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Domestic Energy Crisis and Deforestation Challenges in Nigeria.

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Abstract

The energy crises confronting Nigeria is well known, what however remain unclear to many is the relationship between the energy crises and the continuous depletion of Nigeria's forests resources; despite the warning of the United Nations' FAO that Nigeria accounts for the highest deforestation rate (55.7%) in the world's primary forest. This paper attempted an overview of the Nigeria's deforestation menace from the standpoint of the country's domestic energy crisis. It has identified the various causes of deforestation and concluded that none is more pervasive like that of fuelwood harvesting. The paper has therefore pointed out the potentials of exploiting other renewable energy resources of Hydro, Solar, Wind and Biofuels in place of fuelwood; with the view to removing the present pressure on Nigeria's primary forest for fuelwood as the mainstay of domestic cooking energy.

Keywords: Energy, Deforestation, Fuelwood, Renewables, Desertification, Savannah

1. Introduction

The persistent inadequate quantity, poor quality and low access to energy despite Nigeria's enormous domestic endowments in renewable and non-renewable primary energy resources are continuously affecting domestic energy supply and translating into great threat on Nigeria's forestry. Nigeria's crude oil and natural gas reserves are estimated around 35 Billion barrels and 185 trillion cubic feet respectively. Coal reserves are also substantial at 2.75 billion metric tons.

Also, a large amount of renewable energy resources including hydroelectricity, solar radiation, wind and biomass are present. Hydro resources are estimated at 14,750 Megawatts. Solar radiation is estimated at 3.7 – 7.0 kilowatthour/m2 per day, wind energy 150 000 Terra Joule per year and biomass at 144 million tons per year (Aweto, 1990; Sunderlin etal 2008). However, lack of exploitation of these resources have caused an invariable over dependence on only the biomass of forest resources; which is now being threatened by total devastation.

Nigeria has a 100% tropical forest type. Natural forests continue to be the main source of wood supply (FAO 2009).Deforestation as defined by United Nations Framework Convention on Climate Change is the direct human-induced conversion of forested land to non-forest uses. It is the complete removal of forest vegetation to provide land for other uses(Grieg-Gran, 2008).

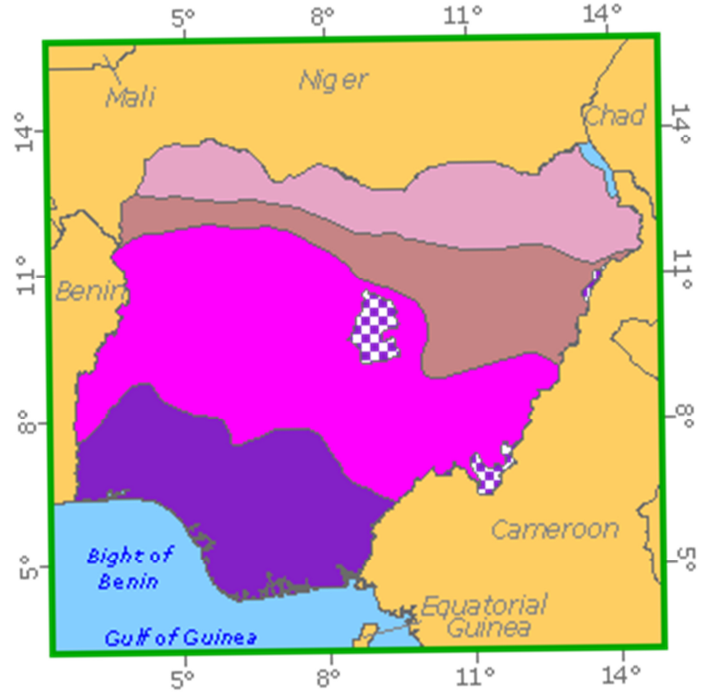
Energy shortages are the greatest challenge, particularly, in rural areas of Nigeria for instance grid electricity and other conventional sources of energy are not reliable or in short supply. Nigeria has a population of over 170 million people with an average population growth rate of 2.5% (FAO, 2009). 52% of the population live in the rural communities and do not earn enough to pay for fuel or electricity. 70.8% are in absolute poverty, below $1 per day with 0.826 metric tons carbon dioxide emissions per capita per year (World Bank 2006). With this population growth and without the concomitance of economic growth or technological advancement the high rate of deforestation is unavoidable. This paper is therefore an attempt to explain the relationship between Nigeria's deforestation and the country's domestic energy crisis as epitomized by the unsustainable fuel wood harvest.

