

# Gender, Energy Systems and Intersections With Regional And Global Systems

**DEFINING A NEW PARADIGM FOR GENDER AND ENERGY ACCESS NEXUS IN NIGERIA**

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As Part of the National Research:  
Fossil Fuels Energy and Climate Justice  
commissioned by WoMIN**

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**Redacted Version**



**Clean Tech Incubation & Acceleration Foundation**  
Energy Innovation Center



**Clean Technology Hub**  
Energy Innovation Center

# Credit

This research initially started out from a series of commissioned work by “WoMIN – African Women Unite Against Destructive Resource Extraction –” and its Nigerian partner, the “Kebetkache Women's Development and Resource Centre .(Kebetkache).

This research was based out of a women-led women's rights campaign to address energy and climate justice, Women Building Power, in Nigeria. The WoMIN campaign is oriented to support the building of a women's movement for climate and energy justice.

Clean Technology Hub – a women led and women centered hybrid was commissioned to carry out this research in Nigeria.

Clean Technology Hub is pioneering hub for the research, development, demonstration and incubation of clean energy ideas, innovations and technologies in Africa, and their validation for commercial stage development.

Focused on addressing Africa's energy poverty, increasing energy access through

clean, renewable energy and sustainability – employing women and women led and owned SMSEs as a strong platform as a gendered approach to support a movement for building universal energy access, addressing energy poverty and climate change; advocating for environmental and climate governance. This research builds on previous and ongoing work by Clean Technology Hub to mainstream gender into the energy access narrative and paradigms and forms part of a body of work on its EmPOWERHER women series.



# Contents

## Executive Summary

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- 1 Mapping the Dominant Energy Systems in Nigeria
- 2 Nigeria's Energy Mix
- 3 Institutional Framework Of Nigeria's Energy Systems
- 4 Involvement of International Bodies in The New Energy Architecture
- 5 Renewable Energy
- 6 Women And Energy - The Energy Ladder
- 7 The Gender – Poverty – Energy Nexus
- 8 A Few Case Study Examples - Field Report
- 9 Recommendations
- 10 Conclusion

## Findings from this research

### EXECUTIVE SUMMARY

Nigeria's energy access challenge is the second largest in the world after India. With over 75 million persons out of the country's 186 million citizens lacking access to electricity the country's energy access challenges are enormous.

The burden is borne primarily by households and businesses, and affects women the most across all levels. From the lack of a basic source of lighting to the use of inefficient energy sources, the energy poverty cost on women includes huge health, social, economic, environmental, and societal consequences.

The grid-connected population is not left out of the country's electricity predicament with women still the most affected by the grid's erratic and unreliable nature. This is simply because women are the main consumers of energy especially on the household level. The history of the Nigerian power sector has arguably not been gender sensitive, providing limited empowerment opportunities and vast negative consequences from its failure.

Key findings from this research follow in-depth analysis of the country's energy system including the bias of the country's energy system towards a centralized system of energy generation. This trend over the past 60 years negatively impacted the country's energy access structures and limited the country's development paradigm in all spheres.

The centralized system of energy access –meant that the structure of the country's energy architecture was in the hands of a few. This has left several people to



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self generate their own energy – using unclean and harmful fuels for cooking and lightning.

The report also contains a description of levels of electricity access and contains an exploration of the historic energy architecture; the current state of affairs and the move towards a more decentralized system of energy access that includes renewable energy sources. Through a rash of policies, programs and pilot projects; Nigeria appears to be taking bold steps to address its lack of energy in the midst of numerous resources.

In the nomenclature of previous energy architecture in Nigeria, women bore the brunt of poor energy systems and its impact on their lives and livelihoods.

This is evident in the numerous examples and case studies cited throughout the paper. The paper explores the context of the emerging energy reforms in Nigeria, its impact on women and the rural poor, and makes the case for the emerging decentralized energy system to take into account – energy independence for women.

This means women taking a more active role in the planning and structure of the new energy systems and using these systems for productive economic use in a way that disrupts the business as usual - patriarchal network.

The paper takes a gendered lens to examine holistically, the complex nature of the country's energy framework and calls for more innovative, disruptive technologies and models, and recommends a more nuanced way of driving energy access and eliminating energy poverty particularly for women who are at the bottom rung of the ladder.



<https://africanbusinessmagazine.com/sectors/energy/africas-power-policy-least-developed-world-says-world-bank-report/>

*The paper explores the context of the emerging energy reforms in Nigeria, its impact on women and the rural poor.*

# Chapter 1

## Mapping The Dominant Energy Systems' In Nigeria



This paper looks at energy both for lighting, for cooking and for productive use. Electricity is predominantly used for lighting, while other energy sources such as gas and kerosene are geared towards cooking.

The term "Energy Access" is used as a broad term to cover both energy for lighting, and energy for cooking and energy for productive economic use.

### Global Energy Demand Context

Global demand for energy is increasing rapidly; with over 70% of increased energy demand from developing countries. About 1.1 billion people globally are without electricity access out of which 588 million reside in Africa.

While the off-grid population in Asia has halved since 1990, Africa's off-grid population has instead increased by 211 million people and is projected to continue rising over the next decade.

Despite several differing estimates on the population of the globally un-electrified ranging between 1.1 billion to 1.3 billion ; the more popularly accepted IEA Energy Access Outlook 2017 states that the number of people without access to electricity globally declined from 1.7 billion in 2000 to 1.1 billion in 2016 – with more than 100 million people gaining electricity access per year since 2012, compared to 62 million people per year between 2000 and 2012, and renewable sources of electricity provided 34% of this increased access.



*About 1.1 billion people globally are without electricity access out of which **588 million** reside in Africa.*

## Nigeria's Energy Demand

Nigeria has an estimated 190 million people as at 2017; and is the most populous country in Africa. It is also the 13th largest oil producing country in the world, with much of its oil and gas mineral resources coming from the Niger Delta, a region located in the mid western and southern parts of Nigeria with one of the highest population densities in the world.

The Niger Delta region has one of the largest global wetlands, a population growth rate of about 3.1% per annum, and a total population of about 30 million. A lot of the country's energy and natural resources such as oil, gas, bitumen, non-timber forest products and timber forest products, wildlife, used for energy production can be found in the Niger Delta where the first ever oil well was discovered.

In 2013, Nigeria ranked 25th globally (from the bottom) on power consumption per capita. Available reports estimate the demand for electricity in Nigeria as at 2016 to be in the region of 12,800 MW to 15,730 MW, and projected to reach 88,282 MW by 2020.

Based on the country's GDP and global trends, electricity consumption should be four to five times higher than it is currently. However, at just 126 kWh per capita, Nigeria lags far behind other developing nations in terms of grid-based electricity consumption. For example, Ghana's per capita consumption (361kWh) is 2.9 times higher than that of Nigeria, and South Africa's (3,926kWh) is 31 times higher. As a developing country, this is grossly inadequate to achieve consistent economic growth.

According to the Nigeria National Committee of the World Energy Council, planning experts have calculated that electricity requirement by 2020 must reach 30,000MW and 78,000 MW by 2030 for the

# 190 million

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# 78,000MW

Electricity requirement by 2020 must reach 30,000MW and 78,000 MW by 2030 for the country to attain a 10% growth rate.

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# 75,000,000

Nigeria's un-electrified population is put conservatively at 75 million people.

## 60m Nigerians

are estimated to own petrol or diesel generators

# \$14bn



80% of grid connected households and businesses spend \$14 billion per year on fuel expense.



## increasing operating costs

This make up a significant part of household and business expenses; and has led to and limited profitability and growth.



## 77% Imports

imports account for 77% of total kerosene consumption in Nigeria, and domestic production accounts for 23%

country to attain a 10% growth rate. Nigeria has set an ambitious power generation target of 40,000 MW by 2020.

The huge disparity between electricity demand and available electricity supply - mainly from the grid has led to widespread self-generation of power in the commercial, industrial and residential sectors with huge financial consequences.

Nigeria's un-electrified population is put conservatively at 75 million people. Other statistics show that 60 million Nigerians are estimated to own petrol or diesel generators, while 80% of grid connected households and businesses spend \$14 billion per year on fuel expense.

This make up a significant part of household and business expenses; and has led to increasing operating costs, and limited profitability and growth. The rural areas are more dependent on firewood and kerosene with a significant percentage of household energy expenses associated with kerosene expenditure.

Recent May 2017 data from the Nigerian Bureau of Statistics shows that the costs of kerosene across the country are prohibitive and volatile. In 2014, total primary energy consumption in Nigeria was 1.328 Quad Btu with kerosene at 5.670 million Btu/bbl.

Thus, kerosene consumption was 0.108 Quad Btu or roughly 8% of total energy consumption in Nigeria. Conversely, domestic production of kerosene in Nigeria was 12,000 bbl/day in 2013. Assuming that the level of imports is equal to total consumption minus domestic production, 40,000 bbl/day of kerosene was imported.

Thus, imports account for 77% of total kerosene consumption in Nigeria, and domestic production accounts for 23% of total kerosene consumption. These estimates are said to be conservative as experts further suggest that the reported annual kerosene consumption in Nigeria varies by 40%.

Nigeria's un-electrified population of 75 million people poses one of the greatest energy access challenges in the world; with decades of billion dollar investments dedicated to the country's grid failing to deliver the required improvements in the electricity sector.

Meanwhile, the country's off-grid population continues to rise concurrent with the country's annual population growth. The rate of electrification and energy access does not only have to meet the current demand but outpace it in order for any substantial gains to be made.



# 28million OFF-Grid

***An estimated 28 million households and 11 million small and medium scale enterprises (SMEs) are either off grid or receive less than four hours of power per day***

## The Access Conundrum - Nigeria

Nigeria's energy access challenge continues to be a constant source of national frustration for majority of the population especially women.

As Figure 2 below shows, most states in Nigeria are generally energy poor apart from the Federal Capital Abuja, and Lagos - the commercial centre of the country.

Nigeria's grid based electricity system is further bedeviled by various technical, financial, operational and regulatory challenges, along with a widening gap between generation capacity and overall population.

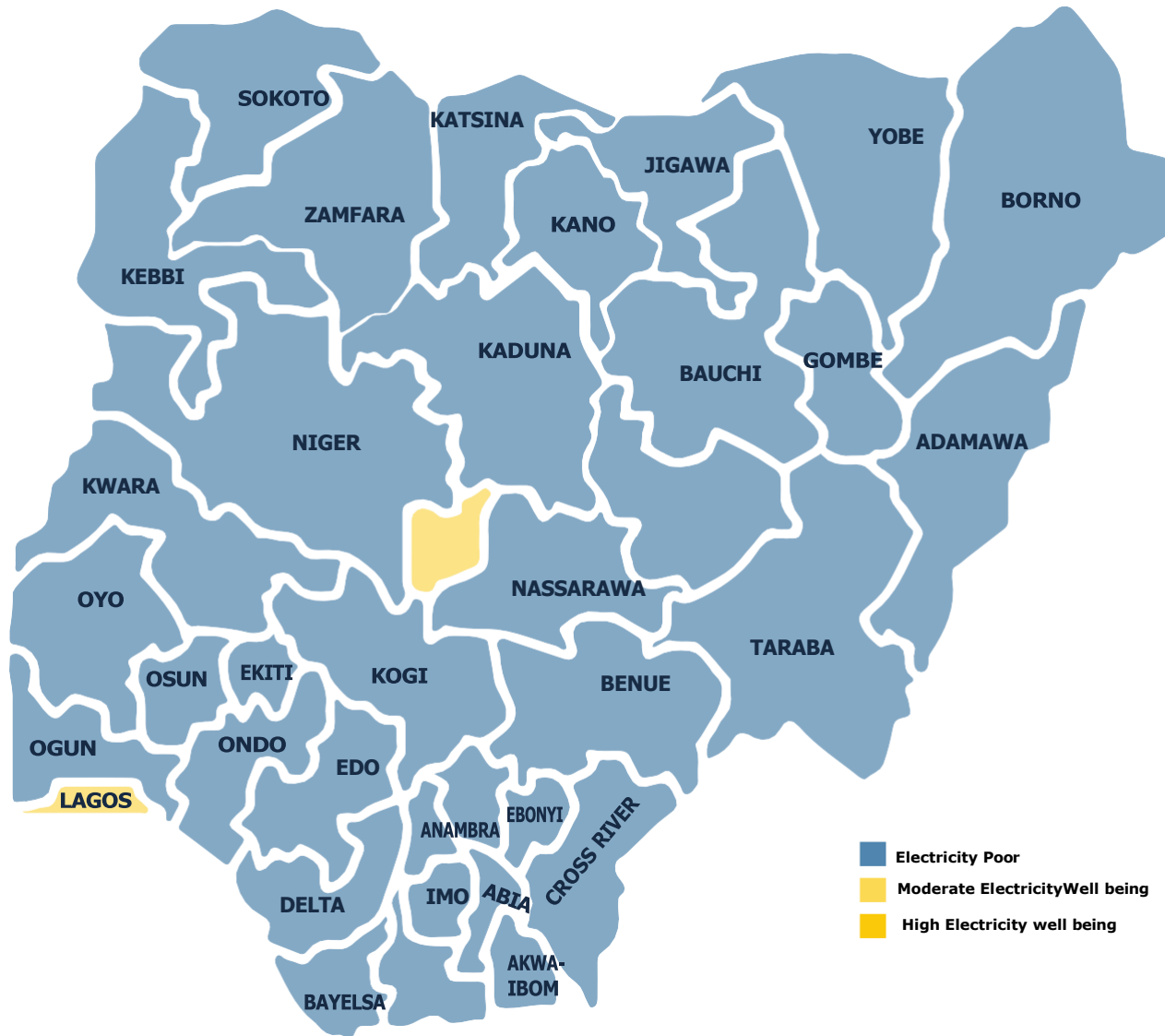
The inadequacy of the grid in relation to Nigeria's growing population has increased the country's poverty gap overall; with women holding the short end of the stick.

