LOCAL ENERGY INITIATIVES AS A SOLUTION TO THE ENERGY SECURITY IN DEVELOPING COUNTRIES

(Case Study of Selected Housing Estates in Lagos, Nigeria)

By

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ABSTRACT

The need for improved energy supply and increased energy access in Nigeria cannot be overemphasized. Access to energy is fundamental to socio-economic development and poverty alleviation. Renewable energy is a promising solution to the energy crisis in Nigeria this is because they are inexhaustible, sustainable and can be set up in small units which made them suitable for community management and ownership. A well formulated and implementable renewable energy policy is needed to drive the process of formation of community based energy generation and adoption of renewable energy technology.

In this research, local energy initiatives as one of the possible solution to energy security problems in developing countries using two estates in Nigeria as our case study. In this research we see local community sustainable energy initiatives as an expression of the general notion that cooperation among people for a common purpose yield good result compared to when done individually. The main research question is **"Can local energy initiative contribute to a sustainable energy future and energy security in Nigeria"?** The goal is to stimulate the two estates on the possibility to generate and control their energy bills through the concept of LEI.

A specific model to analyze the development of local energy initiative could not be found in literature for this purpose we reviewed several literatures on local energy initiatives in Europe. Therefore an integrated conceptual framework was developed for the uptake of LEIs in developing countries for which the theoretical foundation is derive from diffusion of innovation, stakeholders analysis and the integrated model developed by (Dieperink & Boon, 2014) for assessing, fostering and hindering factors in Netherlands. This framework has a checklist of several stakeholders that could participate in the establishment of LEIs, processes of formation of LEIs and the various aspect to be considered such as the three pillars of sustainability, technology, existing regulation, socio-cultural characteristics and market for RET. A total number of twelve stakeholders and actors was interviewed in the energy sector and one hundred and twenty four households responded to our survey questionnaires. In the process we were able to gather information related to barriers, support structures and perception of people towards LEI.

According to the information gathered in the course of this research; Local energy initiative can increase the access to energy services in developing countries as well as contribute to a sustainable energy future. The stakeholders expresses a positive opinion over local energy initiative as a viable tool to increasing energy access especially to the rural communities that are yet to be connected to the grid. They all said LEI is feasible but will only be sustainable should the government regulation support its development and the community members are adequate trained on the maintenance culture.

This research has reveal the need for a bottom up approach to energy generation and increased energy access tackling a wide range of issues such as barriers, intervention strategies and support

structure need for this concept. With appropriate policy support such as financial and fiscal incentives, robust awareness and education and a few pilot projects, we are optimistic that community based energy initiative can be developed, sustained and achieve its full potential as one of the solution to the energy security problems in developing countries and play a role in the sustainable energy transition in the world at large.

DEDICATION

This Thesis is dedicated to the Blessed memories my Late Parents Mr. and Mrs. Samuel Ogunleye. May your gentle souls continue to rest in the bosom of our creator.

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LIST OF ACRONYMS

CEMAC	Economic Community of Central Africa States
ECOWAS	Economic community of West African states.
EU	European Union
ECAs	Export Credit Agencies
EAC	East Africa Community
ECN	Energy Commission of Nigeria
EKEDC	Eko Electricity Distribution company
FEMA	Forum of Energy Ministers of Africa
FMP	Federal Ministry of Power
GHG	Green House Gases
GIZ	Deutsche Gessellschaft Fur International Zusammenarbeit
LEA	Lagos Energy Academy
LEIs	Local Energy Initiatives
LSEB	Lagos State Electricity Board
LaSG	Lagos state Government
MDG	Millennium Development Goals
NBS	National Bureau of Statistics
OECD	Organization for Economic Cooperation and Development
REMP	Renewable Energy Masterplan
RE	Renewable Energy
RET	Renewable Energy Technology
RQ	Research Question
NERC	Nigeria Electricity Regulatory Commission
NESP	Nigeria Energy Support Program
NREEEP	National Renewable energy and energy efficiency policy
NEPAD	New Partnership for Africa

PHC	Primary Health Centre
PV	Photovoltaic
IEA	International Energy Agency
IKEDC	Ikeja Electricity Distribution Company
IPCC	Intergovernmental Panel on Climate Change
UNDP	United Nation Development Program
UNEP	United Nation Environment Program

CHAPTER1: INTRODUCTION

The theme of this research is local community sustainable energy initiative as one of the possible solutions to the energy security issues in developing countries particularly with the supply of electricity. In this research we see local community sustainable energy initiatives as an expression of the general notion that cooperation among people for a common purpose yield good result compared to when done individually. The access to affordable, modern energy is a prerequisite for sustainable development and poverty alleviation and more specifically, for achieving each of the Millennium Development Goals (MDGs). The assumption is that networks and social relations are important determinants of individual's access to resources including energy and in particular access to knowledge and skills, funds, energy and information. The role of the different stakeholders in the energy sector particularly the electricity sector (end-users and suppliers) need to be examined in other to know the possibility of community to take up initiative.

The drive to mitigate climate change and opportunity to empower consumers in the developed and developing worlds, all points towards a less centralized energy generation, the research case is Nigeria (Volkmar, 2005). While liberalization of electricity industries has for long taken place in many developed countries of the world, Nigeria is just in the process of liberalization of its electricity market. The liberalization of this industry has promoted local energy production and usage in many countries including Netherlands and Germany, this is due to the fact that local energy initiatives are allowed access to the grid, and people are able to generate energy and sent it to the grid.

The role of different stakeholders in the energy sector particularly the electricity sector (end-users and suppliers) was examined in other to find out the possibility of individual community to take up energy initiative and to study the barriers and obstacles of the initiatives with experience from the Western Europe.

1.1. Background

Nigeria is the biggest hydro power producer and has the largest oil reserves in the Economic Community of West African States (ECOWAS). The country also has huge potential for renewable energy some of which include natural gas, wind and solar. However, the country's electricity sector is unable to meet the increasing demand for electricity. Currently only half of the installed capacity of 8,900 megawatts is available on the national power grid, which prevent 60% of the population from electricity access (GIZ, .2013)

With the population of about 165million (NBS, 2012) and a GDP of 5.09%, 6.66% and 7.14% for the years 2011, 2012 and 2013 respectively, (NBS, 2014), Nigeria is the most populated and fastest growing economy in Africa. Nigeria's economy surpasses South Africa's as the largest on

the continent after the West African Nation overhaul its gross domestic product for the first time in two decades (Bloomberg, 2014).

(Omoju, 2014) Stated that over the past few years, the various reforms embarked upon by the government has not been able to address the electricity crisis. Huge financial commitment has being budgeted for the sector in the past but in terms of output, generation of electricity have not seen any significant improvement; in some cases, it even deteriorated especially the transmission and distribution network cables. As a result, the growth of the economy as well as the drive for industrial development, poverty alleviation and unemployment reduction has been severely hampered. On the back of the previously failed reforms, the present administration in 2010 initiated a new reform known as the "Power Sector Reform Roadmap". It was on the Electric Power Sector Reform Act of 2005.

The reform aims to generate 40,000 MW of electricity by 2020 while expanding generation and transmission capacity and also improving the market structure (Omoju, 2014). The reform process has been completed with the handing over of the power plants to successful bidder companies. There are high expectations that the present reform will improve electricity supply and aid the much anticipated economic diversification and development in Nigeria.

However, Oluwasola Omoju in his article argued that though the present reform is a step in the right direction, there are new obstacles that need urgent attention to ensure regular, reliable and sustainable electricity supply in the long term. In other words, the present reform is essential but not enough for stable power supply in Nigeria in the long-term.

The current generated electricity capacity is 3,920MW with per capita power capacity of 28.57W and this is grossly inadequate even for domestic consumption (Ibidapo-Obe and Ajibola, 2011). For Nigeria to meet up its energy needs, it requires per capita power capacity of 1000 Watts or power generating capacity of 140,000MW as against the current capacity of 3,920MW. Consequently availability of power in the country varied from about 27% to 60% of installed capacity, while transmission and distribution losses accounted for about 28% of the electricity generated in the country (Omokaro, 2008).

From 2005 to date, several independent power projects has being commissioned by the federal government in other to improve the electricity supply in the country. However the project encountered some problems such as corruption, bureaucratic bottleneck, inadequate gas supply and obsolete infrastructures which has impeded the project from achieving its targeted purpose (CREDC, 2007).

The research aims to contribute knowledge towards possibilities of stimulating communities and neighborhoods toward formation of local energy initiative even as the government has reiterated her commitment to add 4000MW of electricity to the grid every year. Local energy initiatives if taking up could contribute considerable amount to this figure but then there are perceived

barriers and obstacles to this, which the research will also aim to find out and perhaps suggest solution to it.

1.2. Problem Statement

All societies including the Nigerian society require energy services to meet basic human needs (e.g., lighting, cooking, space comfort, mobility, communication) and to serve productive processes**.** For us to achieve a sustainable development, we need to start the delivery of energy services in a secure way which have low environmental impacts. Sustainable social and economic development requires assured and affordable access to the energy resources necessary to provide essential and sustainable energy services (IPCC, 2012).

This may mean the application of different approaches at different stages of economic development. To be environmentally benign, energy services must be provided with low environmental impacts and low greenhouse gas (GHG) emissions. However, 85% of current primary energy driving global economies come from the combustion of fossil fuel and consumption of fossil fuels accounts for 56.6% of all anthropogenic GHG emissions (IPCC, 2012).

It is widely accepted that there is a strong relationship between the access to energy services and socio-economic development. This explains why electricity demand is increasing rapidly in Nigeria. Regular and reliable electricity supply is crucial for the industrialization and economic development. Despite the abundance of various primary energy resources in Nigeria, the country still struggles to generate adequate electricity for its growing population and to support the economy.

Only 40% of households in Nigeria are connected to the national electricity grid. Provision of electricity is largely supplemented by private producer or use of individual electricity generators powered with fossil fuel for the privileged income groups. Over 90% businesses and companies have private generators leading to high cost of production. This has crippled many small and medium scale enterprise and exacerbate the crime rate in the country. (Omokaro, 2008).

The present dependence on fossil fuel (petroleum) is not sufficient to meet the energy needs of the country. Interest in renewable energy development and dissemination in Nigeria is motivated by, among others, epileptic power supply to the majority of the population as well as high cost and energy losses associated with grid extension. The government had made effort through her several power reform programs and policies to attract private participation, thus encouraging renewable energy development. However there are hindrances, mainly due to the technical and financial barriers, that need to be overcome for this to be a reality (Sambo , 2009).

In Europe for example, local energy initiative are being set up by interest groups or volunteers for different motivations some of which include energy security, climate change, lower energy bills while in Netherlands many municipality see local energy initiatives as tools to meet the European union target (EU: 20:20:20) which simply means, that in the year 2020, EU member

states want to have 20% renewable energy in their energy mix, 20% reduction in the use of fossil fuel.

Germany already surpass (25%) the European Union target, this was made possible by local energy initiatives by communities and municipalities. (Hoppe, Graf, Warbroek, Lammers, & Lepping, 2015) Opined that Saerbeck klimakommune a sustainable village in West Germany, has already provided a clue as to the extent to which local energy initiative could help provide solution to the present electricity crisis and climate change problem confronting developing countries and indeed Nigeria. if the government of Nigeria will allow decentralization of the grid system, allow investors to build micro- grids in each local government area, allow public access to the grid, promote the use of renewable energy usage, gives loans and subsidy to interested local communities the issue of electricity crisis will be a thing of the past.

1.3. Research Objectives

Renewable energy plays a very important role as regards providing energy services in a sustainable manner in the sense that they are abundant and are inexhaustible and without any environmental challenges. However, rising concerns about the security of supplies have led to a global search for alternative energy sources (Temilade , 2008).

The motivating factor for Nigeria society to embrace renewable energy is not just for energy security alone but fossil fuel exploration and usage has been chief source of the current environmental and social problems facing Nigeria such as climate change, air and noise pollution from generators and transportation, water pollution from oil exploration, mining accident, oil bunkering and pipeline vandalization in the oil producing region.

The economic, social and cultural development of human society is highly dependent upon a regular and reliable supply of energy. Sustainable development is therefore only possible, if our society attempts to find and implement environmentally sound, socially acceptable and economically viable means to acquire its energy sources, all this can be achieved in Nigeria through the concept of local energy initiative. According to (IPCC,2012), It requires systemic and holistic innovations that include a sustainable supply of resources, the development of highly efficient technical solutions and the adaptation of energy systems to the environmental, economic and cultural context as well as the social and political framework to enable sustainable energy system to be implemented for the welfare of mankind.

The broad objective of this research is not to solve the current energy crisis in Nigeria rather it is to investigate how local energy initiative could be used to proffer solution to the energy security issues in Nigeria.

The research objectives are:

1. To investigate the barriers and obstacles that could prevent the take up of local energy initiatives in Nigeria.

2. To investigate if there are any existing LEIs in Nigeria, and if not, assess the perception of people towards taking energy initiatives.
3. To investigate the support structure that is required to support local energy initiatives to thrive in Nigeria.
4. To formulate recommendations to the policy makers based on the results of the empirical study.

1.4. Research Questions:

The main research question is as follows:

Can local energy initiative contribute to a sustainable energy future and energy security in Nigeria? The following are the Sub-question,

1. What is the extent of the energy crisis and access level in Nigeria?

2. What are LEIs, how could they, on the basis of experience in Europe, contribute to a sustainable energy future and energy security (access) in developing countries and what are the potential barriers?

3. What are the experiences with LEIs in Nigeria?

4. What are the perceptions of people towards the concept of LEI in Nigeria?

5. What are the barriers for development and adoption of LEIs and RET in Nigeria

6. What are the potential drivers, factors and intervention strategies that can motivate people to adopt LEI concepts in Nigeria?

7. What Support structure will be needed or is currently in place for LEIs in Nigeria and what can be learnt from LEI support structures in Europe?

1.5. Significance of Research

This study will help to collect important data and information needed for the planning and formation of Local Energy initiatives by communities toward energy security for social and economic benefits of Nigerians.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Energy is one of the essential inputs for socio-economic development (Johansson & Goldemberg, 2002). This fact coupled with the strong links between energy and the millennium development goals (MDGs) made it even more necessary to address the challenges and prospect of energy services in sub-sub-Saharan Africa (Karekezi, 2002a; Karekezi and Majoro,2002;Modi,2004; Modi et al.,2005;Porcaro and Takada,2004, Brew-Hammond, 2010).

That the supply of energy services is important but not sufficient condition for sub-Sahara Africa to pull itself out of poverty is not in doubt. That energy services should be seen as one of the means rather than the end is also not arguable. What is arguable is how sub-Sahara Africa can go about meeting the energy needs of the ever growing population and whether or not the government and the people of the region will be able to mobilize the resources needed to make this a reality (Brew-Hammond, 2010).

The new partnership for Africa's Development set the ball rolling by putting forward a strategic development vision with clear objectives for meeting the energy needs of the region (NEPAD, 2001). The forum of Energy Ministers of Africa (FEMA) and several sub-regional economic communities, notably the Economic Community of West African States (ECOWAS), the East Africa Community (EAC) and the Economic Community of Central African States and the Economic Community of Central African States (CEMAC) followed suit to initiate energy strategies towards achieving the MDGs and realizing the NEPAD objectives (Brew-Hammond, 2010).

The International Development Organizations have been very active in assisting the sub-Saharan Africa states gain access to electricity through various energy programs especially in the rural areas. To mention but few, the Nigeria energy support program (NESP) being undertaking by the Deutsche Gessellschaft fur International Zusammenarbeit (GIZ) GmbH, on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ and the co-financing by the European Union (EU) with aim of supporting the Nigerian Federal Ministry of Power (FMP) and other public and private partners to improve access to sustainable energy. World Bank reported that they have harnessed insights from a wide range of development partners to put forward an Action plan for Energy Access in Africa based on the investment Framework on Clean Energy and Development (World Bank, 2006).

2.2 OVERVIEW OF ENERGY SECURITY PROBLEMS IN DEVELOPING COUNTRIES

Since the global oil crisis of 1973, many nations of the world have espoused what they called "energy security" as a primary objective of energy policy. They have yet, however, to realize in practice just how different the 'security' issue is, particularly for electricity policy. Walt Paterson (Patterson, 2007) in his book explained this concept as to how the politicians construe 'energy security' or 'security of supply' to mean secure supply of affordable fuel for electricity, especially oil and more recently also natural gas.

For fuel-based electricity, government in most OECD countries appear to believe that the main problem for security of supply is now with import of natural gas, potentially over long distances and from regions political unstable such as Iraq, Iran, Libya. As regards electricity what matters most is the security of supply of the services delivered by electricity. What matter most is that the lights must stay on (Patterson, 2007).

Energy security simply means reliable and regular access to energy services. The best way to minimize energy insecurity by local community is to take energy initiative and reduce dependence on electricity from the grid. The objectives of taking such initiatives in western world as observed are to make the price of a unit of electricity, a kilowatt-hour, as low as possible, retain money in the local community, create sustainable jobs and mitigate climate change. What electricity users want is reliable services-keeping the lights on. Although we know that the anticipated low price unit and reliable electricity may not be compatible but with community initiative and social cohesion this could be achieved.

The term "energy access" has been used to mean "ability to use energy" Namely electricity, charcoal or some other form of energy. Access to energy services means the ability to use energy services. Modi et al.,(2005), Brew Hammond,(2010) have described energy services as "the services that energy and appliances provide…lighting, heating for cooking, heating and cooling space, power for transport, water pumping, grinding and numerous other services that fuels, electricity and mechanical power make possible."

IEA (2006) states that there is no single internationally accepted definition for electricity access. Quite often is a differentiation between household accesses where one is able to use electricity in the home through the grid electricity, sometimes described in terms of the "penetration rate", which simply refers to the proportion of a geographical area covered by the grid, irrespective of how many households are connected. Access to electricity also refers to the availability of electricity in areas not reached by the grid. In this case, electricity is provided by a decentralized or stand-alone power source (petrol and diesel generator), or a renewable energy device (solar PV, wind turbines or biogas digester).

(Ranjit & O'Sullivan, 2002) Argue that "access" refers to a household's ability to obtain a modern energy service, should it decide to do so. In case, access is a function of availability and affordability, where energy is considered to be available if the household is within the economic connection and supply range of the energy network or supply, and energy is affordable when the household is able to pay the up-front connection cost and the energy usage cost.

In this context, an increase in the cost of energy may cause poor households to be less willing to switch to a modern form even though this may be available, denying the household access to the energy form in question. (Ranjit & O'Sullivan, 2002) argued this further that availability and affordability are interrelated, so that if the policy maker decides to maintain energy prices below costs, in order to make energy more affordable to the poorest households, it may actually lead to reduction in availability, as the provider may find it less cost effective to extend coverage to areas where the poor resides.

2.2.1 Current access levels and Projection

The percentage population of people relying on traditional biomass for cooking seems be high in sub-Saharan Africa when compared with other developing countries in the world (see Fig 2.1). At the national level, many countries like Liberia, Burkina Faso and Tanzania have more than 95% of their population relying on traditional biomass for cooking and heating. Access to modern energy system for cooking is therefore very low in most sub-Saharan countries (Brew-Hammond, 2010). In the east Africa region for instance, less than 30% household use LPG or improved cook stoves (EAC, 2006 and EAC, 2007).

In West Africa, Senegal has more than 20% of its population using LPG, while Ghana has less than 10%. Many land-lock countries like Mali and Niger are worse off (ECOWAS, 2006, GOG, 2006).

Taking a closer look at the distribution of modern energy access across Africa, the mission to widen energy access is supported by power initiative with the US government having committed more than $7billion, through a combination of loans, grants, credit enhancements and technical assistance. Private companies have agreed to put up an additional $9billion (US Government, 2013) with partner countries already include Ethiopia, Ghana, Kenya, Liberia, Nigeria and Tanzania; around 40% of those who could not have access to electricity in sub-Saharan Africa live in these countries. In Latins America, the overall level of access to electricity is high with Brazil leading the pack, but some countries like Honduras (83%), Guatemala (82%) and particularly Haiti (28%) still have relatively low electrification rates (IEA, World Energy Outlook, 2013).

With primary energy supply in the continent representing only about 5% of the World's total, the energy use per capita in Africa is about the lowest in the world estimated at 0.67toe in 2008, representing an increase of just 10% against 1990 figures (International Energy Agency (IEA), 2011); the energy use per capita in Africa is about 11% and 5 times less than that of the US and EU-27, respectively. There is also a huge gap between modern energy access in the rural and

urban areas. According to International Energy Agency in 2011, over 80% of the people lacking access to electricity and modern energy for cooking reside in the rural areas, with a larger chunk of these people in Sub-Saharan Africa and South Asia.

UNEP in their recent report on Africa stated that about 600million people have no access to reliable power supply from grid, with the figure estimated to rise to 700milion in 2030. They have no option than to depend on polluting and dangerous sources of lighting such as kerosene lamps, candles and battery-powered torches with the poorest of people sometimes spending as much as 10% of their income on fuel for light. Poor households are buying lighting at the equivalent of $100 per kilo-hour, more than 100times the amount paid by people in the western countries (UNEP, 2015)

Fig 2.1 shows the estimate of the number of people without access to modern energy services by region, 2011. The problem seems to be worse in sub-Saharan countries such as Nigeria, Uganda, Kenya and Tanzania. Developing Asia accounts for more than 70% of the global total and includes seven of the world largest population without access to modern cooking facility. In India, 818 million people, or around two-thirds of the population, rely on traditional biomass-almost twice as in China, which is ranked second (IEA, World energy Outlook, 2015).

Table 2.1 Number of people without access to modern services by region, 2011

	Population without access to electricity	Share of population	Population that use biomass for cooking	Share of population
Brazil	1	1%	12	6%
Africa	600	57%	696	67%
Nigeria	**84**	**52%**	**122**	**75%**
South Africa	8	15%	6	13%
India	306	25%	818	66%
Indonesia	66	27%	103	42%
Pakistan	55	31%	112	63%
China	3	0%	446	33%
Middle East	19	9%	9	4%
world	1258	18%	2642	38%

Source: IEA World Energy outlook electricity access data base (WEO-2013, P.89)

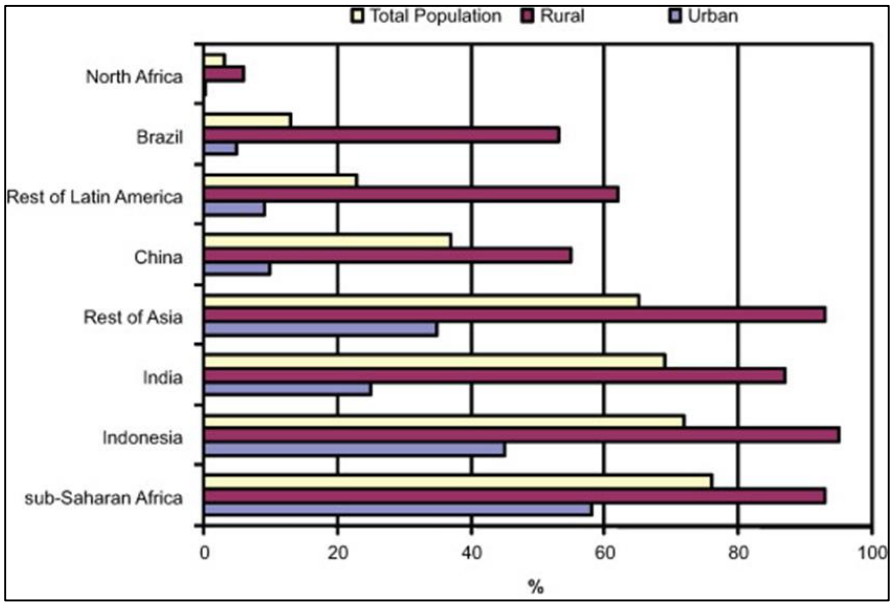
Electricity transmission and distribution losses are also on the increase in many African countries. For example, electricity distribution losses are over 20% in Senegal, Ivory Coast and Ghana while reaching as high as 55% in Botswana (IEA, World Energy Outlook, 2011). The electricity supply to those connected to the grid is also highly unstable and epileptic. Most Sub-Saharan Countries

experience between 50–170 power outages per year with an average power outage lasting between 5–12 hours (Ramachandran, 2008), resulting in significant losses for enterprises in foregone sales and damaged equipment (Eberhard, et al., 2008).

The electricity crisis in Africa does not only affect household but big and small scale industries alike. As a matter of fact industries in Africa and indeed in Nigeria rely on private generators (own generation), which are usually diesel-fired to supplement the short and epileptic electricity supply from the grid, thus increasing the cost of production, further exacerbated by increasing prices of fossil fuels.

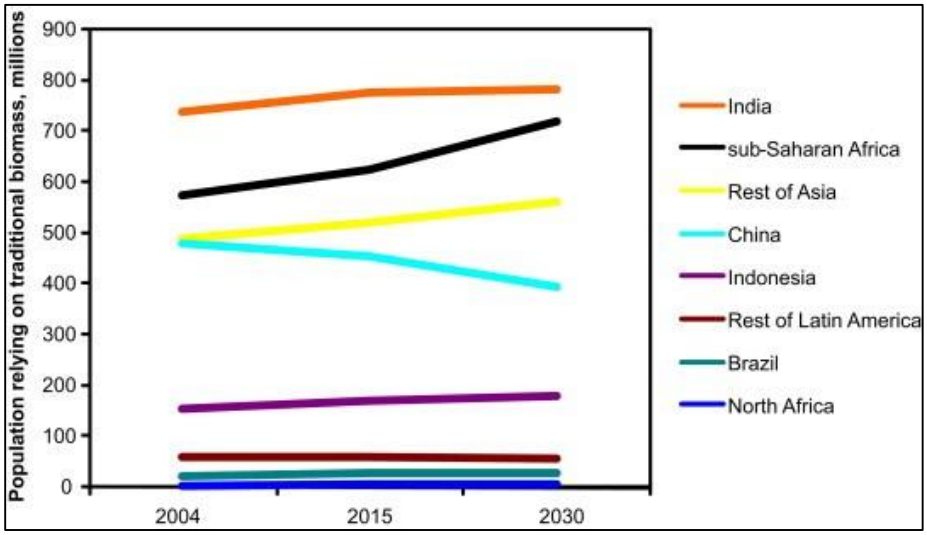
According to the World Bank (2011), over 50% of firms in Africa identify poor availability of electricity as a major constraint for doing business. The poor state and low capacity of electricity infrastructure in Sub-Saharan Africa have led to high electricity generation costs. Today some 25 countries in sub-Saharan Africa are facing a crisis evidence by rolling blackouts. Although the African continent is well endowed both with fossil fuels and renewable resources, these are not evenly distributed, creating windfall profits for some countries and exacerbating the crisis in others.

