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MULTIDIMENSIONAL ENERGY POVERTY IN NIGERIA: A NATIONAL AND ZONAL LEVEL ANALYSIS

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ABSTRACT

This paper analyzed multidimensional energy poverty in Nigeria at national and zonal levels using the 2009-10 National Living Standard Survey data. The study adopted the Nussbaumer, et al, (2011) methodology. National level results showed that 95 percent of Nigerians suffered energy poverty, deprived of 74 percent of the weighted indicators and had an MEPI of 70 percent. Energy poverty was found to be acute in all the zones excepting the South-west where it was moderate. Furthermore, the Southwest had the least share of energy poverty while the North-West contributed the most. In terms of sector, gender and occupation the South-south is the worst hit. It was concluded that energy poverty in Nigeria is both acute and pervasive. It was therefore recommended that local and state governments should embark on rural electrification projects and connect urban centers to the national grid. Available clean energy, like cooking gas should also be made available at affordable prices and in the rural areas.

Keywords: Multidimensional Energy Poverty Index, Poverty, Nigeria
JEL Classification: C21, I31, I32, Q49

1. INTRODUCTION

Energy poverty has been defined as the lack of access to sustainable modern energy services and products. It is defined as a situation where there is the absence of sufficient choice of accessing adequate, reliable, affordable, safe and environmentally suitable energy services. The importance of the availability and access to modern energy services and products at affordable prices in the development process of any country can hardly be overemphasized. By creating the enabling environment not only for small and medium scale businesses to thrive, but also for the effective and efficient use of modern healthcare facilities it enhances livelihood opportunities for all. To affect the life of the poor positively, clean and efficient energy resources are needed. It saves the time spent in collecting firewood for cooking. Clean energy sources for cooking like electricity, gas etc. show improvement in living standards. According to the United Nations, lack of electricity and heavy reliance on traditional fossils and biomass fuel are hallmarks of poverty in developing countries. Lack of electricity enhances poverty and contributes to its upholding, as it hinders industrial activities and the jobs they create (IEA and United Nations, 2010).

To sustain life at the subsistence level in the absence of efficient energy using technologies and adequate energy resources the poor often times, depend on biomass energy, animal power and their own labor. Therefore, they are likely to consume into environmental capital, thereby leading to environmental degradation and unsustainable development. In enhancing the satisfaction of basic human needs and living standards of the people and to reduce poverty, energy resources have to be improved upon. For better healthcare facilities and services, quality education and access to information clean energy is required. The availability and affordability of clean energy resources can also lead to the attainment of evenhanded, economically strong and sustainable development.

The measure of energy poverty takes into account three major deprivations: (i) access to electricity (ii) access to modern cooking fuel; and (iii) access to clean indoor (fresh) air. This is predicated upon the fact that access to electricity does not only provide light, but also enable the people to enjoy the services from the effective use of such gargets as refrigerators, electric iron, information and communication technology, etc.

In spite of the glaring importance of energy, there has been a dearth in the literature of studies on energy poverty in Nigeria. The majority of the people in Nigeria depend mostly on firewood, sawdust, animal dung and other crude biomass fuels as their major source of cooking fuel. Most of them still use an open lantern and candlesticks for lighting, thereby not only exposing the environment to further degradation in addition to that caused by the activities of oil multinationals, but also the individuals to health hazards due to indoor pollution. The huge number of people using generating sets does not only contribute to air pollution, but also increase the possibility of impaired hearing due to noise pollution.

It is worthy of note that not everybody suffers energy deprivation at the same degree, thus making it imperative to have an understanding of the specific degree of deprivation households suffer in different zones of the country, sector (urban and rural areas), among gender (male and female) among occupational groups, and the determinants of energy poverty in Nigeria. This will facilitate policy formulation and ease the problems often associated with properly targeting the poor for possible intervention(s). It is against this backdrop that this paper analyzed multidimensional energy poverty in Nigeria.