Furthermore, Remedies for resuscitating the centralized grid have resulted in minimal improvements particularly in power supply. An estimated 28 million households and 11 million small and medium scale enterprises (SMEs) are either off grid or receive less than four hours of power per day (underserved), representing 6% of the total global population that is off grid or underserved, and 20% of the African total.

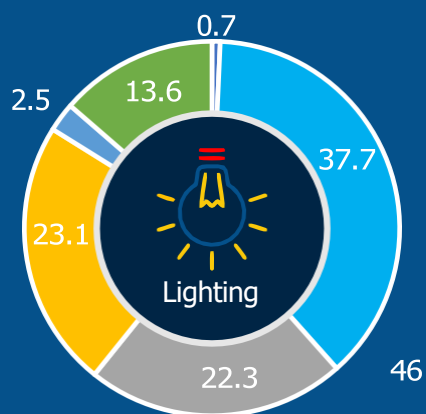
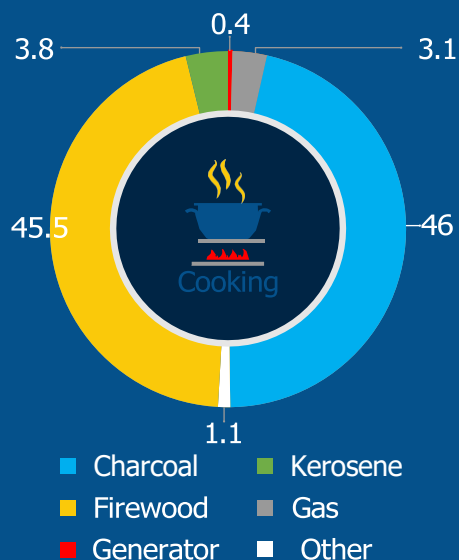
The increased militancy on oil and gas

pipeline and infrastructure across the Niger Delta region (though this has been on a decline in recent months) has meant increasingly low reliability to generate electricity power from the grid.

With over 80% of grid power plants dependent on gas supply, the Niger Delta crisis characterized by frequent gas pipelines vandalization with the power plants has resulted in huge associated costs in pipeline repair, volatility in gas supply, reduced capacity utilization of the power plants, increased risks for companies working in the area, and affecting the unit cost of electricity generated and consumed due to uncertainty in electricity supply.



## Source of Energy during Blackout(2013)



Primary and secondary research, point to the fact that women in general are much more negatively affected by the lack of energy access.

Yet women in Nigeria are the mainstay of the economy in many rural communities; as they are the backbone of small and medium sized businesses and make up the majority of small and medium sized scale agricultural entrepreneurs in the country.

In energy poor communities, amongst family members, women tend to have the more "crowded and highly demanding daily chores of waking early to fetch water and firewood, often from a long distance, preparing meals with inefficient cooking bio-fuels, caring for babies, nursing the sick and elderly, cleaning the compounds, working on the fields, harvesting and marketing farm produce, and so on – exerting a heavy toll on their health".

Women's economic livelihood is greatly undermined when they cannot for lack of energy optimize from which they derive wealth and cultural resilience. The presence of energy poverty intensifies the inability of women to access or climb the energy ladder in order to make more productive usage of the energy resources for themselves, families and communities.

Nigeria's energy poor particularly amongst its rural population is made up more by women who are also the mainstream users of energy. Women in Nigeria often bear the brunt of the

country's energy access dilemma; as it hits them the hardest.

There is a direct impact on women's income from petty subsistence activities, which they engage in due to the poor electricity systems. For instance, in the process of productive usage of electricity; female farmers including seafood farmers, palm oil farmers- most of whom process these in hundreds of small factory operations; or small vegetables farmers who apart from food process such vegetables for medicinal herbs, the labor is twice as long and as hard because they lack energy access.

Even though Nigeria appears to have witnessed significant economic transformation between 2010 and 2014 when oil prices were at an all time high and several economic indicators showed that the country's GDP growth averaged 5.7%, neither the economic growth at that time or the promise of revenues from future liquefied natural gas production brought new development or economic opportunities especially in driving energy access.

With the recession of 2015, many families in Nigeria have fallen back into poverty - struggling to meet their daily needs and leading to increased inefficient sources of energy usage as shown in the figure above.



## The Energy Access Conundrum (Lighting):

Nigeria's off-grid population depends on inefficient energy sources primarily firewood and kerosene for lighting.

At the most basic level in rural areas, energy is primarily consumed for lighting and cooking which the following two sections covers. The off-grid community is not assumed to have electrical appliances due to the absence of electricity.

About 53% of kerosene use in the country is for household lighting, with UNDP reporting about 10.8 million households likely to rely on kerosene for lighting out of the 35 million total households in the country.

Rural households have lesser access to electricity than urban households, however in urban and rural areas served by the same electricity distribution network; the variance in hours of electricity does not differ massively as much as shown in Figure below.

A result of the country's energy access dilemma is that Nigerians pay significantly higher costs on self-generation for basic energy services such as lighting. With the financial and opportunity costs of basic electricity provision falling massive on rural women who are most impacted and the most energy dependent on harmful fuel.

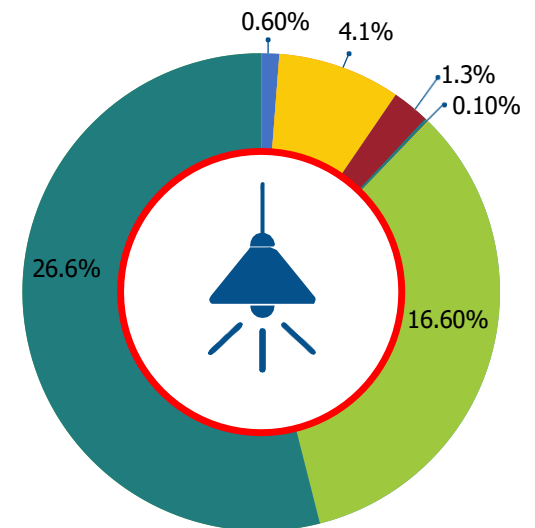
The chart in Figure below also shows that

85% of micro and small businesses in Nigeria rely on self-generation; primarily using petrol-powered generators and kerosene lamps, for basic energy needs such as lighting and phone charging.

The result is air pollution and environmental degradation, and an increase in the price of goods and services due to the high price points.

Research shows that self-generation accounts for a significant portion of most businesses' recurrent expenditure; and that, these costs are usually passed onto consumers and end users

### Inefficient Lighting in Nigeria



- Candles
- Grass
- Collected rewood
- Kerosene
- Purchased rewood
- Battery/Torch

## The Energy Access Conundrum (Cooking):

In the area of energy access for cooking, biomass accounts for a higher percentage with firewood as the primary source of energy for cooking.

Between 2007 and 2010, the percentage of households using firewood for cooking was 74.1%, 79.6%, 70.4%, and 72.2% respectively. This was followed by kerosene for cooking at 22.9%, 18.5%, 27.5% and 23.8% respectively.

There is also a disparity in the source of fuel for cooking between the urban and rural areas; with firewood predominantly utilized in rural areas, while kerosene is more predominantly utilized in peri-urban and urban areas even though recently primary research by us and other organizations (discussed in the coming sub-section) shows an increasing use of firewood in peri-urban and urban areas due to the increasing unavailability and rising cost of kerosene.

In rural poorer communities, fuel technologies for cooking predominantly consists of inefficient energy sources such as kerosene stoves, and 3-pronged wood cookstoves. What is not assessed and often times overlooked however is the amount of trouble and risks women go through to obtain these fuels.

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## Biomass (Firewood/Charcoal):

Firewood and charcoal form the predominant energy source for cooking in rural communities due to ease of access, affordability, and cultural preference.

Issues associated with obtaining kerosene due to its rising cost and increasing scarcity has also increased the use of firewood for cooking in peri-urban regions as well.

Findings over the course of this research in Abuja mirrored similar findings also associated with this paper across the country specifically in the North Central, North East and South South zones, where most women who were interviewed during the course of this research confirmed more use of firewood for cooking due to rising cost and unavailability of kerosene.

This means that the use of firewood for cooking is likely to increase unless cleaner sources like cooking gas become more affordable and accessible.

Many women respondents during the primary data collection complained that the shift towards the use of firewood has led to longer time for cooking which reduced their ability to perform other tasks, including economic activities.

The research, confirms the earlier point which shows the more prevalent cooking fuel to be firewood, followed by charcoal,

*Nigerian government in 2014 approved N9.2 billion for the purchase of 'clean-cook stoves' and wonder-bags under a program called the National Clean Cooking Scheme managed under the Ministry of Environment.*

kerosene, electricity and cooking gas in that order.

Other issues arising during this research include the increasing cost of firewood as well as respiratory and health issues arising from their use. There is also the issue of increased deforestation across the country, partly caused by illegal tree loggers but also exacerbated by sale of wood for cooking.

A United Nations 2001 study in Northern Nigeria showed an annual woodland deforestation of 93, 000 km with 50-55 million cubic meters of woods consumed annually in Nigeria.

The use of firewood however is neither efficient or renewable, hence the growing focus on improving the efficiency in fuel wood usage for cooking while exploring ways to transition to cleaner sources. This is done by attempting to integrate biofuels into the cooking energy mix.

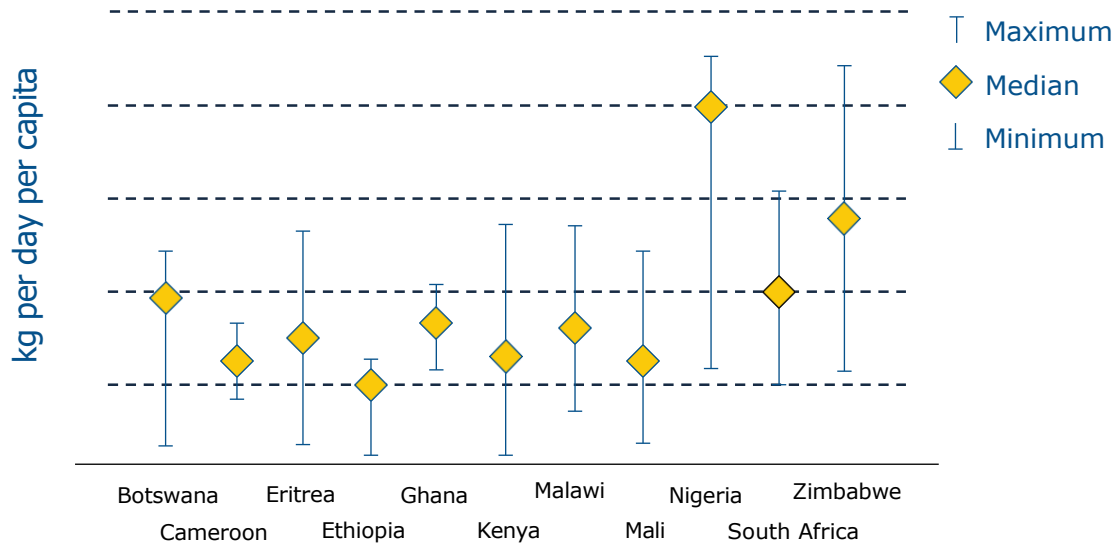
The government and some private local and international institutions have introduced biomass stoves called "clean cook stoves" to stem the harmful and less environmentally friendly use of kerosene stoves or wood for cooking.

A 2017 SE4ALL report states that only 22 percent rural population compared to 78 percent urban population have access to clean cooking technologies.

While globally, improved biomass cook stoves are supporting access in rural areas where natural gas distribution infrastructure does not yet exist, several schemes to provide cleaner cooking stoves to support poor rural women in this regard have been mired in controversies in Nigeria.

A prominent example is when the Nigerian government in 2014 approved N9.2 billion for the purchase of 'clean-cook stoves' and wonder-bags under a program called the National Clean Cooking Scheme managed under the Ministry of Environment.

The program was specifically targeted women in rural areas. That project was and continues to be mired in controversy as most of those clean cook stoves were imported into the country at an unclear cost, and to date remain in storage at the National Stadium in Abuja Nigeria where they continue to lie fallow, deteriorating under dust and mould - unused almost five years since they were imported into the country.



Sources: Department of Energy at the Politecnico di Milano; IEA Analysis

As the chart above shows, massive dependence on firewood (fuelwood) is common across several Sub-Saharan African states, with Nigeria and Zimbabwe leading the pack in terms of maximum usage.

The impact of fuel wood on our environment and especially on women who are consigned to use it was well depicted in the earlier cited 2015 Coal Atlas Heinrich Boll Stiftung Foundation Study. Similar to Kerosene, burning firewood and cow dung – pollutes the air indoors and causes respiratory problems when used for cooking.

Furthermore, the lightning gotten from these energy sources - are too poor, meaning that school-children are unable to do their homework in the evenings. The report states the dire situation of wood harvesting in

Nigeria has led to deforestation and desertification including an expansion of the Sahara Desert into Eleven (11) frontline states abutting the desert and representing 43% of the country's landmass.

The report also lists a rise in carbon emissions and global warming with expected hotter days across the country with huge implications for agriculture and human and animal health.

The warnings from the report are dire as it states - "By 2020, if no climate change adaptation is implemented; between 2-11% of Nigeria's GDP could potentially be lost. Where forests used to cool the climate in northern Nigeria, exposed landscapes and communities suffer from intense solar radiation. At the same time, people continue to cut down the remaining trees for cooking and baking of bread. To drive this message home the report states that "a typical bakery uses one tree per day – that's one forest of 300 trees lost every day for Jigawa State alone."