Figure 2.1proportion of population relying on traditional biomass



Source: (ECOWAS, 2006)

Figure 2.2: Projections of people relying on traditional biomass for cooking



Source: *IEA (2006).*

It is important to note that among the developing regions presented above, North Africa has the least number of people relying on traditional biomass, less than 10 million out of a total population of over 200 million; this is in sharp contrast to sub-Saharan Africa where the corresponding number is expected to rise from around 600 million people today to over 700 million in 2030 as earlier mentioned. It is also worthy of note that for those developing regions with high economic growth rates the number of people relying on traditional biomass are projected to either stabilize as in the case of India, or decrease in the case of China. Should these occur and continue beyond 2030 then sub-Saharan Africa could find itself as the developing region with the largest number of people relying on traditional biomass within the next 30–50 years (IEA, World Energy Outlook, 2011).

There is also a huge gap between modern energy access in the rural and urban areas. According to the International Energy Agency (IEA, 2011), over 80% of the people lacking access to electricity and modern energy for cooking reside in the rural areas, most of which resides in Sub-Saharan Africa and South Asia. This also establishes the clear link between access to modern energy services and income as 75% of the World's poor live in rural areas, mostly in Sub-Saharan Africa and South Asia (World Bank, 2008).

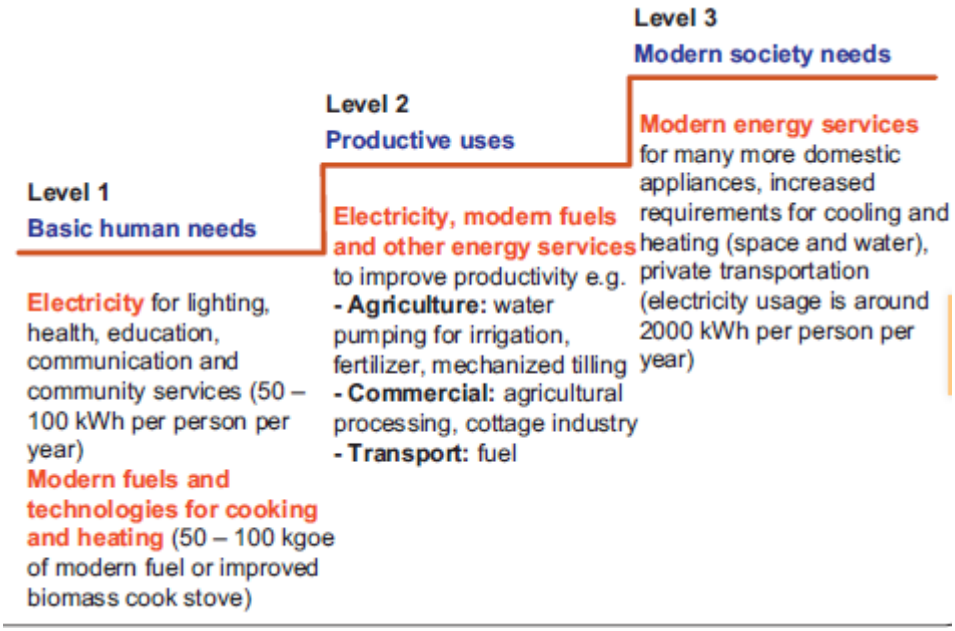


Figure2.3 Incremental access to energy services Source: AGECC (2010)

2.3 LOCAL ENERGY INITIATIVES.

What are LEIs?

Local energy initiatives are bottom-up ideas towards energy independence from the central grid system. It is usually associated with community level operations, this means that project that involve community ownership-through financial investment and managerial control by or on behalf of groups of 'members of the public'- and can be 100% community owned, or maybe developed under co-ownership arrangements with private sector (Walker, 2008).

Renewable energy is already in use across the world. Providing reliable and clean power to the people in rural and urban areas on low incomes and contributing to grid power. In Nigeria for instance, some of the project undertaking by politicians representing certain constituencies are either solar powered street lighting or boreholes. (UNDP, 2000) supported this claim by stating that renewable energy can promote energy security by decentralizing energy supplies with micro, mini, modular and rapidly deployable energy projects that are particularly suited to the electrification of rural communities in developing countries.

If Nigeria and indeed developing countries are to achieve a secured energy access over the next decade or more, the actors and policy makers have to include local energy initiative as one of the strategies to meet up their energy policy target. Local entrepreneurs, and Local government have to be motivated to provide community based electricity generation. (Allen et al., 2012) reiterated this in their article by stating that policies with top-down targets promotes the quick fix rather

than the most sustainable scheme, and institutional and social barriers inhibits the local action needed to identify, plan and deliver the most valuable and appropriate alternatives..

2.3.1 Local energy initiatives-lesson from Western Europe.

Research question 2: How could they on the basis of experience in Europe contribute to a sustainable energy future and energy security (access) in developing countries?

The twin sustainability challenges of climate change and energy security require fundamental shifts in nature of large scale energy systems (Grin, Rotmans, & Schot, 2010) by decentralizing energy network somewhat, it is possible to concur many of the constraints and risks associated with the current centralized system such as transmission and distribution losses. In decentralized networks, building become the power stations and communities become active and informed producers and consumers (Allen, Sheate, & Chavez, 2012).

Local community sustainability initiatives are of various forms and they are increasingly common in the past decade. Predominately state-led sustainability effort has shifted to community driven initiatives since 1990s. Less conspicuously, the Global Ecovillage Network, which has a long history, has experienced a recent increase and has perhaps thousands member communities (Forrest and Wiek 2014).

In Germany, the Federal Republic of Germany's renewable energy act coupled with the EU-27 vision 20:20:20 motivated the uptake community-scale development of renewable energies. Agencies, involved include financial institutions, states and local governments but the residents of the communities play a big role in the initiation of community based energy initiatives.

Although without the government and financial institution 100% success of some of these community project may be an illusion. The fundamental idea for building sustainable communities is to create a partnership network for collective actions among various stakeholders (Li, Janine, Harald, & Werner, 2013).

In Denmark, in 2001, an estimated 150,000 households owned or held shares in wind turbines, while in Germany an estimated 350,000 individuals owned shares in wind cooperatives. In Austria, biomass district heating projects are now widespread, including some under models of cooperative ownership (Walker, 2008)

In order to overcome the current energy security the use of RE such as wind, solar and bioenergy will increase sporadically in the coming years in many European nations and hopeful in developing countries including Nigeria. (Scholtens & Van der Schoor, 2015), in their opinion expected LEIs to play a relevant role in energy transition by their creation and implementation. Already there exist over 300 of such initiatives in the Netherlands and countless number of it in Germany, with approximately 60 LEIs in Friesland provinces alone some of which were created in the early 1990's.

This community option is becoming a serious business, as witnessed by the growing figure of local energy initiatives that are taking off in several European countries in the past few years (Walker et al., 2010, van der Schoor and Scholtens, 2015). We are of the view that if this knowledge could be transferred to developing countries with proper policy support, funding and trust, it could help to ameliorate the problem of electricity crisis and increase the current access level of energy in developing region.

2.3.2 Model of Local Energy Initiatives

Local energy initiatives vary in origin, motives, resources and approach, several common features are discernible: they are very small and usually found in a place typically small towns, village, or neighborhood; they are generally community driven "grassroots" they have gone beyond single-issue actions to "managed", multi-stranded programs; they are oriented towards sustainability. Some of these initiatives are mainly organized by volunteers which involves community members to implement projects intended to produce sustainability related outcomes (Forrest & Wiek, 2014) . Examples of projects includes household energy conservation, community- run mini-bus that drives on biogas, solar PV powered borehole and community wind farm to mention but few.

Although they are professed self-deterministic and bottom-up, the initiatives may owe something to national policy. Initiatives are more common in post-industrial countries, possibly even more in Anglophone countries and U.K. appears to have the highest concentrations of various types-Certainly this is true for transition towns (Forrest & Wiek, 2014)

Projects could be 100% owned by a community, or may be developed under co-ownership arrangements with the private sector as the case of the solar park proposed to be built in Ameland Island in the province of Friesland in Netherlands which is co-owned by the municipality of Ameland and ENECO an energy company and the Solar pack located in Saerberk with 24,000 solar panels and its fully owned by the community. Projects can involve the financing and ownership of energy production that is fed to the grid, rather than being used locally, or combine the locally owned production and consumption of energy as witness in Saerberk in Germany very typical example of a bottom-up approach.

But in general the various models of community energy initiative includes cooperatives owned, community charity, development trust, shares owned by local organization (See Walker, 2008) for details explanation of the different models.

2.3.3 Perceived barriers and challenges of LEIs

What are the potential barriers?

The first barrier that could be witnessed towards the uptake of local energy initiatives in developing countries is the lack of policy support and regulatory frameworks. (Dunning & Turner, 2005) Buttressed this by emphasizing that the formation of community energy project involves many complexities, whichever model of development is adopted and these include the legal conditions under which organizations or projects can operate, establishing a scheme of economic and technical viability. (Yael, Jo, Vickie white, & Bernie, 2013) Also reiterated this by identifying lack of thorough understanding of how they work in practice, and how best to support and develop effective local energy governance as one of the many barriers to LEIs.

Another barrier that could be faced by LEIs is the issue of funding. Due to the high investment cost of the clean energy technology, LEI without good financial strength will not survive. Although in many part of Europe such as the Netherlands as observed, the federal government has made financial commitment in form of grants and subsidies towards RE and LEIs which the various municipalities could assist initiatives to access e.g. is the SDE.

Startup finance for RE and LEIs could pose a great threat to such initiatives in developing countries as funding mechanism such as development agencies and export credit agencies (ECAs) often lack specific lending portfolios for clean energy and energy efficiency projects. (Volkmar, 2005)

Lack or low level of awareness could also serve as a potential threat to LEIs. Communities often have little knowledge of the potential opportunities and benefits of community renewable energy (walker et al. 2007, Allen et al., 2012). More must be done to educate communities and businesses. Furthermore, most actors and institutions do not have the time, or indeed the energy to devote to developing schemes. (Rogers, Simmons, Convery, & Wealtherall, 2008).

Therefore the government of developing countries must be strategic when addressing energy security issues especially if LEIs is to be used as one of the tools. They must ensure that the right people get the right information and the right support at an appropriate time.

The last perceived barrier addressed in this study is the lack of trust between and among people. Because of the level of poverty and distrust in developing countries this could indeed be a potential threat to LEI formation in developing countries. If people cannot substantiate the benefits to be derived from LEI they may be skeptical about taking it up. (Li, Janine, Harald, & Werner, 2013) In their article opined that, starting a LEI is not an easy task as Lack of trust, local identity and a general sense of the need to protect common interests must be overcome to trigger community social capital formation.

2.4 THEORETICAL FRAMEWORK (CONCEPTUAL):

This conceptual framework provides an understanding of the various processes for LEIs to be formed in Nigeria. It consist of the different stakeholders and factors to be considered when forming a LEI. It also enable us to do the following;

- Evaluate the experiences with LEIs in Nigeria (question 3)

- Investigate the perception of people towards the concept of LEI in Nigeria (question 4)

- To empirically analyze what the barriers for development or adoption of LEIs and RET in Nigeria are (question 5)

- To describe the factors and intervention strategies that can motivate people to adopt LEIs and RET in Nigeria (question 6)?

For us to be able to perform the above, a theoretical framework is needed.

A specific model to analyze the development of local energy initiative could not be found in literature, for this purpose we reviewed several literatures on local energy initiatives in Europe. Therefore an integrated conceptual framework was developed for the uptake of LEIs in developing countries for which the theoretical foundation is derive from diffusion of innovation, stakeholders analysis and the integrated model developed by (Dieperink & Boon, 2014) for assessing, fostering and hindering factors in Netherlands. This framework has a checklist of several stakeholders that could participate in the establishment of LEIs, processes of formation of LEIs and the various aspect to be considered such as the three pillars of sustainability, technology, existing regulation, socio-cultural characteristics and market for RET.

This model is based on efficiency, sustainability and stakeholder's participation. Household income level, awareness, clear understanding of the concept of LEIs are some of the factors that should be considered for RET and LEI to be developed in developing countries. For LEI to diffuse in developing countries like Nigeria, certain aspects such as regulatory framework, socio-economic factor, technical know-how, environmental factor, socio-cultural factor, technology need to be critically assessed because this could be a potential barrier for local community to take energy initiatives. Explanatory terms from various literature on LEIs development in Europe were used to refine this model.

Since in Nigeria, grid electricity is epileptic in nature and people largely depends on fossil fueled generator for most of their energy services, this established the reason and the need for energy independence by the local communities. Households and community needs to have control over their own energy system, reduce the amount spent on conventional fossil fuel and reduce the menace of climate change. Therefore energy initiative is needed to be taken for individual and collective benefit. Based on this model we want to elaborate on some it components.

2.4.1 PROCESS OF FORMATION

Perception towards LEIs: Everett Rogers (1995) first developed the concept of diffusion of innovations: In this concept, innovations were defined as ideas or practice perceived as new by practitioners (in this case LEI expert). Diffusion was seen as the spread of ideas among individuals, largely by imitation. Interventions aim at spreading innovation harnessed the interpersonal influence of opinion leaders and change agents, and research mapped the social networks and adoption decisions of target individual (Trisha Greenhalgh et al., 2004).

Before you attempt to solve a certain societal problem, a researcher need to assess the perception and opinion of the member of such society, create awareness before you suggest a possible solution. This we did by interviewing major actors and conducting survey in the housing estate to know people's perception towards LEIs and RET because this will either lead to the acceptance or rejection of the concept.

Individual people adopt different innovations and then share them at different levels to other individuals, some innovations are never adopted at all; while others are vehemently abandoned. A very extensive evidence based from sociology supports the notion of key attributes of innovations (as perceived by prospective adopters) which explain much of the variance in innovation's adoption rates (Trisha Greenhalgh, Gleen , Fraser, Paul, & Olivia, 2004).

Barriers and Challenges: The literature shows that the main barriers for the development of LEIs concern; financial source difficulty (as an internal problem) and bureaucratic personality of the region (as an external problem) (Boon and Dieperink, 2014). Accordingly, in order to settle the challenges on to local energy initiatives, it is essential to establish well prepared and detailed road maps for each of them. On this note it is essential to reveal and every barriers to the formation of LEIs and identify them according to both internal and external forces.

According to Walker's perspective; funding and competition for funds, high maintenance cost and lack of market incentives, are the prior financial barriers on the way of success in the United Kingdom; likewise in the Netherlands. In addition, when the lack of knowledge and unqualified employees are interpreted as the internal technical inability; and lack of policy support are defined as external hindrances (Walker et al., 2008). As a supportive argument for this remark, the quality of the project management activities and the financial resilience are qualified as the determinant factors on the way of success of community based energy (Seyfang et al., 2013).

As it is mentioned above, the most important external hindrance is that of lack of policy support. ''Recent changes in government renewable energy incentive structures which came as a rude shock to several groups undermines their efforts; other problems came from planning hurdles (10%) and other bureaucracy which was perceived to block efforts to develop community energy'' . Furthermore, these bureaucratic barriers can also be link to inequalities between local energy initiatives in the perspective of financial incentives such as the feed in-tariff and Renewable Heat Incentive (Seyfang, Adrian, & Jung, 2013).

Support structure: This is very important for the formation process of a LEI from conceptualization to implementation phase, a supporting structure is needed even for continuity. These include the political structure or conditions for shaping opportunities for collective action. Political structure boils down to the level of regulatory or institutional support given to community group to start a LEI while the latter include its general openness, as well as opportunities for access to and engagement with policy makers.

We also need to ensure that there is no local opposition to the formation process. It is of great importance for the local communities to have a mass support for initiatives this will ensure its sustainability. The acceptance of initiative by individual community is always determined by the structure and quality of their social cohesion.

Knowledge Transfer: A community that can unanimously identify, capture, interpret, share, reframe and recodify new knowledge; to connect it with its own existing knowledge base; and to put it to proper use will be better able to absorb innovations especially those that include technology (Trisha Greenhalgh,. 2004).

In the context of this research, from observation of the liberalization of electricity market in Europe, there is public access to the grid where individual can generate energy and send to the grid in which they are being paid this is called feed-in tariff. We are however of the opinion that if the developing countries especially Nigeria can liberalize the electricity market with diffusion of smart and micro-grids everywhere, this will create opportunity for people to generate and send to the grid. This knowledge can be transferred to developing countries in order to increase the access level of energy services.

Lesson from elsewhere: For any group to adopt an innovation there has to be some success stories about such initiative either from same region or outside. As a student in Netherlands, I took part in a case study research by group of students in Friesland on bundling local energy initiatives. Some of the lessons learnt from the barriers and success stories of Friesland LEIs was used to shape this research.

Trisha Greenhalgh (2004) complements this by stating that the condition for absorptive capacity include organization of existing knowledge and skill base (especially it store of tacit, unmodifiable knowledge and pre-existing technologies a “learning organization” culture and proactive leadership directed towards sharing knowledge).

Knowledge that determines the adoption, distribution and implementation of complex innovation within a community or group is not object or given. Rather, it is socially motivated and frequently contested and must be continually discussed among the member of such community or group.

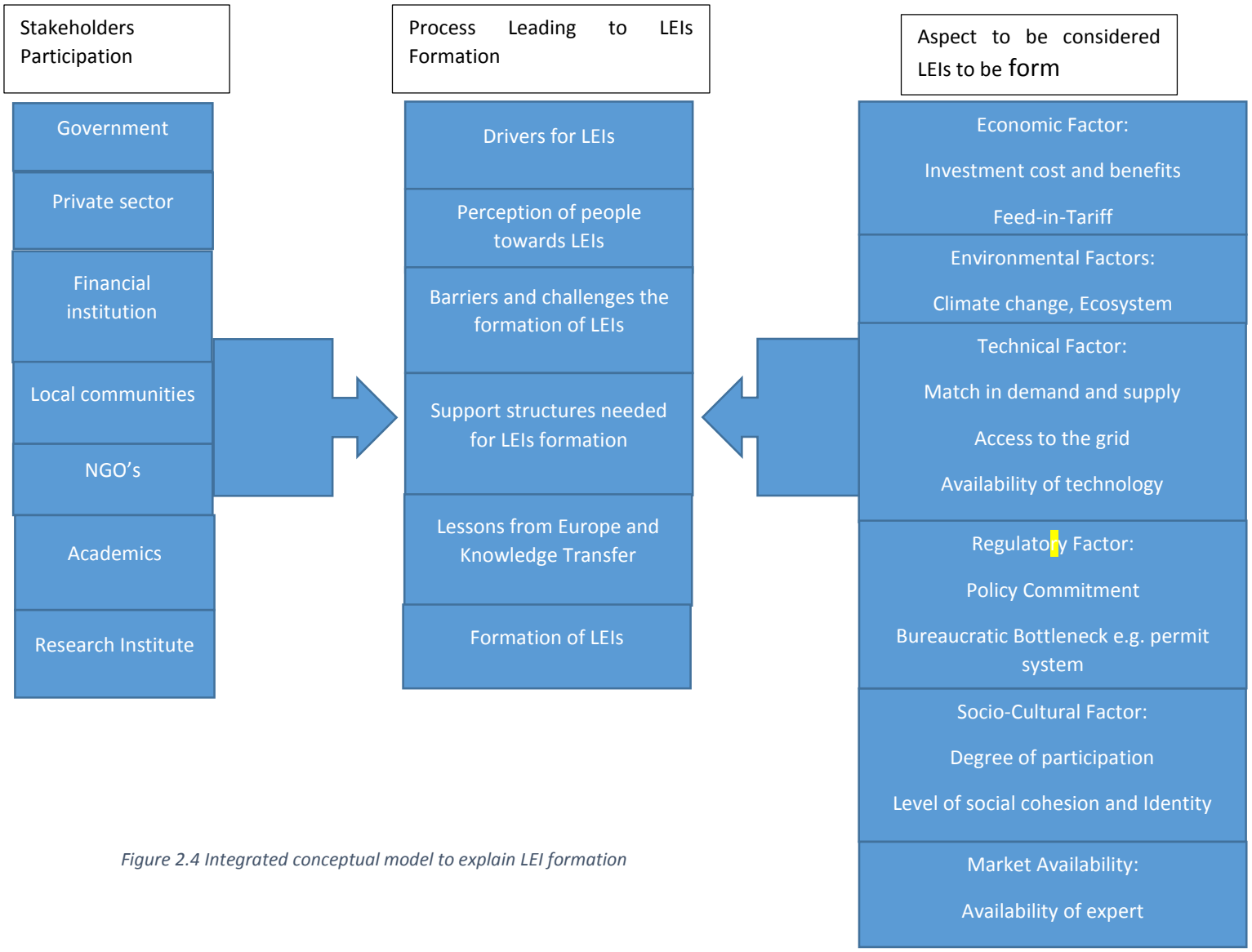


Figure 2.4 Integrated conceptual model to explain LEI formation

CHAPTER3: RESEARCH METHODOLOGY

3.1 Research Framework

According to Verschuren and Doorewaard (2001, p.19), a research framework consists of a "schematic and highly visualized representation of the steps that need to be taken in order to achieve one's research objective". To this end, the basic steps employed to develop the framework of this research on local energy initiative (LEI) in Nigeria are as follows:

Step 1: Characterize briefly the objective of the research project – As aforementioned in Chapter 1, the aim of the research is to stimulate bottom-up approaches towards a sustainable energy security in Nigeria through the establishment of LEI, and also to make recommendation to policy makers on way-forward.

Step 2: Determine the objects of the research project - The research participants or objects included stakeholders in Nigeria's energy sector such as representatives of ECN and NERC; and private citizens from selected households.

Step 3: Establish the nature of the research perspective – This research aims at recommending solutions to the long-lasting issues in Nigeria's energy sector. Such research that focuses on problem identification and solutions are often referred to as intervention-oriented research. Intervention-oriented research is meant to provide knowledge and information that contribute to a successful intervention in order to change an existing situation (Verschuren and Doorewaard, 2010:45). The research perspectives in this kind of research may consist of a substantiated checklist in which policy implementation, or an attempt to obtain a solution, can be monitored. This substantiated checklist is applied to identify the possible barriers that could potentially hinder the successful implementation of a given solution (Verschuren and Doorewaard, 2010:77). In order to make recommendations to policy makers, this present study investigated the barriers and opportunities related to the implementation of LEI in Nigeria using a selected case study of housing estates in Lagos, Nigeria.

Step 4: Determine the sources of the research perspective – Based on reviewed literatures, there is no specific model to analyze the development of LEI in Nigeria. Hence, a theoretical framework was developed using secondary data retrieved from previous studies on LEI and documentations related to the diffusion of innovation; and stakeholders' analysis

Table 3.1 research framework table

KEY CONCEPT	THEORIES
Stakeholders participation	Stakeholders analysis
Process of formation	DOI, conceptual model
Aspect to be considered	Conceptual model, DOI, collective action theory

The purposes of the literature review was to answer the following questions in order to set the research contexts

1. What does LEIs looks like?
2. How are LEIs established?
3. What are the motivation and drivers of LEI?
4. What are the barriers and opportunities of LEI implementation?
5. What are the support structures available for successful implementation of LEIs?
6. What are the level of stakeholders' participation and interest in LEI?

Step5: The schematic diagram of this research

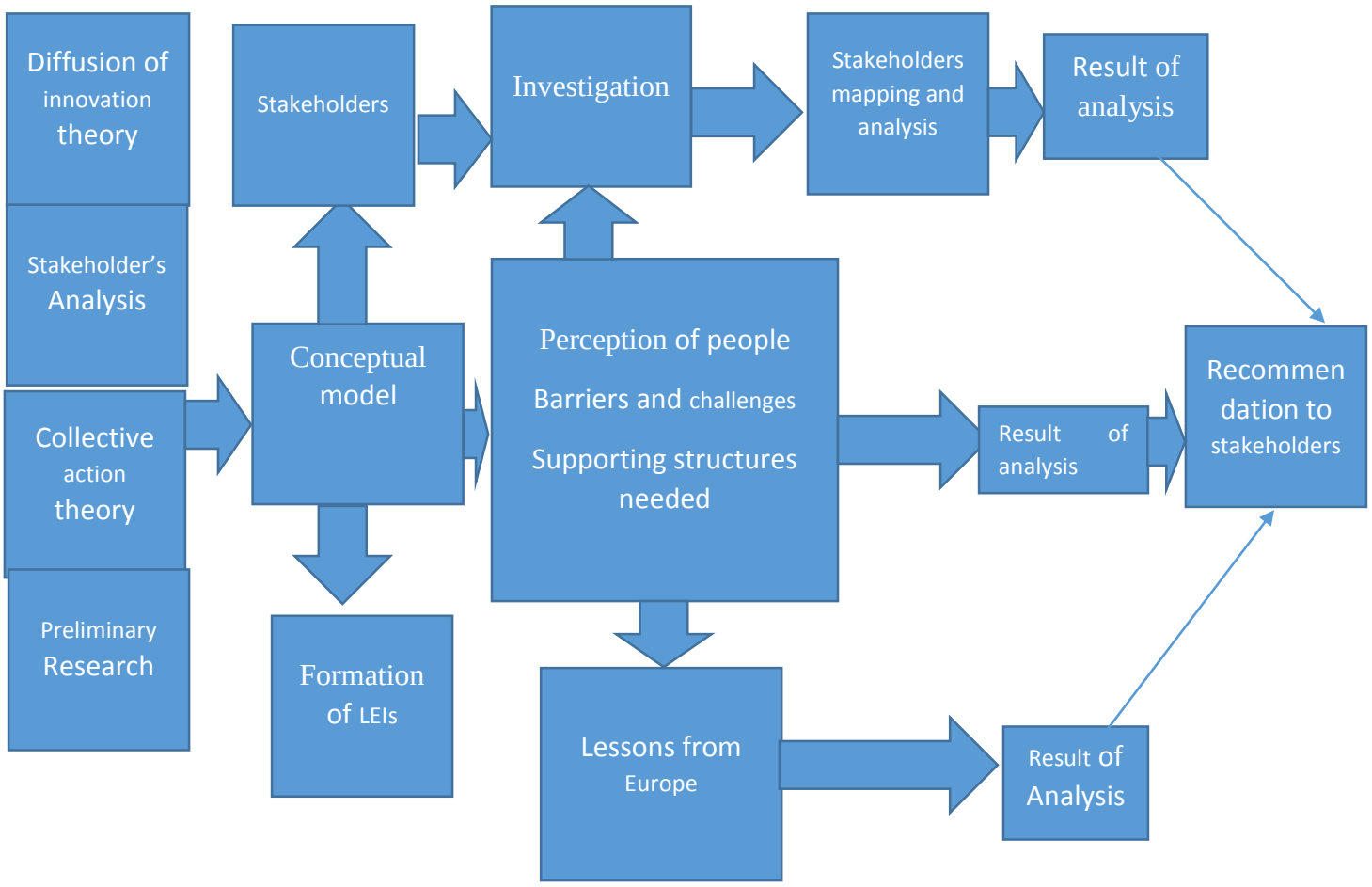


Figure 3.1 Schematic Diagram of Research framework

Step 6 Formulate the research framework in the form of elaborate argument

The course of this research is formulated with the following steps:

a) Literature review of theories related to diffusion of innovation, collective action and stakeholders mapping and analysis, as well as preliminary research on LEIs in Europe provided the theoretical basis for the research analysis

b) Semi-structured interviews with stakeholders in order to gain insight into some of the research questions including themes such as support structure, barriers, perception and knowledge transfer.

c) Stakeholder's mapping and thematic content analysis to ascertain stakeholder's opinion, interests, authority, motivation and levels of collaboration.

d) Make recommendations to policy makers based on research findings.