2. LITERATURE REVIEW

There is a cornucopia of empirical works on energy poverty in the literature. Pasternak (2000) found a strong relationship between measures of human wellbeing and consumption of energy and electricity. A roughly constant ratio of primary energy consumption of electric energy consumption was observed in countries with high levels of electricity use. This ratio was used to estimate global primary energy consumption in the Human Development Scenario. They established positive correlation between the Human Development Index (HDI) and annual per capita electricity consumption for 60 populous countries comprising 90% of the world's population. Results further showed that HDI reached a maximum value when electricity consumption was about 4,000 KWH per person per year. Clancy et al., (2003) showed that 2.8 million Households in England were classified as being in fuel poverty in 2007 (13% of all households). They also showed that fuel poverty in the UK was not of the same order or intensity as that of sub-Sahel Africa.

Stephen et al., (2004) studied the present and future renewable energy potential in Kenya to meet the needs of electrification of the poor. They limited the study to solar and hydro technologies owing to technical and socio-economic hurdles. They assessed that present Rural Electrification Fund (REF) in Kenya realizes the solar and hydro electrification potential for poor. The results showed that if there is a 10 % increase in the Rural Electrification Fund (REF), annual revenue from rural electricity connections increases by 42% in Kenya. They also showed the existence of a positive relationship between access and use of energy and poverty. Pachauri et al., (2004) presented different approaches for

measurement of energy poverty using Indian household level data. They found a positive relationship between well being and use of clean and efficient energy resources and concluded that access to and consumption of clean and efficient energy increases well being. Elahee (2004) found that access to energy is the key to poverty alleviation. The relationship between access to energy and growth is entrenched. It was forecasted that energy access will turn into a severe problem in developing nations in the coming time, principally under the shocks of high population growth rate and increase in the fuel prices.

Tennakoon (2009) analyzed the energy poverty status of Sri Lanka. Two approaches, namely quantitative approach and Pricing approach of measuring energy poverty were used. Results of Pricing approach showed that Sri Lanka is facing a high level of energy poverty (83% energy poverty) while the results of Quantitative approach revealed that energy poverty in terms of cooking is very high due to high inefficiencies of cooking stoves. Shahidur et al. (2010) studied energy poverty of urban and rural areas of India. The estimates showed that in rural areas of India, 57 % of households were energy poor and 22 % were income, poor while in the urban areas energy poverty was 28% and income poverty was 20%. The persons in energy poverty were also facing income poverty.

Marcio et al. (2010) analyzed the impact of energy poverty on inequality for Brazilian Economy using Lorenz Curve, Poverty Gap, Gini coefficient and Sen Index. It was concluded that rural electrification leads to the improvement in energy equity. Jain (2010) explored the problems related to energy consumption faced by the Indian rural and urban households. The results showed that energy poverty in rural areas of India was about 89% and 24% in urban areas. It also shows that 56% of households in India had access to electricity facilities. Poor persons spend almost 12% of their total income only on energy. Energy poverty disturbs all aspects of human welfare like agriculture productivity, access to water, education, healthcare, job creation etc. Energy poor persons do not have access to clean water, electricity, and they spend a large portion of their income and time to get energy fuel. Mirza and Szirmai (2010) discussed the consequences and characteristics of the use of different energy services using Energy Poverty Survey (EPS) data from 2008 to 2009. They showed that 96.6 % of rural households face an energy shortfall. In Punjab province of Pakistan, 91.7 % of rural households of the total rural population are faced severe energy poverty.

Sher et al (2014), employed the Alkire and Foster's (2007) methodology to measure Multidimensional Energy Poverty (MEP) at the provincial level in Pakistan using PSLM data and showed MEP Headcounts of 47%, 51%, 69% and 66% of the households residing in Punjab, Sindh, Khyber Pakhtoon Khaw (KPK) and Baluchistan provinces of Pakistan respectively. Indoor pollution was found to be the largest contributor to MEP Headcount in all four provinces of Pakistan while cooking fuel was the second largest contributor.

Nussbaumer, et al, (2011) developed the multidimensional energy poverty index (MEPI) and estimated energy poverty for African countries reporting the Headcount and Intensity ratios for the various countries. Their results showed that 81% of Nigerians are energy poor and are deprived of 75% of the indicators. Ogwumike and Ozughalu (2012) adopted this methodology and showed that 75.5% of Nigerians are energy, poor but did not report the intensity ratio.

