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Energy Access: A Key to Rural Development in Nigeria

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ABSTRACT

This review work underscores the importance of energy access to development and particularly, modern energy services to rural development. Nigeria's energy profile depicts both potentials and consumption patterns. Then, a comparison of electricity consumption per capita and GDP per capita, shows that electricity does contribute to growth in GDP. However, energy access (modern forms in focus) contained in a complementary social infrastructure programme will promote holistic, meaningful rural development in Nigeria.

INTRODUCTION

Arguably, modern cities of today were previously rural and rustic villages. This makes rural development paramount for national development. Growth in things in any society that translates to social development depends largely on adequate and regular energy supply, particularly in its modern forms such as electricity and modern fuels. In Nigeria, rural access to modern energy services is very abysmal. For example, electricity (apparently the most convenient form of energy usage) is widely scarce in rural areas; given that only 40% of the entire population has access to electricity [1,2]. Author states this antithetically that 60% to 70% has no access to electricity. Little wonder rural electrification rate was only 18% [3].

The connection between electricity supply and social development is long established [4-6]. Hence, electricity generating sets are common in public places and households: despite the fact that this practice is financially costly; environmentally risky and socially unsustainable.

Over 50% of the population lives in rural areas and more than 60% of this depends on fuel wood for energy needs [7,8]. The livelihood of over 65% of rural people, and overall national development is highly impeded due to a lack of access to electricity [9]. Electricity is required for effective delivery of basic services such as potable water, health care, telecommunication and education, as well as agro-industrial processes [10]. These amenities contribute in no mean way positively to poverty reduction and quality of life of any community. Similarly, modern cooking fuels such as LPG (liquefied petroleum gas) and kerosene are expensive and hard to afford by the poor. Renewable energy technologies (RE) such as solar PV (photovoltaic) are not widespread. Initial installation cost is high and awareness level seems to be still low. It is noteworthy here that there is no grid-connected RE electricity system in the country. All applications in use (particularly solar PV) are mainly stand-alone systems, which work minimally or do not work at all. This makes social impact assessment of renewable energy technologies use in Nigeria difficult [11]. Thus, most people still depend on firewood, which has causes annual loss of 3.6% or 350,000 hectares of wood lands [10].

Energy access enables the provision of basic needs, which are essential indices of socio-economic development by improving agricultural methods, and businesses that are responsible for creating goods and services that sustain society. Absence of electricity in particular, directly or indirectly impedes rural development [12]. This paper highlights Nigeria's energy potentials, consumption profile and the importance of improving rural access to modern energy systems, for sustainable rural development (Tables 1 and 2).

Table 1: Fossil energy.

Energy Type	
Coal	Proven reserve: 600 million metric tons
	Inferred reserve: 3 billion metric tons
Crude Oil	Proven reserve: 37.2 billion barrels
	Production: 2.2 million barrels b/d as at 2009
Natural Gas	Reserve: 5.2 billion cubic metres
	Production: 25%

Table 2: Renewable energy potentials.

Energy Type	
Hydropower	Large-scale Power estimate: 10,000 MW
	Small-scale power estimate: 734 MW
Solar	Annual average total solar radiation: 25.2 MJ/m^2-day to 12.6 MJ/m^2-day, North-South
	Average 6 hours of daily sunshine has energy capacity of around 5.08 * 1012 KWh
Biomass	9,041,000 ha (9.9% of Nigeria's landmass); 200 million tons of dry biomass from forage grasses and shrubs, equivalent of 2.28 * 106MJ of energy; 6.1 million tons of dry biomass from crop residues with energy content 5.3 * 1011MJ; 227,500 tons of animal wastes daily with energy content of 2.2 * 109MJ"
Wind	Average wind speed in Nigeria is 3.0 m/s to 5.12 m/s, South to North, at 10m height. Maximum extractable power per unit area is 4.51 to 21.97 watts per square metre apiece.

MATERIALS AND METHODS

Data from government institutions and international bodies (e.g. Energy Commission of Nigeria, US Energy Information Administration, US Central Intelligence Agency, World Bank etc) and journal articles are referenced to justify the argument in this review paper.

DISCUSSIONS

Figure 1 shows that biomass and waste dominated the energy consumption landscape in Nigeria by 2011. In spite of the abundance of fossil and renewable energy resources, most Nigerians still struggle with a dire lack of access to modern energy systems. Even the affluent cannot find enough energy to purchase, for example grid-based electricity. About 95 million people, mostly in rural areas, still fully depend on direct biomass combustion for domestic energy needs [13]. Thus, in Figure 1 (line chart showing consumption profile by resource from EIA, 2013) biomass constitute a whopping 83%; oil, natural gas and hydro consist of 11%, 5% and 1% respectively. On the other hand, there is widespread use of electricity generators, particularly, 'I pass my neighbour', which poses harm to health, environment, economy and social development. The scenario of energy abundance and scarcity is a real paradox in Nigeria.