Step 7: Check whether the model necessitates any changes

The model does not require any change.

In view of the above steps, we collected quantitative data from 124 households located within the vicinities of the two estates selected as case study in Lagos, Nigeria through the distribution of survey questionnaires. Quantitative data were analyzed using descriptive statistics.

Qualitative data were generated through semi-structured interviews with the executives of the housing estate association, government agencies and energy companies and other related stakeholders. Interview data were transcribed manually, followed by stakeholders mapping and analysis.

3.2 Defining the concept:

Local energy initiatives are bottom up ideas towards energy independence from the centralized grid system usually embarked upon by households, communities, cooperative but usually with common interest, goals and ambition with high level of trust.

Household is defined as a group of people who normally live and eat their meals together in the same dwelling space and acknowledge a common household head who must actually live with the rest of the household members (Beaman & Dillion, 2012).

Energy security simply means reliable and regular services, which is not limited to either the supply of fuel or electricity (Walter Patterson,

2007:132).

Energy access refers to a household's ability to access a modern energy service, should it decide to do so (Ranjit and O'Sullivan, 2002). In this case, access is defined as a function of availability and affordability. Energy is presumed to be available when the household is within the economic connection and supply range of the energy network or supply, whilst energy is affordable when the household is able to pay for the connection cost and the energy service used (Ranjit and O'Sullivan, 2002).

3.3 Research strategy

Verschuren and Doorewaard define research strategy as "the coherent body of decisions concerning the way in which the researcher is going to carry out the research, especially gathering relevant materials and processing this material into valid answers to the research questions" (Verschuren and Doorewaard, 2010: 155).

Since there are no specific model to analyze the development of LEIs from reviewed literature, we developed a conceptual model based on diffusion of innovation literature, collective action and stakeholder's analysis literatures and the integrated model developed by Boon (2012). In general, a case study approach was utilized, the case study is a research strategy in which the researcher tries to gain full insight into one or several objects or processes that are confined in time and space (Verschuren and Doorewaard, 2010). This may be an organization, a company, a governance system, etc. (Verschuren and Doorewaard, 2010). This approach was adopted based on how case studies are characterized as domains consisting of small number of cases, detailed, strategic sample, multiple choice of data collection and suitability for practice-oriented research.

3.3.1 Case study

This research focused on two housing estates, Lagos state ministry of energy and Mineral resources, Lagos state Electricity Board which serves as the implementing agency of the state energy policy, two federal government institution such as NERC and ECN, relevant NGO like GIZ, CREDC, Academics, research institute such as Center for energy efficiency and conservation, Academic institute such as Lagos Energy academy and financial institution such ECOBANK Nigeria Plc, private sectors such as the Eko Electricity distribution company in the research domain was chosen as research objects. These institutions are considered sufficient to provide information needed for the assessment of the support structure, perception, willingness to take policy recommendation for LEIs and RET.

3.3.2 Selection of case:

Lagos being the most populated state in Nigeria needs more energy than any other part of the country. Apart from the population, the state is also the most industrialized part of Nigeria. As the population increases, the need for energy also increases and if the Housing estates in Lagos could generate and use their own energy, it will not only improve energy access within the estate but the energy supplier could channel the energy accrued to the estates to other part of the state, this was the idea behind choosing estates in Lagos as the case study for this research. The need for improved energy access coupled with fact that most estates in Lagos are inhabited by the middle class, upper middle class and high-class citizens who are well-educated. This facilitated the quick understanding of the concept of LEI. Many of them are equally financially buoyant, they may be willing to take energy initiatives and make their estate a pilot project for LEIs.

3.3.3 Data collection and analysis for household survey

Data were gathered through a combination of literature, document and print/electronic media review and survey enquiries through the various stakeholders. The survey as data source included the use of semi-structured interviews, questionnaires and collation/content analysis of printed articles, web/email and documents-official publications/memos. During the survey, we were able to attend one of the monthly meeting of sunshine estate and held focused group discussions on LEI with most of the participants, the estate manager assisted in the distribution and collection of the questionnaires. However, the case of the Ojokoro housing estate was a bit different as we dedicated two weekends to visit them flat by flat and some in their retail shops to fill out questionnaires and conducted interviews.

3.3.4 Data collection and analysis for stakeholders

The following are the list of stakeholders that was interviewed, the detail function of each stakeholder is provided in the appendix. A total of 12 stakeholders were interviewed. GIZ, solar Nigeria, CREDC and NERC stakeholders were interviewed through phone conversation, all other stakeholder were interviewed face to face in their offices. The questions were open ended questions and structured in a way that is related to the functions of each of the stakeholders e.g. questions for the financial institution was not the same with the Disco, same way questions related to policy formulation can be not be ask from GIZ. In essence, the stakeholder's questions are unique and related to their relevance to the LEI development in Nigeria although few are similar. Each of the interviews took approximately 45-60mins. We were also able to interview sunshine estate executive (the chairman) but unable to reach the Ojokoro housing estate executive due to their tight schedule as we were reliably told. Stakeholder's analysis and mapping will be conducted to assess the interest and perspective of each stakeholders.

- Eco bank Nigeria Plc.
- Energy commission of Nigeria.
- Nigeria electricity Regulatory commission.
- Lagos state ministry of energy and Mineral resources.
- Executive of Sunshine Estate, Oko- Oba (citizen)
- Ojokoro Housing Estate (citizen)
- Eko Electricity Distribution Company
- Community Research and Development Center
- Center for Energy Conservation and efficiency
- Lagos energy academy
- Lagos state electricity board.
- GIZ
- Solar Nigeria (DFID project)

3.3.5 Research Boundary

Research boundary was determined to ensure that the goals of this research were achieved within the time frame. In order to keep with the scope of the research, this research was limited to 2 housing estates in Lagos, Nigeria. The reason is because Lagos is the most populated parted of Nigeria, the commercial hub of the country, requires more energy than any part of the country, consist larger percentage of educated people who could easily understand the concept of LEI. All these factors facilitated data collection from the households within the study area. Since the electricity market in Nigeria is highly centralized within the federal structure, it was important to interview stakeholders in federal institution.

3.3.6 Research Material

Data and information required: The identification of data required for the purpose of this research is based on the set of sub research questions, as shown in table 3.2

Table 1.2 Source of data, method of collection and where the research questions will be answered

Research questions	Data Required	Source	Accessing the source	Arrangement in the final copy
MRQ: Can local energy initiatives contribute to a sustainable energy future and energy security in Nigeria?	How LEI can proffer solution to the energy crisis and barriers	ECN, NERC, NGO, Literature review, state institution, research institutes, academics	interview	RQ answered in chapter 6
RQ1: What is the extent of energy crisis and access level in Nigeria	Access level	Articles, documents	Content analysis	RQ answered in the literature review and chapter6
RQ2: What are LEIs, how could they on the basis experience in Europe contribute to a sustainable energy	Hypothetical barriers Literature on LEIs in	Literature and document	Content analysis	RQ answered in chapter2

future and energy security (access) in developing countries and what are the potential barriers?	Europe experience			
RQ3 What are the experiences with LEIs in Nigeria?	Mode of LEIs	interview	Observation, content analysis	Answered in chapter4
RQ4 What are the perceptions of people towards the concept of LEIs in Nigeria?	The view point of the various stakeholders	ECN, Households, NERC,NGO, financial institution, state institution	Observation, interview and questionnaires, content analysis	Answered in ,chapter6
RQ5 What are the barriers for development or adoption of LEIs and RET in Nigeria?	Barriers and challenges	ECN, NERC, NGO, Households, research institute	Interview, questionnaires	Answered in chapter6
RQ6 What are the potential drivers, factors and intervention strategies that can motivate people to adopt LEIs concept in Nigeria?	Motivating factors for Formation	ECN, NERC, Households, Articles.	Content analysis, interview and questionnaires	Answered in chapter6
RQ7 What support structure will be needed or is currently in place for LEIs in Nigeria and what can be learnt from LEIs support structures in Europe?	Solution	Articles, Households, ECN, NGO, NERC, Research institution, Academic	Content analysis, Interview, questionnaires, tacit knowledge	Answered in chapter 2,chapter6

3.4 DATA ANALYSIS

3.4.1 Method of Analysing Data

There are many kinds of analysis at the disposal of a social researcher to describe, Explain or interpret. In practice, though, the options tend to gravitate around the notions of 'quantitative' and 'qualitative' research (Denscombe, 2014).

For qualitative analysis, the data collected from the government, private sector, NGOs, research institute, financial institution, regulatory agency, Academics were subjected to content analysis, transcription of interview responses. Responses from the various stakeholders were recorded, compared against each other by listing the various responses of the twelve interviewees and a report was compiled. Stakeholders mapping and analysis was used to know the position, interest, function, power, opinion, interrelation, motivation, information and resources. To ensure the quality of data, the interviews were duly recorded and a friend was hired as a reporter.

For quantitative analysis, responses from questionnaires were coded. Descriptive statistics is used for analysis in this research, in order to describe the main features of collected data. Descriptive statistic present numerical and graphical procedures that summarizes the sample. For this research, numerical and graphical methods are used. For distribution, a frequency of individual values and range of values are summarized. Frequency distribution is depicted as graph, displaying in most cases, percentages. These are applied with the purpose of indicating characteristics and trends in the set of data. We also presented the raw data in tabular form and relative frequencies and analyzed.

Data needed	Method of analysis
Interview with ECN	Stakeholders analysis, transcription
Interview with NERC	Stakeholders analysis, transcription
Interview with research institute	Stakeholders analysis, transcription
Financial institution	Stakeholders analysis, transcription
Literature and document review	Content analysis
Interview with NGO	Stakeholders analysis, transcription
Lagos state minister of energy	Stakeholders analysis, transcription
Survey in housing estates	Descriptive analysis/SPSS
Interview with Eko distribution company	Stakeholder analysis, transcription

Table 3.3 Method of Analysis

3.5 Analytical framework

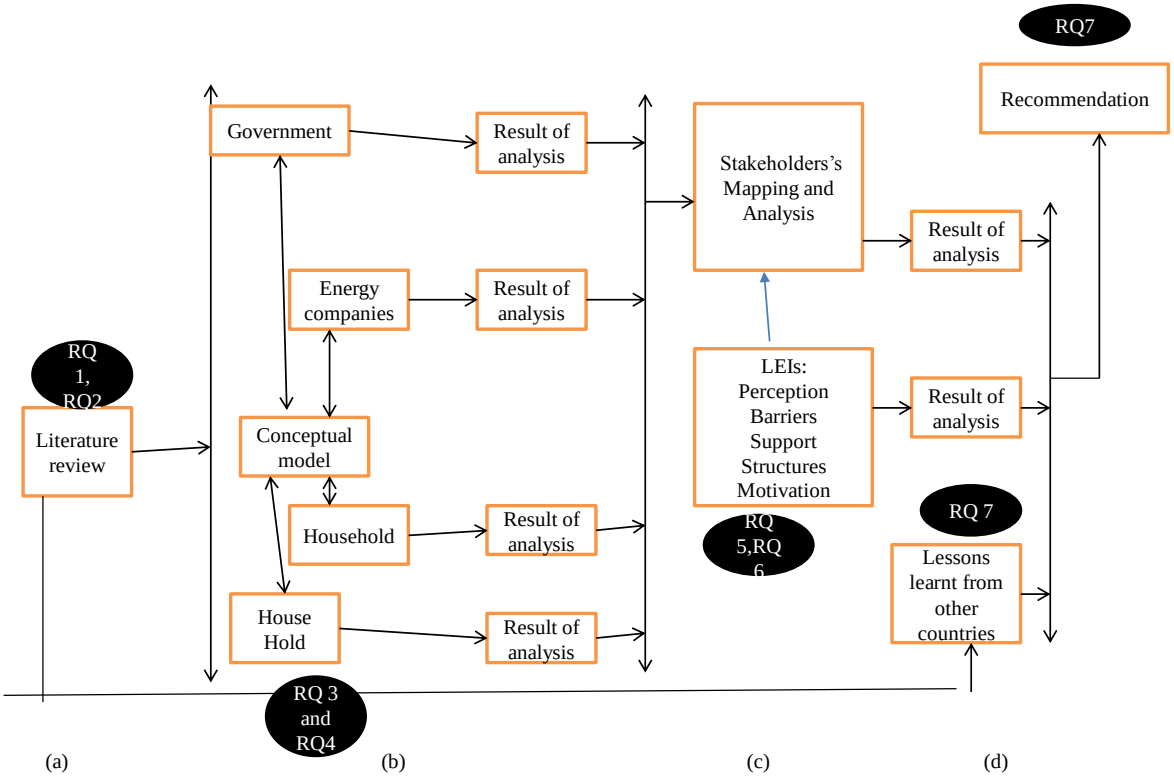


Figure 3.2 Schematic diagram of the analytical framework

3.6 Stakeholders Analysis

A stakeholder's analysis was conducted for different levels of government. At national level, and state level. We were unable to interview the stakeholders in the local government level due to the fact that local government does not have its own autonomy they are solely controlled by the state government and are funded by the federal government. This study also included stakeholders within the private sector domain e.g. Electricity distribution company, Academic and research institute like Lagos energy academy, National Centre for energy efficiency and conservation, local NGO involved in community based energy and housing estate executives etc. A full list can be found in chapter 5.

The qualitative data was important for estimating their positions, levels of interest and influence on possible formation of LEIs. Based on the interviews with stakeholders (as shown in appendix 1) a summary report of each stakeholders was made in accordance to the guidelines suggested by Schmeer (1999). After which a stakeholder mapping was done based on Vietor et al., (2015). This helped to understand their relationship with other stakeholders, their position, their influence, and the resources they bring to the LEIs. The stakeholders were then assessed for their power, interest, urgency and attitude. This was done by following Eden and Ackermann (1999)

3.7 Organization of the report

This research has six chapters. The first chapter explain in more details the need for empirical study on the possibility of local energy initiative as one of the solution to the energy security problems in developing countries particularly Nigeria. The key concept and research question were also presented here.

Chapter two was an extensive literature review on local energy initiatives in Europe and drawing on lessons across Europe especially in Germany and Netherlands. Research question 1 and 2 was answered here. Chapter two also contain the integrated conceptual framework for this research.

Chapter three provides the research methodology. The research process was explained here and the method of data analysis.

Chapter four shows the presentation of the renewable energy policy both at the federal and state level. Also the factors to be considered for Nigerians to adopt renewable energy and formation of LEIs was presented here. We also answered research question three which borders on the experiences with LEIs in Nigeria.

Chapter five focuses on research findings by presenting a descriptive analysis and stakeholder mapping and analysis to gain understanding of the perception of people towards LEI, support structure needed and barriers for LEIs in Nigeria. The interest, attitude, power, position, urgency and the interrelation of various stakeholders in the energy (electricity) sector. We also discussed the findings here.

In chapter six, conclusions were drawn and recommendations given for policy makers by answering the main research question.

Chapter 4.0 RENEWABLE ENERGY POLICIES IN NIGERIA

The energy commission of Nigeria (ECN) which was established by act No 62 of 1979 with a statutory mandate for strategic planning and coordination of national policies in the field of energy in all it ramification. By this mandate, the ECN is the apex government parastatal empowered to carryout overall energy sector planning and policy implementation, promote the diversification of the energy resources through the development and optimal utilization of all the sources, including their new and alternative energy resources like solar, wind, biomass, hydropower and nuclear energy.

The Nigerian government through the energy commission of energy came up with policies and strategies aimed at diversifying the country's power generation to help improve the nation's power supply. Consequently in 2006, renewable energy masterplan (REMP) was approved. REMP articulates the Nigeria's vision for achieving sustainable development and presented a road map for renewable energy development to help achieve this vision. This vision also pointed out the need to encourage the participation of the private sector in the production and supply of energy.

In this chapter, we want to examine the national and Lagos state renewable energy policies particularly the policy objectives and implementation strategies of each of the renewable energy technologies available in Nigeria.

4.1 National renewable energy and energy efficiency policy (NREEEP).

According to (ECN, 2014)The policy objectives and implementation strategies of this policy have been carefully defined with fundamental guiding premises that renewable energy and energy efficiency are very important to National development goals and that government has primary role in creating the enabling environment for meeting the energy challenges facing the nation. Furthermore, the overdependence on crude oil can be reduced through the diversification of the nation's resources, aggressive research, development and demonstration (RD&D), human resources development, etc. Consequently the overall energy policy objective may be summarized as follows:

1. To encourage the diversification of sources of energy supply through renewable energy, and as such improve the energy security of country.
2. To ensure the development of the nation's renewable resources and energy efficiency opportunity for the achievement of National energy security and an efficient energy delivery system with an optimal energy resources mix.
3. To guarantee increase contribution of renewable energy and energy efficiency productive activities to National income.
4. To guarantee adequate, reliable and sustainable supply of energy at appropriate cost and in an environmentally friendly manner, to the various sectors of the economy, for national development.

5. To guarantee efficient and cost effective consumption pattern of energy resources.
6. To promote increased investment and development of the energy sector industries with private sector leadership.
7. To enhance technological development through increased domestic manufacturing of renewable and energy efficiency component.
8. To ensure a comprehensive, integrated and well-informed energy sector plans and programs for effective development.
9. To foster international co-operation in energy trade and projects development in both the African region and the world at large.
10. To promote research and development in, and adoption of, sustainable low carbon and clean energy technologies to mitigate environmental pollution and climate change.
11. To promote gender sensitivity and special attention to rural needs.
12. To promote efficiency, conservation and carbon management best practices in the nation's energy supply chain.
13. To ensure effective coordination of national renewable energy and energy efficiency planning, programs and policy implementation.
14. To stimulate growth in employment generation through an expanded renewable industry.
15. To promote rapid expansion of renewable-based electricity market through cost reducing supply side and demand side incentives.
16. To develop regulatory procedures that are sensitive to the peculiarities of renewable energy based power supply.
17. To create stable and predictable investment climate in renewable energy and energy efficiency market.
18. To provide effective protection of electricity consumers through effective regulation.
19. To reduce household and outdoor air pollution as well as contribute to the abatement of greenhouse gas emissions, and thus contribute to improved health and overall social development.
20. To ensure strategic market transformation from sales of inefficient energy-consuming products to massive sales of energy efficient appliances in Nigeria.

4.2 KEY CHALLENGES FACING THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN NIGERIA

There are quite a lot of challenges hindering the adoption and use of renewable energy technology in Nigeria despite the abundance of renewable energy sources in the country as observed and stated in the in the renewable energy policy document. According to the NREEEP enacted in 2014, the various challenges facing the development and adoption of renewable energy in Nigeria was highlighted by ECN, however we shall take time to elaborate some of them relevant to this study.

1. **Inadequate fiscal and economic incentives:** Financial and fiscal incentives hinders the development of renewable energy in Nigeria because it will indicate the government willingness and commitments to diversify the nation's sources of energy from the current regime of overdependence on fossil fuel.
   Also, to attract local and foreign investment in alternative energy system into the country the federal government should as a matter of urgency endeavor to implement the fiscal and economic investment as stated in the newly enacted NREEEP. The current Nigeria financial incentives mainly focus on the oil and gas sector where a government subsidy is on petrol, diesel and kerosene. Since one of the strategy to implement the NREEEP and REMP is to provide the financial incentives, the government through ECN should work out modalities on how to fully implement this throughout the country.
2. **Low Level of Awareness:** Vast majority of Nigerian public are not aware of the availability, usefulness, economic and environmental benefits of renewable energy system. We believe information is key to the adoption of renewable energy technology, if the government can at least educate Nigerians via the various mass media and make them aware of the various benefit RET this will promote and enhance the application, development and diffusion of this technology. The low awareness create a huge problem in the energy market which put the potential investors in high risk and unwillingness to invest in the renewable electricity projects.
3. **Affordability:** Even though renewables have low operation and maintenance cost, the initial investment cost is still very high when compare to their conventional energy alternatives. Considering the level of income, poverty level and the absence of fiscal incentives on RET adoption in the country it will be very difficult for RE to spread across the country due to the high initial cost. Solar PV, wind turbine have not penetrated the energy supply system in Nigeria because of high investment cost. PV system components require more sophisticated technologies for their manufacture, particularly with regards to PV cells although the NREEEP has made us to understand that the National Agency for Science and Engineering Infrastructure (NASENI) and Sokoto Energy Research Center (SERC) have commence the production of solar panels in the country by the time this spread, it is expected to force down the cost of purchasing imported solar PV.

4. **Lack of Capacity:** There is currently a lack of capacity and inadequate expertise in the technical and managerial aspect of renewable energy market. The current effort of the Siemens energy academy and Lagos state energy academy providing practical training for interested energy expert should in the future bridge the knowledge gap in this area.
5. **Standard Quality Control:** Another very important challenge is the lack of standard and quality control of locally manufactured and imported technologies. Quality assurance builds confidence and motivate consumers especially in a growing renewable energy market like Nigeria.
6. **Intermittency of resources availability:** An underlying barrier affecting all renewable resources is the intermittency of their availability. The challenge of energy storage and system management adds to the complexity and cost of renewable electricity (ECN, 2014).
7. Inadequate policy, regulation and institutional framework for development and adoption of alternative energy system-Clean and renewable energy sources. Even when the policy exist, it fails at the implementation stage.

4.3 LAGOS STATE RENEWABLE ENERGY POLICY

Since Lagos is the study area it is therefore pertinent to look at the state renewable energy policy. The Lagos state government having recognize the need to generate electricity from renewable energy sources enacted this policy in 2012. The main renewable energy sources that are targeted, in the order of their importance and likely ease of deployment are Solar, biomass, wind and municipal solid waste (MSW).

Policy goal: The goal of this policy is to promote the utilization of abundant and locally available renewable energy, for electricity generation in particular, and for other applications (such as heating, cooling and ventilation, lighting, cooking, water treatment and transportation) that cater for the growing needs of the residents of the state.

Target: The LaSG has set a target of minimum installed power generation capacity of 400MW fueled from renewable sources, which will produce up to 3.5Gwh of electricity annually to be deployed for the supply of electricity to consumers in Lagos for a medium term period of ten (10) years.

The drivers for this policy are not far-fetched from the fact that Lagos is well endowed with renewable resources that can be sustainable alternatives to petrol and other fossil fuels, so far they remained largely untapped. Lagos being the economic hub of west Africa and indeed Nigeria due to the large concentration of industries and its growing population, the government have determine to arrest the menace of climate change by reducing the emission of greenhouse gases such as carbon dioxide from the use of fossil fuel.

Another key driver to this policy is energy security, the over dependence on crude oil, natural gas and the incessant vandalization and disruption of gas pipeline by the militants in Nigeria's Niger delta region (where Nigeria's natural gas and crude oil is produce) which causes significant outages from electricity supply utilities. Since most of the alternative energy sources are naturally available in Lagos, the security of energy supply from these sources would not be subjected to any form of disruption by militant action or vandalism or by limited supplies or international crisis. According to the LaSG energy policy, the following are the key drivers for enacting the renewable energy policy for the state.

i. The desire of LaSG to limit emission of greenhouse gas from the activities of government, industries, households, and other users of energy in Lagos-LaSG is a fervent advocate for healthy and green environment and in its pursuit of rapid economic and socio development of its rural and urban areas, is concerned about the environmental effects of development.
ii. The need to bridge the huge energy supply deficit in Lagos state-the current allocation from grid connected supply is insufficient to meet the energy demand of the highly industrialized state.
iii. Re-alignment of the relevant economic imperatives-escalating prices of oil in the international market (and elimination of subsidies in Nigeria) is putting pressure on conventional fossil fuels sources of energy generation, whilst technological advancement means that renewable energy is progressively less expensive.
iv. The need to improve energy security in the state by reducing reliance on feedstock of which is threatened by disruptive activities of militants and vandals.
v. The need to enhance the state's energy portfolio by taking advantage of locally available and non-deplorable resources for the production of energy, whilst at the same time contributing to environmental health;
vi. The need to harness the renewable energy potential of Lagos State in order to achieve socio-economic growth and development in urban and rural areas of the state.
vii. The need to create an enabling environment by introducing fiscal and financial support mechanisms within an appropriate legal and regulatory framework to allow renewable energy technologies to compete with fossil-based technologies (government needs to support renewable energy to help establish initial market share and demonstrated the viability of renewable sources, after which economies of scale and technological developments takeover).

On Solar, the policy stipulated that LaSG will favor projects that do not require large expanse of land such as rooftop PV installations that enable solar generation project to be additional, secondary uses of land and floating solar systems that are built on the substantial bodies of

water comprised in Lagos lagoon this is due to the fact that the state is small, a coastal state with a very high population density.

On Biomass, the LaSG want to focus on waste to energy by harnessing the huge deposit of municipal solid waste on its landfill site in the state by capturing methane gas for power generation. For this purpose the Lagos state ministry of energy aim to work closely with the Lagos state waste management authority (LAWMA), which is responsible for the management of the landfills and the ministry of environment to develop projects for the generation for energy from the landfills in partnership with private sector. The initial focus is the Olusosun and Abule Egba landfill sites. Also the LaSG also will consider conversion of biomass waste to energy, paying particular attention to wood waste from significant sawmilling within the territory of the state.