However, various indigenous clean energy enterprises such as Sosai Renewables, Roshan Global Ltd and Solar Sister amongst several others have taken up the clean energy cooking challenge and are driving the use of efficient clean cook-stoves to last mile communities by cutting down the use of firewood by as much as 80% and with additional benefits such as with faster



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cooking huge wood savings, reduced deforestation and air pollution, and significant cost savings from firewood purchase for rural dwellers.

The Nigerian Alliance for Clean Cook-stoves (NACC), a public private partnership affiliated with the Global Alliance for Clean Cookstoves (GACC), aims to deliver 10 million clean cook-stoves to Nigerian homes and institutions by 2020. Many versions of efficient wood-burning and charcoal stoves (with locally fabricated bricks as the primary source of fuel for the stoves) have been developed and are being used in many parts of Nigeria today.

The overall aim of promoting these cleaner cook stoves lies primarily in curtailing the number of trees that are perennially cut to provide fuel wood and charcoal. Biogas digesters, which are capable of producing biogas that could be used for cooking as well as industrial uses, have been developed in many parts of the country.

## Kerosene

Nigeria's rural population also depends significantly on kerosene for their cooking needs, with experts suggesting that Nigeria is responsible for 5% of total global kerosene consumption.

According to the International Finance Corporation (IFC) Africa's Base of the Pyramid's (BoP) use of kerosene-based lighting accounts for 20 million tons of CO2 emission annually.

In Tanzania and Kenya, a large percentage of kerosene consumption by households is primarily for lighting, with just 2% of kerosene used for cooking and 89% and 94% of the urban and rural population respectively in Kenya, depend on kerosene for lighting. In East Africa, 15-30% of household income goes into kerosene purchase.

An estimated 47% of kerosene use in Nigeria is for household cooking. UNDP also reports that 4.0 million Nigerian households rely on kerosene for cooking out of 35 million total households.

The use of kerosene however is dependent on its cost and availability, with women shifting between kerosene and firewood use based on accessibility and affordability.

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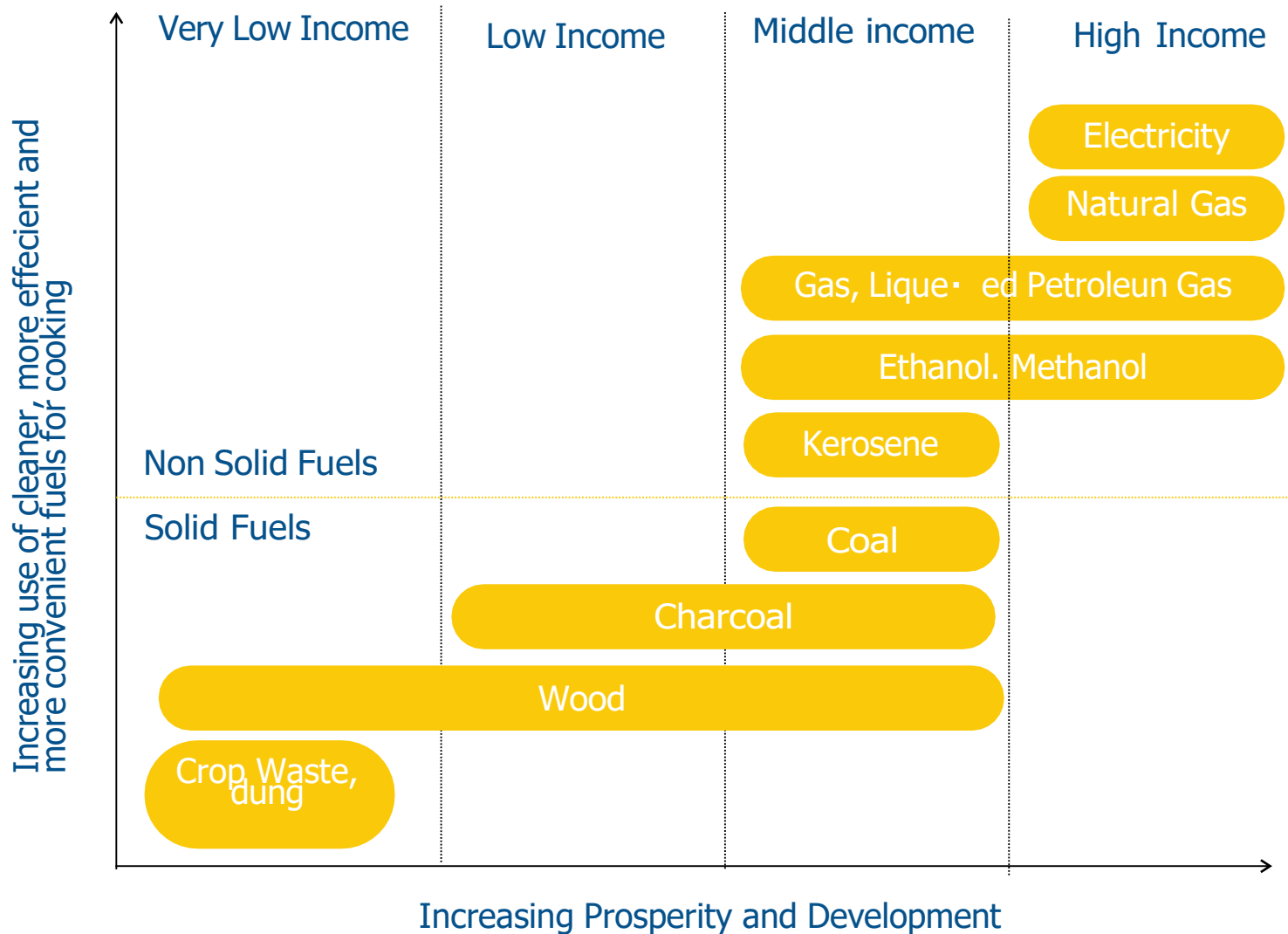
*An estimated 47% of kerosene use in Nigeria is for household cooking. UNDP also reports that 4.0 million Nigerian households rely on kerosene for cooking out of 35 million total households.*

In some African countries, kerosene costs make up 10-25% of household monthly budgets – even where the fuel is subsidized.

As the Energy Ladder below depicts, kerosene consumption in Nigeria is used by both urban and rural poor and middle income households for both lighting and cooking.

Despite the various subsidy initiatives to make kerosene affordable and available, it has only become increasingly difficult and more expensive. Field research in the South-South, South-East and North Central regions of the country attest to buying kerosene at prices between N250 – N300 per litre despite the subsidized price of N50.00, and a now supposedly unsubsidized price of N83 per litre.

# The Energy Ladder: Household Energy and Development Inextricably linked





*In Nigeria, a lot of the Kerosene product is diverted to the aviation sector, where it is converted for aviation fuel and sold for a much higher price resulting in large arbitrage profits for intermediaries.*

A recent May 2018 publication on the availability and access to fuels in the country shows a bleak picture around kerosene as a source of fuel in Nigeria.

For instance, the report cites a total absence of the product in the South-West for periods ranging between six months to three years in all but one out of the 11 filling stations visited, while kerosene prices averaged N455 and N425.44 in Lagos and Ogun states respectively.

Over 20 filling stations were also observed to have closed down due to the increasing unavailability of petroleum products.

The Nigerian government has made several interventions to address the availability of kerosene to the rural poor. One of such initiatives is the 2015 Kero-Direct-Scheme of the Nigerian National Petroleum Corporation (NNPC).

Yet, communities in rural and urban areas find it almost impossible to obtain the product. Most buyers including the rural poor pay a premium for a product meant to be the cheapest source of petroleum products.

The earlier cited published investigation reveals a booming illegal market controlled by a powerful cabal siphoning available petroleum products like kerosene to other markets by creating artificial scarcity in order to make huge profits from exorbitant retail prices.

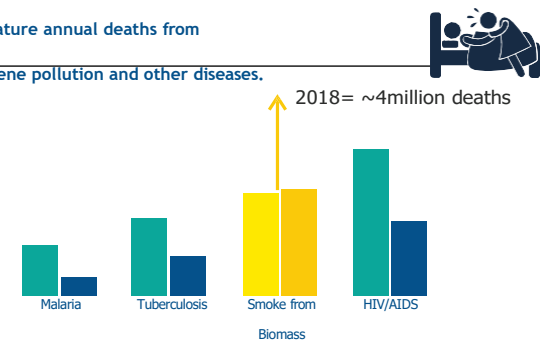
For instance, the Energy Sector Management Assistance Program (ESMAP) reported in 2009 that 20-30% of petroleum consumption in Niger Republic is smuggled from Nigeria.

Numerous studies have revealed that the primary beneficiaries of kerosene and kerosene subsidy to be these illegal cabals, the importing companies and local wholesalers who smuggle the subsidized fuel to neighboring countries to sell at higher price.

In Nigeria, a lot of the Kerosene product is diverted to the aviation sector, where it is converted for aviation fuel and sold for a much higher price resulting in large arbitrage profits for intermediaries. This has resulted scarcity of the product despite the subsidy removal, with exorbitant costs associated with the product where they are available.

Premature annual deaths from

kerosene pollution and other diseases.



## Chapter 2

### NIGERIA'S ENERGY MIX:

### NIGERIA'S ENERGY MIX:

Nigeria's energy mix consists of a number of energy sources. The energy mix chart cited below is the clearest plan available in terms of the country's energy targets. The charts below and throughout this section show the progressive plan for achieving these targets between 2016 and 2030 with the 2016 chart below depicting the status quo.

Currently the country generation capacity is dominated by thermal (gas powered plants) along with only three hydro plants in existence.

The government has set out plans to diversify the mix to include significant renewable energy solutions for both on-grid and off-grid electrification using the vehicle of the Rural Electrification Agency (REA).

However prior to the emergence of Oil; the country was largely dependent on Coal. Now with Nigeria having the largest gas deposits in the world, a number of the country's energy mix is driven by the gas to power the country's energy access for electricity.

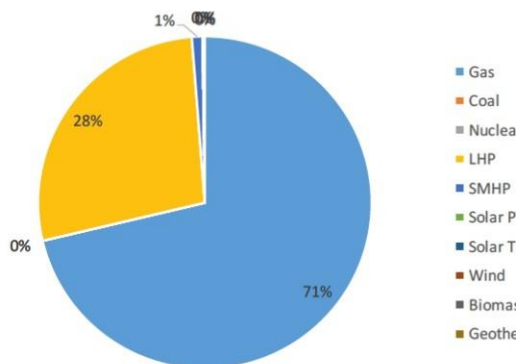
### Coal in Nigeria

Coal was the major source of energy in Nigeria before the discovery of crude oil.

The discovery of coal in 1909 at the Udi Ridge in present day Enugu state and commercial exploitation in 1916 catalyzed Nigeria's economic growth with the development of the defunct Eastern Region, powering key infrastructures such as the Oji river Power station which supplied electricity to the whole eastern region, the locomotive

	2016
Gas	3,121
Coal	0
Nuclear	0
LHP	1,200
SMHP	45
Solar PV	0
Solar Thermal	0
Wind	10
Biomass	0
Geothermal	0

**NIGERIA'S ENERGY MIX in 2016:  
4.5GW ON-GRID**



*The two most prominent examples of Coal Fired power plants in Nigeria were the Ijora Thermal Power Station and Oji River Power Station.*



Coal exists in about 22 coal fields spread in over 13 states of the Federation.

*The proven coal reserves so far in the country are about*

**639m tons**

*while the inferred reserves are about*

**2.75bn tons**

railway and the country's first national cement company in Nkalagu.

At its peak, coal production hit 790,030 metric tonnes before its decline arising from the discovery of oil and transition of major key coal powered infrastructure such as the Nigerian Railway Corporation and Electric Company of Nigeria from coal to diesel.

Other series of events such as the Nigerian civil war, poor management of the Nigerian Coal Corporation, withdrawal of government support eventually led to the decline of the coal industry in the country.

Coal exists in about 22 coal fields spread in over 13 states of the Federation, including Adamawa, Anambra, Bauchi, Benue, Cross-River, Edo, Enugu, Gombe, Imo, Kogi, Kwara, Nassarawa, Ondo and Plateau states.

The proven coal reserves so far in the country are about 639 million tons while the inferred reserves are about 2.75 billion tones consisting approximately of 49% sub-bituminous, 39% bituminous and 12% lignite coals.

The two most prominent examples of Coal Fired power plants in Nigeria were the Ijora Thermal Power Station and Oji River Power Station. In terms of Coal resources for power – The Behre Dolbear study cites 11 significant known coal deposits in Nigeria and of these, the following short list of four

properties, appear to have the highest economic potential for coal-fired power plants development:

- i. Ogboyoga Property: Located on the northeast flank of the Anambra Coal Basin, the main seam appears to extend from Ogboyoga to Okaba in the south;
- ii. Okaba Property: Located approximately 20 kilometers south of the Ogboyoga area, the main seam also outcrops along the foot of the Enugu Escarpment;
- iii. Orukpa Property: Located south of Okaba along the eastern flank of the Anambra Basin, the main coal seam crops out along the foot of the Enugu Escarpment;
- iv. Ezimo Property: Located immediately south of the Orukpa coal area and extends and merges with Orukpa to the north and Onyeama to the south, lies approximately 70 kilometers north of the City of Enugu.

Several other coal deposits but with the potential for being developed in conjunction with coal-fired power plants includes

## Literature:

### True Cost of Electricity

*A well detailed research publication by the Heinrich Boell Foundation titled the true cost of electricity show that at present, the investment costs as well as costs to society (encompassing health-related costs of air pollution and damages of climate change) make solar PV fully competitive with coal and natural gas.*

*While the government still explores ways of utilizing its coal resource, there is yet*

#### **i. Onyeama Coal Property and Mine:**

Located south of Ezimo along the eastern flank of the Anambra Basin on the outcrop at the foot of the Enugu Escarpment. The underground mining complex has been closed since 1993, and is flooded with acidic water;

#### **ii. Okpara Property and Coal Mine:**

Located south of Onyeama on the eastern flank of the Anambra Basin and, with coal outcrops at the foot of the Enugu Escarpment. The high ash content coal requires washing and would not be economic for firing a power plant.

