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The Role of Renewable Energy in Mitigating Deforestation and Climate Change in Nigeria

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Abstract
This paper provides an overview of the role of renewable energy in mitigating deforestation and climate change in Nigeria. There are strong concerns over greenhouse gas (GHGs) buildup in the atmosphere which is leading to global climate change. Most of the energy supply and use for cooking and heating in the country is derived from fuel wood. This paper highlights the need to reduce burning wood substances as fuel since they generate carbon dioxide which is the main culprit behind the current climate change by exploiting other renewable energy sources like biofuels, solar and wind technologies. This minimizes overreliance on forests for fuel wood while still slowing down deforestation and climate change. In attaining this, the renewable energy contribution to the country's energy generation and consumption must be improved. This paper suggests that the government in partnership with other stakeholders should design and implement effective renewable energy policies and programmes by strengthening its relevant institutions. It needs to also come up with more simpler and affordable renewable energy technologies as a pre-requisite to achieving environmental protection and sustainability.
Keywords: renewable energy, fuel wood, carbon dioxide, greenhouse gas, climate change, deforestation

1. Introduction

Since time immemorial, energy has been used by man to cook food and to provide warmth especially during winter period. During the time, people had begun burning wood to make fire. This continued until later when people relied on animal strength to do work after which wind mills were introduced as an energy source mainly for grinding cereals and lifting water from wells. It was after the industrial revolution in 1890s and further development of technology that made the need for energy by man to significantly increase and newer sources of energy like coal, petroleum and natural gas were used. Subsequently, hydropower and nuclear power were developed and used to generate more energy since then. It will be worthwhile to note that currently there is a considerable rise in the use of non-renewable resources like fuelwood for energy production which pose serious threat to environmental quality particularly in developing countries like Nigeria.

The nature of the Nigerian energy consumption pattern is increasingly fossil based. This has lead to overdependence on forests for fuelwood mostly used for cooking purposes. The effect of this is seen massive deforestation which causes greenhouse gas emission builds up in the atmosphere and consequent climate changes which have already started sending signals of its potency worldwide. Increasing extreme weather events testify to its occurrence in different regions including Nigeria. ECN (2003) added that the increasing fuelwood consumption in Nigeria also result into soil erosion as well as desertification problems.

With the current rapid increase in the country's population and the threat of environmental damage, it makes the exploitation of the abundant renewable resources imperative as they have much less environmental and climatic impacts. This is in addition to the fact that the current reliance of energy on mostly fossil fuels is not enough to meet our growing energy needs. It is through the adoption of zero-carbon energy sources like solar, wind and small hydo technologies that these environmental problems could be mitigated. Abiodun (2012) added that there has to be sufficient swing in considering renewable energy option and a diversification in fuel resources if energy security is to be achieved in Nigeria.

The objective of this paper, therefore, was to highlight the role of renewable energy technologies as the major option in mitigating deforestation and climate change in Nigeria. The lack of significant adverse effects to the environment and current availability makes it to be perhaps the most effective way to curtail these environmental problems which pose serious challenge to the existence of humanity in our era. The paper in the end tried to profound policy recommendations which need to be taken to bail the country out of its current energy crisis.

2. Renewable Energy Sources in Nigeria

Renewable energy is energy generated from renewable natural resources that include geothermal heat, rain, sunlight, wind and tides. This is made possible by virtue of the geographical positioning of the country i.e. one with a tropical climate having in most parts ample sunshine and rainfall with strong winds, wide coastal area, varied relief and different vegetation belts. Nigeria is renewable energy rich country since it has abundance of

these natural resources the estimated reserve of which is shown in Table 1 below. The good thing about them is that they are perpetual and continually replenished in addition to being environmentally friendly. The renewable energy technologies that could be developed from these resources include biofuels, solar thermal and PV, hydropower, wind power, geothermal power and tidal power.

Table 1. Estimate of Renewable Energy Resource Reserves in Nigeria

Type	**Estimated Reserves**
Large Scale Hydropower	10,000MW
Small Scale Hydropower	734MW
Solar Radiation	3.5 - 7.0kWh/m2/day
Wind	2 - 4 m/s (annual average)
Fuelwood	4589 tonnes/yr.
Animal Waste	6466 tons/yr
Crop Residue	8798 tons/yr

Source: Energy Commission of Nigeria (2003)

The development of this clean energy sources in Nigeria rest on the Energy Commission of Nigeria (ECN). The establishment of ECN as the governmental organ for the coordination of all energy sector activities and the implementation of a comprehensive and integrated energy policy is a major development in the country. This must however be complemented by promoting synergy between ECN and other relevant federal ministries and institutions such as NERC, Ministry of Environment, Ministry of Power and Steel, presidential task force on power, NNPC and the Nigeria Coal Corporation. In order to increase the efficiency and effectiveness of energy delivery in the country, there is the need to develop the technological capabilities of these energy sector companies to cope with the challenges of future energy development in Nigeria.