On wind, according to the policy, the state want to take advantage of a study carried out by Lahmeyer international GmbH in 2005 on behalf of the federal government of Nigeria which identified the state as having a promising wind condition. In its final report on *"Wind energy resource mapping and related works project"*. Lahmeyer ranks Lagos as number one (1) on the priority list of the most promising regions for a wind power generation in Nigeria.

4.4 IMPLEMENTATION STRATEGY AND GOVERNMENT INITIATIVE

In the Lagos state renewable energy policy one of the key strategy to achieve the policy goal is raising awareness and capacity training of the residence of the state on the benefit of renewable energy and attract the attention of potential investors to the opportunities that exist within the renewable energy space. It is on this premise that the then Governor of Lagos state, Mr. Babatunde Fashola kicked-off the Lagos solar projects in public schools in partnership with UK department for international development (DFID), the state is set to light up 172 public schools and 11 flagship public health care centers across the state. This is to provide a sustainable renewable energy solutions for schools and primary health care center with a clear, reliable energy services to currently underserved communities in Lagos state (LSEB, 2015).

According to the release from Lagos state electricity board (LSEB) the solar installation at EPE PHC with capacity of 78KWP commission on 7th January happens to be the maiden project. 67% of public schools in the state which are exceptionally poor or absolutely lack of electricity due to their distance and isolation from the city would be connected to the solar solution to run an un-interrupted power supply.

Another laudable initiatives that has being successfully carried out by the state government is the Lagos power kids program which is part of the power sector development plan. According to a press release on LSEB website which is the implementing agency of the renewable energy policy for the state, the program aim to teach students about energy awareness and conservation practices.

The program covers electricity, calculating energy consumption, energy efficiency, energy conservation, electrical hazards and safety, renewable energy and water conservation. It was also stated that the program is the first of its kind in sub-Saharan Africa and has been overwhelmed with positive reactions from the press and international aid organization on this innovative initiative. This program has being running successfully for two years and1600 students has being trained.

As part of implementation of the capacity training stated in the policy, the LaSG established the Lagos state energy academy in 2014 with the mandate of providing comprehensive technical training for young people in the power sector power, public lighting and energy development.

The aim of LEA is to inspire the future leaders of energy in Nigeria. LEA aim to combine a classroom based teaching approach and hand-on, practical vocational training as a response to the desire to meet the skilled labor requirement of the power sector, this is in line with the state renewable energy policy. In the NREEEP, the FG government has also make a policy commitment of sponsored training for interested individuals on RE and EE technologies as business ventures we await the implementation of this part of the policy.

4.5 Factors to be considered for adoption of LEI and RET in Nigeria.

Refer to the integrated conceptual framework developed for this research (See right hand side Fig2.4 above).The availability of the all or some of this factors couple with the cooperation of all stakeholders involved will lead to the development of LEI and adoption of RET in developing countries.

4.5.1 Awareness and education

For a society to adopt any new technology or whatsoever, a good enlightenment program on the benefits of RET needs to be embarked upon. A proper awareness and education seems to be the first step for Nigerians to adopt this technology. People need to have a clear understanding of whatever you are introducing to them. Should they have proper knowledge of RET and its benefits, it will be easier to adopt and diffuse it and this will aid the formation of LEIs in communities.

As it stands now, there is no clear understanding of the government effort as regards the mass awareness of Nigerians on RET, even majority of Nigerians do not even know there is an existing policy on renewable energy policy. According to the interview with CREDC, the respondent advocate for special workshop, seminar and publicity of the NREEEP for Nigerians to be fully aware, Educated and enlightened so as to have a clear understand and possible adoption of RET.

4.5.2 Economic Factor

For a developing country such as Nigeria to adopt RET and for LEI, the current high initial investment cost of the technology is one of the major factors to be put into consideration this is due to the fact that most of the renewable energy technology are not yet locally manufactured in Nigeria, they are still largely imported. Also the lack of implementation of the feed in tariff policy since the citizens cannot have access to the grid and thus cannot send the excess energy generated to the grid, the implementation of financial and fiscal incentives in the policy can even serve as a motivation for individual, community to adopt RET consequently form LEIs in their community.

4.5.3 Environmental Factor

The more the Nigerian society realize that they are doing the ecosystem and climate some good by adopting and embracing RET the better for the country. Although, Nigeria is a signatory to so many treaties on climate change and environment but the non-commitment to the implementation of this treaties in the country can be said to be one of the challenges. Even when the government want to be alive to her responsibilities by implementing some of her policy, the monitoring and enforcement team in the implementing agency are characterize by bribing and corruption which jeopardize the government effort. Once Nigerians are aware that RET help to preserve the environment for future generations, they will be able to adopt the technology. We are of the opinion that a high level of public environmental awareness positively affects the local support of RET and LEIs.

4.5.4 Technical factor

This encompasses a whole range of issues such as, access to the grid and availability of technology. As earlier discussed, Nigerians does not have access to the grid and this will limit people's motivation towards embracing RET and formation of LEIs. Also the lack of local skilled labor to operate and maintain renewable energy equipment is another major barrier to the widespread adoption in Nigeria even in the urban areas.

As earlier discussed, the Lagos state is currently building capacity to bridge the gap of skilled man power by training and re-training experts in the power sector with the creation of Lagos energy academy. Also with the availability international energy companies in Nigeria such as Schneider electric, General electric and Siemens, we expect an improvement in the availability of technical know-how in the future which will aid the adoption of RET and formation of LEIs in Nigeria even as many expert has seen local energy initiative as a concept for the future just as the privatization of the electricity market is still in its early stage.

4.5.5 Regulatory Factor

Regulatory barriers may arise from long bureaucratic procedures and/or absence of long-term and consistence policy framework. For individual and community to generate electricity via renewable energy, regulatory framework has to be friendly. At the moment, it is possible you generate your own electricity in Nigeria but you are not allowed to distribute neither are you allowed access to the grid as the NREEEP policy has not being implemented to cater for the feed in tariff structure. The primary government body saddled with this responsibility, energy commission of Nigeria can stimulate the emergence of and development of LEIs, adoption of RETs by providing and facilitating the quick implementation of the NREEEP especially the financial and fiscal incentives and feed in tariff structure.

4.5.6 Socio-cultural factor

This encompasses the degree of participation, level of social cohesion and identity within a community or an estate. A community or an estate consist of different people, different background, culture, orientation and understanding of this concept. LEIs formation may encounter local opposition if the community members does not have the proper understanding of what they stand to benefit at the long run.

As reiterated by (Dieperink and Boon 2014) that local support and acceptance within a community towards LEIs is found to correlate with the degree of ownership and expectancy of receiving a fair and equal share of benefits generated by the organization. When there is an unequal allocation of benefits there is bound to be hostility which result in the decline of local support for the projects.

Also we must emphasize here that the degree of social cohesion and level of trust within the estates under study in this research and its organization can influence local perception, acceptance, support and formation of LEIs. There will also be some free riders who will want to benefit from the efforts of others. There is no way RET can be optimally adopted and LEIs formed in the communities if the prospective end users are ignorant of the derived benefits and could collectively agree on some terms in other to form LEIs in their community.

4.5.7 Market and expert availability

The availability of suppliers and installers of renewable energy technologies also play an important role for communities or people to adopt RET and LEIs in Nigeria. From observation and findings from this research, we can affirm that there is availability of renewable energy suppliers such as Simba solar, PSC solar Uk Nigeria off, Schneider electric in Nigeria etc. and the only barriers that could be observe is high cost of solar PV in the country due to non-existence of local manufacturers and incentives for the importers of this technology.

Much policy attention needs to be paid to this aspect in order to lower the barriers to small-scale generators entering the supply market. But since many of the stakeholders sees LEI development as the future, we are of the view that barriers like this will be addressed later by the policy-makers but obviously we believe the implementing agencies of the NREEEP such as NERC, ECN will encourage microgeneration (LEIs) in the near future.

Also, as stated earlier, the current effort of the Lagos government and Siemen Nigeria in training interested experts in this field will go a long way to provide local installers of this technology in the near future even has LEA has set the target of training 100,000 energy experts including installers, power engineers and energy managers in the next 15years.We are of the view that a similar effort by the federal government through her implementing agencies and other 35 states in Nigeria will bridge this gap and address this vital factor of LEI development and RET adoption in Nigeria.

4.6 Research question 3: *what are the experiences with LEIs in Nigeria?*

To answer this question we shall draw conclusion from the findings made available by key stakeholders especially the NGO, regulators, government parastatals and international aid organization. We shall also look into the project report available on community research and development center website (www.credcent.org). As of now there is no community motivated energy system in Lagos or Nigeria at large in which all the stakeholders interviewed attested to this and lack of awareness, lack of capacity and financial constraint can be attributed to this fact. On feasibility and sustainability of LEIs in Nigeria, all the stakeholders agreed that it is very feasible for housing estate to take this initiatives but cited regulatory bottleneck, finance, technical know-how in maintaining and managing the system, maintenance cost and lack of awareness as the major challenges but sees LEIs as the future.

However GIZ, opined that community cannot adopt what they do not know about and stated that the only initiatives that could be likened to LEIs are being taking by private companies as CSR and NGO in Nigeria in which grants from UNDP and other international aid organization like Global Environment facility-small grant program (GEF-SGP) are used to finance them. This is to say that the existing LEIs in Nigeria are motivated by NGO such as CREDC and Schneider electric. CREDC has so far champion three community based energy across Nigeria two in Edo state, (ofetebe and uniarho) southsouth region of Nigeria and one in Nassarawa state (Roguwa village), North central region Nigeria.it should however be noted that all the three LEIs are set up in a rural community that has never being electrified and it is completely funded by UNDP and GEF.

According to CREDC report on the Ofetebe solar micro off-grid facility in 2014, the community was never connected to the national grid before this project, this made them depend on unsustainable form of energy like candle, diesel generator, kerosene lamp and bush lamps. Therefore, the driver for undertaking this project was climate change. Prior to the implementation of this project, CREDC paid a courtesy visit to the villages, organized training workshop for fifteen youths in the community, 3 local energy regulatory committee (LERC) on

installation, maintenance of the project and to create awareness in the community. After the training, the next phase was the installation and finally the appraisal phase.

The capacity of this installation is 4KW and provided energy access to thirty households, community health center, five small scale businesses and community borehole. There was no local opposition to this project as the community secretary in his speech pledge a full support for the NGO. The fact that the community was part of the implementation of the project, they see it as their own and are doing everything to ensure that the services delivered by the facility is sustained. The electricity is supplied daily between 7pm-11pm and a current limiter, a device that help to regulate the consumption rate of each of the 30households was install to make sure no household takes more than the 60w allocated to its. All the three community based energy championed by CREDC followed same process of formation.

Also we were reliably informed of another similar project undertaken by Schneider electric Nigeria in Asore community somewhere in Ogun state, southwest Nigeria which they describe as first of its kind not only in Nigeria but in entire sub-Saharan Africa. Before the project, Asore had no access to any form of electricity and this project has brought relief to the once sleeping village. This project holds the possibility to unlock the economic and productive capacities of Asore. According to the speech made by the country president of Schneider electric Nigeria, the project could produce 4KW of power to support community services such as schools, health centers. Water supply and lighting. All efforts to get in contact with Schneider electric prove abortive as there was no response to the several mails sent to the company and countless number of visit.

We can conclude from the above experiences that LEIs in Nigeria are championed by NGO through grants and partnership and private company as CSR and not by communities themselves. Although we hope that with proper awareness, local manufacturing of RETs, fiscal and financial incentives in future LEIs will spread across Nigeria and indeed other developing countries.

Chapter 5.0 RESULTS AND DISCUSSIONS

The main purpose of this chapter is to present the findings of this research. This findings contribute to the possibility of the formation of LEIs as one of the possible solution to the energy (electricity) security problems in developing countries particularly in housing estates in Lagos, Nigeria. This findings shall be presented in two parts, the first part will be the findings from stakeholders such as Federal government, State government, private sectors and research institute alike while the second part will be the presentation of the findings from the household surveys.

5.1 Major findings from the Stakeholders: Based on the methodology presented in chapter three. The stakeholders were classified into government (state and federal), private sector, Non-governmental organization, research institute and Academic institute, Housing Estate Executive (end-user).

5.1.1 Stakeholder Mapping: The stakeholder were analyzed by mapping their positions, function and interrelation with other stakeholders, their opinion about LEIs formation in Nigeria, Barriers identified by stakeholders, supporting structure, how they could support LEI formation.

Stakeholders	Position and function	Interrelation with other stakeholders	Opinion towards LEIs	Barriers identified by stakeholders for LEI formation	How to support LEIs
Nigeria electricity regulatory commission (NERC)	Regulate the activities of the Gencos, Disco, and Transisco. They also ensures the compliance to market rules and operating guidelines, issuing of licenses and permits to market participants.	All activities of the electricity market are regulated by NERC	positive	Cost of investment	N/A
Energy Commission	It is a statutory body established for	Policy formulation and implementation	positive	Lack of awareness, lack of finance,	Technical support

of Nigeria (ECN)	the strategic planning and coordination of national policies in the field of energy. ECN is the apex government parastatal empowered to carryout overall energy planning and policy implementation	in the energy sector		little or no technical knowledge	
Lagos State Ministry of Energy and Minerals	Policy formulation in the state electricity sector	They coordinate all parastatal related to electricity in Lagos state such as LSEB, LEA	positive	Lack of awareness about LEI	Help draft power purchase agreement, human resources, help raise awareness
Lagos State Electricity Board (LSEB)	This is the implementing agency for the power sector in Lagos. Their aim is to maximize power supply through independent power projects (IPPs) and improve public lighting for the citizens of Lagos.	They have held several meetings with the Disco and industrialist on how to make power situation better in the state.	positive	Technical knowledge, infrastructure, enlightenment of the citizen, Lack of incentives	Advice, Technical knowledge, system design
Lagos Energy Academy (LEA)	This is an academy dedicated to the training of skilled manpower for the Lagos	They work hand in hand with the supervising ministry and parastatal. They are in partnership	positive	Initial Capital cost, lack of skilled trained technicians, Education and awareness	Security of investment by providing certified engineers to install the system that

	electricity sector. They provide technician training and professional certification beyond tertiary education.	with Siemens, CETpower and other private sector actors.			is if the grant is provided
National Center for Energy Efficiency and Conservation	This is one of the three energy research centers set up by ECN for the implementation of policy. They train personnel, disseminate information on energy use and develop standards, codes and policy guidelines.	They are set up by ECN and they work together with other stakeholders on areas related to their mandate.	positive	Low awareness, high cost of installation and lack of social cohesion amongst people.	Help educate the community
Community Research and Development Center (CREDC)	This is an NGO that focusses on environmental issues, and an advocate of renewable energy.	They are always in contact with the policy maker and regulator.	positive	Low awareness, high cost of solar batteries, technical amateurs	Technical support, Help seek for fund.
Sunshine Estate Chairman	Coordinate all activities in the estate	They only interact with the Disco supplying the estate.	positive	Financial barrier, Awareness	Mobilization of the estate to support the project
Ecobank Nigeria Limited	Ecobank is one of the commercial banks operating in Nigeria and other west African state.	They have provided counterpart funding for Disco during the privatization process	positive	Maintenance cost, pricing, lack of social cohesion, poverty level in the society	Financial support (loan)

	They are currently funding renewable energy projects.				
Solar Nigeria	This is a DFID sponsored project targeting rural communities that are yet to be connected to the grid	They are in constant interaction with the Federal ministry of power, ECN and GIZ	Neutral	Awareness, expensive to startup, Lack of understanding of the technology	NA
GIZ	This German international organization involve in the Nigeria energy support program, rural electrification. They give advice on enabling framework on energy access and work with private sector in developing micro and mini grid	They work with NERC on establishing regulation, support mechanisms. They also work with the federal ministry of power on an enabling framework to increase energy access	positive	The initial capital and maintenance cost, technical know-how, low awareness level	Lagos is not part of their jurisdiction. GIZ is currently working in five states in Nigeria.
Eko Electricity distribution company	This is one of the two distribution companies in Lagos and newly privatized. They distribute electricity to the Lagos islands and its environs.	All their activities are subjected to NERC approval	Neutral	Lack of social cohesion because Lagos is a multicultural society, unavailability of expert, awareness, funding, no enabling structure	Technical support if affordable, Help to structure it.

Table 5.1: Stakeholder Mapping

5.1.2 Stakeholders Analysis: After the stakeholder mapping overview, we will now analyze each stakeholders comprehensively in a stakeholders analysis worksheet (SAW) based on the guideline provided by Schemer (1999). These can be found in appendix 1 of this research. On the basis of worksheet, the results were summarized into stakeholders scoring table to see their opinion and view of LEIs. A detailed explanation of scoring table matrix can be found in 'SAW' in appendix 1. This was developed on Eden and Ackermann (1998).

The table scoring table can be found in table 6 below.

Ref to SAW	Name of stakeholder	Type of stakeholder	Attitude (Champion, Supporter, Neutral, Critic and Opponent	Power (1to-1)	Interest (1to-1	Urgency (1to-1
SAW 1	ECN	Federal government	Champion	1	1	1
SAW 2	NERC	Federal government	Champion	1	1	1
SAW 3	LSME&M	State government	Champion	1	1	1
SAW 4	LSEB	State government	Champion	1	1	1
SAW 5	LEA	Academic Institute	supporter	0	1	0
SAW 6	EKEDC	Electricity supplier	Supporter	0	0	1
SAW 7	ECOBANK	Private sector	Supporter	-1	0	-1
SAW 8	CREDC	NGO	Supporter	-1	1	0
SAW 9	GIZ	NGO	supporter	0	-1	-1
SAW 10	SOLAR NIGERIA	NGO	Neutral	-1	-1	-1
SAW 11	SUNSHINE ESTATE	End User	Supporter	0	1	0
SAW 12	NCEEC	Research Institute	Supporter	-1	-1	0

Table 5.2: Stakeholder scoring table

As shown in the table above, all government parastatals are champion except the research institute which have support attitude, NGO such as Solar Nigeria are neutral. This because it is a DFID program that mainly focus on rural areas yet to be connected to the grid, while other stakeholder are supporter of LEIs formation.

On the **level of interest**, all government parastatal shows high interest while the private sector shows medium interest, however the interest of most of the NGO is very low since they see LEIs to only be feasible in areas not yet connected to the grid and its only possible if the housing estate can let the private sector to set it up for them and the estate manages and maintain. This is due to the low knowledge and understanding of how LEIs works and the high initial cost of the technology. Estate chairman (End user) shows high interest since they see LEI as an alternative to the electricity from the grid that is not stable.

On the **level of power**, all government parastatal have a very strong ability to encourage or discourage the uptake of LEIs since the formation of LEIs cannot be successful without government incentives and regulatory support. On the other hand private sector and energy supplier has medium power since they cannot possibly support LEIs without a solid government backing particularly when all the activities of the energy suppliers are subjected to government regulatory approval. Research institute and NGO's have same level of power. Even though they have no direct power on LEIs, their expertise could significantly influence the decision making process of government towards LEIs.

On the **level of urgency**, all government parastatal see LEIs formation as a step in right direction with a high urgency level. The energy supplier also shows high urgency since LEI formation will be beneficial to their business. The private sector (Financial institution) shows low urgency as they will only finance LEI with high internal rate of return and quick payback period. Research institute have medium urgency since they will be important in giving advice towards LEI formation, Estate chairman shows medium urgency since require alternative source of energy to the inconsistent grid electricity. All NGO except the local NGO (CREDC), shows a low urgency since Lagos is not part of their state of jurisdiction and the state is well connected to the grid.

5.2 Presentation of Household Survey Findings

The second part of this chapter gives a general perception of household on LEIs, the barriers and the supporting structure needed for the adoption of RET and formation of LEIs. First we shall present the socio-economic characteristics of the respondents followed by their opinion and perception on LEIs. It should however be noted that the samples to be presented in this section are not representative samples of the inhabitant of the two estates under study but they are sufficient for statistical analysis.

5.2.1 Characteristics of Sample

This section present the distribution of samples by gender, age, marital status, educational level, religion, occupation and how long they have lived in the estate. Though the analysis of the total

sample was conducted, the data was presented by marital status, educational level, religion, age, occupation and how long they have lived in the estate. The frequency distributions, percentages of these demographic variables are first presented in table followed by the descriptive statistic using pie charts and histogram charts.

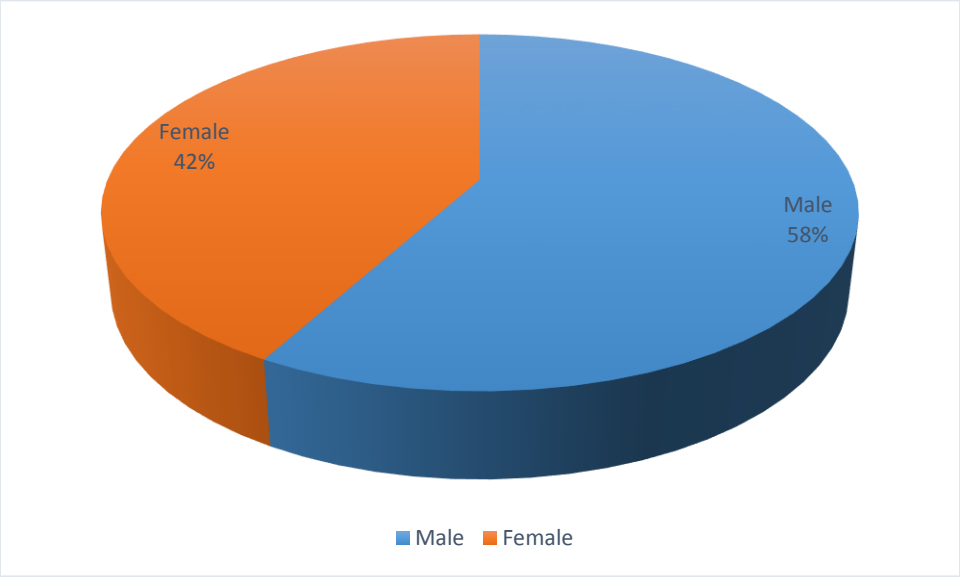
Q1: Gender

Table 5.3: Gender of Respondent

	Name of Estate			
Gender	Sunshine Estate	Ojokoro Estate	Total	Percentages
MALE	28	44	72	58
FEMALE	12	40	52	42
Total	40	84	124	100

Out of the 160 structured questionnaires administered in the two estates, a total of 124 households responded to the questionnaires. This gives a response rate of 77.5% of the questionnaires administered. This is made up of 72males (58%) and 52 females (42%) as shown in the pie chart below.

Fig 5.1 GENDER OF RESPONDENTS



Q2: Age

Table 5.4 Age Distribution

Age distribution (YEARS)	Name of Estate			
	Sunshine	Ojokoro	Total	Percentage (%)
20-30	6	14	20	16
31-40	15	32	47	38
41-50	11	28	39	32
51-above	8	10	18	14
Total	40	84	124	100

Out of the 124 household respondents, the histogram below represent the age distribution which shows that 47 respondents (38%) fall between the age group 31-40, 39 respondents (32%) fell

between age group 41-50, 20 respondents (16%) are in the age group 20-30 and 18 respondents (14%) fell in the age group 51-above. It can be deduced from the figure below that majority of the households in the estate are people in their middle ages (31-40 and 41-50) there is likely hood that if they are adequately educated about LEIs, they will take up this initiative.