#### **iii. Enugu Mining District:**

Located immediately south of the Benue Mining District along the eastern margin of the Anambra Basin, encompasses the City of Enugu. Six mines have operated in this area. Onyeama and Okpara still potentially accessible for continued coal mining, but are currently flooded and would be difficult to rehabilitate.

The Behre Dolbear study concludes that each of the Kogi, Benue, and Enugu Districts can likely support a significant coal-fired generating plant.

The Study demarcated a number of the coal properties into concessions, which were then recommended for sale, and eventual sold by

a privatization process by the Bureau of Public Enterprises (BPE).

It is understood that although the BPE received payments for all the concessions sold, virtually bar two (The Okaba and Owukpa Coal Concessions) have been reversed and sale proceeds returned to the purchasers. Some of the reasons cited include material mis-descriptions of the concessions and their respective assets.

The federal government has expressed interest in generating at least 30% of its energy mix by 2030 from its coal deposits. Currently a few large private industrial facilities have coal mining licenses and self-generate electricity from coal for their industrial processes.

The government has said it is exploring getting finance for coal projects in the country, as well as setting up of modular coal fired plants of 20MW to 30MW for community clusters across the country.

However, reputable finance firms such as FBN Quest have cast their doubts on the ability of the government to raise the required funds for coal power generation from international financial organizations.

The government's coal generation plans have also been met with resistance from Human Rights and Energy Governance

*to be any significant progress in this regard. Another publication by the Heinrich Boell Foundation titled - COAL ATLAS: Facts and figures on a fossil fuel 2015 further lists all the historical and modern day development of coal mining in Nigeria including its consequences to mining communities in Nigeria.*

groups who argue that the actual price in terms of environmental pollution, climate change, and human consequences are too high a cost to bear.

## Oil In Nigeria

*Despite its status as the first oil producer in Africa, Nigeria imports mostly refined oil products*

*the federal government spends as much as N3 trillion importing petroleum products including kerosene, diesel and petrol.*

Globally, Nigeria is ranked eighth in OPEC's share of oil reserves in 2015 after Venezuela, Saudi Arabia, Iran, Iraq, Kuwait, UAE and Libya.

Nigeria is the largest oil producer and the most populous country in Sub-Saharan Africa, however, more than most other countries, it has suffered what is popularly known as the curse of oil.

Despite its status as the first oil producer in Africa, Nigeria imports mostly refined oil products because the country's 450,000 barrels per day (bbl/d) refining capacity is shut down or significantly underperforming.

Therefore, the Government continues to subsidise oil prices for the domestic market, which creates financial difficulties for the Government and advantages for fuel importers.

For instance, Nigeria is well recognized as the largest importers of generators world-wide. This is analogous with the importation of petroleum products with the federal government spending as much as N3 trillion importing petroleum products including kerosene, diesel and petrol.

Nigeria is the largest private generation market in the world with at least 15,000 MW of private generation, which represents three

times the grid-installed capacity.

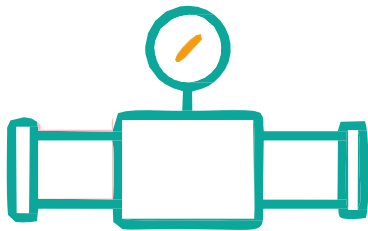
The first oil wells in Nigeria was drilled by Shell in Oloibiri, Rivers State, before extending it to Afam, Bomu and Ebubu in 1956 all located in the Niger Delta and oil exports began in 1958.

This business venture of granting oil licenses was not extended to Nigerian traders or entrepreneur. Despite being the focal point of the nation's wealth through oil and gas exploration, the Niger Delta region has little to show for it.

In the Niger Delta, an estimated 34% of rural dwellers have very little development and negligible energy access, and this is compared to 84% in the urban areas, who despite having some level of grid access still contend with frequent blackouts and power cuts.

It is clear from that despite being the main stay of the country's energy sector resource, that energy poverty is a key issue affecting the Niger Delta region. This amongst other glaring lack of development is the reason for years of sustained militancy by people of that region





Most gas infrastructure is limited to the south with little realistic prospects for development of the gas network to the north, due to the lack of investment.



gas pipeline vandalization by militants in the Delta is also an ongoing issue

## Gas – Thermal Plants

The primary energy source for the country's electricity infrastructure remains gas with over 85% of installed generation capacity fuelled by gas. The country's gas downstream infrastructure remains insufficiently developed to enable effective supply of power across the country.

Most gas infrastructure is limited to the south with little realistic prospects for development of the gas network to the north, due to the lack of investment. This greatly impacts the ability of the country to be electrified due to issues of supply and inefficiencies.

Two major issues bedevil the power generation capacity of the country and both are tied to the Nigerian Gas sector. The first is the inadequacy of gas infrastructure such as ageing gas pipelines and the second is the issue of gas pricing which falls under the mandate of the Petroleum sector but impacts the power tariff structure in Nigeria.

It is important to note that gas pipeline vandalization by militants in the Delta is also an ongoing issue and is directly analogous to many of the issues earlier highlighted in the Oil section of this paper above.

Much of the agitations in the Niger Delta by the militants and sometimes with the

support of host communities comes from years of neglect and disfranchisement by the government and the Oil communities.

While most of these gas pipelines remain critical infrastructure, the continuous danger caused by fire disaster to the ecosystem is yet to be quantified.

Moreover the impact on the community especially women and children; will be long lasting particularly where there is little post-disaster recovery programme.

There is currently a labour-intensive approach to pipeline monitoring in Nigeria which on its own has fueled a new sort of corruption that benefits only a specific subset of people.

In all of this, the host communities are the loser, as the pipeline monitoring contractors and the oil and gas companies completely overlook the indigenous people in the solutions and impose a new hierarchy that does not benefit the poor especially the women.

Therefore, there is the need to deploy new digital and technology enabled tracking system, and enhanced communication and transport infrastructure, as well as the review of the existing right-of-way regulations, and their strict enforcement around all critical infrastructures.

## Hydro

As at 2016, Hydropower made up 17.8% of Nigeria's total capacity and with a significant hydropower potential exists in Nigeria, well over 10,000 MW.

However, hydropower resources are difficult to develop and new Hydro Power Plants require very long periods from the initial pre-feasibility study phase until final design and implementation and takes up to 8 to 10 years for development.

Nigeria's history with Hydro Power Plant is similar to those of Oil and Gas. The country has three main Hydro Power plants listed in the charts below – most of which are operating below optimal levels.

The three major dams are all located in Niger State, Nigeria. The Kainji Dam built in 1968, Jebba Dam built in 1985 and Shiroro Dam built in 1990 all host Hydro Power Plants. A fourth dam is being built at Zungeru, also in Niger State and flows along Kaduna downstream.

These are all hydroelectric dams and generate a potential combined power output of 1,900 megawatts. These Hydro Power plants are plagued with mismanagement and are not operating at optimal levels are strategic projects.

The other strategic dams in the country includes the Mambilla Hydro Power Plant

located along the (Donga river / affluent of Bénue); Kashimbila is located towards the (Kaduna upper reaches); Gurara II is located along Kaduna river upstream;; and each of these dams support several with irrigation dams across the Northern states and middle belt states.

## The Nigerian Government projection on Energy Mix

The government through the Ministry of Power has further in the last quarter of 2016, the Nigerian government launched an Energy Investment prospectus that details the country's projected energy mix strategy and the future expansion of Nigeria's energy infrastructure.

The document, “recognizes that the sector currently suffers from an over dependence on gas and therefore sets out to encourage a more diverse energy mix in a bid to rapidly provide much needed electricity for Nigeria.”

The guide complete with graphs, infographics, and pictorial illustrations, highlights the geographic regions and portions of the value chain where energy access opportunities abound.

*In West Africa, .....energy poverty is a regional problem with many countries with many countries facing black-outs and limited economic activities.*

*electricity access rates range from below 20% in Liberia, Sierra Leone, Niger and Burkina Faso to more than 50% in Senegal and above 70% in Ghana.*

It also portrays Nigeria's rich energy potential and natural resources and details investment attractiveness as well as available incentives along with pertinent policies and regulations that support the diversification of investments and the exiting enabling environment.

One significant shift in Nigeria's energy mix from the status quo to the projected state in 2030 is the recognition of various renewable energy resources of which solar, wind, biomass and small hydro power (SHP) are the most ubiquitous.

As the data shows, hydropower has the largest commercially exploited renewable energy source for grid connectivity in Nigeria.

There is a recognizable growth in Solar PV, Biomass and Wind as a factor in meeting the country's energy access.

This shift is important because renewable energy – specifically solar is now predominantly viewed as the necessary pathway to addressing the country's energy access quagmire.

This is evident in the rash of policies and programs rolled out at the federal, regional and state levels in meeting the targets of the government.

The figures below show Nigeria's proposed energy mix projection up to 2030 as contained in the Energy Mix Prospectus developed by the Nigerian Ministry of Power in conjunction with the Sustainable Energy for All (SE4ALL) Agenda.

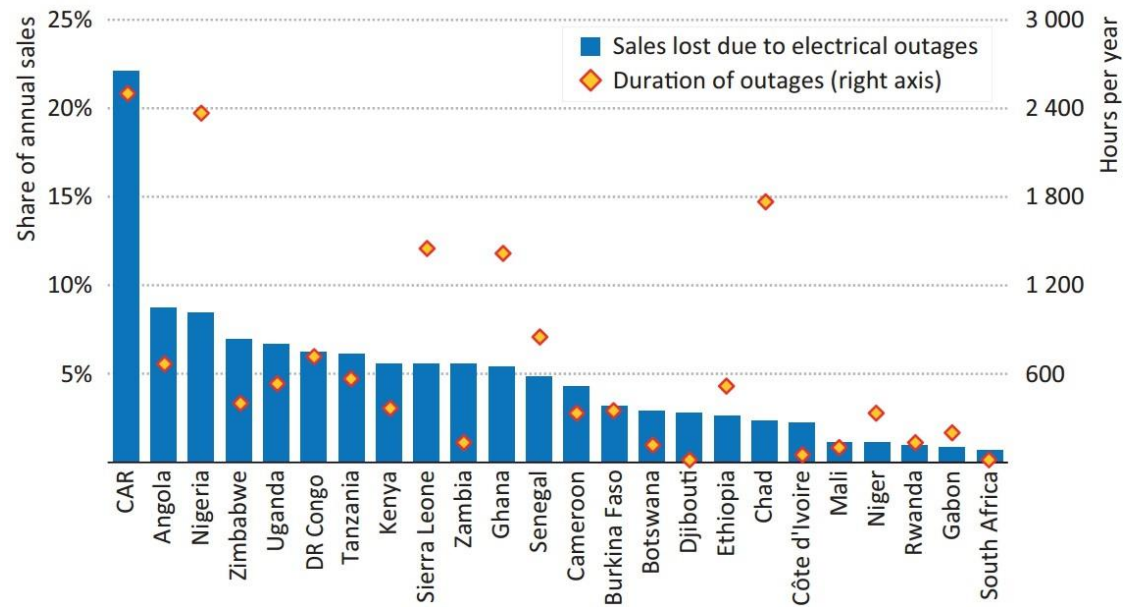
### **Regional Energy Systems – How has Nigeria fared compared to other Sub Saharan African countries**

According to the International Energy Agency (IEA), average per-capita consumption in 2012 was less than 100 kWh across a range of African countries (16 countries assessed) and an average of 317 kWh for the whole of sub-Saharan Africa (225 kWh with South Africa excluded).

As figure 14 below shows, Nigeria is one of the highest countries in Africa in terms of the length of power cuts, with businesses losing on average almost 2400 hours per year (almost seven hours per day), more than double the African average..

In West Africa, electricity access rates range from below 20% in Liberia, Sierra Leone, Niger and Burkina Faso to more than 50% in Senegal and above 70% in Ghana.

Energy poverty is a regional problem with many countries with many countries facing black-outs and limited economic activities. This means that during outages – people are more dependent on other energy sources - mainly fuel based for their power.



Notes: CAR = Central African Republic. Data is from the latest available business survey for a given country.

# Chapter 3

## INSTITUTIONAL FRAMEWORK OF NIGERIA'S ENERGY SYSTEMS

The historically low level of investment in Nigeria's power sector saw a significant barrier to private investment in the country particularly during the military regime.

Successive governments in Nigeria from 1999 upon the country's transition to civilian rule, made efforts to improve the power situation in the country by pumping in an average of \$2 billion annually on electricity provision; yet with little improvement.

### Shift in Power Architecture – Historical Context

In 2001, the power sector reform in the country commenced with the National Electric Power Policy (2001) , and this led to the passage of the very pivotal Electric Power Sector Reform Act (2005) which constituted the framework under which reforms in the power sector were made.

Prior to its privatization in 2013, the Nigerian electricity sector was characterised by a vertically integrated model with single state-owned utility, National Electric Power Authority (NEPA), responsible for most of generation (a few gas independent power

producers or gas IPPs sold power to NEPA), transmission and distribution, as well as providing administrative and operative duties at each part of the value chain. However with rising challenges in the power sector and decreasing efficiency of the national grid, various power sector stakeholders reconvened after the implementation of the Power Sector Reform Act 2005, to develop plans and strategies to combat the problem of unreliable electricity supply leading to the power sector reform.

In the first stage of the reform process, which eventually led to the privatisation in 2013; NEPA was restructured as Power Holding Company of Nigeria (PHCN). The Nigerian power sector privatisation began in 2005.

During this process, NEPA was unbundled under PHCN into generation and distribution companies and a transmission company. In 2013, the PHCN generation and distribution corporations were privatised into six-generation companies, Transmission Company of Nigeria (TCN), with the System Operator and Market Operator residing within TCN, the Nigeria Bulk Electricity Trader (NBET) and 11 Electricity Distribution Companies (Discos).

