate inequity is to increase opportunities for the most disadvantaged. Disparities in basic necessities such as kerosene, cooking gas, and electricity must be greatly decreased so that, even if the laws are strictly implemented, impoverished people will have choices and perceive a reason to follow the rules.

Deforestation causes environmental degradation, which is the disintegration of the earth or deterioration of the environment as a result of human action, whether known or unknown, through resource depletion such as air, water, and soil. Deforestation can also be defined as the destruction of habitat and ecosystems, the extinction of species, pollution, and natural disasters such as gully erosion, all of which are consequences of deforestation. The consequences of deforestation;

- i. Environmental consequences
- ii. Social consequences
- iii. Health consequences
- iv. Economic consequences.

**Environmental impacts:** Constant deforestation of forest reserves meant to protect the immediate environment and serve as a shield against the direct impact of downpours of rain, high temperatures, and wind that will result in erosion, flood, and other environmental instability causes loss of bio-diversity, endangering plants and animals. For example, the highland vegetation of the country's south eastern region was once densely forested, but due to massive deforestation caused by urbanization, population growth resulted in gully erosion, which could have been avoided by reforestation to prevent downpours from washing away natural habitats.

**Social impact:** This comes as a result of high rates of deforestation, which degrades the environment and forces local residents to migrate to metropolitan areas, resulting in overcrowding, a lack of jobs, an increase in crime, and a lack of social facilities to care for the population. For example, deforestation in Anambra has resulted in extensive gully erosion, which has forced several villages to migrate, and oil exploration in the Niger-Delta has forced many villages to evacuate due to soil degradation. As a result, people were compelled to leave their homes, where they had a source of income, and relocate to the city, where they had little possibility of finding work or a source of money.

**Health impact:** It occurs when a large number of people have migrated to urban areas due to deforestation, oil spills, and erosion in their rural areas, resulting in a lack of basic amenities such as water and electricity, as well as a lack of proper drainage systems, resulting in the outbreak of diseases such as malaria, Lassa fever, and other diseases. For example, Abakpa Nike is a highly inhabited neighborhood with inadequate urban planning, and more people from Uguwo Nike are moving to the area as a result of deforestation caused by wood fuel and the ongoing urbanization process in their forest reserves.

**Economic impacts:** Economic impacts have also had a negative impact on the environment, particularly in the Niger Delta where oil exploration is taking place. Because the petroleum and gas sector accounts for over 97 percent of the country's GDP, there has been an increase in oil exploitation, which is causing environmental degradation in places like Ogoni. Oil spills have caused significant damage to the ecosystem in that environment.

### *Solution to Deforestation and Climate Change*

IRENA analysis (IRENA, 2019a) shows that a combination of renewable energy, energy efficiency and electrification represent a safe, reliable, affordable and already deployable pathway capable of achieving over 90% of the energy-related CO<sub>2</sub> emission reductions needed to meet pledged climate goals, and that such a transformation constitutes the most effective strategy going forward. This energy transition, however, requires a global approach that involves all levels of society, from communities, regions, and governments to public and private sector stakeholders.

Government should facilitate, support, and make those basic amenities easy to access, while the public should focus more on creating an enabling environment by engaging in tree planting not only in the forest but throughout our surroundings, while the public should leverage the strength of the stakeholders to create policies with significant outreach at maximum efficiency with less strain on public resources. Contribution of the public sector, non-governmental organizations (NGOs), global partnerships, research and academic communities in identifying the best tree species for each region of the country, as well as conventional settlements (IRENA, 2019). With sufficient understanding and education, poor populations can help themselves. Kerosene is being monitored before it is distributed to the public in order to avoid contaminated products, which might cause fires at home and dissuade some people from using it. To reduce deforestation, recycle papers and plastic bags (IPCC, 2018).

### *Wind Energy*

With no commercial wind power facilities connected to the national grid, wind energy's percentage of national energy consumption has remained at the low end. In the early 1960s, only a few stand-alone wind power plants were erected in five northern states, primarily to power water pumps, as well as a 5-kW wind electricity conversion system for village electrification at SayyanGidanGada in Sokoto State (Uzoma et al. 2011). Recently, research works have been carried out to analyze the wind speed attributes and the affiliated wind energy possibilities in various locations in Nigeria. Wind turbines reduced water consumption in the electricity sector by 36.5

billion gallons in 2013, according to the US Department of Energy. In addition, wind turbines cut CO<sub>2</sub> emissions by over 115 million metric tons in 2013, which is equivalent to the emissions of 20 million cars (Wind Energy Benefits).

Wind power, on the other hand, faces some difficulties. Birds and bats have been killed by flying into the whirling blades, which is a major challenge. However, one solution to the problem of birds and bats being killed by spinning blades is to avoid putting up wind turbines in locations where there are a lot of migratory. Another option is to limit the rotation of wind turbine blades to a set wind speed. In some regions, researchers discovered that when the wind speed exceeds 15 mph, 99 percent of bat activity ceases. (Wild-life-Friendly Wind Power 19).