Fig 5.2 Age distribution of Household Respondent

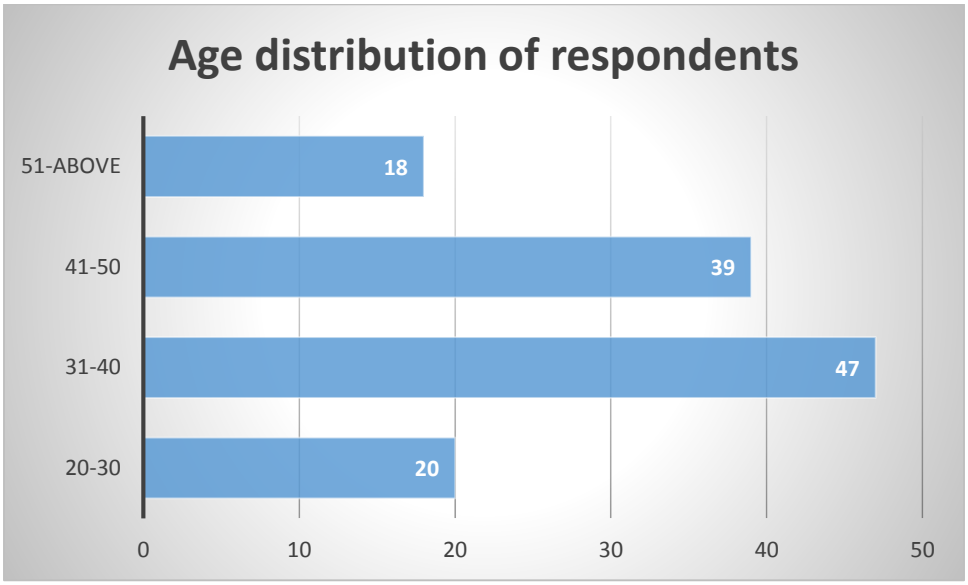


Table 5.5: Marital Status of Respondents

Marital status	Name of Estate			
	Ojokoro	Sunshine Estate	Total	Percentage (%)
Married	60	34	94	76
Divorced	2	0	2	2
Single	22	6	28	22
Others	0	0	0	0
Total	84	40	124	100

Q3: Marital status

Fig 5.3: Marital status of Household Respondent

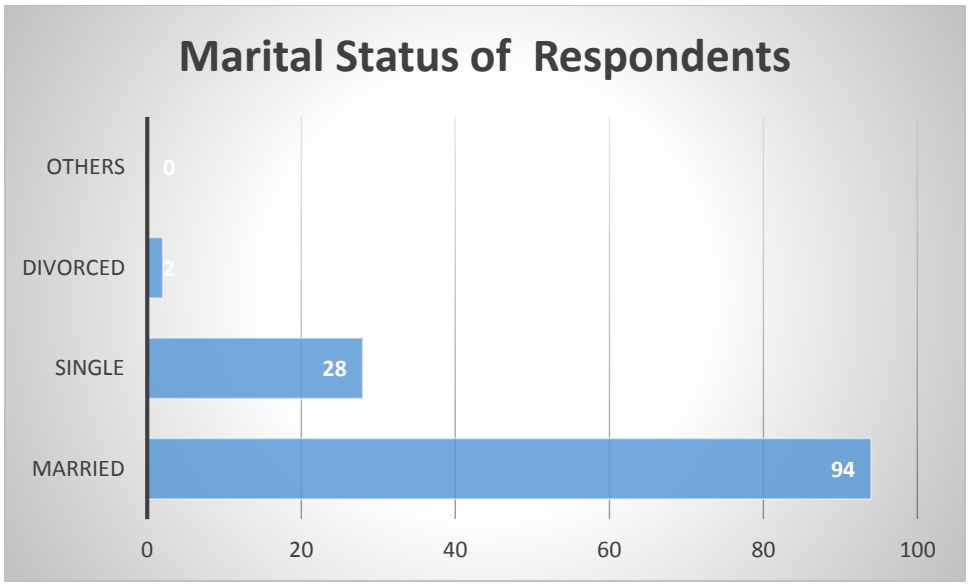
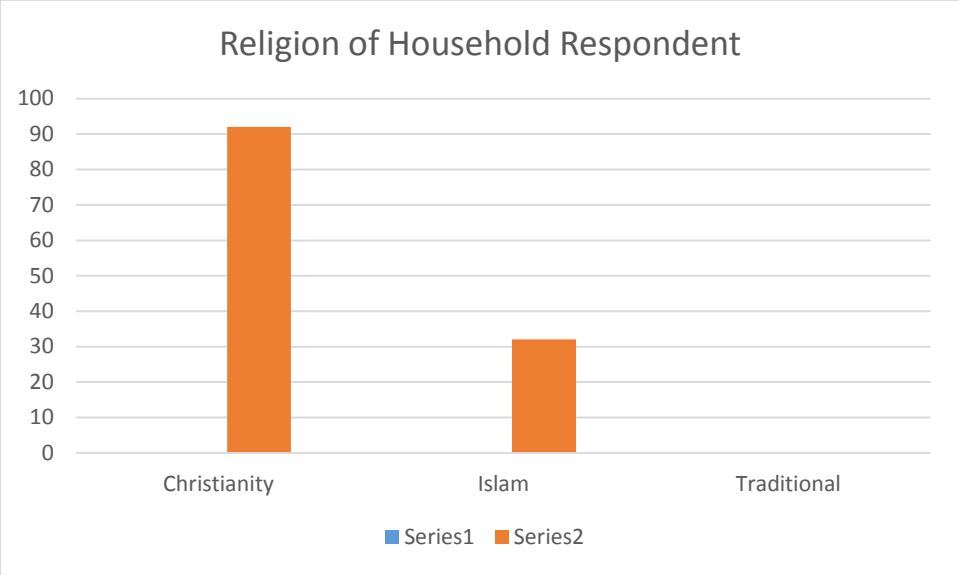


Table 5.6: Religion of Respondent

Religion	Name of Estate			
	Sunshine	Ojokoro	Total	Percentage (%)
Christianity	32	60	92	74
Islam	8	24	32	26
Traditional	0	0	0	0
Total	40	84	124	100

Q4: Religion

Fig 5.4: Religion of Household respondent

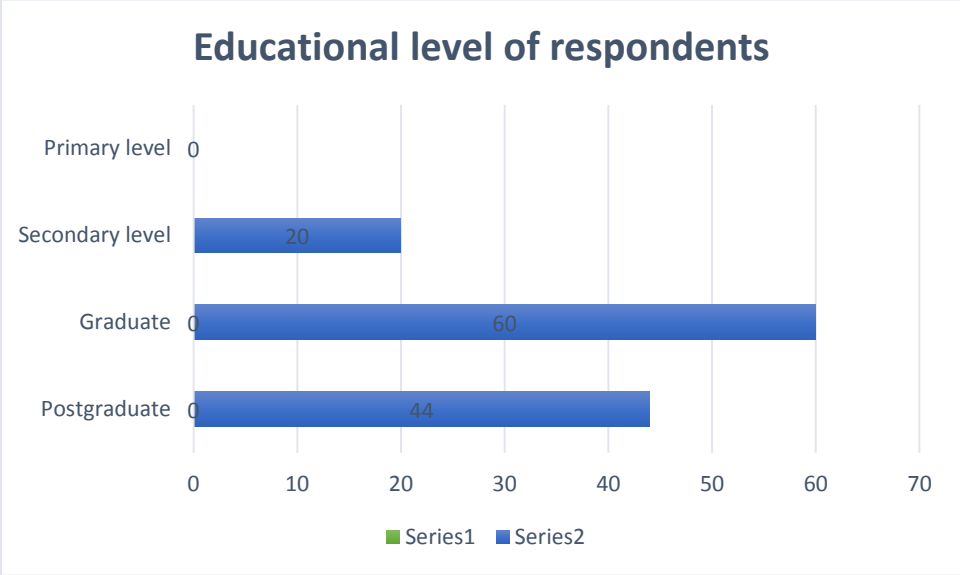


Q5: Education level

Table 5.7: Education Level of Respondent

Educational Level	Name of Estate			
	Ojokoro	Sunshine	Total	Percentage (%)
Postgraduate	24	20	44	36
Graduate	44	16	60	48
Secondary	16	4	20	16
Primary	0	0	0	0
Total	84	40	124	100

Fig 5.5: Education level of respondent

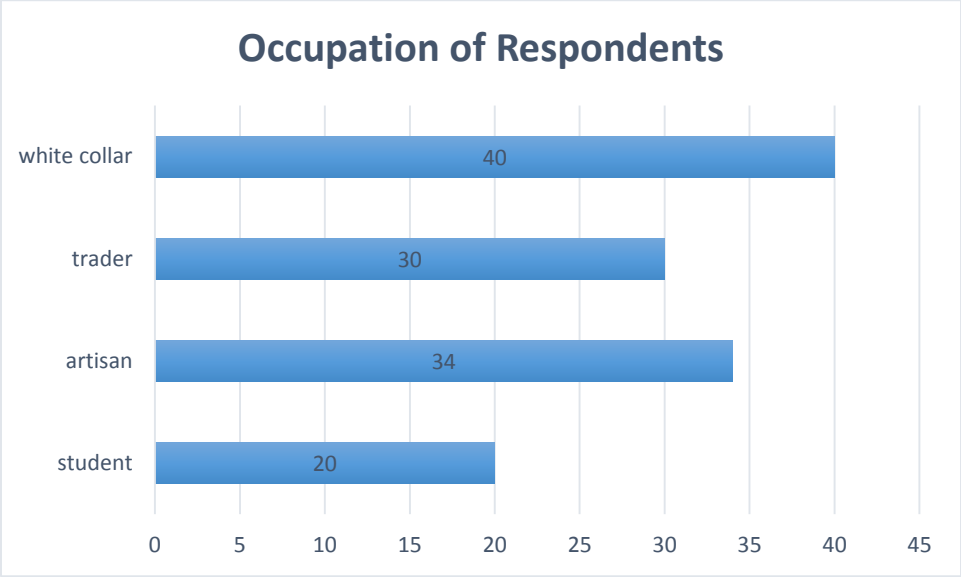


Q6: Occupation

Table 5.8: Occupation of Respondents

Occupation	Name of Estate			
	Ojokoro	Sunshine	Total	Percentage (%)
Student	14	6	20	16
Artisan	26	8	34	28
Trader	20	10	30	24
White Collar	24	16	40	32
Total	84	40	124	100

Fig 5.6: Occupation of Respondent

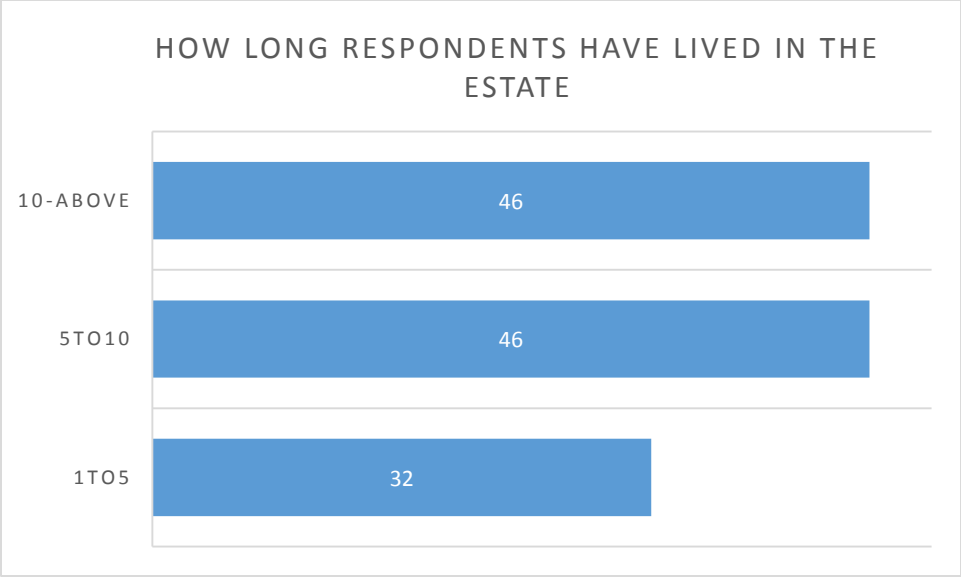


Q7: How long have you live in the estate?

Table 5.9: How long have you lived in the estate

Duration of stay in the Estate (Years)	Name of Estate			
	Sunshine	Ojokoro	Total	Percentage (%)
1-5	10	22	32	26
5-10	24	22	46	37
10-above	6	40	46	37
Total	40	84	124	100

Fig 5.7 Duration of years Respondent have lived in the estate



Conclusion

We can however conclude here that of all demographic parameters analyzed above, only the level of education can significantly influence the household decision on LEI formation in the estate this is due to the fact that they can easily understand the concept when they are thoroughly sensitized and educated on the concept. In case they decides to take up this initiative or perhaps form an energy cooperative, there is abundant of some professionals needed for an energy cooperative such as Lawyers, accountants, electrical engineers among the respondents from European experience.

5.3 presentation of the opinion and perception of Household Respondents on LEI

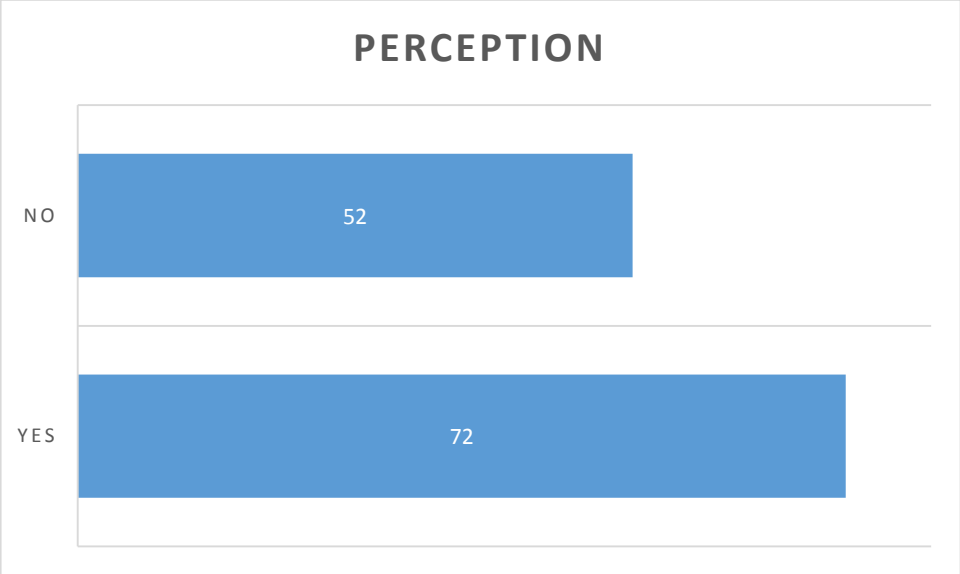
This section is focused on the opinion and perception level of the households on LEIs. A total of 160 structured questionnaires were administered out of which only 124 (77.5%) were retrieved. We shall present the question and the corresponding answers of all respondent with a histogram. The household questionnaire can be found in appendix 2 below. It comprise of close open and close ended questions.

Q8. Have you heard of Local energy initiatives before?

(a). Yes

(b) No

Fig 5.8 Perception

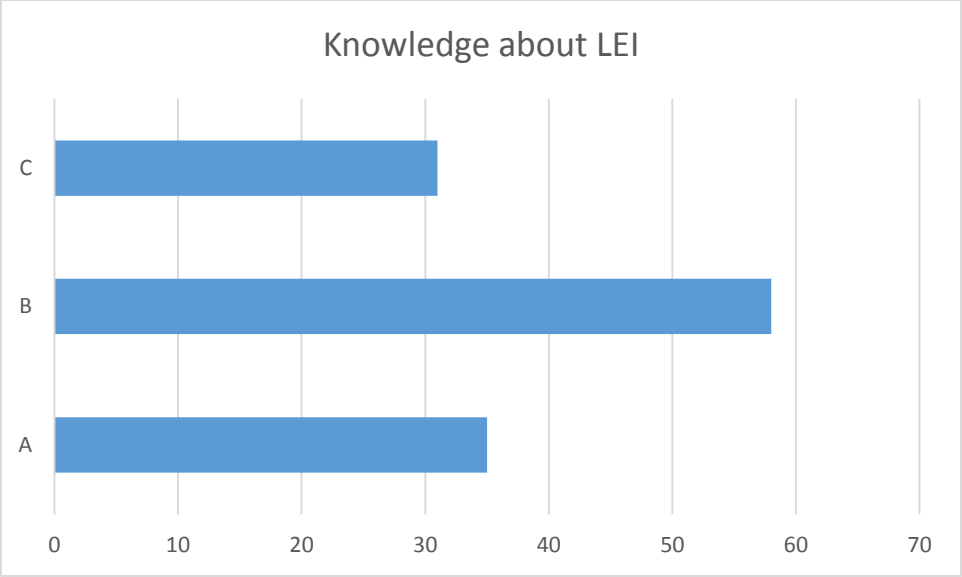


Q9. What do you know about LEI?

i. It is a way to make people energy independent off the grid (A)
ii. It is a way to make energy services accessible for all (B)
iii. No response. (C)

The level of education couple with the clear understanding of the preamble on the questionnaires distributed can be attributed to the high level of LEI knowledge among the respondents as shown in the figure below.

Fig 5.9 Knowledge about LEI



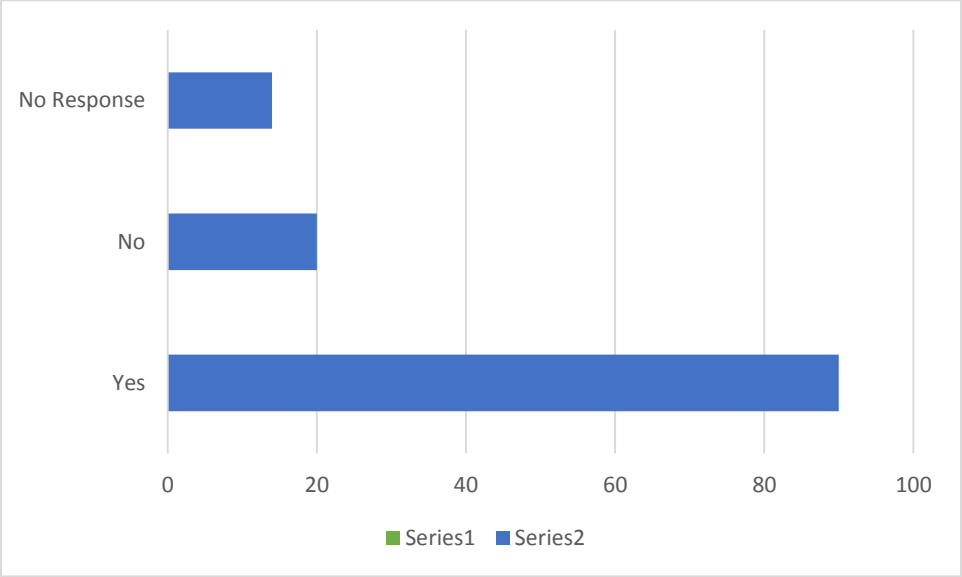
Q10. Do you think LEI can be one of the solution to the energy security problems in Nigeria?

(a). Yes

(b). No

(c). No response

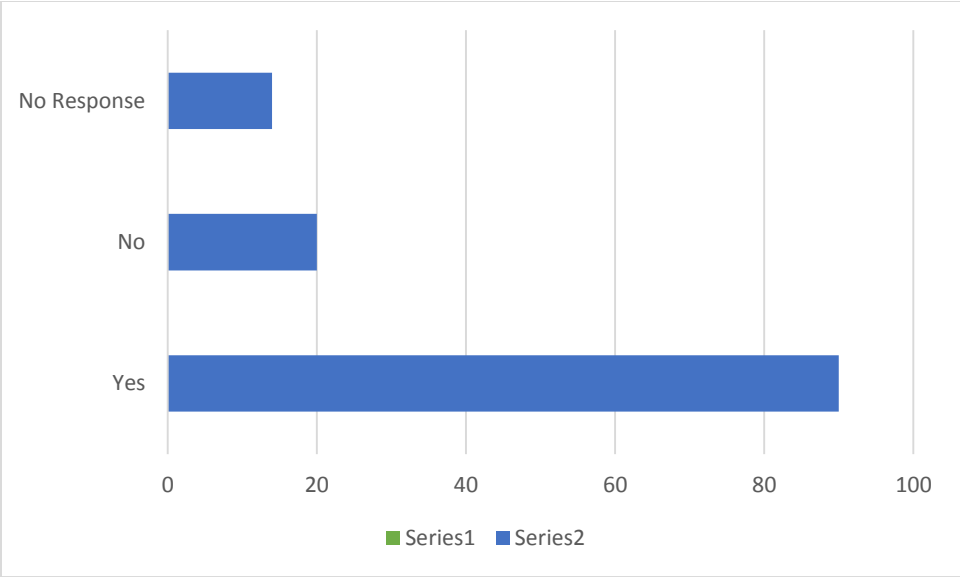
Fig 5.10 Do you think LEIs can be one of the solution to the current energy security problems?



Q11. Do you think you can cooperate with other neighbors in estate to form a Local energy initiative?

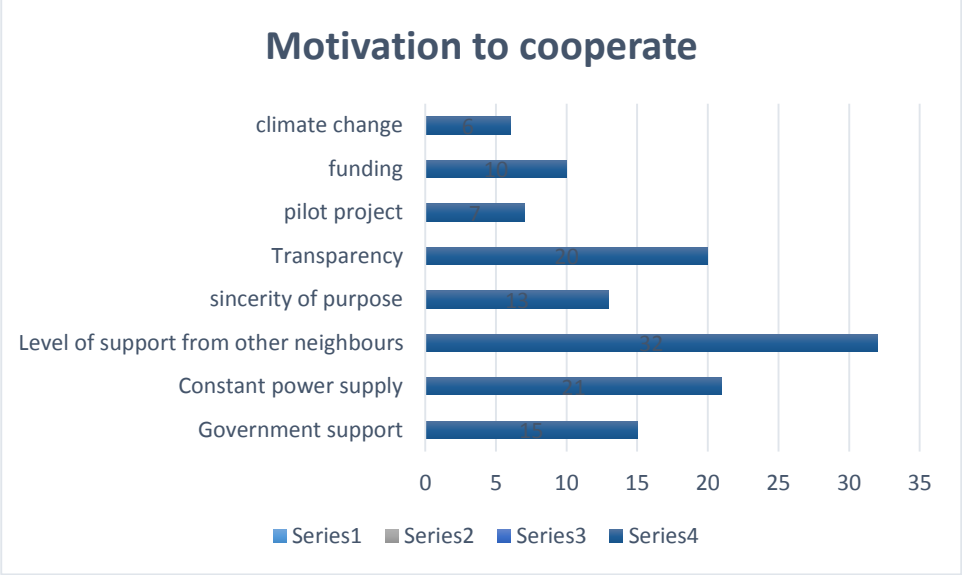
(a) Yes
(b) No
(c) No response

Fig 5.11 Willingness to cooperate with neighbors



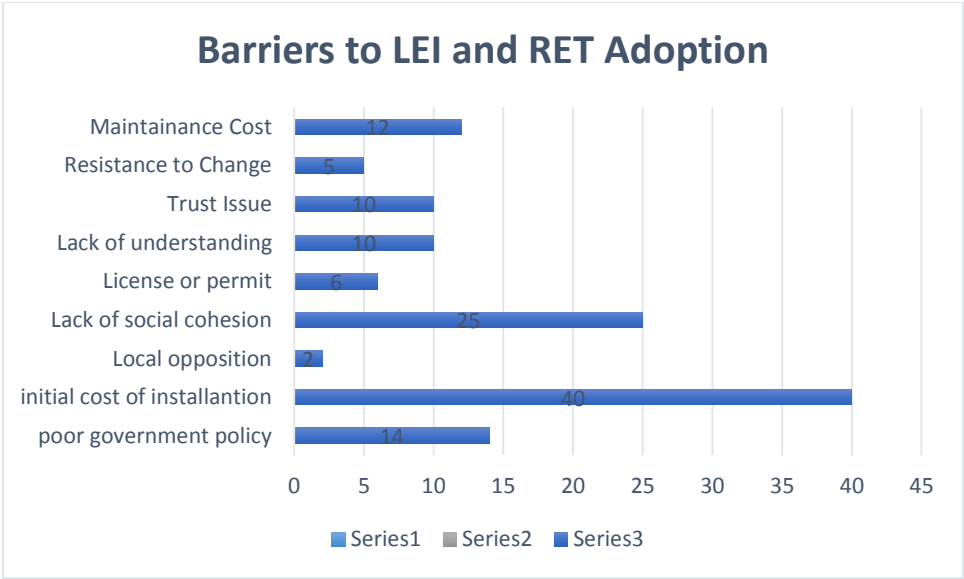
Q12. If Yes what can motivate you to cooperate and if no why? Briefly state it here

Fig 5.12 Motivation to cooperate



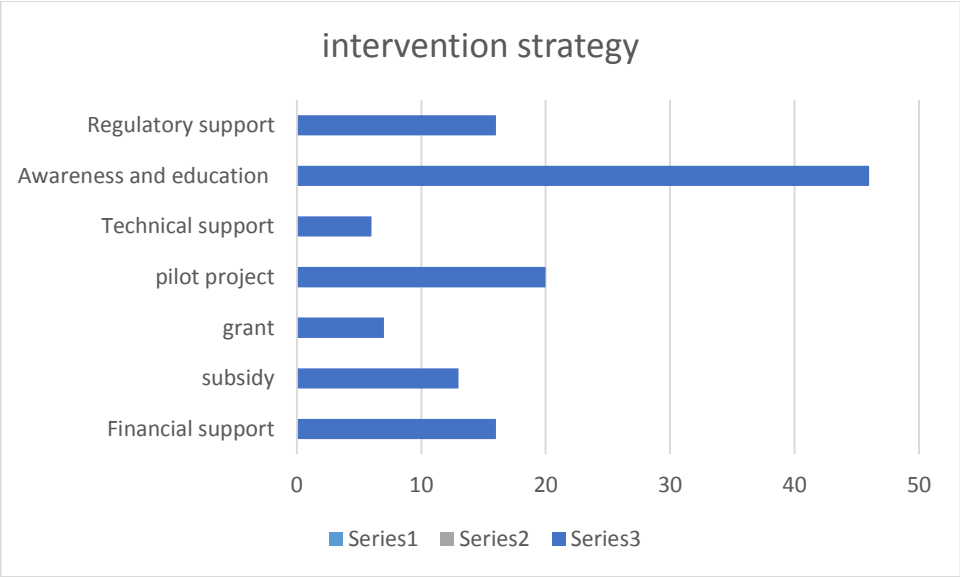
Q13.In your opinion what obstacle, barriers or challenges do think will hinder the formation of LEI and adoption of RET in your Estate.

Fig 5.13 Barriers and challenges to form LEI and to adopt RET



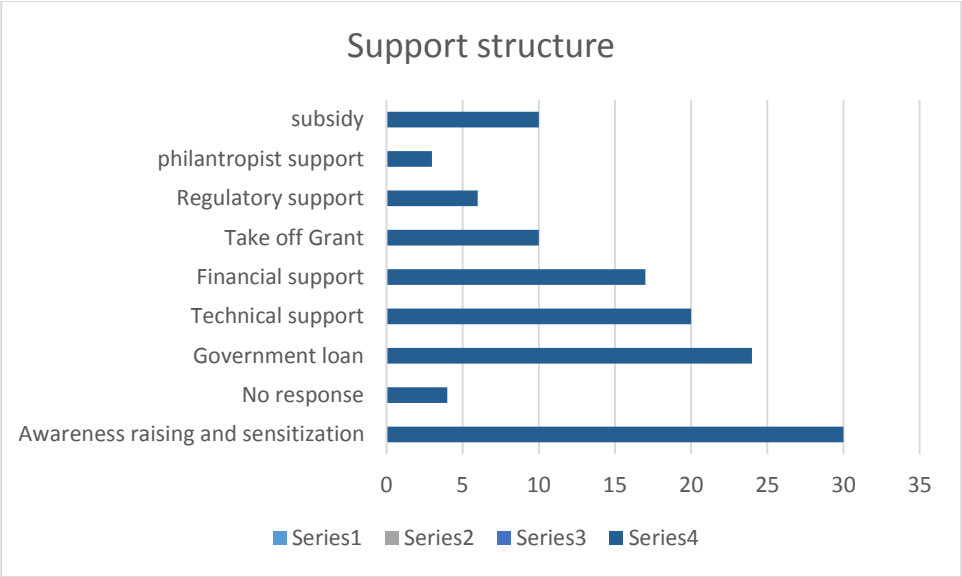
Q14. What factors or intervention strategy do you think will be needed to adopt RET and LEI in your Estate?

Fig 5.14 Intervention strategy



Q15. What support do you think will or may be needed for your estate to take up this initiative?

Fig 5.15 Support structure



Cross tabulation: This is a tool that allows you to compare the relationship between two variables. From the below table, there is a relationship between the number of years and educational level of respondents from the estate. We can conclude that the more number of years you lived in an estate can influence your decision of cooperating with your neighbors for collective bottom up energy solution in the estate. Also the level of education within the estate is amazing, this can facilitate the proper understanding of the concept of LEI and we believe is they thoroughly understand this concept they will be able to convince the less educated people to take up initiatives like this. Both level of education and number of years lived in the estate are important factors that will aid the uptake of LEI in the estates.