Following the privatization institutions such as the Nigerian Electricity Regulatory Commission (NERC) have a central role in the overall process through licensing of new



*The Transmission Company of Nigeria (TCN) is the sole transmission company in the country..... TCN has difficulties in mobilizing sufficient financial resources to consolidate and extend its services throughout the country.*



**8000MW**

*Nigeria generates 8000MW*

**5000MW**

*Nigeria transmits 5000MW*

companies, authorising exploitation, giving concessions, and regulating the prices and pricing policies.

The Nigerian Bulk Electricity Trader (NBET) oversees power transactions between Gencos and Discos. It has control over power purchase agreements (PPAs) but has experienced certain difficulties in honouring all its contracts.

Some Gencos still need to contract payment guarantees against lack of payments by NBET. New projects including renewable energy face pricing challenges while discussing PPAs with NBET, making it difficult for them to achieve bankable projects.

The Transmission Company of Nigeria (TCN) is the sole transmission company in the country. It was not privatised and remains Government owned.

There are considerable problems and bottlenecks in the transmission system, which is technically limited to around 5,000 MW of transmission capacity, against a maximum potential generating capacity of 8,000 MW. TCN also has difficulties in mobilizing sufficient financial resources to consolidate and extend its services throughout the country.

The privatization of the PHCN successor companies has been completed, the second phase of privatization, currently underway,

relates to the sale of 10 government-owned independent power projects, called National Integrated Power Projects (NIPPs), however the process which commenced in 2013 has been stalled.

The FGN conceived the NIPPs as a fast-track public sector-funded initiative to add significant new generation capacity to Nigeria's electricity supply system

The FGN continues to retain 20% shareholding in each of the NIPP assets.

The process of fully privatizing the NIPP plants has been stalled for various reasons such as gas shortage, drawn-out negotiations, court actions and delays in executing gas supply agreements, which have all affected the project's bankability as the banks and investors are reluctant to invest either debt or equity into the project given the high level of uncertainty and risks.

It is clear that structural and operational inefficiencies in the electricity value chain has led to the underutilization of Nigeria's generation capacity.

This is why the World Bank has stated that it takes a median length of 9 years to build and operationalize a power plant and estimates that it cost billions of dollars to upgrade, maintain and expand the already existing grid to increase the power generation.

## Involvement Of International Bodies In The New Energy Architecture

In 2013, Financiers of energy projects in Nigeria consisted of domestic equity private sector, domestic debt private sector, local money banks and the Central Bank of Nigeria.

## 2014- \$2bn

In news statements published in 2014, the **financial commitment** from donor countries to the Nigeria's power sector was said to **hit \$2 billion by 2018.**

As a developing nation, Nigeria is largely dependent on support from developed nations which could be in the form of finance, technical support, capacity development, infrastructure development amongst many others.

Looking to attract foreign investment to boost its economic growth and as one of the most prominent countries in Africa, Nigeria maintains healthy relationships with the international community most of whom provide support and assistance across several areas such as education, health, infrastructure, trade, economy and growth, agricultural and rural development, information and technology, transport, energy and mining, political stability and so on.

With electricity being one of the government's priority areas, there has been huge donor and foreign support and funding for Nigeria's energy architecture since the passage of the Electricity Sector Power Sector Reform Act of 2005.

There is a donor coordination group in Nigeria made of all the major international donor and international finance agencies in Nigeria.

The aim of the donor coordinator group is to ensure harmonization through active exchange of information, policy dialogue

with Government and coordination of donor activities.

Most of the International Donor Agencies and International Finance Institutions each have some ongoing project on Renewable Energy as part of their mission in Nigeria.

Over the years the Donor Coordination Group made up of the EU, GIZ, AFD, AfDB, JICA, DFID, USAID;, World Bank, individually and collectively fund and implement various institutional support measures in the Nigerian electricity sector, including but not limited to pilot programs, studies, and capacity building programs.

The role of the multi-nationals and development organizations in the Nigerian has been huge.

A number of the electrification models; planning and pilot projects have been significantly influenced by donors. For instance, GIZ, the European Union and the German Embassy are heavily involved in the country's Mini-Grid electrification plans.

In news statements published in 2014, the financial commitment from donor countries to the Nigeria's power sector was said to hit \$2 billion by 2018.

This not limited to the electricity sector as it stretches to the clean cooking, sustainable

water and agriculture program.

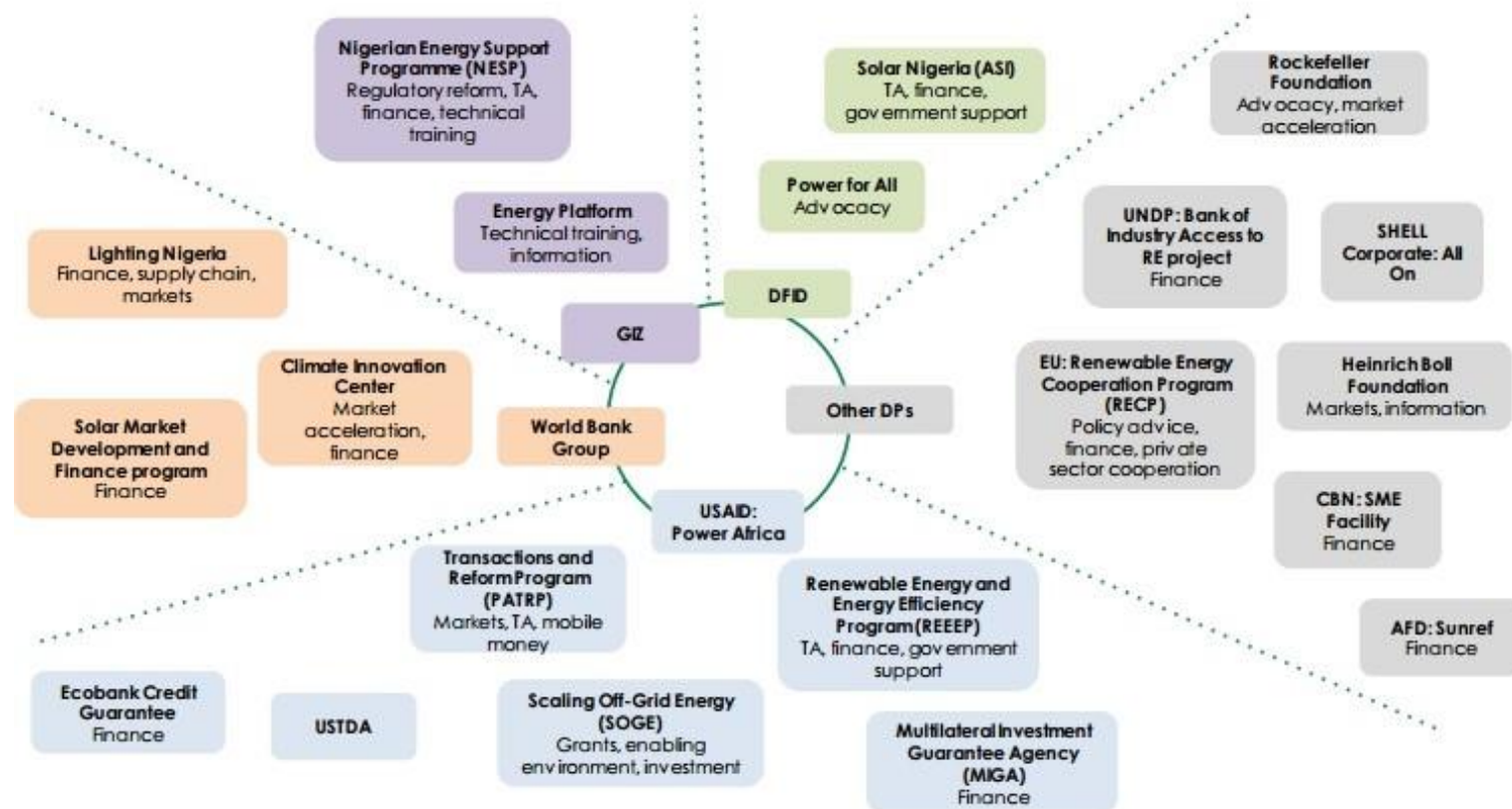
In 2013, financiers of energy projects in Nigeria consisted of domestic equity private sector, domestic debt private sector, local money banks and the Central Bank of Nigeria.

Prior to 2013 following its privatization, the power sector was controlled and funded by the federal

government. As of 2017, only the CBN, the World Bank Group and DFID through the Solar Nigerian Program are still able to provide financing for viable projects.

Below is a snapshot of donor activities in the Nigerian Electricity and Energy Access sector

## Development partners in the Nigerian energy space





## Chapter 4

# RENEWABLE ENERGY

### Renewable Energy

In theory, renewable energy (solar, hydro, and biomass) could be among the solutions to provide energy to the rest of the country including rural areas in the North, where poverty is most pervasive and life expectancy is the lowest.

Solar energy is the fastest growing renewable energy source. This is evidenced in the launch of two (donor led initiatives) in the areas of Micro-Grids and Mini-Grids in Nigeria.

The BoI and UNDP have jointly funded the deployment of mini-grids across the country including a 24kW mini-grid by GVE Projects in Onono-Anam community, Anambra State; a 24kW mini-grid by Arnergy in Obayantor community, Edo State; a 24kW mini-grid by GVE Projects in Bisanti, Niger State; and a 24Kw mini-grid by GVE Projects in Egbeke, Rivers State.

These community based projects have unlocked significant socio-economic activities; significantly reduced rural-urban migration, and boosted the livelihood and wellbeing of community dwellers.

For example, Bisanti village which was one of the site visits undertaken during this research project, has now become transformed economically as this community now generates more revenue than it ever did

and attracts indigenes from neighboring villages and communities for business and leisure purposes.

The community is safer for women to travel at dark hours as there is light, Women have started viable business as a result of light and access to refrigerator and freezers for cold merchandise, Children in the village no longer have to read in the dark or struggle to study with candles and local burners, and living standards across the board are greatly improved.

Just recently, two 50kW mini-grids each were launched in Plateau State developed by GVE Projects in Angwan Rina and Demshin communities funded by the European Union and the German Government under the Nigerian Energy Support Programme (NESP).

There are also new and emerging technologies that can help small and medium sized agriculture such as solar-water powered system for agriculture, to help farming in drought affected areas especially in Northern Nigeria – an area close to the Sahara Desert and impacted also by deforestation due to tree felling and logging activities.

It is important here to cite an example of on-going government project known as the Nigerian Erosion and Watershed management Project (NEWMAP) which

*Solar PV installations in Nigeria have been largely private sector led but there is an increase of Government at the Federal or State level involvement with the Rural Electrification Agency (REA) having a target of 10,000 solar power rural communities by 2030.*

provides household and institutional clean cook-stoves in seven states – Abia, Anambra, Cross River, Ebonyi, Edo, Enugu and Delta, as part of efforts by the government to manage the gully erosion and watershed challenges across Nigeria and to reduce the rate of deforestation in these pilot states.

Most of the solar PV installations in Nigeria have been largely private sector led but there is an increase of Government at the Federal or State level involvement with the Rural Electrification Agency (REA) having a target of 10,000 solar power rural communities by 2030.

This is strongly aligned with the earlier referenced investment prospectus, which contains some focus on solar mini-grids but also identifies several sites with potential for small hydro power.

The prospectus also provides the necessary and specific steps for investors interested in this type of power generation as it does for power generation from large hydro, gas, coal, solar, wind and biomass; including opportunities in the transmission and distribution portions of the value chain.

The contribution of wind energy to the current energy mix is still at an insignificant phase. Wind energy technology was tried in the early 1960s in the Northern region of the

country (Kano, Sokoto, Katsina, Bauchi, Plateau) mainly for water pumping from open wells in secondary schools but they are no longer working.

The existence of two functioning wind electricity technology; 1kW Benin energy research centre Edo State, and rehabilitated wind power pump at Kadawa village in Kano State, 5kWp capacity located at Sayya Gidan-Gada and 0.75kWp located at Danjawa village both in Sokoto State was observed.

The first wind farm in Nigeria - a 10MW farm located in Katsina and it is worth N5.5 billion was awarded in 2010 with expected completion in 2012; The project activities has been slow since inception, with only about 5 wind turbines of 37 expected units mounted; each turbine installed at a height of 55m and having a generation capacity of about 275kW.

However, the project is yet to be completed even after a second projected completion and commissioning slated for 2015 and in March 2018. There were talks as recently as 2017 of a planned commissioning. Reasons for its delay may be connected to security issues.

What is clear however from the Katsina wind project and others like it, is that government led investment in power generation is still mired in bureaucratic bottlenecks and financial inefficiencies making it difficult to

*Up to 14% of the population remains unconnected and a large percentage of those connected are without regular power supply due to grid unreliability.*

actualize power projects that can electrify rural communities.

Another potential source of energy is nuclear energy which is unavailable in Nigeria. A decade ago, plans to establish a viable nuclear power plant begun as about 152T eU of Uranium reserve was discovered in two locations by the defunct Nigerian Uranium Mining Company (NUMCO) which showed that Nigeria has the potential for a self-sustaining nuclear power plant.

However, concerns were raised on environment and public safety issues with reference to nuclear incidents in Japan and Russia.

A 2017 study by the Heinrich Boell Foundation in Nigeria and the Nigerian Economic Summit Group (NESG) assessed the costs of different electricity generation technologies in Nigeria.

By forecasting up to 2025, the study shows on-grid solar PV being fully competitive with coal generation in Nigeria in the next 5 years.

The study suggests that the availability of natural gas-powered electricity fuel in the long term is in doubt due to deficient distribution and resource depletion in the

midterm.

In off-grid generation, it also shows that off-grid solar PV systems already cost competitive in Nigeria on a lifetime basis supporting the country's Off Grid Renewable Energy push.