2. Overview of Deforestation in Nigeria.

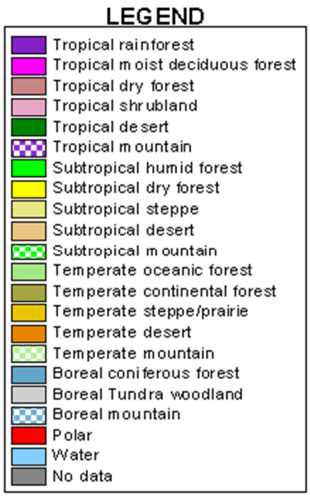
Deforestation is one of today's pressing worldwide problems relating to human survival, welfare and development. Deforestation is progressing rapidly in the tropics, where an estimated 13 million hectares (an area the size of England) is deforested each year (FAO 2006). According to the 2000-2005 Global Forest Resources Assessment of the Food and Agricultural Organization of the United Nations (FAO), Nigeria has the world's highest annual deforestation rate of primary forests at 55.7%. The country is one of the two largest losers of annual natural forests in Africa.

At 11.1%, Nigeria's annual deforestation rate of natural forest is the highest in the world and puts it on the pace to lose virtually all its primary forest within few years. Deforestation is a major problem occurring in many parts

of the Nigeria and the most serious affected region is the less endowed northern part of the country with the forest and game reserves being intensively and extensively exploited. Examples includes the Gorgoram forest in Jakusko LGA, Yobe State and the Sambisa Game Reserve, Konduga LGA, Borno State, other states like Bauchi, Kano, Katsina, Zamfara and Plateau are also faced with the same challenge. The arid nature of the country to the North makes it resource-poor and more vulnerable. Odihi(1993) says that "it is the geography (i.e. the location of deforestation) that makes it so contentious. The vegetation is sparse and seasonal determined by climate, in particular by the rainfall and the severity of the dry season (FAO 2004). The North has a Savannah vegetation including: The southern Guinea zone (with Rainfall statistics of 1,150 to 1,500 mm and 4 to 5 months dry season); The northern Guinea zones (1 000 to 1 250 mm of rainfall and 5 to 6 months of dry season); The Sudan zone (500 to 1 500 mm of rainfall, with 5 to 7 months dry season), which can be subdivided in a northern, median and southern Sudan zones; The Sahel zone (250 to 500 mm of rainfall and 7 to 8 months dry season).



Nigeria Ecological Zones



Map source: Global Forest Resources Assessment 2000, base map: ESRI

Deforestation is occurring in places where it undermines biodiversity and its attendant benefits to humans or, it is occurring in places where the environment lack inherent abilities to heal itself (i.e. places which are fragile and little endowed). The forest area of the Northern region between 1980 and 1990 decreased from 4.37 x 10^7 to 4.0 x 10^7 ha(Singh, 1993). This gives an annually deforested area of 3 x 10^5 ha. Annual change rate between 1999 and 2000 is -2.7% and -3.3% between 2000 and 2005. Forest is a natural resource of critical economic and environmental importance possessing characteristics of both renewable and non-renewable resource.

There is a growing concern about the uncontrolled exploitation of Nigeria's forest resources in accordance with a recent observation that continuing deforestation poses a great risk to sustainable land use and the wellbeing of the people(Schulte-Bispin, et al). Continued felling of trees at the same rate will result in substantial damage to water resources (freshwater shortages), ecosystems, as well as having an impact on food supplies, health and diseases, and the loss of their livelihoods and homes. The loss of forest cover have adverse effects on the supply of wood fuels for household energy, soil and water resources, and the quality of rural life (Barnes and Allen 1985).

The forests are being cleared because people want to use the land to grow food and livestock, extract minerals or build infrastructure (Grainger, 1993).Demand for food, timber and other commodities result in turn from a whole host of underlying social, economic and political causes, including population growth, economic development (wealth creation, direct or indirect policy incentive), lack of clear and secure land tenure systems, weak law enforcements, poverty and inequality and other governance incentives. Illegal logging, urban expansion and fuel requirements are also driving forces of deforestation. Therefore, in the process of feeding, sheltering and improving human wellbeing, the poor have to depend, more intense on resources from their own local environment, practicing the principle of the tragedy of the commons.