Table 5.10 Cross tabulation

Duration in the estate	Level of education			
GENDER	graduate	postgrad	secondary	Grand Total
female	29	16	6	51
Male	33	27	13	73
Grand Total	**62**	**43**	**19**	**124**

5.4 DISCUSSION

After presenting the findings of the research using the stakeholder analysis and mapping to analyze the stakeholder's opinion and descriptive analysis for the household survey, we shall then discuss the findings. To what extent could the integrated conceptual framework (Fig2.4) explains the process of formation of LEI in Nigeria? This research started by discussing the concept of LEI and a success story from Western Europe experience, whilst bottom-up sustainable energy initiatives maybe critical in developing solution to sustainability problems, they are often faced with barriers and challenges.

For Nigeria, where there is non-existence of a bottom up initiatives by cooperation of neighborhood or community members except the once initiated by NGO funded with grant and the one initiated by a corporate organization done as corporate social responsibility, the framework above spelt out some conceptualized process leading to successful LEI formation in developing countries. We shall then go ahead to use these process leading to LEI formation (fig2.4) to discuss the findings presented above.

Perception of people towards LEI: For LEI to be formed in any community or Estates in Nigeria it is important to sample the opinion of the inhabitants of the community as regards LEI. From the result above (fig 5.8), when ask about if they have heard of LEI, 72 respondents (58%) said yes while 52 respondents (42%) said NO, from this result we can conclude that majority of the 124 respondents in the households have heard of LEIs where community come together to own, control their energy but opine that it is not practicable in Nigeria due to the highly centralized energy sector.

The sample collected within the estate is not sufficient enough to represent the entire country but we can infer from this samples that people who live together as neighbors in a community especially in estates like this in Nigeria are likely to adopt LEI if they are well informed and understood how it can be organized and maintained and since they have done some collective projects together such as providing water for themselves via boreholes they could as well take up LEI as means of providing constant power supply for themselves.

When ask what they know about LEI, 47% of respondent said it is a way to make energy services accessible for all, also 28% said it is a way to make people energy independent off the grid, while 25% does not respond to the question (fig5.9) this translate to mean that majority of the respondents knows about LEI, this is due to the fact that 36% of the respondent are educated to the postgraduate level, while 48% are educated up to graduate level and 16% to the secondary level.

In Fig5.10 above, when ask if they think LEI can be one of the solution to the energy security problems in Nigeria, 79% of the respondent said Yes, 12% said No, while 9% were indifferent about this with No response however express the view that energy sector in Nigeria is highly centralized and government regulation may not support it at the moment. While many express concerned about the noise from the individual generators in the estate, they will however support LEI if the people in charge can be trusted even if it through a big generator that can power the whole estate.

Support Structure Needed for LEI formation: For LEI to be formed Nigeria it is subjected to not only support from government but also local support from the community or household the reason being that if there is considerable local opposition since many people in developing countries express high level of resistance to change which may hinder successful formation of LEI. In view of this premise, the households were ask if they can cooperate with other neighbors to form LEI in their estate in which 73% of respondent said Yes, 16% said No while just 11% did not respond. Since majority of the respondents are willing to cooperate with other neighbors to form LEI it then mean it is feasible in the Estate, the level of education also play a role here (see fig 5.11).

Nonetheless, from observation majority of Nigerians are in dare need of cheaper, affordable and constant electricity for their economic and social wellbeing. If this research is to be upscale, we would likely get almost if not the same percentage of respondents willing to cooperate to form LEI in the entire country. Many are even tired of paying estimated energy bills giving to them by the discos, if LEI will afford them a better alternative they will be willing to cooperate to adopt initiatives like this.

When ask what can motivate them to cooperate, 12% said government support, 17% said so far it will guarantee a constant electricity they will cooperate while 26% opine that it depends on the level of support or cooperation from neighbors because in a collective action like this many people want to be free riders. The level of social cohesion in the estate can influence LEI formation or project outcome but that outcome can influence stakeholders.

However, 10% said it depends on the sincerity of purpose among those in charge of the project citing that, in a project like this people in charge are liable to give in to corruption, 16% of the opinion was transparency, they want people that can be trusted and accountable who can give them regular feedback to be in charge, 7% said they will rather be late adopters because they will only join when they confirm it working perfectly, 8% said they will only cooperate if government, philanthropist, corporate organization can provide the initial investment cost this can motivate them to cooperate while only 5% will cooperate in other to contribute to climate change mitigation (see fig5.12)

In figure 5.15, when ask the support structure needed for LEIs to be formed in their estate, of the various support structured mentioned awareness and education seems to be the most important with 24% of respondents. This is not surprising considering the fact that the electricity market in

Nigeria is highly centralized, the first step towards LEI formation in country that is yet to liberalized her electricity market is to educate, sensitize them on the concept, a full understanding of the concept and it benefits will influence their decision on adoption of the LEI.

However, 19% of respondents said government loan, 16% said technical support will be needed, 14% said financial support is germane, 8% said they are okay with a take-off grant, 5% opined that regulatory support is enough, 3% said the support of philanthropists and corporate organization will be needed while only 8% said government subsidy is needed such as the kind currently on fossil fuel (diesel and petrol).

Barriers and challenges for LEI to be formed: The challenges and barriers that will hinder LEI formation in Nigeria as stated by the respondents are Initial cost of installation (32% respondents), Lack of social cohesion have 20% respondents, poor government policy have 11% respondent, Lack of understanding, trust issues and skepticism have 8% respondents each, 4% said resistant to change, 10% stated cost of maintenance, while 5% stated license and permit, and just 2% said social opposition may post a challenge (see fig 5.13).

For some of this barriers to be minimized, households were ask what factors or intervention strategies needed for them to form LEI and adopt the use of RET in their estate. Of the various strategies stated, awareness raising (37%), having a pilot project where lesson can be learnt from the success stories (16%), provision of finance 13%, flexible regulation to support it formation 13%, government subsidy 10%, grant 6%, and while 5% stated provision of technical know-how (see fig 5.14).

6.0 Conclusion and Recommendation

This study was conducted to investigate the possibility of a bottom up approach to the current energy security problems Nigeria and two estates in Lagos was selected as a case study. In this final chapter, we shall provide answers to the main research question and other sub-research question yet to be answered in the previous chapters. Final policy recommendation shall be made based on the findings and conclusion of this research.

6.1 Conclusion

In other to provide answer to the main research question, we shall first of all answer the sub-questions.

Research question 1: What is the extent of energy crisis and Access level in Nigeria?

It is widely accepted that there is a strong relationship between the access to energy services and socio-economic development. This explains why electricity demand is increasing rapidly in Nigeria. Regular and reliable electricity supply is crucial for the industrialization and economic development. Despite the abundance of various primary energy resources in Nigeria, the country still struggles to generate adequate electricity for its growing population and to support the economy.

Only 40% of households in Nigeria are connected to the national electricity grid. Provision of electricity is largely supplemented by private producer or use of individual electricity generators powered with fossil fuel for the privileged income groups. Over 90% businesses and companies have private generators leading to high cost of production this has cripple many small and medium scale enterprise, exacerbate the crime rate in the country. (Omokaro, 2008).

The electricity crisis in Nigeria does not only affect household but big and small scale industries alike. As a matter of fact industries Nigeria rely on private generators (own- generation), which are usually diesel-fired to supplement the short and epileptic electricity supply from the grid, thus increasing the cost of production, which has made many industries to lay off their workers due to increased overhead cost.

The current generated electricity capacity is 3,920MW with per capita power capacity of 28.57W and this is grossly inadequate even for domestic consumption (Ibidapo-Obe and Ajibola, 2011). For Nigeria to meet up its energy needs, its require per capita power capacity of 1000 Watts or power generating capacity of 140,000MW as against the current capacity of 3,920MW. Consequently availability of power in the country varied from about 27% to 60% of installed

capacity, while transmission and distribution losses accounted for about 28% of the electricity generated in the country (Omokaro, 2008).

From Observation, In recent months this figure has increased and there is considerable improvement in electricity supply to Nigerians this is largely due to the body language of the current government, regular supply of gases to the power stations and the privatization of the electricity market.

Research question 4: What are the perception of the people towards the concept in Nigeria?

In other to answer this question, two out of the total number of questions related to LEI on the questionnaires (see appendix 2) distributed were target to provide answer to this question and also the interviewed stakeholders were ask of their opinion on development of LEIs in Nigeria and how feasible and sustainable it is.

In figure 5.8 above, it can be shown that 58% of respondent claim to have heard of LEI before while in fig5.9, when ask of what they know about LEIs 47% said it is a way to make energy services accessible for all, 28% said it is a way to make people energy independent off the grid and 25% did not respond to this question. It can be infer from this percentages that people are aware of collective action towards becoming energy independent since they are currently cooperating to provide portable water for themselves through borehole which they collectively drill in the estate. The level of education of respondents couple with the clear understand of the brief explanation of what LEI look like found on the distributed questionnaires, physically explaining to them while they fill the questionnaire can be attributed to the high level of LEI knowledge among the respondents.

Also, all the 12 interviewees were positive about LEI, however they opined that it is a way to go but is the future of Nigeria electricity market and that the country is not yet ripe for it. This can be attributed to the fact that the electricity market in Nigeria was recently privatized, and the grids are still centralized and far from the people. LEI can only strive in a liberalized electricity market where grids are built closer to the people, they generate electricity and are allowed to send excess energy to the grid. The only Disco interviewed opined that they can develop proposal to the NERC in conjunction with volunteers, estate or cooperatives and on approval they can buy the energy generated from them but the current infrastructure does not support that. They also said in other to satisfy their customers, there are ongoing discussions with NERC which is focus on embedded generation which is related to LEI. The details of the interview transcript can be found in appendix2.

We can therefore conclude that the people are aware of the possibility for them to own and control their energy bills same way they control their water supply. As observes in Fig 5.11, 90 out 124 respondents are willing to cooperate with other neighbors to form LEI in their estate. Although the assistance of external parties such as NGO, government, private sector and experts were found to be important for development of LEI. Not only the economic aspect of the project are important, but also the community involvement in the process of formation. The fact that the community can participate directly in the governance of initiative, while developing trust and cohesion, are also important catalyst towards LEI adoption.

Research question 5: What are the barriers for development or adoption of LEIs and RET in Nigeria?

In the course of this study several barriers to the development of LEIs and RET was revealed by the stakeholders and household respondents. From the stakeholders perspective, the initial cost of investment, lack of awareness, lack of fund, lack of technical knowledge, lack of infrastructure, maintenance cost, poverty level, lack of social cohesion and lack of understanding of the technology itself. As shown in the stakeholders mapping table (table 5.1) above, the initial cost of investment (finance) which is due to the fact that the fiscal and financial incentives as stated in the NREEEP policy are yet to be implemented in the country. The lack of technical knowledge will also be a barrier due to the fact that RET technical knowledge is still very scarce and none of Nigeria's higher institution offers it as course either at undergraduate or postgraduate level except for the recent effort of Lagos state energy academy and Siemens academy. These are the two popular barriers envisage by the stakeholders.

The household survey also revealed several barriers such as poor government policy with 11% respondents, initial cost of installation 32%, lack of social cohesion 20%, maintenance cost 10%, trust issues and lack of understanding of the technology with 8% respondents, license or permit 5%, resistance to change 4% and local opposition 2%. As shown in figure 5.13, the initial cost of investment and lack of social cohesion will play a major role in the decision making of the community on the adoption of RET and formation of LEI. Although every other barriers mentioned must also be put into consideration for a successful LEI formation.

From observation, many Nigerians have the desire to generate their own energy but the barriers are enormous. One of the main barriers to be address is community awareness. Communities will not adopt what they do not have the clear understanding of the benefits, risks and how it can be organized. Another major barrier is the initial cost of investment due to the high cost of solar panel and batteries but this can be minimized only if there is local production of this technology and perhaps the remover of import duties on the importation of RET to the country will lead to a crash in price of these technologies.

For local generation of electricity in the communities, GIZ the German cooperation in charge of the Nigeria energy support program (NESP) suggested that a private model will only work. Private model in the sense that the system will be installed and maintained by private organization in

which the community will play a role. They propose a hybrid model where the ownership is the community but distribution access is given to the private sector. As opined by GIZ interviewee, for LEI to work in Nigeria the government can finance it for local community, the private energy companies install and train the people on how to manage the infrastructure.

On the issue of trust, many stakeholders and respondent express concern on the current corruption rate among Nigerians. Since the level of corruption in Nigeria is high compared to the Netherlands, respondents are very skeptical about the integrity of the persons that will be in charge of the project planning process.

We can therefore conclude that, for the adoption of RET and formation of LEI in a Nigerian community, all these barriers are of utmost important and must be systematically removed with appropriate policy supports. This is also in line with the barriers found in literatures on LEI which has already being explained in chapter four above (see 4.5). The first step must be to educate the community on the need for the adoption of RET and formation of LEI. From observation during the survey many respondents were very inquisitive and eager to know more about RET most especially the cost of installation and economic benefits. Majority of the respondents were of the view we install a pilot project in their estate as the expected outcome of this study.

Research Question 6: What are the potential drivers, factors and intervention strategies that can motivate people to adopt LEIs and RET in Nigeria?

There are multiple drivers for adoption of RET and development of a community bottom-up energy solution in Nigeria as well as barriers to adoption but certain strategies has to be put in place to motivate Nigerians to start thinking in this direction. In other to answer this question, the household respondents and stakeholders were ask related question.

From figure 5.14, 13% of the respondents said that regulatory bottlenecks such as permitting and licensing process must be friendly or totally removed. This was also reiterated by majority of the stakeholders expressing the opinion that it is very difficult for communities or small producers (prosumers) to influence the policy making surrounding a bottom up approach to energy generation, transmission or access or development. The ECN and NERC also responded that LEI does not align with the current renewable policy but in the future we are optimistic that community-based energy will be inculcated into the NREEEP. The Eko disco also expresses concern about permitting and licensing, in fact the interviewee emphatically stated that LEI is a way to go but NERC regulation does not support it as most of its activities will be subjected to NERC approval. Similar view was opined by the NGO interviewed which was one of the reason given for their focus on rural areas that are yet to be connected to the grid.

Also 37% of respondents to our survey stated that the awareness level is very low, that appropriate education, sensitization of communities in Nigeria can be a motivational strategy for adopting community based energy. Awareness raising was also among the stakeholders response to question related to this research question. Another very important strategy is the success story

of a pilot project in which people can learn from. GIZ stated that *"The success of a pilot project somewhere, then call people to see it. It can be replicated somewhere else. You need to learn the success story of an innovation like this before taking decision on adoption."* As shown in figure 5.14, we can also see that 16% of the survey respondents also stated they want a proof of where this concept has worked as a source of motivation. The NCEE believed that government should initiate an award system among all the estates in Nigeria particular Lagos state that will encourage the community to take up initiatives like this and while doing that a certain proportion of our annual budget should be set aside for community based energy system, this will not only raise awareness it will also motivate people communities to take up this initiative.

We can also observe from the figure 5.14, financial incentives (grant 6%, subsidy 10% and financial support 13 %) are also seen as a very crucial strategy for the adoption of RET and development of LEI in Nigeria. The implementation of the financial and fiscal incentive as stated in the NREEEP such as feed-in tariff is a good strategy for stimulating community based energy system. The result of household survey also shows that provision of technical support (5%) to the community is also an important strategy for adoption of LEI and RET. Although many of the stakeholders especially the government stakeholders are ready to provide technical know-how and advice to communities that are willing to take up such energy initiatives (See table 5.1 stakeholders mapping).

Question 7a: What Support structure will be needed or currently in place for LEIs in Nigeria?

Since there are no LEIs in Nigeria, supporting structure cannot be in place. Although there are many supporting structure needed for LEI development in Nigeria as identified by the stakeholders and survey respondents. The LEA stated that a single digit interest rate loan should be provided by financial institution. Interviewees from the finance institution, Disco however said the enacting a regulation that allow community to have access to the grid can be found supportive such that individuals, communities and cooperatives can have a good business case attractive enough for bank loans. GIZ, CREDC, EKEDC, LSEB, NCEE Lagos state ministry of energy opined that support in terms of awareness, education and training of community members on LEI is the first step for LEI development in Nigeria, they stated that the government at all levels coupled with the private sectors and professionals should commence awareness raising among Nigerians. The details of interview transcript can be found in appendix 2.

From the survey respondents as shown in fig5.15, we found out that finance and fiscal incentives are the most important support structure needed for LEI development in the two estates. Incentives such as Government loan with 19% of respondents, subsidy and grant 8% each, financial support 14%, summing up to be more than one third of the total respondents (49%). A quarter (24%) cited sensitization, awareness and education on the need and benefit of LEI should be carried out for proper understanding of the concept. Few people (3%) did not respond to this question perhaps they are among those that will oppose the development in the estate or

perhaps they needed more clarification on the concept. Another set of people believes that they will need the support of philanthropist who will be able to donate money or infrastructure towards LEI development. However only 5% of respondents expresses their concern for regulatory support. They want LEI development to be backed up by government regulation this will provide security for their investment.

Question7b: What can be learnt from LEIs support structures in Europe?

In Europe for example, local energy initiative are being set up by interest group or volunteer for different motivation some of which include energy security, climate change, lower energy bills while in Netherlands many municipality see local energy initiative as a tool to meet the European union target (EU: 20:20:20) which simply means, that in the year 2020, EU member states want to have 20% renewable energy use in their energy mix, 20% reduction in the use of fossil fuel while Netherlands are still struggling to meet up with this target

Germany already surpass (25%) the European Union target, this was made possible by local energy initiatives by communities and municipalities. Saerbeck klimakommune a sustainable village in West Germany is a very good example of a successful local energy initiative and provides a clue on how community energy initiative could help provide solution to the present electricity crisis and climate change problem confronting developing countries and indeed Nigeria. And if the government of Nigeria will decentralize the grid system, allow investors to build micro- grids in each local government area, allow public access to the grid, promote the use of renewable energy usage, gives loans and subsidy to interested local communities the issue of electricity crisis will be a thing of the past.

The integration of financial tools such as Feed-in-tariff, in policies is a major contributing factor to the success of LEI development. Such tools in Europe provide investors and users guaranteed return on investment and price for power generated from a renewable source. (Li wen Li etal, 2013) stated that the financial tools in integrated into German energy policy reduces local opposition and even promoted public acceptance of, and participation in, local energy initiatives. The renewable energy act in Germany provides basis for community-scale development of renewable energies. The involvement of financial institutions whose major interest is the loan repayment, agencies, states and local government will also play a role in LEI development without which 100% success of the project is an illusion.

The success of LEI in Europe can be attributed to the liberalization of the electricity market. This has given rise to the establishment of micro grids, mini grids and smart grid system. The decentralization of the grid has motivated many communities to take up energy initiative due to the fact that they can generate, use, and send excess energy produced to the grid. Also the implementation of the fiscal and financial incentive such as SDE fund in the Netherlands has

motivated many volunteers, cooperatives and individual to generate energy via a renewable energy source.

In Denmark in 2001, an estimated 150,000 households owned or held shares in wind turbines, while in Germany an estimated 350,000 individuals owned shares in wind cooperatives. In Austria, biomass district heating projects are now widespread, including some under models of cooperative ownership (Walker, 2008).

In UK small scale sustainable energy projects led by local community are numerous. According to Energy share website, an online forum for community initiative reported about 1000 active groups (T.Hargreave etal, 2008). What can be learnt here is that some of the initiative were solely designed to boast activities within the community sector, often providing funds to intermediary organizations in order so that they could advice local community groups over the development of local energy initiative.

Furthermore, recently community initiative now have to adopt a business-like model, whereby they generate investment capital from other sources other than grants. This is because the Feed-in-tariff structure provides guaranteed, above market rate payment for each unit of electricity generated from approved and certified, small scale renewable energy generation. We believe this a very important lesson developing countries like Nigeria can learn from the developed countries.

In summary, the supporting structure that can be learnt from LEI development in Europe are enabling regulation, decentralization of the grid, Liberalization of the electricity market, integration of financial tools such as Feed-in tariff and involvement of the states, local government and financial institutions. This can serve as a lesson to the developing countries particularly Nigeria.

Main Research question: Can local energy initiative contribute to a sustainable energy future and energy security in Nigeria??

According to the information gathered in the course of this research; we can say yes to the above question. Local energy initiative can increase the access to energy services in Nigeria as well as contribute to a sustainable energy future. The stakeholders expresses a positive opinion over

local energy initiative as a viable tool to increasing energy access especially to the rural communities that are yet to be connected to the grid. They all said LEI is feasible but will only be sustainable should the government regulation support its development and the community members are adequate trained on the maintenance culture. GIZ stated LEI could improve energy access but specialized organization is need to drive the process. The Disco said LEI could fill up certain deficit in amount of power available for them to distribute.

The result of the survey in fig 5.10 shows that more than half (79%) of the respondents sees LEI development as one of the veritable tools to solving the current energy security problems in Nigeria. Also fig 5.11, shows that over half (73%) of respondents are willing to cooperate with their neighbors to form LEI in the estates. This signal the fact that, if Nigeria can develop LEI, it will contribute to sustainable energy future and energy security.

Although the number of samples are not representative sample of Nigeria population but they are enough to provide a clue as to how relevant LEI could contribute to increasing access to energy in Nigeria.

Currently, DFID and other international organization have initiated some programs that focusses on electrifying the rural communities without grid connection, one of which is the solar Nigeria program. To address the challenges of rural urban migration arising from inadequate electricity supply as well as to aid improved access to affordable power through RET, the Nigerian bank of industries on 14th October, 2015 inaugurated a 24kilowatts micro-grid solar solution in two communities in Osun state, southwest Nigeria.(The Guardian newspaper, 15th October, 2015).

The energy commission of Nigeria already set up platforms to encourage Nigerians to adopt solar energy such as solar energy society of Nigeria, association of solar energy promotion. Hopeful this platforms will live up to the purpose for which they are set up. Also, the NERC stated that LEI will allow quicker access to energy and the rural electrification fund in view will help develop them. The LSEB believes that estates in Lagos state could cooperate among themselves to improve energy access.

Furthermore, the newly sworn-in African development bank (AfDB) president, during his inaugural speech promised to focus on tackling African's chronic power shortages to try to unlock its economic potential and ends its vulnerability to fluctuations in commodity prices. He also identify the lack of reliable power grids as a major obstacle to industrializing the continent.

> *"Energy poverty on the continent has to be solved as a matter of urgency, as a matter of scale. This is going to be my most important priority"* Femi Akinwumi

In conclusion, this research has reveal the need for a bottom up approach to energy generation and increased energy access tackling a wide range of issues such as barriers, intervention

strategies and support structure need for this concept. With appropriate policy support such as financial and fiscal incentives, robust awareness and education and a few pilot projects, we are optimistic that community based energy initiative can be developed, sustained and achieve its full potential as one of the solution to the energy security problems in Nigeria and play a role in the sustainable energy transition in the world at large.

According to the integrated conceptual framework above (chapter 2.4), we can also conclude that for LEIs to be formed in Nigeria, the different stakeholders has a role to play. With the stakeholders, performing their roles and all the necessary factors are taking into cognizance as elaborated in (chapter 4.5), LEI formation will not only be successful in Nigeria.

Since all developing countries faces almost the same problems including energy security problem, we can as well generalize the findings of this research to other developing countries. The best way to minimize energy insecurity in developing countries is to encourage communities to take up energy initiatives. In other to widen energy access in developing countries, we can conclude that local energy initiative can contribute to a sustainable energy future and energy security in developing countries with the stakeholders playing their roles and taking cognizance of the factors for adoption of LEI (see 4.5).

6.2 RECOMMENDATIONS

This section aim to formulate recommendations to the policy makers based on the result of empirical study.

1. Government should empower local NGO's, volunteers to embark on mass education, awareness, sensitization and dissemination of knowledge about renewable energy, energy efficiency and local energy initiatives.
2. Government should liberalize the Nigeria electricity market such that we can dismantle the centralized grid and build mini grids, micro grids and smart grids to allow grids to be closer to the people. This can be effectively managed and reduce the transportation of electricity which will reduce the cost of infrastructure needed for electricity transmission such as high tension cables.
3. Collaboration between the government and citizen groups can help spread LEI, most importantly is the case of local government to give attention to these type of initiatives.
4. ECN should declare a state of emergency in our energy research centers for them to start producing locally made solar panels. The government should fund massive R&D of RET through ECN so that when solar panels and other RETs are produced locally the initial capital cost for LEIs will significantly reduce.
5. Government through ECN should implement the Feed-in-tariff in the NREEEP so that Nigerians can be sure that if they invest in energy they are going to be paid according to the number of watts or kilowatt they fed to the grids. This is one of the motivational

strategies for LEI development and adoption it will not only motivate, it will create avenue for development of business cases in this sector.

6. Community based energy generation should be included in the NREEEP to encourage communities to take up local energy initiatives.
7. Government should institute strict laws to curb the corruption in our energy sector and our society at large.
8. Government should immediately remove import duty on importation of RET equipment to the country. This will lead to a fall in price of solar panels and therefore reduce the initial capital to set up LEIs.
9. Government through ECN and NERC should urgently implement the fiscal and financial incentives stated in the NREEEP policy. This will motivate Nigerians to install solar panels on their roofs and adopt LEIs.
10. Federal government should allow states and local government to generate and distribute energy to citizens. This will enhance the spread of micro and mini grids and stimulate people to generate their own energy and an access to the grid will make them generate excess that could be sent to the grids due to the financial motivation. From Findings, Lagos has develop several mini grid but since they cannot distribute energy to Lagos residence, the minigrids due to the strict NERC regulation which prohibited any state, local government or individuals to distribute energy, the mini grids are left unused and becoming rusty.
11. Capacity building should be intensified to empower communities to advocate renewable energy and local energy initiatives. The federal government should emulate the Lagos state government by setting up energy academy to train and re-train energy experts this will bridge the technical know-how gap found in the course of this research.
12. All Nigerian Universities should set up renewable energy research centers and a dedicated department for renewable energy technology to train interested Nigerian youths both at undergraduate and postgraduate level this further build capacities in this sector.
13. Financial institution should be mandated to finance renewable energy projects yearly and should be included in their yearly financial reports.
14. Government should set up a separate ministry for renewable energy and energy efficiency that will oversee the development of this sector and set up renewable energy fund that will be accessible to all volunteers, NGO's communities, estates that are willing to adopt RET and form LEIs.
15. Nigeria government in partnership with local NGO's should develop partnership with international agencies to develop community based-energy generation.
16. The ECN should organize several workshops in all the thirty six states inviting interested Nigerians, NGO's, private sectors, and students to discuss NREEEP as many Nigerians and actors do not know that the policy is in existence. The policy should be publicized via television advert, radio jingles and newspapers couple with workshops this will further bridge the information and awareness gap found in the course of this research.