There is growing evidence of the potentials of decentralized solutions to increase energy access in urban areas as well, where up to 14% of the population remains unconnected and a large percentage of those connected are without regular power supply due to grid unreliability.

This is evidenced in the number of rooftop solar on homes across the country. Furthermore, in 3yrs, at least 30 renewable energy-solar powered mini-grids have come into operation generating a total of up to 2MW. Although these projects are sited predominantly in rural communities.

Furthermore, primary data collection during the course of this research further highlights the true cost of access on women in rural and peri-urban communities. Responses from the over 350 women engaged during the research in Kogi, Enugu, Umuahia, Calabar, Port Harcourt and Lagos put the range of generating their own energy for cooking and lightning using kerosene and fuel-wood at a premium.

## Opportunities through Decentralized Renewable Energy (DRE) Solutions

Introducing these women to clean renewable energy solutions, e.g. pico-solar lighting and clean cook-stoves was immensely beneficial with 98% of women surveyed stating that the engagement was most beneficial to them.

Some of them are quoted below with testimonials to the promise and scale of energy access in changing and improving their lives.

- *"I have just realized how I have been making myself sick from kerosene and firewood, thank you for this information",*
- *"I will get the solar light and cookstove and if it works very well I will buy for my mother and younger sister",*
- *"Please come to my community and talk to our women, they need it more",*
- *"You just made me realize how much I have been wasting on kerosene and charcoal, and hospital bills",*
- *"Do you have a bigger cook-stoves I can use for my restaurant";*
- *"How do I get these systems that can serve for my hair salon business"*

The lack of general consumer awareness on renewable energy solutions is changing fast and this is a testament to the awareness raising and education on renewable energy solutions by the renewable energy ecosystem in Nigeria which has invested heavily into building consumer and customer confidence.

Some questions often arise around affordability, particularly in the face of high capital and operating costs for renewable energy companies.

It is a fact that several renewable energy companies' lack seed capital to start a highly capital intensive business such as renewable energy.

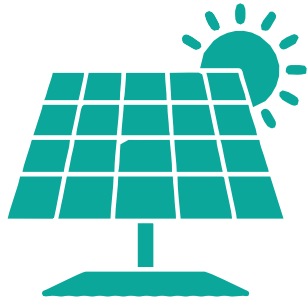
There is the lack of access to low interest loans to finance business operation, and for project financing. Most commercial banks in Nigeria offer loans at 30% interest rate or more,, while financing from Development Financial Institutions are quite competitive and usually take a long period of time to reach closure.

Many of these development and donor finance institutions also require several hurdles that a lot of local SMEs are sometimes unable to meet.

The challenges for the technology providers can be surmised as

(i) high capital cost which leads to somewhat higher tariffs for the consumers;

(ii) high local interest rates which adversely affects small and medium scale project developers; (iii) and



*For instance, there is the Pay-as-you-go solar model which brings together solar PV, storage and mobile pay technologies to give customers especially women an affordable option for electricity.*

*Women through this system are able to pay for their household electricity weekly, monthly or daily as the agree structure permits.*

the pricing of the renewable energy and energy access equipment in foreign currencies, as well as

(iv) the dearth of local manufacturing capacity to bring down the costs of these products and services.

Some renewable energy companies are unable to offer consumer financing on their own due to limited cash flow, while others who have to fund-raise internally; most times provide their solutions on credit in order to keep businesses moving until the consumer is able to fully pay off.

However, this often reduces their access to liquid finance for future capital and business, and reduces the ability to scale.

This is why a case has been made for renewable energy subsidies by the government for the poor especially in communities where mini-grids are installed as part of a consumer financing mechanism to bridge the high capital cost of renewable energy solutions.

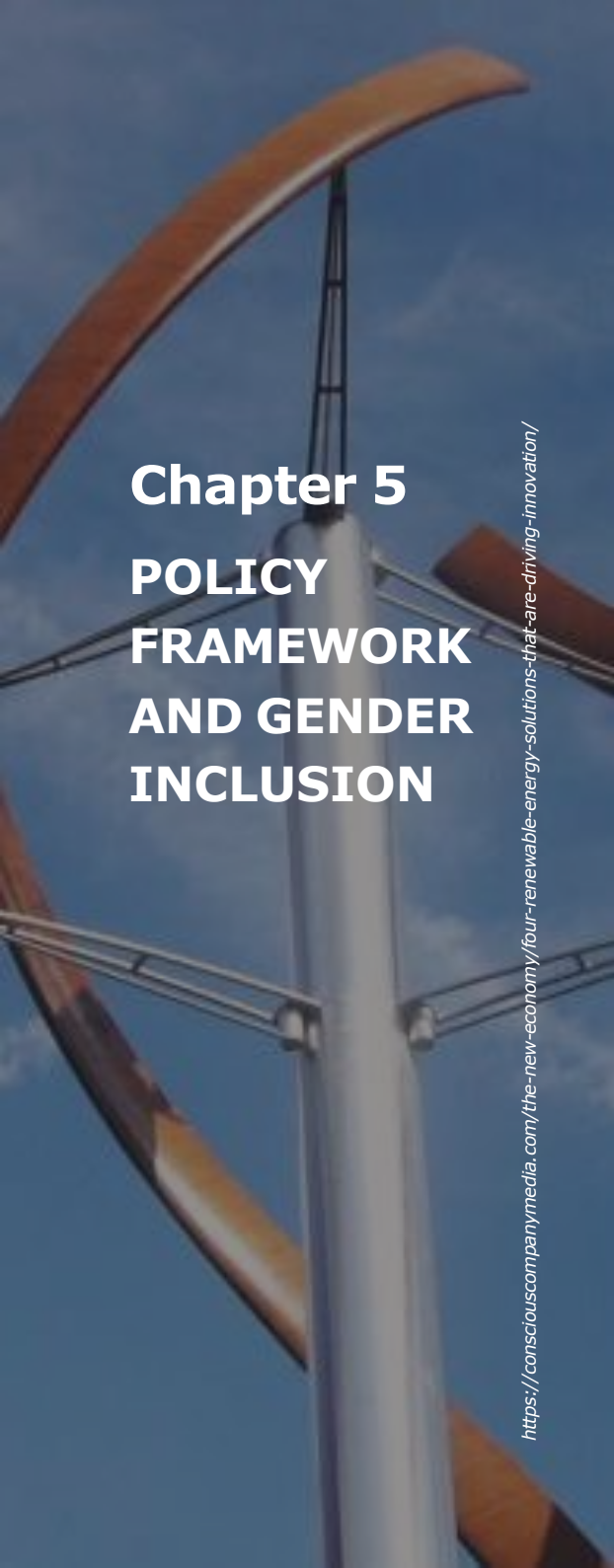
The renewable energy eco-system in Nigeria in terms of payment and affordability is flexible enough with business models that puts the woman in control of her energy consumption and creates business opportunities for the woman.

For instance, there is the Pay-as-you-go solar model which brings together solar PV, storage and mobile pay technologies to give customers especially women an affordable option for electricity.

Women through this system are able to pay for their household electricity weekly, monthly or daily as the agree structure permits.

These women can become clean energy entrepreneurs with organizations like solar sisters; where they both use and make money from renewable energy products at the same time.

According to UN Climate Change News, solar energy dominated global investment in new power generation at unprecedented levels in 2017, and this underlines the fact that clean energy makes sense not only for the climate but for the global economy as well.



## Chapter 5

# POLICY FRAMEWORK AND GENDER INCLUSION

<https://consciouscompanymedia.com/the-new-economy/four-renewable-energy-solutions-that-are-driving-innovation/>

Nigeria's 2014 National Energy Masterplan provides an "Action Plan for Gender Issues", which includes "an activity to organize meetings between women, grassroots-level development partners and other stakeholders to make energy policy recommendations to governments".

The Masterplan details the convening and coordination activities of the Federal Ministry of Women Affairs and Social Development which is tasked with nearly 40 unique activities, including conducting training on the installation RETs; conducting awareness campaigns on energy related environmental problems and the establishing micro credit facilities for women entrepreneurs to invest in clean energy and providing training for women to construct their own energy efficient cook-stove".

The Nigerian Renewable Energy and Energy Efficiency Policy of 2015, (NREEP) as a national policy that addresses the entire energy access value chain refers to optimization of "gender and environmental issues amongst others."

There appears to be a specific gender focus underpinning this policy as it states as a policy objective that it seeks "to ensure the increased indigenous participation and the application of gender main streaming in the planning, design and construction of micro, mini and large hydro power stations".

It further states as one core strategy to meeting the policy goals, a need to "establish micro-credit facilities for entrepreneurs, especially for women groups, for the establishment and operation of commercial solar energy facilities in remote and off-grid areas.

For this policy to be as effective as it was designed, there must be an effective and result-oriented advocacy strategy, especially on the role defined for women in the policy.

In contrast – The Rural Electrification Strategy and Implementation Plan in its 42-page document has only one mention of 'women' in the entire policy document in reference to the objective of "promoting the use of domestic electrical appliances to reduce the drudgery of household tasks typically allocated to women".

Nowhere in the Electricity Sector Power Reform Act (ESPRA) of 2005, the fulcrum of the new power infrastructure in Nigeria and the base of the new emergent power and access infrastructure in Nigeria, is the word 'gender' or 'women' mentioned at all.

*the Federal Ministry of Women Affairs and Social Development which is tasked with nearly 40 unique activities, including conducting training on the installation RETs*



## Policy Framework and Gender Inclusion – Regional

Very recently, the International Union for Conservation of Nature (IUCN) Global Gender Office with support from Power Africa and USAID, sought to understand how Sub-Saharan Africa national energy frameworks includes gender considerations, and analyzed 45 national energy frameworks from 29 sub-Saharan African countries.

This was a global assessment to identify and understand the degree to which gender considerations were being addressed in energy policies, plans and strategies across the globe.

This resulted in a very detailed report titled “Energizing Equality” which sought to offer insights into the ways in which national and sub-national governments across Sub-Saharan Africa view and recognize gender in the context of their energy policymaking and planning.

The report further highlighted several key cross-cutting gender issues, and how each country and region is seeking to address them. It further engages in a regional comparison of how governments are actively mainstreaming gender into their energy programs and policies.

The report, which was recently released in 2nd quarter of 2018 reveals that nearly three-quarters of the frameworks include mentions of women and/or gender.

At a regional level, there is the ECOWAS policy for gender mainstreaming in Energy Access – which is a body that sets policy goals required to accelerate responses to the gendered experience of energy poverty as a priority.

This ECOWAS Policy tool box rests on four pillars of

(1) enhancing equal access to modern energy services for member states as a right irrespective of gender, age or socio-economic status;

(2) Accelerate and harness different energy form in an inclusive way, taking into account the need for gender mainstreaming and access;

(3) Harmonize and legislate practices across member states with regards to gender equality and energy access; and

(4) increase women and men's equal participation and involvement across energy value chains.

The policy framework sets out strategic objectives, targets and milestones that ensure that these goals are met.

This policy was adopted on June 5, 2015, by the 15 countries of the Economic Community

of West African States (ECOWAS), the first-ever regional policy on gender-responsive energy development.

At the policy workshop held in June 2015, the body recognized the need to establish a regional regulatory framework aimed at enforcing the goals and principles set out in Policy for Gender Mainstreaming in Energy Access and came up with a set of directives “to support member states to specifically address the omission of gender considerations in the planning and execution of energy infrastructure projects...” amongst several others.

## **Gender Representation in Nigeria's Energy Sector**

In the recently published “Energizing Equality” paper, women's transformative as energy entrepreneurs, innovators and decision makers”.

The report goes further to state the importance of making women an integral part of the energy access eco-system and integrating women and gender planning at “all levels of the energy value chain to unlock greater productivity, returns on



*A specific example in the "Energizing Equality" report which cites only 20% of the total employees at-the Ibadan Electricity Distribution Company (IBEDC) as women and with only two women represented in their ten person management team.*

*we have women working within the energy access sector, barely as part of the decision making or energy planning process.*

investment, energy efficiency and customer satisfaction."

Yet as the report notes, women potentials, skills, knowledge and capacities in this sector remains quite limited due to socio-economic and political factors which in turn limits their access to clean, reliable and affordable energy.

In the past, evidence of gender representation in the Nigerian energy access sector can often be nebulous or non-existent.

Similar to other sectors, we have women working within the energy access sector, barely as part of the decision making or energy planning process.

There is evidence of changing pattern of women in leadership positions in Nigeria's energy.. There is a growing body of women playing a participatory role in energy access management both on the policy end and the private sector end.

While the visibility of women in top leadership positions in Nigeria must be lauded we must look beyond explore how this trend is filtering down across the value chain.

For instance, a McKinsey and Company report cites the low representation of women

across the African continent and puts the figure of positions occupied by women "at about 22% of middle management and 22% of senior management positions in the "energy and materials" sector across the African continent".

A specific example in the "Energizing Equality" report which cites only 20% of the total employees at-the Ibadan Electricity Distribution Company (IBEDC) as women and with only two women represented in their ten person management team.

The Abuja Disco's Management team for example has three women making up half of its management team.

Apart from Solar Sisters in Nigeria, other women led companies includes SOSAI Renewables - founded and managed by Habiba Ali which electrifies homes and communities across Nigeria using mini-Grids, stand alone home solar systems and other clean energy technologies.

There is Creeds Energy run by Hannah Kabir introducing clean sustainable renewable energy to businesses and homes across the country.

There is Ajimah farms, and Smarter Grid International run by Heather Onoh who as CEO is developing and distributing solar

*The Abuja Disco's Management team has three women making up half of its management team.*

systems, appliances and services for homes and businesses in emerging economies.

There is also Avenam Links Int'l Ltd, run by the CEO Mrs. Nina Ani, and using biogas technology in Lagos, addressing the waste management challenge in Nigeria by converting municipal waste to energy.