Open and free access forest resources are utilised by without any form of regulation as for them survival is the principal denouement. As(Chritchley; 1991) observed prevention of degradation of natural resources is irrelevant to the present needs of the poor. Deforestation is the result of survival pursuit: they rely on fuel wood, charcoal, and other biomass for cooking and heating; vegetation is cleared for agriculture; and plants are used for medication, construction, fodder, arts and crafts and fuel. Barraclough etal (2000) observed that the imperative of survival (self-preservation) sometimes predisposes human beings to take desperate actions in desperate situations. Also, other causes of deforestation include lack of effective alternative energy options for majority of people, high profit margins in the fuel wood economy and recent energy

policies of government. The tyranny of the energy market discourages use of environmental knowledge in household energy policy decisions. Many households using gas or kerosene energy prior to the present condition of energy scarcity and underdevelopment have reverted to the use of fuel wood, causing reversed energy transition and increased rates of deforestation.

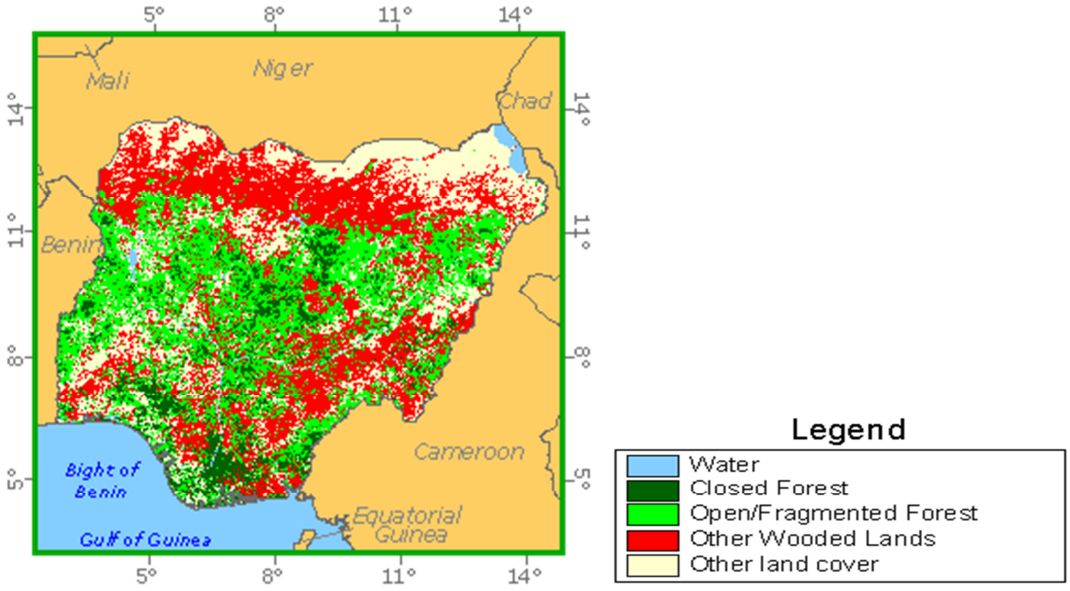
3. Fuelwood Consumption as Driver of Deforestation

Deforestation intensity, severity, and consequences have worsened over time by human actions. The continued exploitation and persistent problem of forest resources, their utilisation and trade in for instance the semi arid Northern Nigeria has many causes. However, underlying real factors are grounded in socioeconomic accord.

Africa accounts for more than one-quarter of global wood fuel production. Nigeria produced 13% of Africa's fuelwood in 2006 reports (FAO 2009). Wood energy comprises a number of different types of wood-based fuels. The most prominent of these is fuel wood, cut directly from trees and forests (FAO 2009). This is further refined into other types of energy like charcoal. The major types of domestic energy used are fuel wood, kerosene, electricity and gas. However, the effective most available is the fuel wood and charcoal. The rate of exploitation of trees for fuel wood has been increasing significantly since the late 1980s making it an important factor of deforestation in the Sudan Sahel region of the Northern part of the country reportedOdihi (1993), however Available evidence suggests that reasons for exploiting forest resources for fuel wood are rather complex. They included physical availability of alternative energy such as kerosene, cooking gas, electricity and problems of their effective availability (i.e., their affordability). Political instability became a prominent factor affecting the

distribution and reliability of alternative energy. The Gorgoram area forest exploitation had an additional reason. Many members of the Gorgoram community had been made redundant by lack of water therefore could no longer operate as commercial fishermen. Parochial interests, which hindered the release of dam water (in the upstream sections of the Komadugu-Yobe system both in Kano and Bauchi States) downstream changed water conditions in the area adversely affecting river-dependent economic activities such as fishing.