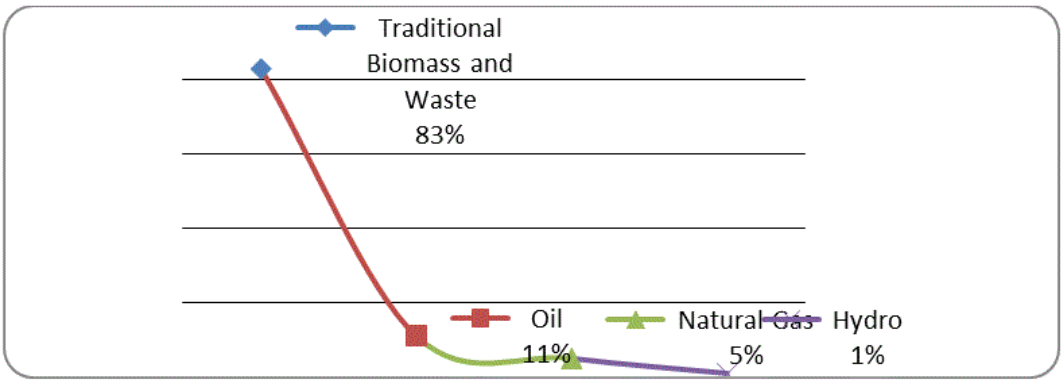

Figure 1: Energy consumption profile by resource.

Household sector consumes more energy (65%) than commercial and industrial sectors combined. Major household energy needs are cooking (91%), lighting (6%) and (3%) for basic appliances like television, fan and pressing iron [14]. Cooking is the highest energy need of families and this met by biomass materials particularly, fuel wood. Many urban dwellers also depend on charcoal and kerosene. Lack of roads to transport kerosene and cooking gas, or for rural grid extension leads to high costs.

Nigeria's electricity consumption per capita is grossly low at 25 Watts. Ghana and South Africa have 62 Watts and 826 Watts respectively [2]. **Table 3** shows per capita electricity consumption and GDP, both of which are global development indices. Energy scarcity is ubiquitous in Nigeria particularly in rural areas. Usually, women and children experience drudgery in domestic lives, health problems, reduced or lack of reading hours, low productivity in agriculture and SMEs (small medium enterprises) and so on.

Electricity, as an engine of growth, impacts directly on a range of socio-economic activities and living standards [15]. Electricity access remains a viable tool to measure GDP substantially (**Table 3**). For example, Barkat et al. [16] noted that electrified irrigation boosted agriculture, industries and personal income in rural Bangladesh. McMenemy et al. [6] and Adhikari [17] concurred that micro-hydro power (MHP) and solar home systems improved rural living standards in Nepal. Kirubi et al. [18-21] complemented that rural electrification in Kenya improved service delivery at local schools and clinics: reading hours, storage of medicines and residency of medical doctors [22-25].

Table 3: Electricity Consumption per capita (kWh) and GDP per capita (US$): 2009-2011

Year	2009	2010	2011
Electricity per capita	120	135	149
GDP per capita	1,091	2,294	2,519

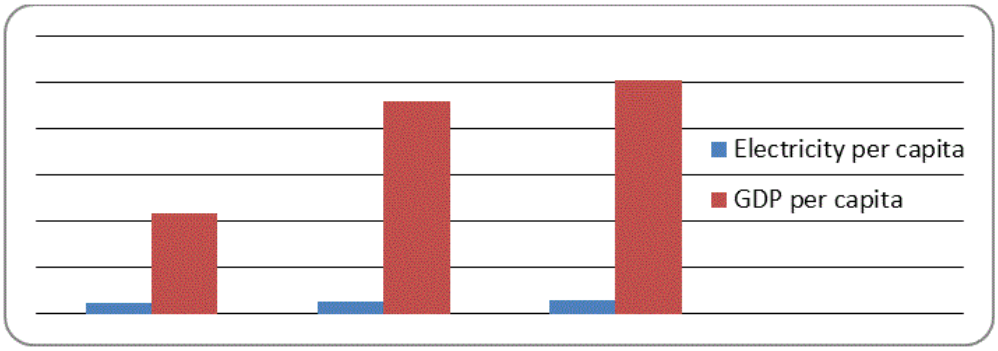

Figure 2: Electricity consumption per capita kWh and GDP per capita US$.