Edoumiekumo et al, (2013) in their study examined multidimensional energy poverty in the South-South geopolitical zone of Nigeria and reported a zonal head count ratio of 0.832, intensity ratio of 0.903 and multidimensional energy poverty index (MEPI) of 0.751. They also showed that three out of the six states in the zone suffered acute energy poverty in terms of MEPI while the other three suffered moderate energy poverty. In terms of intensity all six states suffered severe deprivation with Bayelsa State is suffering the lowest deprivation of 0.851. Edoumiekumo and Karimo (2014) examined multidimensional

energy poverty in Bayelsa State of Nigeria and its implication for sustainable development, using the National Living Standard Survey data from 2009-2010 and showed that 96% of the inhabitants of the state suffered energy poverty and were deprived of 82% of the indicators. Rural dwellers were the worst hit, with 98% being energy poor and deprived of 82% of the indicators. They also showed energy poverty to be acute and pervasive, permeating all sectors of the state.

From the foregoing, it is clear that empirical works on energy poverty, especially multidimensional energy poverty are scarce. Nussbaumer, et al, (2011) focused on continental level; Ogwumike and Ozughalu (2012) focused on the household head without weighting for the household size; Edoumiekumo et al, (2013) and Edoumiekumo and Karimo (2014) who weighted for household sizes were concerned with a specific zone and state respectively. Thus, this paper would contribute to knowledge and fill an existing gap in the literature by paying particular attention to the multidimensional energy poverty in Nigeria with a focus on the National and Zonal level indexes.

3. METHODOLOGY

3.1 Data

This study used secondary data that were collected during the National Living Standard Survey (NLSS) of households carried out between 2009 and 2010. That is the latest national data collected by the Federal Republic of Nigeria on different aspects of households' activities. The sample design adopted a multi-stage stratified sampling. At the first stage, from each State and the Federal Capital Territory (FCT, Abuja) clusters 120 housing units called Enumeration Area (EA) were selected at random. In the second stage 10 housing units from the selected EAs were randomly selected. A total of 600 households were randomly chosen in each of the States and 300 from the FCT, summing up to 21,900 households in all (NBS, 2010). However, some households did not fully complete the questionnaires therefore data were available only for 19,158 households. Households' characteristics were appropriately weighted for cross-sectional differences. It was the weighted data this study adopted.

3.2 Model Specification

Borrowing a leaf from the work of Nussbaumer, et al, (2011) this study constructed a Multidimensional Energy Poverty Index (MEPI) using three major indicators of energy deprivation. These indicators include access to light (main electricity or generator), access to modern cooking fuel, and access to fresh air (indoor pollution free home).

a) *Light:* A household is deprived of light if its source of light is not main electricity/generator set and it is assigned 1 and 0 otherwise. This is the deprivation index, which is then weighted by 0.3

b) *Modern cooking fuel:* A household is deprived of modern cooking fuel if its main cooking fuel is not electricity, cooking gas/oil or kerosene and it is assigned the value of 1 and 0 otherwise. The deprivation index is then weighted by 0.4.

c) *Fresh indoor air:* a household is deprived if it cooks on stove or open fire (no hood/chimney) or is using any fuel besides electricity and/or gas and the household is assigned the value 1 and 0 otherwise. The deprivation index is then weighted by 0.3.

After computing the deprivation indexes for all households, the energy poverty score for each household, c_i is then computed as the sum of household weighted deprivation. The

Multidimensional Energy Poverty line, z of 1/2(= 0.5) is adopted. A household is energy, poor if it is deprived of more than 50% of the indicators. Therefore a household whose sum of weighted deprivation is greater than or equal to 0.5 is classified as energy poor and households whose sum of weighted deprivation is less than 0.5 are energy non-poor.
We then computed the multidimensional poverty index (MEPI) as follows:
Energy Poverty Headcount:

$$H = 1/N \sum_{i=1}^{q} hsize_i \quad . \quad . \quad . \quad (1)$$

Energy Poverty intensity ratio:

$$A = \sum_{i=1}^{q} (c_i * hsize_i) / \sum_{i=1}^{q} hsize_i \quad . \quad . \quad . \quad (2)$$

Multidimensional Energy Poverty Index

$$MEPI = H * A \quad . \quad . \quad . \quad (3)$$

Where: H is the Headcount of Energy poverty, i(1,2,…,q) is the ith poor household to the qth (last) poor household, $hsize_i$ is the household size of the ith poor household, N is the population size (sum of all household sizes), A is Energy poverty intensity, c_i is the sum of the ith household weighted deprivation (poverty score) and MEPI is the multidimensional poverty index.