Fig. 2 FOREST TYPE AND COVER MAP



Map source: Global Forest Resources Assessment 2000, base map: ESRI

According to Andersonetal (1998), "In low-income countries the consumption of fuelwood energy by households is typically ten times the total consumption of commercial energy for all purposes, including transport and the generation of electricity; in Nigeria it is twice the total."Odihi (1993) reported that the energy situation in rural communities was homogeneous with between 100% and 96% of the people using and collecting their own fuel wood respectively. Fuel wood harvesting (i.e. gathering, collection or fetching) in many communities is becoming increasingly more demanding in terms of time spent or distance covered to secure fuel wood due to depletion or overexploitation of nearby resources.

Alternative energy in the form of kerosene and cooking gas (liquefied natural gas) are not readily available or affordable. Furthermore, Fuel wood economy had become a popular part-time employer of rural labour especially during the off-season. Also the economy of fuel wood market is booming as a household preferential choice of energy because of its qualities. These qualities include; Availability, accessibility, affordability, source reliability, flexibility, and taste. Fuel wood is the most available energy in its source reliability, accessibility and affordability. Source reliability refers to the probability of finding energy at the supply source (e.g. depots, sheds or markets). Accessibility connotes nearness of supply sources, their prevalence or the relative ease of getting to the sources. Affordability refers to energy prices with respect to household income. It also incorporates flexibility which refers to the ability to buy just how much energy one wants as opposed to being compelled to buy what the seller offers for sale. Again, its non-discriminatory and non-specialised economic nature has important characteristics, which enhance fuel wood usage. For instance, in hard times the consumer could buy just enough fuel wood for his immediate needs, and does not need any specialised package or containers.

Owing to its features of affordability and minimisation of family tension and food insecurity the overall price of domestic energy was best in the fuel wood sector. Domestic energy hunger due to both physical and economic availability problems caused family tension in many households but usage and dependence on fuel wood minimized it. The belief and notion by both rural and urban people of the better taste and aroma of fuel wood cooked food makes them addicted to cooking with wood. Studies of the quantitative and organizational

dimensions of fuel wood production, consumption and exchange since the mid-1980s indicate a trend of increasing deforestation that would possibly weaken energy security in the region (Cline Cole et al, 1990: FEPA,1992) Using the FAO report of 2000-2005, the fuel wood consumption and production in Nigeria is at 61,628,000 m^3 for the former and 61,629,000 m^3per year for the latter respectively. Also, report by the federal ministry of environment says that Nigeria plunders its forest by more than 30 million tons for firewood annually due to the pressure on urban poor who resort to the cheapest means of cooking. The rate of fuel wood consumption far exceeds replenishment rate. Statistics has shown that there is a negative correlation between exploitation of the forest and conservation in Nigeria.

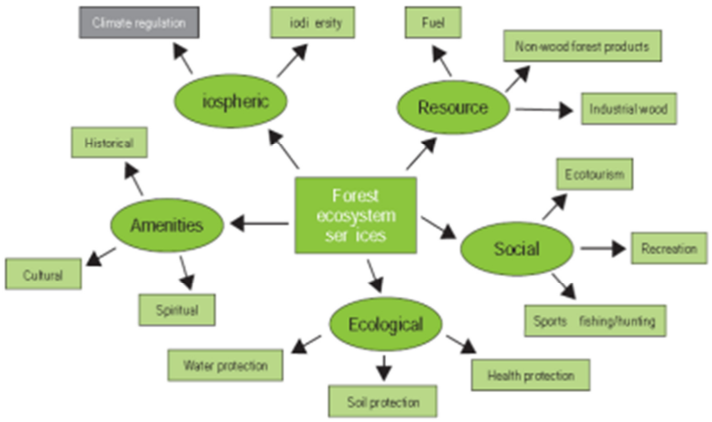
Projected demand, supply and deficit of forest products in Nigeria 1987-2020 (thousand m^3)

PRODUCTS	DEMAND	SUPPLY	DEFICITS
Fuelwood	628952	51540.0	577412

Source: Bendl 2007

The growing intensity of fuelwood, which Bdliya (1987) observed, led him to believe strongly that there was the ‘‘probability of complete depletion of forests by 1995’’. Odihi (1996) also noted that the reversion of more than half of middle income households to fuel wood use from various types of alternative energy (e.g. kerosene, cooking gas and electricity) was tantamount to reverse energy transition and posed grave dangers to the environment.