6.3 Limitation and opportunity for further research

The households and housing estates selected in Lagos state and indeed Nigeria are far from representative of the general population as a whole. To extrapolate our results to the general population would be misguided and misleading. The selective sampling approach employed in this studies was for practical reasons and is not representative of the entire population of Nigeria.

Furthermore, this is a Master of Science research with time and logistical constraint hence we could not cover all of the estates and stakeholders in the energy sector. Thus, this open a window of opportunity for further research on LEI development in Nigeria which will not only cover the housing estates but the entire country. Although, the researcher hope to continue with this research up to PH.D level, this will cover the entire southwestern region of the country if fund is made available.

One vital limitation we faced was the fact that the concept of LEI is relatively new in Nigeria, we can affirmed that this is arguably the first research on this concept in Nigeria as stated by one of the key stakeholders interviewed. This makes the process of data collection very tedious as we need to explain to most of them what the concept is all about. We were unable to interview the distributor of solar panels in Nigeria as many of them are skeptical to divulge any information to us for the fear of healthy competition. Many of them believes we are researching for their competitors who want to come to the market as we were embarrassed on visiting one of them.

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APPENDIX 1 STAKEHOLDER ANALYSIS WORKSHEET

STAKEHOLDERS ANALYSIS WORKSHEET					
Stakeholder group	NATURE OF STAKE				
Contact					
Impact of stakeholders on LEIS					
Impact of LEIs formation on Stakeholder					
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder	The stakeholder itself alone can	The stakeholder is one of the several persons that are allowed to make decision		The stakeholder cannot make decisions regarding the use of the resources. Hence	

to affect LEIs formation	make decision regarding the use of the resources in his or her organization	regarding the resources. Hence the stakeholders depends to some extent on others	the stakeholder is fully dependent on others in decision making
2. Level of Interest			
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs	The stakeholder gains little or no interest/advantage from LEIs
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

List of stakeholder's analysis worksheet

REF	NAME OF STAKEHOLDER
SAW 1	Energy commission of Nigeria
SAW 2	Nigeria Electricity Regulatory commission
SAW 3	Lagos state Ministry of Energy and Minerals
SAW 4	Lagos State Electricity Board
SAW 5	Lagos Energy Academy
SAW 6	Eko Electricity Distribution Company
SAW 7	Eco bank Nigeria Limited
SAW 8	Community research and Development Center
SAW 9	GIZ
SAW 10	Solar Nigeria
SAW 11	Sunshine Estate Community Chairman
SAW 12	National Center for energy efficiency and conservation

Energy Commission of Nigeria

STAKEHOLDERS ANALYSIS WORKSHEET		SAW 1
Stakeholder group	Government	NATURE OF STAKE
Contact	Engr Oluyemi	
Impact of stakeholders on LEIS	Technical support	
Impact of LEIs formation on Stakeholder	Help drive the RE masterplan	

LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation

Level of power, level of interest, level of urgency			
Definition	High (1)	MEDIUM (0)	Low (-1)
1. Level of Power			
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others	The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making

	or her organization		
2. Level of Interest			
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs	The stakeholder gains little or no interest/advantage from LEIs
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

Nigeria Electricity Regulatory Commission

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 2)					
Stakeholder group	Government	NATURE OF STAKE			
Contact	Dr Okoro				
Impact of stakeholders on LEIS	Enabling regulation to support LEI				
Impact of LEIs formation on Stakeholder	Helping government to reach its goals on energy access				
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's	Stakeholder who agrees	Stakeholder who agrees	Stakeholders whose view	Stakeholders that do not	Stakeholders who disagree

support, oppose or its neutrality to LEI formation	with LEIs formation and give significant support	with LEIs and give less significant support to its formation	and opinion are neutral to the formation of LEIs and do not give significant support	agree with LEIs and criticize its formation but do not oppose it	with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs		The stakeholder gains little or no interest/advantage from LEIs	
3. Level of urgency					
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way		The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.	

Lagos State Ministry of Energy and Mineral Resources

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 3)					
Stakeholder group	Government		NATURE OF STAKE		
Contact	Mr. Sikiru				
Impact of stakeholders on LEIS	1 Technical support 2.Assist in drafting power purchase agreement				
Impact of LEIs formation on Stakeholder	Help to achieve government power sector plans and energy access				
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI	The stakeholder is highly	The stakeholder gains medium		The stakeholder gains little or no interest/advantage from LEIs	

formation or advantages or disadvantages that bring to the stakeholders through LEIs	interested in LEIs formation and believe it has lots of advantages	interest/advantages from LEIs	
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

Lagos State Electricity Board

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 4)					
Stakeholder group	Government NATURE OF STAKE				
Contact	Mr. Femi and Mr. Demola				
Impact of stakeholders on LEIS	1. Raise awareness 2. Design system 3. Technical support and advice				
Impact of LEIs formation on Stakeholder	Help meet the goal of implementing the state policy on RET				
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its	Stakeholder who agrees with LEIs formation and	Stakeholder who agrees with LEIs and give	Stakeholders whose view and opinion are neutral	Stakeholders that do not agree with LEIs and	Stakeholders who disagree with LEI and

neutrality to LEI formation	give significant support	less significant support to its formation	to the formation of LEIs and do not give significant support	criticize its formation but do not oppose it	oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs		The stakeholder gains little or no interest/advantage from LEIs	
3. Level of urgency					
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way		The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.	

Lagos Energy Academy

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 5)

Stakeholder group	Academic Institute	NATURE OF STAKE
Contact	Miss Dolapo (Asst Coordinator)	
Impact of stakeholders on LEIS	Capacity building and knowledge	
Impact of LEIs formation on Stakeholder	Trained technician from the institute will have jobs to do	

LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation

Level of power, level of interest, level of urgency			
Definition	High (1)	MEDIUM (0)	Low (-1)
1. Level of Power			
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others	The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making
2. Level of Interest			
The stakeholder's interest in LEI formation or advantages or	The stakeholder is highly interested in LEIs formation	The stakeholder gains medium interest/advantages from LEIs	The stakeholder gains little or no interest/advantage from LEIs

disadvantages that bring to the stakeholders through LEIs	and believe it has lots of advantages		
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

Eko Electricity Distribution Company

STAKEHOLDERS ANALYSIS WORKSHEET (SAW6)					
Stakeholder group	Energy supplier NATURE OF STAKE				
Contact	Mr. Nosa Igbinedion				
Impact of stakeholders on LEIS	1 Education and awareness. 2 Help facilitate permit 3 Technical advice				
Impact of LEIs formation on Stakeholder	It will help fill up certain power distribution deficit				
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation

Level of power, level of interest, level of urgency			
Definition	High (1)	MEDIUM (0)	Low (-1)
1. Level of Power			
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others	The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making
2. Level of Interest			
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs	The stakeholder gains little or no interest/advantage from LEIs
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

Ecobank Nigeria Limited

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 7)		
Stakeholder group	PRIVATE SECTOR	NATURE OF STAKE
Contact	Mr Dolapo Oni	
Impact of stakeholders on LEIS	Help source for fund	
Impact of LEIs formation on Stakeholder	Return on investment and profit	

LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs		The stakeholder gains little or no interest/advantage from LEIs	
3. Level of urgency					
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way		The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.	

	support inhibit LEI formation		

Community Research and Development Center

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 8)					
Stakeholder group	NGO NATURE OF STAKE				
Contact	MR UYIOSA				
Impact of stakeholders on LEIS	LEI Driver, Willing to help source for grant. Technical support				
Impact of LEIs formation on Stakeholder	Help drive its main aim of mitigating climate change				
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	

2. Level of Interest			
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs	The stakeholder gains little or no interest/advantage from LEIs
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

GIZ

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 9)		
Stakeholder group	NGO	NATURE OF STAKE
Contact	Mr. Carlos	
Impact of stakeholders on LEIS	Technical support	
Impact of LEIs formation on Stakeholder	Help drive its program of Nigeria energy support program	
LEGEND OF MAIN CONCEPT		
Level of attitude		

Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs		The stakeholder gains little or no interest/advantage from LEIs	
3. Level of urgency					
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way		The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.	

Solar Nigeria/DFID

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 10)					
Stakeholder group	NGO NATURE OF STAKE				
Contact	MRS IFEOMA				
Impact of stakeholders on LEIS	NA				
Impact of LEIs formation on Stakeholder	NA				
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI	The stakeholder is highly	The stakeholder gains medium		The stakeholder gains little or no interest/advantage from LEIs	

formation or advantages or disadvantages that bring to the stakeholders through LEIs	interested in LEIs formation and believe it has lots of advantages	interest/advantages from LEIs	
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

Sunshine Estate

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 11)					
Stakeholder group	End User	NATURE OF STAKE			
Contact	ESTATE CHAIRMAN				
Impact of stakeholders on LEIS	Help galvanize support within the estate, help draft letter for government support and permit				
Impact of LEIs formation on Stakeholder	1. Improve electricity supply 2. Main beneficiary				
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation

			significant support		
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs		The stakeholder gains little or no interest/advantage from LEIs	
3. Level of urgency					
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way		The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.	

National center energy efficiency and conservation

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 12)		
Stakeholder group	Research Institute	NATURE OF STAKE

Contact	Mr. Charles	
Impact of stakeholders on LEIS	1. Awareness 2. Technical Advice	
Impact of LEIs formation on Stakeholder	Help reach its research goals	

LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision regarding the use of the resources in his or her organization	The stakeholder is one of the several persons that are allowed to make decision regarding the resources. Hence the stakeholders depends to some extent on others		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully dependent on others in decision making	
2. Level of Interest					
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs		The stakeholder gains little or no interest/advantage from LEIs	

3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way.	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

STAKEHOLDER ANALYSIS WORKSHEET (SAW 13)

STAKEHOLDERS ANALYSIS WORKSHEET (SAW 13)					
Stakeholder group	NATURE OF STAKE				
Contact					
Impact of stakeholders on LEIS					
Impact of LEIs formation on Stakeholder					
LEGEND OF MAIN CONCEPT					
Level of attitude					
Definition	champion	Supporter	Neutral	critics	opponent
Level of stakeholder's support, oppose or its neutrality to LEI formation	Stakeholder who agrees with LEIs formation and give significant support	Stakeholder who agrees with LEIs and give less significant support to its formation	Stakeholders whose view and opinion are neutral to the formation of LEIs and do not give significant support	Stakeholders that do not agree with LEIs and criticize its formation but do not oppose it	Stakeholders who disagree with LEI and oppose to its formation
Level of power, level of interest, level of urgency					
Definition	High (1)	MEDIUM (0)		Low (-1)	
1. Level of Power					
The ability of the stakeholder to affect LEIs formation	The stakeholder itself alone can make decision	The stakeholder is one of the several persons that are allowed to make decision regarding the resources.		The stakeholder cannot make decisions regarding the use of the resources. Hence the stakeholder is fully	

	regarding the use of the resources in his or her organization	Hence the stakeholders depends to some extent on others	dependent on others in decision making
2. Level of Interest			
The stakeholder's interest in LEI formation or advantages or disadvantages that bring to the stakeholders through LEIs	The stakeholder is highly interested in LEIs formation and believe it has lots of advantages	The stakeholder gains medium interest/advantages from LEIs	The stakeholder gains little or no interest/advantage from LEIs
3. Level of urgency			
The urgency of a stakeholder for successful implementation of the LEIs	The stakeholder support is very urgent to the LEIs and the absence of its support inhibit LEI formation	The stakeholders support is slightly urgent to the LEIs, but the absence of its support will affect the LEI in a rather negative way	The stakeholder support is less urgent to the LEIs and the absence of its support will not significantly affect LEIs.

APPENDIX 2

LIST OF INTERVIEW CONDUCTED

TOTAL NUMBER OF STAKEHOLDERS INTERVIEWD		
NAME	**ORGANIZATION**	**CONTACT**
ENGR OLUYEMI JOHNSON	Energy commission of Nigeria	Johnson.ojosu@energy.gov.ng johnsonrains@gmail.com
Dr okoro	National Electricity Regulatory commission	sokoro@nercng.org
Mr Dolapo ONI	Ecobank Nigeria limited	Dooni@ecobank.com
Mr. Nosa Igbinedion	Eko Electricity distribution company	Nosa.igbinedion@ekedc.com
Miss Dolapo popoola	Lagos Energy Academy	d.popoola@lea.gov.ng
Engr Sikiru tajuden	Lagos state ministry of energy and mineral resources	Sikiru.tajudeen@gmail.com
Mr. Femi and mr demola	Lagos state electricity board	Demolaf@yahoo.com
Mr. Carlos Miro	German cooperation (GIZ)	Luis-carlos.miro@giz.de
Mr. aroyemwun	Sunshine Estate	aroyaroy@yahoo.com
Mr. Godfrey	Community research and development center	godfrey@credcentre.org
Mr. Charles Eguma	National Center for energy efficiency and conservation (NCEE	Charleseguma@yahoo.com
Mrs. Ifeoma	Solar Nigeria(DFID project)	ifymalo@gmail.com

RESEARCH TOPIC: LOCAL ENERGY INITIATIVE AS A SOLUTION TO THE ENERGY SECURITY ISSUES IN DEVELOPING COUNTRIES (Case studies of selected housing estates in Lagos).

SCHOOL: UNIVERSITY OF TWENTE, NETHERLANDS

RESEARCHER'S NAME: OGUNLEYE OLAOLUWAKITAN

SUPERVISOR: Dr. Frans Coenen (Associate professor)

The theme of this research is local community sustainable energy initiative as one of the possible solution to the energy security issues in developing countries particularly with the supply of electricity. In this research we see local community sustainable energy initiatives as an expression of the general notion that cooperation among people for a common purpose yield good result compared to when done individually. The access to affordable, sustainable and less polluting energy is a prerequisite for sustainable development and poverty alleviation and more specifically, for achieving each of the Millennium Development Goals (MDGs). Local Energy Initiatives are bottom up ideas towards energy independence from the centralized grid system usually embark upon by households, communities, cooperative but usually with common interest, goals and ambition with high level of trust.

The research aim to contribute to knowledge about possibilities to stimulate communities and neighborhoods toward formation of local energy initiative. Even as the government has reiterated her commitment to add 4000MW of electricity to the grid every year, local energy initiatives if taking up could contribute considerable amount to this figure but then there are perceived barriers and obstacle to this, which the research will also aim to find out and perhaps suggest solution to it.

Socio-Economic Characteristic of Respondent:

Name of Estate:

How long have you being living here: (a) 1-5 (b) 5-10 (c) 10-above

Gender: (a) MALE (b) FEMALE

Age Distribution: (a) 20-30 (b) 31-40 (c) 41-50) (d) 51-above

Religion: (a) Christianity (b) Islam (c) Traditional

Marital Status: (a) Single (b) Married (c) Divorce (d) others

Education Level: (a) Postgraduate (b) Graduate (c) Secondary school (d) Primary school

Occupation: (a) Student (b) Artisan (c) Trader (d) white collar

Response of Local Energy Initiatives:

Have you heard about local energy initiative? YES/NO

What do you know about local energy initiatives?

(i) It is a way to make people energy independent
(ii) It is a way to make energy services accessible for all

(iii) No response

Do you think LEI could be one of the solution to energy security problems in Nigeria? YES/NO/NO RESPONSE? And why not

Do you think you can cooperate with other neighbors in the estate to form a local energy initiative? YES/NO/NO RESPONSE

If YES what do you think can motivate you to cooperate and if No why? Briefly state it here

In your opinion what obstacles, barriers or challenges do you think will hinder the formation of LEI and adoption of renewable energy technology in your estate? Please list them here.

What factors or intervention strategy do you think will be need for you to adopt RET and LEI in your estate?

What support do you think will or may be needed for your estate to take up this initiative?

Do you like to add opinion or advice anything that may be relevant for this study? Please add it here

What output do you expect from this study?

International Organization questions GIZ-Deutsche Gessellschaft fur International Zusammenarbeit (GIZ) GmbH

We are conducting a research on the topic "LOCAL ENERGY INITIATIVE AS A SOLUTION TO THE ENERGY SECURITY PROBLEMS IN DEVELOPING COUNTRIES (Case study of selected housing estates in Lagos). We are aware that your organization is working on the Nigeria energy support program with the aim of supporting the Nigeria ministry of power and other public and private partners to improve access to sustainable energy. Therefore, your organization is an important stakeholders relevant to this study.

We would like to know about your activities especially the Nigeria energy support program (NESP), we would also like to know your opinion on the concept of Local energy initiative or community based energy system. The following are the few questions;

Name of Interviewee: Mr. Carlos Miro

Position: Advisor Rural electrification and cook stove

1. What is your role within this organization?
   Adviser rural electrification and cook stoves, gives advice on enabling framework and work along with the Nigeria Federal Ministry of power and rural electrification agency.

2. How did your company get involved in the NESP?
   Through the bilateral agreement between Nigeria and Germany and EU. GIZ is a Germany cooperation together with EU. GIZ act a consultant to the NESP.
3. Have you heard of Local energy initiative?
   Yes, but not in Nigeria.
4. What is your organization opinion on the concept of local energy initiatives (LEIs)
   This community model has worked in other developing countries like Nepal, Indonesia but definitely not in Nigeria. GIZ is working on a private model where private company will build and maintain the system but the company will have to play a role. He said and I quote *"We are proposing a hybrid model where the ownership is the community but the distribution access is given to the private sector"* LEI will work in Nigeria if

government could give money to community, train and manage the people in the community.

5. Do you think they are feasible and sustainable in Nigeria?
   Yes, but only if there is an energy company maintaining it for them else there is going to be a big challenge.
6. Do you have knowledge of any existing LEIs or community based energy system in Nigeria?
   No, it has not work but there is an NGO that does that with grant from UNDP. Many community do not have the knowledge due to lack of awareness maybe if they know, they can take this initiative.
7. If yes, could you shed more lights on it perhaps give us a contact
   See question 6
8. Do you think Local energy initiative if adopted could improve energy access in Nigeria?
   The community do not know so they cannot adopt it. LEI model could contribute but specialized organization is needed to drive the process for it to work.
9. Do you think Nigerians can adopt local energy initiatives? If yes can you explain further and if not could you suggest some of the challenges and barriers to the adoption of Local energy initiatives and renewable energy in Nigeria?

   The community do not know so they cannot adopt it. Many initiatives are taking by private companies and government. Operators needs to make sure it is based on the governance structure of the community.

   As for the barriers,

   i. Lack of awareness
   ii. Necessary knowledge to run the initiative
   iii. Lack of capacity to maintain especially LEI that run on RET
   iv. Lack policy support.
10. One of the core objectives of NESP is to promote the renewable energy investment in Nigeria, what is the current adoption level of renewable energy technology in Nigeria?
    Generally very low except for the large hydropower. Technical data base is also very difficult to find.
11. In your opinion what are the barriers to the renewable energy technology (RET) in Nigeria?
    i. Technical know-how.
    ii. Economic barrier, initial capital cost and maintenance cost.
    iii. Lack of awareness.
12. In your opinion, what strategy do you think can be put in place as a sort of motivation for Nigerians to adopt Local energy initiative and RET?

Pilot project: The success of a pilot project somewhere, call people to see it then it can be replicated somewhere else. People need to learn from the success story of a project before they can adopt it. If successful at the initial stage, it can be improved.

13. What support can your organization give to potential volunteers or community who are willing to form an energy cooperative or local energy initiative?
    We can only support if the project is within our jurisdiction. I mean the five Nigerian states we are working on. We need to see if the community is viable, if close to the main grid, see which technology is available then we can include them in the state electrification plan but Lagos is not part of our jurisdiction.
14. Support in what form?
    Technical support
15. Would you add something that might be considered important for this study?
    It is very difficult for community to start such LEI in Nigeria. He suggested that community should partner with a company to assist them to set it up. "*Like what we are doing now is to select prospective companies to help us in our rural electrification project for the communities within our scope of operation"*

16. Do you know any other organization that perform same role as yours?
    i. Solar Nigeria a DFID project
    ii. Renewable and energy efficiency by USAID.
    iv. World Bank and International finance cooperation
    But none of them are in for community model.

EKO ELECTRICITY DISTRIBUTION COMPANY

Name: Nosa Igbinedion

Position: Head, Embedded Generation

1. What is your role within this organization?
   My role is basically embedded generation with a team in which am the Head.
2. What kind of energy do you distribute- I mean the source of energy?
   Power from the grid which is a mixture of Hydropower, thermal and gas.
3. What is the percentage of renewable energy in the energy mix that you distribute?
   At the moment no renewable energy that I know of

4. What plans do you have in the future to increase this percentage?
   They are planning to include that, we do not have power over that due to the fact that we only buy our distributed energy from the Genco.
5. Do you think the adoption of RET by Nigerians will harm or be beneficial to your business?
   It will fill up certain deficit.
6. Is Eko Distribution Company 100% privatized?
   NO, government still own a 40% stake
7. What is the main driver to privatize this company?
   The need for better service delivery and efficient performance
8. What is the long and short term goal?
   Augmentation of new grids, expansion, and long term goal to build micro-grids (Embedded generation) since 250MW-350MW we are being allotted is not sufficient to distribute to over customers.
9. What is your perspective about electricity market in Nigeria particularly Lagos.
   The market is large, the distribution is dependent on generation capacity.
10. In your opinion what would be the role of your companies like yours in the near future?
    Improve supply to our customers
11. What is your company's opinion on the concept of Local energy initiatives?
    It is a way to go
12. Do you think such initiative will be feasible and sustainable in Nigeria?
    The feasibility is subjected to NERC approval. Although it is what they are looking at for but it is the future. It is possible, the appetite and understanding is not there.
13. Would you consider local energy initiative as an important target group for your business?
    The more we can distribute the better, currently we are looking at embedded generation. If both work together is fine but currently we don't have infrastructure that can support it
14. Do you know any existing initiative or community based energy?

    None that I know of, although there are talks in that direction.

15. In your opinion what challenges or barriers do think local energy initiatives will face in Nigeria?
    i. Lack of Understanding
    ii. Funding
    iii. Lack of social cohesion since Lagos is a multicultural society
    iv. Lack of expertise
    v. Lack of policy support
16. How do you think these barriers can be surmounted?

By involving team of expert, Land, better technology and educating the estates on the need for it.

17. Do you think your company can support the formation of Local energy initiative?
    Yes, we have made proposal to NERC for embedded power generation. If it's profitable and NERC approves it.
18. What form of support do you think will be needed for local energy initiative to be formed or adopted by community and what form of support can you offer for the formation of LEIs?
    i. We can help them structure it in a way that is efficient.
    ii. Technical support if it's affordable.
    iii. Advice
    iv. Facilitation of permit since it is easier for NERC to listen to proposal once a Disco is involve.

19. What strategy do you think could be used to motivate community to adopt or form LEIs?
    i. Education and enlightenment on the benefit
    ii. Training and awareness into energy management.
    iii. Financial and fiscal incentives such as subsidies
    iv. Policy formulation to encourage LEI formation.
20. Would you add something that might be important for our study?
    The current electricity infrastructure cannot support. Also people will only take initiative that they know about.

ENERGY COMMISSION OF NIGERIA (public sector in charge of implementation of policy at federal level).

Name: Engr Oluyemi Johnson Josu

Position: Director, Energy planning and analysis

Gender: Male

Education level: Postgraduate

1. What is your role in this organization?
   ANSWER: Director, energy planning and analysis, energy commission of Nigeria. The role is to provide policy direction and master plan for implementation of such policy, including electricity in Nigeria.
2. What are the core mandates of this organization?
   ANSWER: ECN core mandate is to coordinate energy policy in its ramification in Nigeria.

3. Does Nigeria have any policy on renewable energy? If yes, what is the main driver of such policy and if no why?
   Yes, we have a national energy policy that contains a chapter of renewable energy and added to that is the renewable energy master plan. The main driver is to be able to convert various RE sources into the Nigeria energy mix, and harness them in support of the national economy, to also diversify from fossil fuel and for environmental and climate change mitigation.
4. Does Nigeria have any renewable energy goal and target?
   ANSWER: yes, they are specified in the RE master plan. The target are set until 2030
5. What strategy have you adopted to implement this policy? (if policy exist)
   Most of the strategy is to involve stakeholders in meetings and consultation, look at the barriers and seek for solutions on how to remove them. The Federal government also initiate community intervention renewable energy based projects through the commission and national assembly constituency projects Private organization also builds RE projects for community.
6. What is your organization opinion about local energy initiative?
   Here in Nigeria, this concept does not exist, but there are local initiatives directed by governments, private sectors, and international donors such as British council and German cooperation (GIZ). No organizational opinion on LEI, but ECN has encourage the formation of National association such as solar energy society of Nigeria, association of biofuels, biodiesel, etc.
7. Do you have any knowledge of an existing community based energy initiative or LEI?
   Not in existence
8. Do you think LEI development or formation align with your energy policy if yes how, if not why?
   No, but the policy have been encouraging local community based projects funded by government and donor agencies.
9. Do you think local energy initiative is feasible and sustainable in Nigeria?
   Yes, it is feasible. But it requires a lot of work to organize local people together
10. In your opinion, what motivational strategy do you think could be put in place for Nigerians to adopt local energy initiative and renewable energy technology?
    i. Encourage cooperative to key into production of energy for local communities just like what is done in fadama program.
    ii. Provision of Bank loan.
    iii. Providing policy that will support LEI.
11. What is the level of adoption of renewable energy in Nigeria?
    The level of adoption of RE is generally low compared to fossil fuel utilization in the country. But the situation is increasing gradually.
12. What kind of support can your organization give to interested volunteers or community that want to start a local energy initiative?
    Technical support

13. Do you have a platform to encourage Nigerians on the adoption of RET?
    Yes. They are solar energy society of Nigeria, association of solar energy promotion, association of Jatropha promotion, etc.
14. What is the current level of renewable in Nigeria's energy mix?
    About 10-30% including large hydro plants
15. Do you think LEI if adopted and develop by Nigerians could be a solution to the energy security (electricity) in Nigeria?
    No, because LEI is voluntary and communities don't have money to execute such energy programs
16. What output do you expect from this study

    The researcher should know the kind of output he/she is expecting, so is not for me to pre-empt any output.

17. Is there any extra information you would like to share with us? If not thanks for your time.
    LEI will work in Nigeria when it is well conceptualize according to the local conditions and situations (Nigeria framework) of Nigeria system.