4. RESULTS AND DISCUSSIONS

Table 1 showed multidimensional energy poverty in Nigeria and its distribution according to sector, gender and occupation. The national level results showed that 95 percent of Nigerians suffered energy poverty and are deprived of 74 percent of the weighted indicators. An adjusted head count ratio (Multidimensional Energy Poverty Index, MEPI) of 70 percent implies that energy poverty is acute in Nigeria. While the distribution showed that energy poverty is acute among urban households, male headed households, agriculture and the other occupational groups and moderate among households in rural areas and households headed by females. Those that experienced moderate energy poverty were just marginally below the cutoff of suffering acute energy poverty. Whereas urban households contributed 76 percent of energy poverty rural households' share was 24 percent. Male headed households share in multidimensional energy poverty headcount (MEPH) was 91 percent and that of female headed households was 9 percent. While both households in the agricultural sector and those in the other sectors suffered acute energy poverty households in the agricultural sector contributed more to energy poverty, having a 70 percent share in national MEPH leaving a paltry 30 percent of households in the other sectors.

The distribution of MEP, according to geopolitical zone presented in table 2 showed that whereas households in the Southwestern geopolitical zone suffered moderate energy poverty households in the remaining five (5) geopolitical zones suffered acute energy poverty. While the South-West had the least share (11.75 percent) of energy poverty the North-West contributed more (24 percent) followed by North-East (18.77 percent), North-Central (18.40 percent), South-South (13.45 percent) and the South-East (13.21 percent). This implies that households in Northern Nigeria contributed more to energy poverty relative to their counterparts in the Southern parts of the country.

Table 1: MEPI in Nigeria and Contribution by Sector, Gender and Occupational Group

Sector	Headcount ratio (H)	Intensity ratio (A)	MEPI = (H*A)	Degree of Energy Poverty	Contribution to MEPH (%)
National	**0.95**	**0.74**	**0.70**	**Acute**	**100**
Sector					
Urban	0.95	0.74	0.70	Acute	75.98
Rural	0.93	0.74	0.68	Moderate	24.02
Gender					
Male	0.95	0.74	0.70	Acute	90.84
Female	0.94	0.73	0.69	Moderate	9.16
Occupation					
Agriculture	0.95	0.734	0.70	Acute	69.89
Others	0.94	0.738	0.70	Acute	30.11

Note: MEPH is Multidimensional Energy Poverty Headcount. *Source:* Author's Computation

Table 2: MEPI in Nigeria and contribution by Geopolitical Zones of Nigeria

Geopolitical Zone	Headcount ratio (H)	Intensity ratio (A)	MEPI = (H*A)	Degree of Energy Poverty	Contribution to MEPH (%)
National	**0.945**	**0.735**	**0.695**	**Moderate**	**100**
North-Central	0.949	0.738	0.70	Acute	18.40
North-West	0.947	0.731	0.70	Acute	24.43
North-East	0.943	0.734	0.70	Acute	18.77
South-East	0.944	0.738	0.70	Acute	13.21
South-West	0.939	0.732	0.69	Moderate	11.75
South-South	0.943	0.740	0.70	Acute	13.45

Source: Author's Computation

Table 3 showed the percentage distribution of Nigerians according to the main source of cooking fuel. It revealed that more people are deprived of modern cooking fuel relative to those having access to it. 76.50 percent used firewood, 0.77 percent charcoal, 0.1 percent crop residue and 0.1 percent animal waste bringing the total percentage deprived of modern cooking fuel to 77.47 percent. This is a call for concern. Table 4 showed the percentage distribution of Nigerians according to the main source of lighting. It revealed that more people are deprived of light compared to those having access. 62.22 percent used kerosine, 0.05 percent battery, 0.11 percent candle and 3.05 percent firewood bringing the total percentage of deprivation of light to 65.43 percent. This, also is a call for concern.