Major classes of forest services



Source: Millennium Ecosystem Assessment (2005)

4. Other Renewables as Options to Fuelwood.

Those who depend on forests are some of the poorest people in the world. Over 90per cent of those living on less than $1 per day depend on them for their livelihoods (FAO).Forests resources were depleted by the rural poor due to the failure in the energy production and supply systems in the country. Notwithstanding, Forests are a significant contributor to global CO2 emissions. It stands at 5.8 GtCO2 and accounts for around 17 per cent of global GHG emissions, the third largest source of anthropogenic GHG emissions after energy supply and industrial activity (IPCC 2007). Estimates analysis shows that in the absence of any mitigation efforts, emissions from the forest sector alone will increase atmospheric carbon stock by around 30 ppm by 2100 (Eliasch, 2008). The state of the soil condition, pattern of rainfall, agricultural yield, frequency, magnitude and duration of drought, violent dust storms, rate of desert encroachment and the threat of sand dunes burying villages and farmlands are symptoms of the emerging environmental bankruptcy and increasing hazards. The federal ministry of environment reports that drought in the northern parts of the Nigeria arid zone has been very frequent, of high

magnitude and long duration. Odihi(1989) noted that storm-related impact included direct damage such as tree falls, stem breaks, branch dismemberment and leaf falls. Indirect damage, he noted, occurred through plant resources exploitation for repairs of storm-damaged houses, stalls, barns, workshops, sheds and animal pens.

The fuelwood economy according to Aweto (1990) surveys, were divided into groups of operators. These include producers, distributors/retailers, and consumers. Although the major sources of fuel wood and the hewers were located in rural areas, those who controlled the economy as merchants were based mostly in the urban areas. These fuel wood merchants controlled fuel wood fields and owned the depots in urban areas. Many of these merchants had or hired Lorries to transport fuel wood from the field to urban depots. They had men who felled trees and split wood for them. Independent rural fuel wood lords had started emerging in the energy landscape of the semi-arid zone.

There are also those who felled trees and split wood by themselves or used family labour to do so. He also identified four classes of fuel wood users inclusive of households, commercial (e.g. hotels and traditional meat houses like suya), institutions (e.g. schools, prisons, hospitals) and industries such as bakeries and traditional breweries. All members of the different classes preferred fuel wood to other forms of energy because it was always available and affordable. These trees are fell illegally mostly during late night hours by armed cutters with mechanised appliances and trucks to carry out their activities expediciously, taking away forest products. People are aware that cessation of exploitation of forest resources was important to environmental stability. Farmers are well aware of the environmental decay. They would change their exploitation habit if there were viable alternatives. However, many were not sufficiently motivated to stop exploiting forest resources because there were no options.

The use of renewable energy has grown in importance as part of efforts to reduce dependence on non-renewable energy sources such as fossil fuels(FAO 2005b). Nigeria is endowed with abundant renewable energy resources like solar, wind, biomass, small hydro, etc., which have minimal or zero supply logistic problems. Harnessing these resources leads to decentralized use and local implementation and management, thereby making sustainable rural socio-economic development possible through self-reliance and the use of local natural resources. Rural dwellers are involved in deforestation activities because they are poor, unemployed, lacking in alternatives and must eat to survive. They do not know what effects would transition from fuel wood to renewable have on energy security of the rural households. There is the need to use various variables of availability of energy types (e.g. reliability, accessibility, availability and affordability) for achieving sustainable resources development and deforestation. This involves making of what is almost like a farm where trees are grown to make sure that there is always enough wood. The venture of community woodlot for making fuel wood could help mitigate deforestation in Nigeria. However, the most reliable way to check it is through the use of the renewable energy resources of solar, wind, hydro and others in both rural and urban Nigeria.

In order to enhance the energy security of the country and establish a sustainable energy supply system, it is necessary to promote the policy of diversifying the energy supply so as to include alternative or renewable resources and technologies into the nation's energy supply mix. Switching to other types of energy. Alternative renewable energy sources are the best manner to obtain energy, and are the best way to step into the future. This energy sources could be in the form of Anaerobic digestion (biogas), solar energy, and biofuel (*jatropha*) were not readily available or affordable.

5. Conclusion

Deforestation is a form of disinvestment for the future generations because the nutrients in the soil would have been lost in time and space. People value forests according to cultural, spiritual and historical factors ranging from intrinsic and aesthetic value to more geographically specific values relating to the traditional homelands of indigenous people. Deforestation is progressing rapidly, particularly in the tropics. Firm and urgent action is needed. The fuel wood consumption crisis, is related more to the lack of regular energy supply and the price of fuel wood and charcoal that is affordable by the poor. However, deforestation poses a real threat to the long-term sustainability of forest resources in particular, environmental and human resources in general due to its scale and the preponderance of the factors causing it. Governments, communities and individuals can successfully manage forests in a sustainable way, but only when the appropriate enabling elements are in place. Alternative energy provision and resource access are two of these elements.

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