Despite questions on the spread of this trend, the fact remains that women in the energy sector in Nigeria are becoming more visible and recognized.

The significance of this is that women are becoming more empowered and increasing

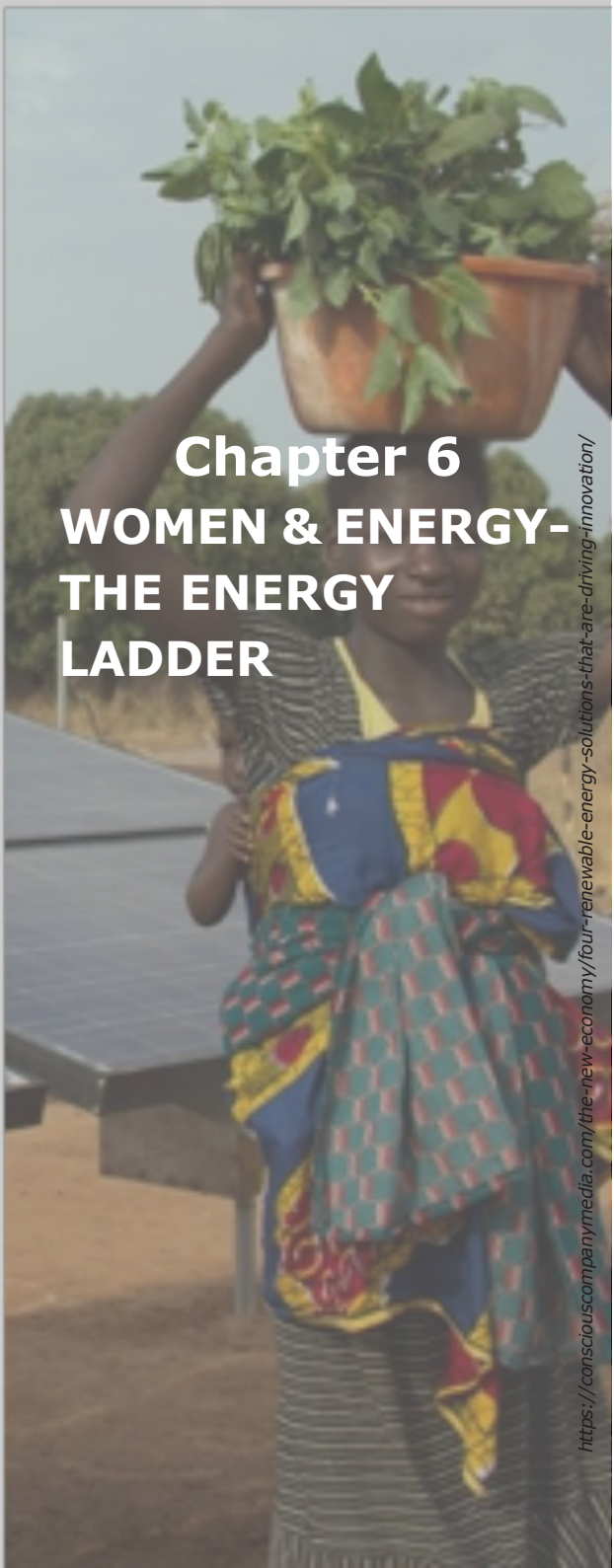
their capabilities, skills and productivity in energy value chain.

They are going beyond consumers of energy technologies and services and are getting on the table with voice and agency to negotiate around their specific energy needs to suit their local peculiarities.

It also means women are climbing what is globally known as the energy ladder. The question though is how fast and how sustainable is this climb? And more importantly, how do we empower more women to get on the next rung of that ladder.

*women in the energy sector in Nigeria are becoming more visible and recognized. The significance of this is that women are becoming more empowered and increasing their capabilities, skills and productivity in energy value chain.*





## Chapter 6 WOMEN & ENERGY- THE ENERGY LADDER

<https://consciouscompanymedia.com/the-new-economy/four-renewable-energy-solutions-that-are-driving-innovation/>

### WOMEN AND ENERGY - THE ENERGY LADDER

It is important to contextualize the Energy Access debate in the history of oil politics in the Niger Delta and in Nigeria including an analysis of the historical timeline of the energy system in Nigeria the current changes since privatization and the implications of those changes to women.

#### Nigeria's Historical Energy Planning - A Gendered Perspective

The Nigeria's energy timeline ranges from the use of wood pre-colonization to the emerging inclusion of more renewable energy sources primarily solar, wind, biogas and small-scale hydro.

Historical trends in the production and utilization of Nigerian energy sources range from the wood which has the longest history and used primarily for domestic cooking and heating; to the use of imported coal in 1896, its local discovery in 1909 and subsequent production in 1916; oil exploration in 1901 but its discovery in commercial quantity in 1956 and production in 1958 taking over from coal; and the use of hydropower from 1969 which has since then accounted for a larger share of energy consumption in the country.

Tar sands reportedly accounts for about 55% of total proven non-renewable reserves, however this resource is yet to be developed.

### Coal Mining – It's impact on women:

Various articles have discussed both the negative impacts of coal in host communities, as and have decried the loss of jobs, since many of these mines became moribund or none functional currently estimated at 2.8 billion tones of high quality lignite coal.

However from the mining, transportation and use of coal, each phase on the utilization of coal for power generation had gender related effects.

Mining operations then were significantly more crude with less safety and environmental measures than currently seen in coal extractive countries.

Hazards and negative impacts from mining operations including the devastation to the environment, mining accidents from coal dust explosion, flooding and collapsing shafts formed news headlines during the coal era.

Other impacts with more permanent consequences such as loss of farmland, ground pollution, surface and sub-surface water pollution, and high level of health issues from coal dust inhalation in communities where mining activities were carried out were also reported although in lesser degree but still affect these previous coal mining communities to this present day. The impacts on women are huge with some key ones described or highlighted below:

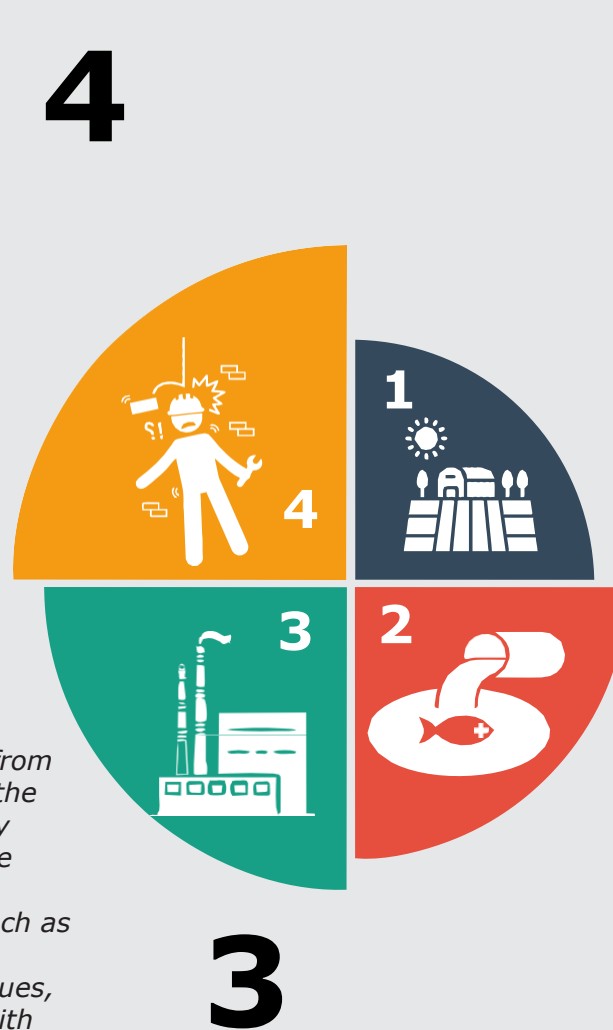
# Coal Mining's impact on women:

## Loss or incapacitation of husbands and Sons from mining accident:

Women suddenly become breadwinners and carry the full responsibility of these households resulting from the loss or incapacitation of their husbands from mining accidents, or health issues resulting from mining activities. Also during agitations by mining workers with strikes resulting in non-availability of income from the male workers, the women faced the brunt of providing for the family having to increase their economic activities, and take over more responsibilities at home while the men were striking at the mines.

## Health issues from coal dust inhalation

The brunt of the resultant health issues from the inhalation of coal dust especially on the vulnerable – women, children and elderly – usually falls on the woman. Firstly these women suffer from various health issues resulting from the high carbon of coal such as Pneumoconiosis and silicosis including respiratory and cardiovascular health issues, hitting hard more on pregnant women with research showing coal inhalation during pregnancy to lead to low birth weight and infant mortality. These health issues limit the ability of the woman to perform her responsibilities as well as economic activities.



## Loss of farmland 1

With more women during the coal era especially in the coal rich areas such as Enugu and Kogi state dependent primarily on agriculture and trading, the loss of farmland due to pollution from nearby coal extraction activities on both the farmland and water bodies that served as source of irrigation significantly affected their means of income and livelihood, as well as the basic provision of food for their households.

## Surface and sub-surface water pollution 2

Not only do these women have to deal with the loss of their primary source of food from the polluted farmlands, they also have to grapple from the loss of their source of drinking and cooking water from their local streams. Coal mining is water heavy and usually the closest available sources of water suffer the impact. The loss of clean water results either in the use of the polluted water in its condition leading to various health ailments, or having to travel long distances in search of a cleaner source of clean water such as in Okobo community, Kogi state with negative health and safety implications on these women.



## **Loss of farmlands**

Community residents still complain of the loss of their farmlands, lack of clean water and population reduction from death arising from coal mining back during the coal era.



## **Coal Mine**

despite the economic benefits of the coal mines listed above in addressing Nigeria's power needs, that the "negative and long term effects", outweigh the benefits.



## **Redundant Mines**

Twenty two mines across Nigeria are currently redundant, with four of them being fully developed coal mines",

The impact of coal mining for energy generation in these communities are still much present till date. One of such communities, Odagbo in Kogi state is till today still saddled with the consequences of cola exploitation in the form of huge gully erosions resulting from abandoned coal mines, pollution of three streams killing all their fishes, and fatalities from ingesting polluted food and water.

Till date the community residents still complain of the loss of their farmlands, lack of clean water and population reduction from death arising from coal mining back during the coal era.

In Akwueke and Iva coal mine communities in Enugu state, the major impacts have been water pollution, extinction of major tree species, high case of blindness, reduction of soio-economic activities amongst various other issues, some with devastating impact on the communities, livelihoods and the health and well being of the people especially women and children.

The earlier cited 2015 Heinrich Boll Stifung Foundation report titled "COAL ATLAS" states that despite the economic benefits of the coal mines listed above in addressing Nigeria's power needs, that the "negative and long term effects", outweigh the benefits.

The negative effects includes the government's failure in reclaiming these mines when abandoned and its attendant effects on the environment such as erosion and acidic impact on human health. One huge indicator of the negative impact of coal mining on host communities is the dangerous quality of the water from surrounding streams and rivers for which indigenous populations rely upon.

Citing the impact of mining pollution on the community water source, the report states that women and children have to travel long distances to neighboring communities to "fetch water for their consumption because their stream has become so bad that they cannot use it even for their laundry".

The report further cites the fact that about "twenty two mines across Nigeria are currently redundant, with four of them being fully developed coal mines", and notes more importantly that there is very little "coherent public discussion about their existence or more importantly, their reclamation."

## Impact of Oil and Gas Exploration on Women:



UNEP estimates that remediation activities will cost upwards of

**\$1 billion and above**  
with about a time frame of  
**no less than 25 years**  
for full restoration.



**October 17,  
1978**

Women were most hit by the destructive and harmful extractive practices in the Niger Delta and since the famed Shell's Jones Creek spill of October 17, 1998,

Oil and gas exploration activities are centred the Niger Delta region on the country which has been ongoing since the country's first discovery of oil at Oloibiri oilfield in 1956.

The region is burdened with issues of militancy, restiveness, kidnap and violence by the indigenous youth protesting the alarming environmental degradation and damage to their communities from the oil mining and gas flaring in these communities.

The United Nations Environmental Programme (UNEP) carried out an extensive environmental assessment of Ogoniland in the Niger Delta and published an extensive report in 2011 which revealed severe and widespread contamination of soil and groundwater. UNEP estimates that remediation activities will cost upwards of \$1 billion and above with about a time frame of no less than 25 years for full restoration.

The adverse environmental impact of large-scale oil and gas projects in the Niger Delta are often disproportionately borne by women and girls.

An Oxfam Factsheet on the rights of women in relation to oil, gas and mining activities highlights that women are the hardest hit from the social and environmental problems created by these activities which includes loss of clean water, loss of agricultural land, and the exclusion of women in the negotiation processes between the

communities and the oil and gas exploration companies and as such unable to contribute to those areas which affect them directly.

Daily exposure to particulate from gas flaring and oil mining are felt most by the women who spend most of their times outdoors in farms and markets. Risks of miscarriages and stillbirth abound resulting from the lack of clean water which increases the blood pressure of these women and starve the fetus of oxygen.

Other health issues include cancer, asthma, blood disorder, respiratory illness, reduced life expectancy and deformities in children with the risk higher among pregnant and lactating women.

Another reported but often overlooked effect resulting from oil and gas extraction in the Niger Delta is the increasing rate of sexual assault by soldiers usually sent to these areas to quell violence and militancy.

A report in a province in the Niger Delta showed as many as 40 rape cases with increased risks of sexually transmitted diseases, in addition to the mental torture, stigmatization and socio-cultural impact on these women.

Similar to coal, women were most hit by the destructive and harmful extractive practices in the Niger Delta and since the famed Shell's Jones Creek spill of October 17, 1998, there have been numerous other

spills in the Niger Delta region bestowing it with the unenviable record of some of the most environmentally most polluted communities across the globe. The resultant effects of the destruction of the environment include destroyed farmlands, polluted rivers, flooded villages, and desecrated shrines.