**Biomass** Crops, forage grasses and shrubs, animal wastes, wastes deriving from forestry, agriculture, municipal, and industrial activities, as well as aquatic biomass, make up Nigeria's biomass resources. The most promising feedstocks for biofuel generation were sweet sorghum, maize, and sugarcane (Nnaji et al. 2012). Plant biomass can be used as a source of energy for small businesses. Anaerobic bacteria could ferment it to provide a low-cost fuel gas (biogases).

**Hydro energy:** The country has a good number of big rivers and a few natural falls. Small rivers and streams can also be found within the country's current 11 River Basin Authorities, some of which have year-round minimum discharges. Hydropower presently contributes for around 29% of total electrical power generation. They show that Nigeria has a renewable energy potential along her multiple river systems, with a total of 70 micro-dams, 126 mini-dams, and 86 minor sites discovered. The Nigerian Electricity Supply Company (NESCO) and the government have erected eight SHP stations throughout Nigeria with a combined capacity of 37.0 MW. The majority of these stations are in the Kwall and Kurra Falls areas of Jos. The overall theoretically exploitable hydropower capability depending on the country's river system is approximated to be around 11,000 MW, with just 19% been accessed or generated at the moment (Okafor & Joe-Uzuegbu, 2010).

### **Green Buildings**

Existing buildings release CO<sub>2</sub> due to their reliance on fossil fuels for energy, which includes anything from air conditioning to electricity (Energy-Efficient Buildings). Furthermore, according to Energy-Efficient Buildings, buildings where we live and work account for 30% of all greenhouse gas emissions in the United States. Energy-Efficient Buildings help to reduce the amount of CO<sub>2</sub> emitted from buildings by using energy-efficient light bulbs and more efficient heating and cooling systems. As a result, we are less reliant on fossil fuels for energy, which reduces greenhouse gas emissions (Energy-Efficient Buildings).

The Empire State Building in New York, for example, underwent modifications to improve its energy efficiency.

### **Future Renewable Energy Trends in Promoting an Eco-Friendly Environment**

Renewable energy is pure, inexhaustible, limitless, and regenerated quickly in nature. Renewable energy sources have prompted the need for technological innovation to solve climate change challenges, such as lowering the rate and volume of GHG concentrations in the atmosphere and protecting the ozone layer from further depletion. The utilization of renewable energy sources will also drastically reduce our reliance on fossil fuel combustion. Furthermore, rather than flaring gas in Nigeria, the gases can be converted to methanol and used as a home and industrial fuel. When the finest practices and technologies for energy efficiency are used, the use of fossil fuels for energy generation is considerably reduced. Nigeria has a lot of renewable energy resources that could be used. Given Nigeria's tremendous solar energy generation potential and the necessary political will to exploit these resources, the country would undoubtedly overcome the difficulties of climate change and global warming. With a circumference of 1.4 million kilometers and a black body temperature of 6000 K, the sun generates around 4.506 1020 MW of energy. About 2.055 1011 MW of this electricity reaches the Earth's surface, resulting in a solar intensity of 1.58 kW/m<sup>2</sup> on the planet's surface. If 1% of Nigeria's 794,000 square kilometers was used to harvest solar energy at a 5 percent effectiveness, there will be around 627,260 MW attainable (ECN, 2003).

Analyses by the International Renewable Energy Agency (IRENA) indicate that growing development of renewable energy solutions

paired with energy efficiency techniques are safe, reliable, and cheap alternatives to achieve over 90% of the energy-related CO<sub>2</sub> emission reductions required to reach nationally stated climate targets. However, to really be impactful, this requires a global approach, engaging all levels of society – from communities, regions and governments to numerous other stakeholders across the public and private sectors.

Given the ample evidence that power systems dominated by renewables can function at high levels while underpinning sustained economic growth, the transition towards 100% renewable power has now become largely a matter of political will, as the required technologies are mature and readily deployable.

## Conclusion

Beyond government action around climate change, communities (rural and cities), non-governmental organizations (NGOs) and the private sector in general can also combine their knowledge, expertise and decision-making processes to take immediate action. In fact, the combination of energy and information technology (IT) innovations and renewable energy's growing competitiveness are transforming the landscape of energy services. The importance of distributed energy resources (DER) as a source of energy for buildings is growing, lighting communities in cities and rural areas, as well powering companies. Several benefits are linked to DERs and society-wide engagement, and empowering all stakeholders constitutes an effective action to accelerate the energy transition.

In addition to financial resources, cities, islands, and rural off-grid areas must engage in capacity building and training courses to enable the successful integration of DER renewable power solutions. Curriculum should also incorporate "do-it-yourself" approaches and specific certification programs for developing off-grid abilities. Fostering the necessary production and services innovation enables the creation of dedicated platforms and networks of experts who are then able to help customise the applied DER solutions and share best practices.

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