3. Renewable Energy for Deforestation Mitigation in Nigeria

Most people in Nigeria currently depend on fuel wood as the primary energy source for domestic activities like cooking. A lot of forests and wood lands were removed as a result of these activities with attendant consequences of erosion and desertification risks. Vincent-Akpu (2012) argued that over 50 million metric tonnes of fuel wood is consumed every year in Nigeria which significantly leads to erosion and desertification. He also added that more than 80% of Nigerians and 60% of rural communities used fuel wood as energy source. This shows how people depend on fuel wood which causes most of the deforestation occurring particularly in fragile ecosystems of northern Nigeria. Boafo (2013) reported (FAO, 2010; CIFOR, 2005) that in Africa as a whole, deforestation is occurring at the rate of around 3.4 million hectares/year.

Renewable energy could play important role in curtailing deforestation in Nigeria. In order to reduce the rate of deforestation in the country, renewable energy must be popularized among the people and accepted so they will gradually move away from clearing forests for fuel thereby preserving them. Since the fuel wood collection is one of the greatest contributors to deforestation in Nigeria, a shift towards renewable energy strategies in this regard will be of immense importance. Promising alternative energy means therefore include biofuels, improved stoves, solar cookers, charcoal kilns, small hydro and wind farms.

The adoption of renewable energy technologies like the aforementioned ones could serve as a panacea towards mitigating deforestation in Nigeria. Deforestation if not checked could further lead to disastrous consequences to the environment and socio-economic condition of the people. These include desertification, soil erosion, biodiversity loss and climate change. The later although affected by deforestation can also affect forests by inducing deforestation.

4. Management of Forests and Climate Change Mitigation

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a “change of climate which is attributable directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over a comparable time periods (IPCC, 2001)”. It is obvious from the aforementioned definition that human factors are part of the causes of climate change apart from the natural ones and this includes deforestation which as earlier mentioned is one of the CO_2 emitting activities. Action must be taken to arrest this by carbon sequestration through sustainable management of forests.

Curtailing deforestation through renewable energy is as well a very effective way of slowing down climate change. This is because trees and other woody plants serve as carbon sinks by absorbing from the atmosphere CO_2 which is stored in form of carbon as wood. However when there is accelerated deforestation or degradation, CO_2 is released back into the atmosphere which together with other greenhouse gas emissions like methane (CH_4), nitrous oxide (NO_X), and Chlorofluorocarbons (CFCs) combines to induce global warming

through greenhouse effect. About 17% of all greenhouse gas emissions result from deforestation and forest degradation (IUCN, 2007). Rise in global temperatures cause significant change in weather and climatic patterns over wide areas including Nigeria.

Climate change and more specifically the carbon emission from energy production and use is one of the most troubling problems facing society today (Ladan, 2007)". According to the Fourth Assessment Report (AR4) of the (IPCC, 2001), the impacts of climate change in Africa may be greater than in any other continent and most vulnerable areas that include tropical forests and sub-Saharan drylands' forest ecosystem all of which are found in Nigeria. Climate change is manifested in extreme weather events such as increased frequency and intensity of rain storms, droughts and heat waves. Consequences like flooding spread of pests and diseases, wild fires e.t.c. have already started showing up in Nigeria and elsewhere in the world.

It must be mentioned that there is a nexus between climate change, forests and renewable energy. This is because forests depend on climatic parameters to grow at same time forests store carbon thereby helping to mitigate climate change. Climate change could also affect renewable energy sources like hydropower which depends on rainfall. Others like wind and solar technologies are also vulnerable to climate change. These renewable energy measures in turn mitigate both deforestation as well as climate change by preservation and development of forests and reduced build up of CO_2 in the atmosphere. Renewable energy must therefore be vigorously pursued in Nigeria both to increase the amount of energy production and to help towards mitigating the twin but interconnected environmental problems of deforestation and climate change.

5. Conclusion

It will be concluded that renewable energy plays a very large and essential role in the nation's energy future in view of the current environmental threat posed by the use of solid biomass in form of fuelwood. This is seen in the way environmental problems like deforestation, forest degradation and climate change have become enigmatic These environmental problems arising from excessive utilization of forests as source of fuelwood are not just environmental issues; they are also economic and social issues of paramount importance in Nigeria and other developing nations. Mitigating them through renewable energy will be a step further in the fight against global greenhouse gas build up.

6. Policy Recommendations

The following policy recommendations if implemented will help address the current energy crisis and environmental problems of deforestation and climate change in Nigeria.

- Nigeria should seek partnership with countries that are known to have gone far in renewable energy technologies to develop its own clean energy sector.
- Private sector participation should be encouraged to invest in renewable technologies in the country.
- The government must continue to lead research and development into renewable energy technologies.
- Public awareness campaign must continue to be vigorously pursued by the government on people to know and accept that renewable energy technologies is needed to supplement the low energy output in the country.
- The existing power reform and privatization must continue to be vigorously pursued.
- Efforts should be made to acquire technical knowledge to increase capacity to manage renewable energy technologies in the country.
- Massive re-greening of the land should be undertaken by both the government and the people to reduce the level of greenhouse gas emissions in the atmosphere.

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