Table 3: Percentage Distribution of respondents according to main Source of cooking fuel

Zone	Main Source of Cooking Fuel								Total
	Firewood	Charcoal	Crop residue	Animal waste	Kerosene	Gas	Electricity	Others	
South South	11.51	0.18	0.04	0.02	3.01	0.10	0.07	0.15	15.07
South East	10.83	0.08	0.01	0.02	2.88	0.07	0.05	0.14	14.08
South West	12.14	0.10	0.03	0.01	3.37	0.10	0.07	0.14	15.95
North central	13.93	0.14	0.02	0.02	3.63	0.10	0.08	0.23	18.15
North east	13.00	0.08	0.00	0.01	1.40	0.12	0.07	0.22	19.98
North west	15.09	0.19	0.01	0.04	4.23	0.14	0.08	0.19	19.98
National	76.50	0.77	0.10	0.10	20.39	0.64	0.43	1.06	100.00

Source: Authors' computation from the National Bureau of Statistics, 2010 National Living Standard Survey Data

The study also considered the distribution of energy poverty, according to sector, gender and occupation of each of the geopolitical zones and the results are presented in table 5. The results revealed that while energy poverty was acute in the North-Central it was also

acute among urban dwellers, male headed households, households in the agricultural sector and the other sectors. 95 percent of urban households suffered energy poverty, deprived of 74 percent of the weighted indicators and had MEPI of 0.70. Households headed by male, households in the agricultural sector and households in the other sectors shared similar statistics while households that were moderately energy poor were marginally below the acute cutoff of 0.70 MEPI. While the North-Central zone contributed 18.4 percent of national energy poverty, male headed households, households in rural areas and households in the agricultural sector contributed 93, 76 and 68 percent to this amount respectively, which were the highest in the zone.

The North-West which had acute energy poverty and contributed 24.43 percent to the national incidence had acute energy poverty in the urban areas and households that have more of their economic activities in the other sectors. Again, those that suffered moderate energy poverty were very close to suffering acute energy poverty with the least MEPI of 0.68 recorded in the rural and female headed households. Male headed households contributed more (99 percent) to energy poverty in the zone followed by households in occupation groups other than agriculture (81 percent) and households in the urban centers (75 percent). In the North-East energy poverty was acute in the urban centers and among households headed by females. While the zone contributed 18.77 percent of national energy poverty, male headed households contributed more (97 percent) to this amount followed by households in the agricultural sector (80 percent) and households in the urban centers (77 percent).

Table 4: Percentage Distribution of respondents according to main source of lighting

Zone	Main Source of lighting								Total
	Kerosene	Gas	Main electricity	Generating set	Battery	Candle	Firewood	Others	
South South	9.35	0.17	4.84	0.10	0.02	0.03	0.42	0.16	15.07
South East	8.69	0.13	4.53	0.08	0.01	0.02	0.47	0.15	14.08
South West	9.96	0.22	5.09	0.05	0.00	0.02	0.46	0.14	15.95
North central	11.19	0.16	5.91	0.07	0.00	0.01	0.61	0.20	18.15
North east	10.67	0.16	5.10	0.09	0.01	0.01	0.50	0.23	16.78
North west	12.37	0.22	6.46	0.08	0.01	0.03	0.60	0.22	19.98
National	62.22	1.05	31.94	0.46	0.05	0.11	3.05	1.10	100.00

Source: Authors' computation/ National Bureau of Statistics, 2010 National Living Standard Survey data

In the South-East, whereas acute energy poverty is observed among urban households, male headed households and households in the agricultural sector these groups also contributed more to energy poverty in the zone with male headed households contributing 79 percent, which was the highest, followed by households in the urban areas which contributed 77 percent and households in the agricultural sector which contributed 70 percent. Although, in the South-West energy poverty was moderate, even across sectors, gender and occupation groups, male headed households contributed more (82 percent) to the incidence followed by households in the other occupation groups (61 percent) and households in the urban areas (59 percent). Here the difference between the sections is not as large as that experienced in other zones. In the South-South geopolitical zone energy poverty is both acute and pervasive permeating all sectors, gender and occupation groups. Urban dwellers, both male and female headed households, households in the agricultural sector and those in the other sectors all suffered acute energy poverty, with male headed households contributing more (83 percent) followed by households in urban areas (77 percent) and households in the agricultural sector (60 percent).