In **Figure 2**, electricity consumption per capita increased steadily by 13% in 3-years. GDP per capita rose sharply by 110% in 2009-2010 and plummeted to 10% in 2010-2011. The 2009-2010 profile suggests that a rise in per capita electricity use leads to a rise in GDP per capita, but the sharp slump in GDP per capita in 2010-2011 contradicts. So, per capita electricity use alone may not increase GDP per capita; this tends to be vis a vis other social infrastructure [26,27].

CONCLUSION

Modern energy access is vital to improve rural living standards. Its benefits can be seen in agro-industry, healthcare, portable water, education, domestic output and income. Grid, mini-grids or isolated RE systems inspired socio-economic growth in many countries: Bangladesh, India, Kenya, Nepal, South Africa etc. Nigeria has a plethora of variety of energy resources, which could be explored and mixed for national development. Decentralized grid policy with RE in view is vital and suitable in vast countries with dispersed rural areas [28-30].

References

1. Sambo AS. Strategic developments in renewable energy in Nigeria. International Association for Energy Economics, First Quarter 2009:15-19.
2. Nnaji B. Power Sector Outlook in Nigeria: Government's Renewed Priorities. The Presidency. Presidential Task Force on Power, Federal Republic of Nigeria, 2011.
3. Igbinovia S and Orukpe P. Rural electrification: the propelling force for rural development in Edo State, Nigeria. J Energy Southern Africa. 2007;18:18-26.
4. Barnes D and Toman M. Energy, equity and economic development: final draft. Energy and Economic Development. Columbia University: Initiative for Policy Dialogue, 2004.
5. Dinkelman T. The effects of rural electrification on employment: New evidence from South Africa. Princeton University, Princeton, 2010.
6. McMenemy C, et al. Rural Energy Development: An Integrated Approach in Nepal, 2010.
7. Nnaji CE, et al. Electricity consumption, economic growth and the need for alternative source of power in Nigeria. Nig J Solar Energy 2011;22:177-182.
8. The World Bank Group. Electric power consumption (kWh per capita), 2014.
9. Adejumobi IA, et al. Developing small hydropower potentials for rural electrification. IJRRAS 2013;7:105-110.
10. Sambo AS. Matching electricity supply with demand in Nigeria, 2010.
11. Uzoma CC, et al. Social impacts of renewable energy on Nigeria's South East Zone. Proceedings of the 2nd International Workshop on Renewable Energy for Sustainable Development in Africa (IWRESDA) Abuja, Nigeria, 2010;225-238.
12. Bank of Industry. Absence of electricity, constraints to rural development, 2017.
13. Mshelia HI. Energy Access for All: The Role of Clean Energy in Alleviating Energy Poverty. Federal Government of Nigeria. National Energy Policy, Abuja, 2012.
14. Osueke CC and Ezugwu CA. Study of Nigeria energy resources and its consumption. International Journal of Scientific & Engineering Research 2011;2:2229-5518.
15. Odularu GO. Does energy consumption contribute to economic growth? Empirical evidence from Nigeria. Journal of Economics and Business 2009;12:48-49.
16. Barkat A, et al. Economic and social impact evaluation study of the rural electrification programme in Bangladesh. Human Development Research Centre-HDRC, 2002.
17. Adhikari E. Rural electrification in Nepal: Cooperative concepts in rural electrification, 2007.
18. Kirubi C, et al. Community-based electric micro grids can contribute to rural development: Evidence from Kenya. World Development, 2008.
19. BP Statistical Review of World Energy, 2015.
20. http://www.gecf.org/countries/nigeria
21. Ohunakin OS, et al. Small hydropower (SHP) development in Nigeria: An assessment. Renewable and Sustainable Energy Review 2011;15:2006-2013.
22. Osueke CO, et al. Study and evaluation of solar energy variation in Nigeria. Int J Advanced Technol Advanced Engineering 2013;6:501-505.
23. Ozor OC, et al. Biogas production using cow dung from Abakaliki abattoir in South-Eastern Nigeria. Int J Scientific Technology Res 2014;3:237-9.

24. Sambo AS. Renewable energy for rural development: the Nigerian perspective, 2005.
25. ISESCO. Science and Technology Vision 1:12-22.
26. The World Bank Group. GDP per capita (current US $), 2014.
27. Scienceray. Renewable energy source for rural development: the solar energy perspective, 2009.
28. Shaaban M and Petinrin JO. Renewable energy potentials in Nigeria: Meeting rural energy needs. Renewable and Sustainable Energy Reviews 2014;29:72-84.
29. Shell Nigeria. Unlocking Nigeria's potential in natural gas.
30. World Energy Council. Gas in Nigeria, 2018.