NATIONAL ELECTRICITY REGULATORY COMMISSION (public sector in charge of policy regulation at federal level).

Name of interviewee: Dr Sam Okoro

Educational Level: Ph.D.

Position: Special assistant (Research and strategy)

1. What is your role in this organization?
2. What are the core mandates of this organization?
   i. Monitoring and Regulation of the Electricity Industry.
   ii. Issuance of Licenses to market Participants.
   Iii. Ensure Compliance with Market Rules and Operating Guidelines.

3. Does Nigeria have any policy on renewable energy? If yes, what is the main driver of such policy and if no why?

Yes, the energy Commission of Nigeria in 2003 assented to the National Energy Policy Programme, this policy is expected to promote the harnessing of all viable and potential energy resources so as to achieve optimal energy mix.

4. Does Nigeria have any renewable energy goal and target?
   i. To address the Nations challenges of moving towards clean, secure, reliable and competitive energy supply.
   ii. To develop and implement strategies that will achieve clean reliable energy supply and also establish mechanism to develop the sector based international best practices to showcase viability for private sector participation.
   iii. Ensure alternative sources of energy that are clean, reliable, stable and sustainable.
   iv. Develop policy objectives of sovereignty, national security and self-sufficiency.

   The Targets are listed below:
   v. National agenda on emission reductions.
   vi. Millennium development goal.
   vii. Clean development goal.
   viii. Vision 20:20 Environmental sub-sector.
   ix. Clean energy rural entrepreneur incubation.
   x. Alternative sources of energy that is clean and sustainable.

5. What strategy have you adopted to implement this policy? (if policy exist)
   i. An enabling environment for investors in renewable energy to utilize Nigeria's vast amount of renewable energy sources (wind, solar biomass) to diversify energy mix for energy generation in rural energy. This is evident from the development of feed in tariff for renewable energy.
   ii. Competitive procurement strategy.
   Iii. Net metering strategy.
   iv. Simplified licensing procedure for renewable energy projects.

6. What is your organization opinion about local energy initiative?
   It is evident that renewable energy plays an important role as regards providing energy services in a sustainable manner, in the sense that they are abundant and inexhaustible and without environmental challenges.
   The Commission is now developing light handed regulations for micro grids for communities who will develop power on their own (LEI).

7. Do you have any knowledge of an existing community based energy initiative or LEI?
   There are ongoing efforts to ensure the development of LEI but these efforts are not yet crystallized. The UNDP is presenting supporting such projects.

8. Do you think LEI development or formation align with your energy policy if yes how, if not why?
   Yes, they align with our policies, the LEI will allow quicker access to energy and with the rural electrification fund in view, it will help implement LEI.

9. Do you think local energy initiative is feasible and sustainable in Nigeria?
   Yes, I think LEI is feasible and also sustainable. The viability depends on the business investments in the communities that will enable them pay for the investment. Presently there is an ongoing project funded by UNDP in Abakiliki, ebonyi State, Nigeria, to develop power from rice husk.

10. In your opinion, what motivational strategy do you think could be put in place for Nigerians to adopt local energy initiative and renewable energy technology?
    i. If there will be capital subsidy from rural electrification fund to achieve the construction and also energizing the community.
    ii. Provision of special tax incentive for the communities, such that will allow them operate tax free.

11. What is the level of adoption of renewable energy in Nigeria?
    It has not been quantified yet to the best of my knowledge, but the goal is to achieve 80% renewable energy by 20:20

12. What kind of support can your organization give to interested volunteers or community that want to start a local energy initiative?
    No Answer
13. Do you have a platform to encourage Nigerians on the adoption of RET?
    The platform could the seen in the power consumer assembly where renewable energy investors are encouraged to invest in the country.

14. What is the current level of renewable in Nigeria's energy mix?
    Hydropower has a larger share although Nigerians now uses solar panel to pump water and for street lighting.
15. Do you think LEI if adopted and develop by Nigerians could be a solution to the energy security (electricity) in Nigeria?

It could be one of the numerous solution but certainly not the only solution

16. What output do you expect from this study
    NA
17. Is there any extra information you would like to share with us? If not thanks for your time.
    NA

FINANCIAL INSTITUTION
Name: Dolapo Oni
Position: Head, Energy research
Organization: ECOBANK NIG LIMITED

1. What is your role in this organization?
   Head, energy research
2. Does your bank finance any energy project? If yes can you give more details?
   Yes we have finance quiet a good number of energy projects such as;
   i. Co-finance of Ikeja Disco project
   ii. Sahara group
   iii. Egbin power plant
3. Does these project include renewable energy project? If yes can you give example, if not will you be willing to invest in a renewable project?
   Renewable energy is not included. They are still looking at the possibility of financing RE projects in partnership with NEDBANK which the bank involve in RE financing in South Africa.
4. In your opinion what will be the role of your bank in the near future regarding the adoption of renewable energy technology by Nigerians?
   They are looking to play a key role leveraging on the expertise of one of their partners NEDBANK.
5. To what extent can you finance renewable energy project?
   Yearly they have 5billion dollars budget for energy out of which oil and gas (80%), power (20%). "*We could source for fund from our shareholders such as Qatar National Bank, Nedbank, funding won't be our problems".*
6. What is your opinion on the concept of local energy initiative?
   It is the future of Africa especially sub-Saharan African where grid has always being the problem but we are not there yet.
7. Do you think it's feasible and sustainable in Nigeria?
   Yes, it is but it depends on our creativity and maintenance culture. Government should mandate every new house owners to place solar PV on their roof tops.
8. What do you think could be the potential challenges and barriers to the formation of LEI in Nigeria?

i. Financial challenge
ii. Poverty level in the country
iii. Lack of social cohesion.
iv. Cost of maintenance.
v. Class of people in the community

9. What motivational strategy do you think could be adopted to encourage Nigerians to take this initiative?
   i. Creating a regulation that allow people access to the grid.
   ii. Implementation of feed-in-tariff (FIT).
   iii. Awareness raising.
   iv. Information and communication among communities.
10. What supporting structure do you thing should be put in place for Nigerians to take energy initiative?
    Regulation that support the formation of community-based energy system
11. Will your bank be willing to support a volunteer or community who wish to start a community based energy?
    Yes, a lot of estates are looking to start embedded power generation, we can always provide loan and knowledge
12. What form of support can you render to such a community?
    Knowledge, Funding. We can also assist them to attract funding and soft loan.
13. Would you add something that might be important for this study?
    We can benefit from both top down and bottom up approaches to solving the energy crisis in Nigeria. Government still have a role to play after privatization such as deregulation that involves Local government and state government participation.
14. Lastly, what output do you expect from our study for your organization?
    This type of study will give us more information on how to finance renewable energy.

LAGOS STATE ELECTRICITY BOARD

Name of interviewee: Mr. Femi and mr Demola

Department: Rural electrification and public lighting

1. What is your role in this organization?
   Relieving Head of Public lighting and electrification
2. What is the core mandate of your organization?
   The Lagos state electricity board is the implementing agency under the ministry of energy and mineral resources responsible for energy development, independent power projects and public lighting in Lagos state.
3. What is your vision and mission?
   Mission: The use of best practices to design, execute and maintain improved public lighting projects in Lagos.

Vision: The establishment of independent power projects (IPPs) across the state using a standardized and sustainable framework for power.
To maximize power supply through independent power projects (IPPs) and improve public lighting for Lagos citizens.

4. What is your opinion about local energy initiative?
   It is a good idea if community can generate their own electricity and sale excess to the energy company willing to buy.
5. Do you think LEI is feasible and sustainable in Lagos?
   In those estate, I believe it is feasible.
6. Do you know any existing local energy initiative in Lagos? What are the experiences and evaluation?
   An estate in Lekki is generating energy via generator, inverter system as a backup. I heard but I do not know so I cannot share their experience but all I know is that they depend on inverter (400KVA) during the day, and generator during the Night. Most people in the estate cooperate while some are at loggerhead with the initiator. As part of this research we were unable to reach out to the estate because we could not get the Name of the estate nor a contact.

7. Do you think some of the community or estates in Lagos state could take this initiative?
   Yes, they can cooperate.
8. How do you think they can be motivated to take up this initiatives?
   Incentives in form of loan.
9. In your opinion, what are the likely challenges and barriers do you think could hinder communities and estates to take up this initiative?
   i. Infrastructure
   ii. Lack of awareness and Enlightenment
   iii. Lack of Technical support.
10. How do you think the barriers could be surmounted?
    i. Development of infrastructure
    ii. Education and awareness on climate change.
11. What supporting structure do you think would be needed for LEI to be formed?
    i. Provision of Infrastructure.
    ii. Technical support
12. What kind of support can your organization give to interested volunteers, community or estates willing to form a local energy initiative?
    i. Give them advice
    ii. Technical know-how
    iii. System design

13. We are aware that the Lagos state government secretariat no longer depend on the national grid due to the mainland micro-grids built by the state. Can you tell us more about this project?
    It was built in 2012 with a capacity of 10.6MW, it is a public-private partnership project, and it was built by Lagos state government in partnership with CETpower Limited in which they are to manage it for 10years before handing it over to the state.it runs on compress natural gas in the day and diesel at night as backup. (Two gas engine of 3.3MW, 2diesel engine 2.2 MW each). It is only used to light Lagos state government secretariat.
14. What are the main driver for this project?
    i. Climate change mitigation because before it was built almost all the government ministries and parastatal run their day-to-day activities with generators which is polluting the environment.
    ii. Unavailability of power supply to the secretariat.
    iii. Reduce overhead cost of government.

15. Can you tell us the kind of energy fed into this micro-grid?
    Diesel and Compressed natural gas
16. What is the percentage of renewable energy in the energy mix fed into this grid?
    6MW from the CNG
    4MW from diesel
17. Does the grid allow for public access?
    The strict government policy must be change to allow public access since electricity regulation in Nigeria is still centralized.
18. In the future do you have plan to extend the micro-grid to other part of Lagos in other to improve the epileptic power supply in the state?
    There are micro-stations scattered around but NERC regulation does not allow the state government to distribute, they can only distribute to the government facilities.
19. Do you have contact with the Discos in the state?
    Yes, we have had several meetings on how they can make power situation better, the last was concerning the industrial estates in the state
20. Do you have any other information to share with us?
    The federal government should allow organization to generate electricity to complement whatever is being generated by the Gencos
21. What output do you expect from this study?
    Studies like this should be able to raise the awareness of people.

LAGOS STATE MINISTRY OF ENERGY AND MINERALS
Name of interview: Engr Sikiru Tajuden
Position: Head, Energy Audit Unit (Relieving Director of Power)
Education Level: Postgraduate

1. What is your role in this organization?

Coordinate all energy audits in the state and provides advice on energy savings

2. What is the core mandate of this organization? Your mission and vision?
   Core mandate: Overall responsibility of strategizing, promoting and developing sustainable policies for energy planning to ensure availability of reliable energy for all Residents in Lagos state as well as making Lagos state an investment friendly destination using available resources as catalyst. They also supervise the activities of the Lagos state electricity board.
   Vision: To make Lagos a global economic and financial hub through the development of sustainable energy strategy and safe exploitation of available mineral resources.
   Mission: Promoting and attracting investments in energy and mineral resources sectors to enhance infrastructural and socio-economic development for wealth and job creation in the state.
3. We learnt that the Lagos state has an energy policy, could you please tell us more about how you are implementing this policy especially renewable energy?
   The creation of the Lagos state energy academy was one of the landmark we made in 2014 to train energy expert because we know there is a lack of technical know-how in the state and country at large. They have also started some solar power project across the secondary schools in the state. They are making progress.
4. What are the main drivers for the formulation of the Lagos state energy policy?
   Power for all because of the deficiency in the power supply in the state, climate change.
5. We also understand that the Lagos state secretariat no longer depends on the national grid could you tell us more about this project?
   It started in 2012 with 2diesel engine of 2.2MW each and 2gas engine with 3.3MW each making to have 10.6MW power rating. The gas engine is used in the day while the diesel engines serves as a backup during the night and it powers all LASG offices and for street lighting. It's a Public-private partnership project managed by CETpower.
6. What is the source of energy fed into the two micro grids at mainland and ikeja?
   Answered in question 5
7. What are the drivers for this micro-grids?
   The driver was basically to cut down government overhead cost because before it was built, all government parastatals within the government secretariat run on generator.
8. Does the grid support public access?

   No, hopefully in the future.

9. In the future do you plan to extend the building of micro-grids to other areas in Lagos?
   Of course yes
10. What is the percentage of renewable energy in the energy mix that is fed into this grid and what is the capacity of the grid?
    Just the compress natural gas of 6.6MW.

11. What is your opinion about local energy initiative (LEI)?
    I think it will be a step in the right direction because energy is needed in the state.
12. Do you think LEI formation is feasible and sustainable in Lagos?
    Sure, it is.
13. Do you know of any existing Local energy initiative in Lagos? If yes, can we have a contact? What are the experiences and evaluation?
    None in existence that I know of.
14. What barriers and challenges do you think LEIs in Lagos will face?
    Low level of awareness and lack of policy support for initiatives like this.
15. Do you think Estates or community in Lagos could cooperate to form a local energy initiative?
    It depends on the kind of people in the state and how much they cooperate among themselves but If this concept will proffer solution to their energy needs, I think they will.
16. What motivational strategy do you think can be adopted to encourage housing estate in Lagos to take up this initiative?
    Finance, if money is provided
17. What supporting structure do you think will be needed for volunteers, estates and community to take up this initiatives?
    Awareness and sensitization even via radio jingles and exhibition in the estate.
18. What kind of support can your ministry give to interested housing estates or community that may want to start LEIs?
    Human resources by provision of experts, help draft power purchase agreement.
19. Is there an extra information you would like to share with us if not thanks for your time.
    N/A
20. Lastly, what output do you expect from our study?
    Positive output

LAGOS ENERGY ACADEMY
Name of Interviewee: Miss Dolapo Popoola
Position: Assistant Coordinator
Educational Level: Postgraduate

1. What is your role in this institute?
   Business development, strategy development, operations and support the coordinator in his day to day activities.
2. What is the core mandate of this institute? Vision and mission?
   Core mandate: dedicated specifically for the power sector by training electrician and professional certification beyond tertiary education and the discos in Lagos state.
   Vision: To train the next generation of power engineers
   Mission: To support the energy sectors in Nigeria and Lagos state.
3. What is the main driver for this institute to be formed?

The Lack of skilled Manpower in the state energy sector. The driver was to bridge the technical knowledge gap in the sector.

4. Do you think Local community knows about your institute?
   Good numbers of our target audience knows about the academy which are the industry players such as ABB, SIEMENS, the Discos, and Schneider electric
5. Do you think LEI if adopted by Nigerians could be a solution to the energy security (electricity)?
   If people are adequately trained and educated about it will work. It is one of the solutions to the current energy crisis in the country.
6. What is your opinion on the concept of Local energy initiative?
   It should be embrace because RET is more cost effective in the long run than generator
7. Do you have the knowledge of any existing local energy initiative in Lagos?
   Not in Lagos, but there is one done by Schneider electric in Asore community of Ogun state as a CSR project.
8. Do you think estates and community in Lagos state would be willing to take up this initiative?
   Yes
9. What do you think are the barriers and challenges for local energy initiatives to be formed?
   Initial capital, lack of skilled trained technicians, education and awareness.
10. What motivational strategy do you think can be adopted to encourage community and estates to take up this initiatives and to embrace Renewable energy technology?
    Single digit interest rate loan should be provided by government and financial institution
11. What supporting structure do you think would be needed for housing estates in Lagos to successfully form a LEI?
    Question was thrown back at me and I shared the Netherlands support structure for LEIs
12. How can your institute support the housing estate to take up this initiative?
    Provision of certified technicians to install it, capacity building and knowledge.
13. Any other information you would like to share or any contact numbers?
    N/A
14. What output do you expect from our study?
    I will wait to see

HOUSING ESTATES COMMUNITY DEVELOPMENT ASSOCIATION CHAIRMAN/PRESIDENT

Name of Estate: Sunshine Estate, Oko Oba, Agege Lagos

Name of Interviewee: Mr. Aroyewun (ESTATE CHAIRMAN)

Education Level: Postgraduate

1. What is your role in this estate?
   Chairman of the residence association.

2. How long have you lived in this estate?
   5yrs
3. What is your educational level?
   MSc. Management Accounting and Fellow chartered institute of accountant of Nigeria
4. Do you think the energy security issues in Nigeria particularly Lagos state can be solved? If yes in what way?
   Yes it can if only the Federal government is ready to allow state and local government to generate and distribute energy.
5. What is the major source of electricity in this estate?
   Electricity from the grid, inverter and petrol/diesel generator.
6. Have you heard of local energy initiative before?
   Yes but not in an estate as big as ours but it was basically big diesel generator
7. Do you think this is feasible in your estate?
   Yes
8. Do you think you can convince your estate into taking this initiative?
   Yes but with the assistance of expert like you.
9. Do you think they will be willing to cooperate to form an energy initiative in your estate?
   Reasonable number of them will cooperate if they clearly understand what is involve.
10. In your opinion, what are the likely challenges and barriers that could hinder the formation of this initiative in your estate?
    Funding, lack of awareness and education.
11. What factors or intervention strategy do you think will motivate your estate to adopt renewable energy and form Local energy initiative?
    Seeing is believing if there is pilot project somewhere we can learn from then this will motivate us, integrity of the proponent of the project, proper education and awareness with a demonstration project.
12. What support do you think will or may be needed for your estates to take up this initiative?
    Technical support, bank partnership, soft loan and grant from the government
13. What output do you expect from this study?
    Hopefully a project in our estate.

SOLAR NIGERIA: A DFID PROJECT

Name of the interviewee: Mrs. Ifeoma Malo

Position: Energy policy and strategy expert

Education Level: MSc

1. What is your role in this organization?
   Energy policy and strategy expert to Nigerian infrastructure advisory fund

2. What is the core business of your organization
3. Do you think Local energy initiative is feasible in Nigeria?

If they understand.

4. What are the likely barriers do you think LEI formation will face in Nigeria?

Lack of understanding of the technology
Lack of education and awareness
The technology are expensive, so the initial cost of the set up.

5. What motivation strategy do you think can be adopted to encourage Nigerians to adopt this technology?

   Awareness on the benefit of renewable energy and building local capacity

National Center for Energy efficiency and energy conservation
Name of interviewee: Mr. Charles
Position: Head of Technical Unit

1. What is your role in this institute?

   Head of technical unit in charge of technical and research unit.
2. What is the core mandate of this institute?
   i. Develop guidelines for efficient end-user products and advise on their implementation.
   ii. Gather, analyze and manage energy supply and consumption data and information.
   iii. Serve as a center for training high level manpower in energy efficiency and conservation.
   iv. Disseminate information on energy efficiency and conservation concepts through awareness program such as seminars, workshops and publications.
3. What is the main driver for this institute to be formed?

   Formulation of energy efficiency and conservation policy, energy wastage and awareness creation on energy efficiency.
4. Do you think Local community knows about your institute?

   Yes, because they we have carried out retrofitting of the university building, retrofitting project across some estates in Lagos.

5. Do you think LEI if adopted by Nigerians could be a solution to the energy security (electricity)?

   Yes, it help reduce stress on our grid.
6. What is your opinion on the concept of Local energy initiative?

   It's a nice concept, it will increase availability of energy to people.
7. Do you have the knowledge of any existing local energy initiative in Lagos?

No, but I have seen individuals generating energy via solar panel and inverter as a backup

8. Do you think estates and community in Lagos state would be willing to take up this initiative?
   It will be difficult to convince them due to low level of awareness on this concept now. It might be possible in future.
9. What do you think are the barriers and challenges for local energy initiatives to be formed?
   i. Current cost of RET
   ii. Lack of cooperation among the inhabitant of the estate.
   iii. Lack of compelling policy from the government to take up this initiative.
10. What motivational strategy do you think can be adopted to encourage community and estates to take up this initiatives and to embrace Renewable energy technology?
    i. Bank loan where bank provide an upfront investment cost.
    ii. Incentives for the importer of this technology.
11. What supporting structure do you think would be needed for housing estates in Lagos to successfully form a LEI?
    i. Awareness through NGO
    ii. Government award system where for the various community development association in Lagos state for the CDA that will present the best initiative proposal.
    iii. Setting up certain percentages of the budget for initiatives like this.
12. How can your institute support the housing estate to take up this initiative?
    i. Help educate the community.
    ii. Depend on scale we can assist up to 10%
13. Any other information you would like to share or any contact numbers?
    If you have organization from Europe that can set up this in Nigeria, please kindly give we contact so we can galvanize support from them
14. What output do you expect from our study?
    It should not end as a master thesis, in 3years set up a forum to attract people on awareness.

COMMUNITY DEVELOPMENT AND RESEARCH CENTER

Name: Mr. Godfrey
Position: Project Director of the Centre

1. What is your role within this organization?
   Project Director
2. What are the goals, vision and mission of your organization?
   Goals: To ensure sustainable development at all levels local, regional and national.
   Vision: Ensure sustainable management of environment and its resources.
3. A. How did your company get involved in the Renewable energy project, I means the drivers? RET is a mitigating tools to climate change, we are an NGO that focus on environmental issues, climate change and its challenges. We advocate for the use of alternative form of energy as way to suppress climate change

   b. Have you heard of Local energy initiative? Yes
4. What is your organization opinion on the concept of local energy initiatives (LEIs)?
   We called it community energy based, it is a concept we are driving and we believe in. The energy challenge in Nigeria can be address through a bottom up approach. Our organization have passion for it.
5. Do you think they are feasible and sustainable in Nigeria?
   Yes
6. Can you tell us more about your projects especially your recent one in nasarrawa?
   The project is about 2yrs old; we have done two projects in Benin, one is in ofetebe community with 4kw serving 3000people, Uniarhro is about 2.4KW with 1500 users, 5KW is generated in Nassarawa with 5000 users and no household can take more 60KW else it will automatically be cut off the system, five business outfit is also supplied with 200W, 150W for freezers. All solar panels are imported with 200W per panel. We help to train solar technician and maintain while operational aspect I left for the community.
7. Do you have knowledge of any existing LEIs or community based energy system in Nigeria?
   No
8. If yes, could you shed more lights on it perhaps give us a contact
   No contact
9. Do you think Local energy initiative if adopted could improve energy access in Nigeria?
   Yes it could improve energy supply, our grid is faulty, it can't take more than it capacity. We have to dismantle the existing grid and build a new one, we are advocating for off grid electricity only LEI can help to motivate this, it is the only way forward.

10. Do you think Nigerians can adopt local energy initiatives? If yes can you explain further and if not could you suggest some of the **challenges and barriers to the adoption of Local energy initiatives and renewable energy in Nigeria?**
   YES, Nigerians are in dare need of increase access to energy.
   i. Low awareness.
   ii. High cost of solar part like batterry.

iii. Technical amateur

But there will be crash in price as more people adopt this technology

11. One of the core objectives of CREDC is to promote the renewable energy use in Nigeria, what is the current adoption level of renewable energy technology in Nigeria.

It is increasing, it should be around 15-20% if we look at the public sector using it for borehole, hospitals and health centers. With time we will be there.

12. In your opinion what are the barriers to the renewable energy technology (RET) in Nigeria?

Community awareness is very low on RET

13. In your opinion, what strategy do you think can be put in place as a sort of motivation for Nigerians to adopt Local energy initiative and RET?

i. Government incentives for every citizens that generate his/her energy.

ii. Implementation of the feed-in-tariff.

iii. Reduction or remover of import duties on importation of solar PV.

iv. Encourage local investors by giving them subsidies.

14. What supporting structure do you think a community or estates will need should they consider taking this initiative?

i. We can help seek fund and collaboration as I know there are international organization like USAID collaborating with Eco bank to finance energy projects.

ii. Awareness on RET, enlightenment on energy efficiency and conservation.

iii. Financial support.

15. What support can your organization give to potential volunteers or community who are willing to form an energy cooperative or local energy initiative?

Technical support, we are working with GIZ to support projects like this

16. Support in what form?

Through the development of proposal to funding organization for grant

17. Would you add something that might be considered important for this study?

No for now

18. Do you know any other organization that perform same role as yours?

Development association for renewable energy in Kaduna state but they only focus on cook stoves and solar water heater.

PRIVATE SECTOR: SOLAR PANEL SALE COMPANY

1. What is your role in this company?
2. What is the core business of your company
3. Can you tell us about your company and product particularly Simba solar
4. Are these solar PV manufactured in Nigeria? If not where are they manufactured?
5. What is the power rating of the solar PV, lifespan, and payback period of these panels?
6. What are the drivers or motives for going into the business of selling solar panel and what benefit does your company get from selling this panel?
7. Can you tell us the level of awareness of Nigerians particularly Lagos residence on this area of your business? Do you think they know about this technology?
8. Who are your current customers and what services do you render to them
9. What is your opinion about the local energy initiative (LEI) in Lagos?
10. Do you think local energy initiative is feasible and sustainable?
11. Do you think if LEI and RET is adopted by Nigerians could be a solution to the energy security (electricity) issues in Nigeria?
12. In your opinion what challenges and barriers do you think will hinder Nigerians from forming a Local energy initiative and adoption renewable energy technology (RET) such as solar PV
13. Do you think the adoption of LEI and RET in Lagos will be beneficial to your company?
14. What support structure do you think is required to motivate individuals, housing estate and communities to adopt LEI and RET in Nigeria?
15. What support can your organization give to individuals, group, community, and housing estates that are willing to adopt RET and LEI?
16. Is there any policy currently affecting your business, I mean Simba solar?
17. Would you be willing to partner with any NGO who are willing to start up an energy cooperative?
18. Would you like to add something that might contribute to our research?

LIST OF ORGNIZATIONS	WEBSITES
GIZ	www.giz.de
COMMUNITY RESEARCH AND DEVELOPMENT CENTRE	www.credcentre.org
ECO BANK NIGERIA LIMITED	www.ecobank.com
NATIONAL ELECTRICITY REGULATORY COMMISSION	www.nercng.org
ENERGY COMMISSION OF NIGERIA	www.energy.gov.ng
EKO ELECTRICITY DISTRIBUTION COMPANY	www.ekedp.com
LAGOS STATE MINISTRY OF ENERGY AND MINERAL RESOURCES	www.lagostate.gov.ng
LAGOS STATE ELECTRICITY BOARD	www.lseb.gov.ng
LAGOS ENERGY ACADEMY	www.lea.gov.ng
NATIONAL CENTER FOR ENERGY EFFICIENCY AND CONSERVATION	www.nceec.gov.ng