Table 5: MEPI in the six Geopolitical Zones of Nigeria and Contribution by Sector, Gender and Occupational group

Geopolitical Zone	Headcount ratio (H)	Intensity ratio (A)	MEPI = (H*A)	Degree of Energy Poverty	Contribution to MEPH (%)
North-Central	**0.95**	**0.74**	**0.70**	**Acute**	**18.40**
Urban	0.95	0.74	0.70	Acute	23.86
Rural	0.94	0.74	0.69	Moderate	76.14
Male	0.95	0.74	0.70	Acute	93.02
Female	0.94	0.74	0.69	Moderate	6.98
Agriculture	0.95	0.74	0.70	Acute	67.81
Others	0.94	0.74	0.70	Acute	32.19
North-West	**0.95**	**0.73**	**0.70**	**Acute**	**24.43**
Urban	0.95	0.73	0.70	Acute	74.94
Rural	0.93	0.73	0.68	Moderate	25.06
Male	0.95	0.73	0.69	Moderate	98.95
Female	0.89	0.76	0.68	Moderate	1.05
Agriculture	0.95	0.73	0.69	Moderate	18.63
Others	0.94	0.74	0.70	Acute	81.37
North-East	**0.94**	**0.73**	**0.70**	**Acute**	**18.77**
Urban	0.95	0.73	0.70	Acute	76.73
Rural	0.93	0.74	0.68	Moderate	23.27
Male	0.94	0.73	0.69	Moderate	97.20
Female	0.97	0.73	0.71	Acute	2.80
Agriculture	0.95	0.73	0.69	Moderate	79.95
Others	0.93	0.74	0.68	Moderate	20.05
South-East	**0.94**	**0.74**	**0.70**	**Acute**	**13.21**
Urban	0.96	0.74	0.71	Acute	76.53
Rural	0.91	0.74	0.67	Moderate	23.47
Male	0.94	0.74	0.70	Acute	79.32
Female	0.95	0.73	0.69	Moderate	20.68
Agriculture	0.94	0.74	0.70	Acute	70.35
Others	0.94	0.73	0.69	Moderate	29.45
South-West	**0.94**	**0.73**	**0.69**	**Moderate**	**11.75**
Urban	0.94	0.73	0.69	Moderate	59.08
Rural	0.93	0.73	0.68	Moderate	40.92
Male	0.94	0.73	0.69	Moderate	82.41
Female	0.94	0.73	0.69	Moderate	17.59
Agriculture	0.95	0.73	0.69	Moderate	39.46
Others	0.94	0.73	0.69	Moderate	60.56
South-South	**0.94**	**0.74**	**0.70**	**Acute**	**13.45**
Urban	0.95	0.74	0.71	Acute	76.70
Rural	0.91	0.74	0.67	Moderate	23.30
Male	0.94	0.74	0.70	Acute	82.95
Female	0.94	0.74	0.70	Acute	17.05
Agriculture	0.95	0.74	0.70	Acute	59.82
Others	0.94	0.74	0.70	Acute	40.18

Source: Author's Computation

5. CONCLUSION

Based on the findings, this study concludes that energy poverty in Nigeria is both acute and pervasive, permeating all zones, sectors, gender, and occupational groups. In showing that 95 percent of Nigerians suffered energy poverty and are deprived of 74 percent of the weighted indicators, and adjusted the head count ratio, MEPI of 70 this study differs from that of Ogwumike and Ozughalu (2012) who showed that 75.5% of Nigerians are energy poor but failed to report the intensity ratio and the MEPI. It also differs from that of Nussbaumer, et al, (2011) who showed that 81% of Nigerians were energy, poor but similar in terms of their reported intensity ratio. By reporting the distribution of MEP, according to geopolitical zones, gender, occupational groups and sector the study further differs from Nussbaumer, et al (2011) and Ogwumike and Ozughalu (2012) who failed to do so. In

reporting the zonal measures of multidimensional energy poverty in the south-south geopolitical zone the study is similar to Edoumiekumo et al, (2013) but Edoumiekumo et al (2013) went a step further to show MEP measures in the six states of the zone in which this study failed to take into account. This study, however, went a step further to show MEP measures in each of the six geopolitical zones and the rural-urban, male-female and agriculture-other sectors' dimensions at the national level and in each of the geopolitical zones which none of the studies reviewed considered. This study is totally different from that of Edoumiekumo and Karimo (2014) who focused on multidimensional energy poverty in Bayelsa State of Nigeria in that this study is an aggregate and zonal level study. The study is also similar to Sher et al (2014), who measured Multidimensional Energy Poverty (MEP) at the provincial level in Pakistan, Punjab, Sindh, Khyber Pakhtoon Khaw (KPK) and Baluchistan provinces respectively, but they also failed to report the rural-urban, male-female, agriculture-other sectors' dimensions of energy poverty headcounts respectively.

6. RECOMMENDATIONS

This study recommends as follows:

- Local and State governments should be encouraged to invest aggressively in rural electrification projects. Non Governmental Organizations and donor agencies can also contribute in this direction. Multinational corporations are also encouraged to under rural electrification projects as part of their community development service.
- Urban centers should be connected to the national grid
- Government should collaborate with higher institutions of learning and invest in research and development of modern and clean energy sources.
- Available clean energy should also be made available at affordable prices to all.
- These will not only combat energy poverty, but also lower the cost of doing business and in turn provide needed environment for small and medium scale businesses to thrive. More people will become self-employed, generate income and gradually move away from poverty.

REFERENCES

Clancy, J. S. and Skutsch, M. and Batchelor, S. (2003), Finding the energy to address gender concerns in development, UK Department for International Development DFID Project CNTR 998521.

Edoumiekumo, S. G. and Karimo, T. M. (2014). Multidimensional Energy Poverty in Bayelsa State of Nigeria: Implications for Sustainable Development. *African Journal of Social Sciences, 4 (1): 135-145.*

Edoumiekumo, S. G., Tombofa, S. S. and Karimo, T. M. (2013). Multidimensional Energy Poverty in the South-South Geopolitical Zone of Nigeria. *Journal of Economics and Sustainable Development, 4 (20): 96-103.*

Elahee, K. (2004). Access to energy: The key to poverty alleviation, The Small Island Developing States.

IEA, UNDP, and UNIDO (2010). Energy Poverty – How to make modern energy access universal? Special early excerpt of the world energy outlook 2010 for the UN General Assembly on the Millennium Development Goals. Paris: International Energy Agency.

Jain, G. (2004). Alleviating energy poverty: Indian Experience. Regulatory Studies and Governance Division, *The Energy and Resources Institute*.

Marcio, G.P., Aure, M. Freitas, L.V., Silva, N.F. (2010). Rural Electrification and energy poverty: Empirical evidences from Brazil, 14, 1229–1240.

Mirza, B. and Szirmai, A. (2010). Towards a new measurement of energy poverty: A cross-community analysis of rural Pakistan. United Nations University – Maastricht Economic and Social Research and Training Centre on Innovation and Technology Working Paper Series 024. .

Nussbaumer, P., Bazilian, M., Modi, V., and Yumkella, K. K. (2011). Measuring energy poverty: Focusing on what matters. Oxford Poverty and Human Development Initiative Working paper No. 42, Oxford University .

Ogwumike, F. O. and Ozughalu, U. C. (2012). Analysis of Energy Poverty and Its Implications for Sustainable Development in Nigeria. Unpublished.

Pachauri, S., Muller, A., Kemmler, Spreng, D. (2004). On measuring energy poverty in Indian households. *World Development, 32(12): 2083–2104*.

Sher, F., Abbas, A. and Rehmat, U. A. (2014). An Investigation of Multidimensional Energy Poverty in Pakistan: A Province Level Analysis. *International Journal of Energy Economics and Policy, 4(1): 65-75*

Stephen, K., Kimani, J., and Amenya, S. (2004). Improving energy access: Possible contribution of RETs to poverty alleviation. Global Network on Energy for Sustainable Development.

Tennakoon, D. (2009). Energy poverty: Estimating the level of energy poverty in Sri Lanka, Practical Action, Intermediate Technology Development Group, United Nations.

Pasternak, A. D. (2000). Global Energy Futures and Human Development: A Framework for Analysis. Lawrence Livermore Laboratory, U.S. Department of Energy, October