There have also been incidents of women and children killed in avoidable pipeline fires, as well as violent deaths resulting from clashes between communities and agents of the Government.

The nature of the protests has taken a variety of forms, culminating in several dramatic occupations of oil platforms by groups of women.

This occupation of oil wells by the women in early 2000, women in the Niger Delta have gained more prominence both in terms of political structures and economic outcomes.

Between 2013 and 2015, there were several reports of protests and seizure by village dwellers of oil wells and of production units of major oil companies continues almost on a monthly basis.



*B-DERE, NIGER DELTA, NIGERIA- JULY, 2016: In B-Dere an oil spill from Shell*  
<https://persecondnews.com/2018/03/16/shell-eni-negligent-nigeria-oil-spills/>



Nigeria's dependence primarily on fossil fuel continues to be a major contributor to unhealthy air pollution



**Women are most vulnerable**

These disasters often affect women more because their poor socio-economic status and the fact that lack of economic agency limit their mobility.

## 13% fatality rate

thousands of Nigerian women and children are maimed each year by kerosene lamps with an alarming 13% fatality rate.

## Impact of Hydro on Women:

The issues and impacts on women of hydropower in the country are considered to be significantly lesser than that of coal and oil, as hydropower is seen as a clean sources of energy generation.

With no air pollution or spills, the key impacts of hydropower for energy generation however revolve around two key main areas – the change in the water body ecosystem and impacts on aquatic life and more significantly the displacement of communities around areas where these large dams are to be built.

The has the most effect on women, with such communities usually dependent on the water body for livelihood and economic activities having to leave their communities to new areas and as such their sources of livelihoods.

The country's Kainji dam, one of the oldest in the country generating 500MW and commissioned in 1958 has led to the displacement of 50,000 people including those affected by land and dwellings to the canal network for irrigation downstream.

Women who are bear the responsibility of providing food, water and other household responsibilities for their households have to adapt to new lifestyles, and look for new sources of economic activities to sustain

their households.

Communities that are not affected are usually faced with issues of flooding destroying fisheries and starving the floodplain soils of moisture and nutrients, and thus the negatively impacting farming and agricultural activities of primarily women in these communities.

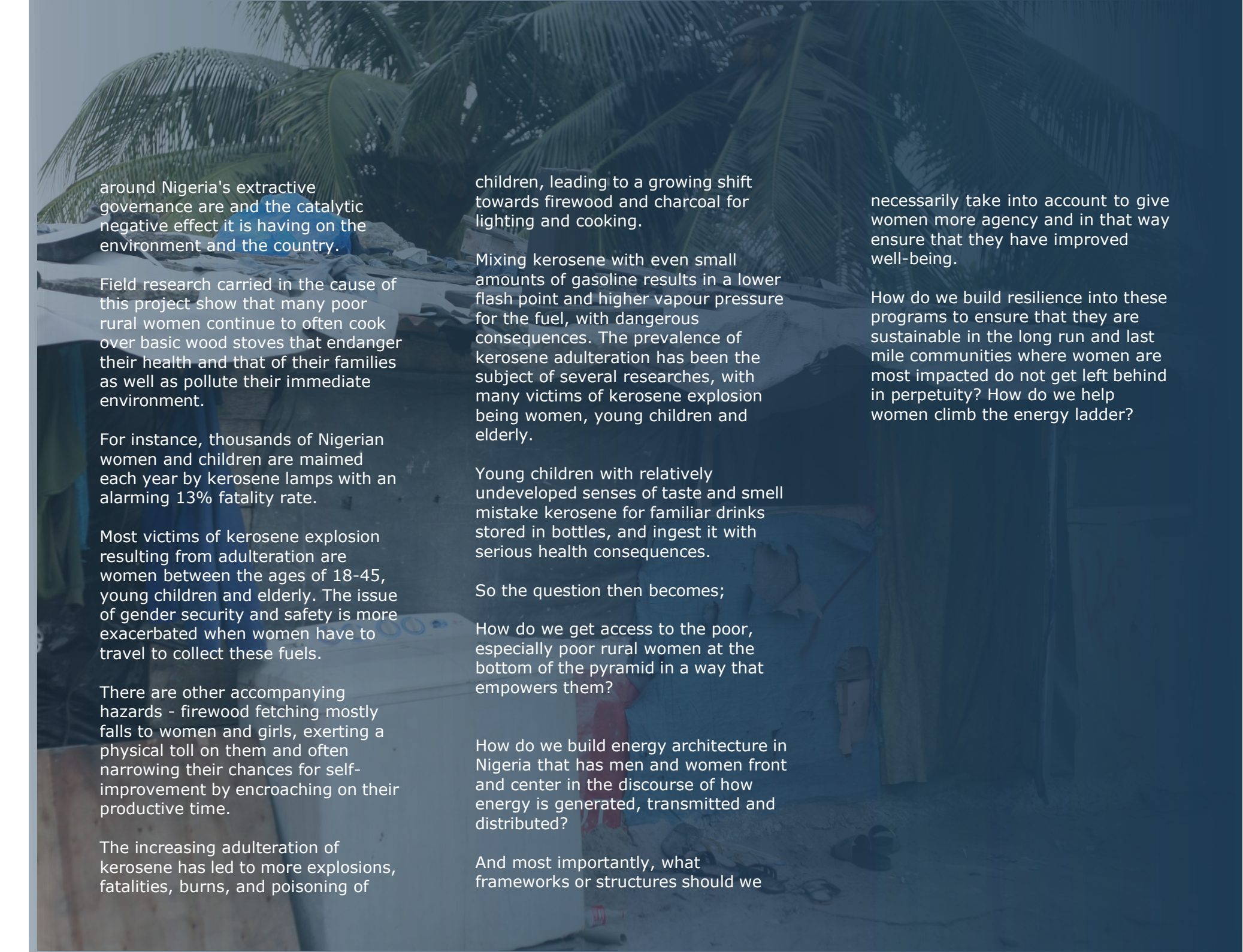
## Women, Energy and Quality of Life

Nigeria's dependence primarily on fossil fuel continues to be a major contributor to unhealthy air pollution with environmental and climate implications, which when unheeded can lead to greater catastrophic events such as flooding, drought, violent storms, and climate induced population displacements.

These disasters often affect women more because their poor socio-economic status and the fact that lack of economic agency limit their mobility.

In the documentary movie titled "No Where To Run," the focus on the harmful extractive practices of multi-national corporations exposed how weak the issues





around Nigeria's extractive governance are and the catalytic negative effect it is having on the environment and the country.

Field research carried in the course of this project show that many poor rural women continue to often cook over basic wood stoves that endanger their health and that of their families as well as pollute their immediate environment.

For instance, thousands of Nigerian women and children are maimed each year by kerosene lamps with an alarming 13% fatality rate.

Most victims of kerosene explosion resulting from adulteration are women between the ages of 18-45, young children and elderly. The issue of gender security and safety is more exacerbated when women have to travel to collect these fuels.

There are other accompanying hazards - firewood fetching mostly falls to women and girls, exerting a physical toll on them and often narrowing their chances for self-improvement by encroaching on their productive time.

The increasing adulteration of kerosene has led to more explosions, fatalities, burns, and poisoning of

children, leading to a growing shift towards firewood and charcoal for lighting and cooking.

Mixing kerosene with even small amounts of gasoline results in a lower flash point and higher vapour pressure for the fuel, with dangerous consequences. The prevalence of kerosene adulteration has been the subject of several researches, with many victims of kerosene explosion being women, young children and elderly.

Young children with relatively undeveloped senses of taste and smell mistake kerosene for familiar drinks stored in bottles, and ingest it with serious health consequences.

So the question then becomes;

How do we get access to the poor, especially poor rural women at the bottom of the pyramid in a way that empowers them?

How do we build energy architecture in Nigeria that has men and women front and center in the discourse of how energy is generated, transmitted and distributed?

And most importantly, what frameworks or structures should we

necessarily take into account to give women more agency and in that way ensure that they have improved well-being.

How do we build resilience into these programs to ensure that they are sustainable in the long run and last mile communities where women are most impacted do not get left behind in perpetuity? How do we help women climb the energy ladder?

## Some Constraints to the ladder (A gendered lens)



*These financial and economic constraints makes it difficult to reach spread and for many very poor rural women lack of access to seed capital for new renewable energy technologies discourages them from attempting to try these new technologies.*



Some of the constraints to climbing the energy ladder include low level of awareness and finance.

There is little market knowledge of the local renewable energy technologies which are cleaner, cheaper, and healthier alternatives to the inefficient energy sources predominantly used by women in rural communities, or the companies that provide these technologies.

There is also little knowledge of the numerous financing opportunities available to women especially those in rural and last-mile communities to access them.

Many renewable energy and energy access companies including those owned by women depend on international funding and very little local investors and are bound to develop bankable projects following the required standards of such funding.

These financial and economic constraints makes it difficult to reach spread and for many very poor rural women lack of access to seed capital for new renewable energy technologies discourages them from attempting to try these new technologies.

This perpetuates behavioral change issues associated with climbing the ladder. It is important to note however, that things are changing and that new renewable energy

entrepreneurs are becoming increasingly aware of where to get market information and support.

## The Gender – Poverty - Energy Nexus



Photo: Annie Griffiths, Ripple Effect Images

Data shows that women make up 70% of people living in poverty in rural areas, making them a significant number of the worlds poorest.

There is data to show that the lack of energy impacts women more, yet despite significant progress made, women still lag behind in terms of energy access for economic usage.

The question is how then can women be lifted up the energy ladder? The intersection between energy access and energy opportunities across the value chain for women provides women with several economic empowerment activities to build capacity, knowledge, skills and opportunities where they can engage, influence policy or address developmental issues such as land and property rights.

In the global renewable energy sector, a survey found that "women's leadership is extremely vital and essential for the task of building a sustainable energy future.

The growing consensus around the discourse on women and energy in developing countries are focussed increasingly on addressing the overall workload of women in domestic responsibilities specifically gender defined roles associated with supporting the family such as food provision and utilization of traditional fuels which not only consumes a large proportion of their time and energy but also makes them susceptible to other social and health problems.

In a 2017 publication by Practical Action, the

issues around gender inequality and in the energy sector was analyzed from early socialization where enforcement of gender traditional roles is likely to impact access to education and skills training for girls, and limit their opportunities in highly specialized sectors like the energy sector. This view is further emphasized by the chart below which shows a strong synergy between gender inequality and poverty rates and shows that in communities where gender roles remain traditional and static with little opportunities to grow, poverty rate for women remain endemic.

Data shows that women make up 70% of people living in poverty in rural areas, making them a significant number of the worlds poorest.

What is often not said is that the lack of access to energy constitutes a large part of this poverty.

In developing countries, women produce up to 80% of the food, and play a significant role in sustainable development, however they own less than one fifth of the cultivation areas thereby limiting the opportunity for them to climb the economic ladder What this means in Nigeria is that energy poverty continues to wears a female face and therefore, any representation of gender has not impacted the lives of women, particularly the poorer, rural women.

## RECOMMENDATIONS

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*With the lack of energy comes increasing decline in socio-economic development and livelihood for its citizenry especially as the country's population*

Nigeria's energy history for many years has been based on a rigid centralized energy structure. Unfortunately despite million dollar investments in the energy sector – and despite being rich in oil and gas, the country still ranks as one the most “energy poor”.

With this lack of energy comes increasing decline in socio-economic development and livelihood for its citizenry especially as the country's population and thus its off-grid population increases, and loss of billions of dollars over decades of poor energy access in lost economic development opportunity from small scale enterprises to large industries and factories.

The evolution of the clean energy market globally and the off-grid market primarily in Africa poses huge opportunity for a country like Nigeria which is slowly transitioning towards a decentralized energy system, with promise of increased connections parallel to population growth. This in turn provides an opportunity to have greater energy independence devoid of the parochial old school boy's network.

### Democratizing The Energy Access Equation

Nigeria's transition from a centralized grid to a decentralized grid system should also provide an enabling environment for women to become more socio-economically independent.

Beyond decentralizing the grid energy system – policies and plans must take into account the impact of each energy access technology deployed to each region and ensure that women are given a choice on which technology best suits their homes and their communities.

An important lesson in this research is the need to reduce the the demand for fossil fuels and protect the environment. This can be done through energy conservation initiatives through viable renewable energy infrastructure and products.

A few commendable policies such as the Nigerian Mini-Grid Regulation have set the country on that part.

However a truly energy independence would mean accelerating the deployment of these Mini-and Micro grids in communities where women are battling with kerosene and fuel-wood, along with all the attendant dangers earlier discussed.

Lastly, there is the need for inclusive participation by women at the community and rural level in developing energy independent programs in order to make these programs more resilient and sustainable over time.

Democratizing the energy market will go a long way to eliminate energy poverty and will boost the gender economic capacity of the entire country as a whole.

The Mini-grid revolution on-going in Nigeria is creating new opportunities, with women looking to play more active role in the emerging renewable energy market.

### **Gender Mainstreaming – Attaining The Sustainable Development Goals**

There is a strong need to begin to align the Sustainable Development Goals and directly link the contributions and benefits of energy access especially those dealing with electricity and cooking solutions in Nigeria.

For instance, the following SDGs - SDG 3 (Healthy Lives); SDG 4 (Education); SDG 5 (Female Empowerment); SDG 8 (Economic Empowerment); Goal 9 (Industry, Innovation and Infrastructure); and SDG 10 (Reduced Inequality); SDG 17 (Partnerships to achieve these goals); can be directly linked with those of SDG 7 Affordable and

Clean Energy; and SDG 13 (Climate change).

The transformational potential for women to step up as energy access champions across communities in Nigeria will have more women empowered to negotiate, organize, strategize and promote their rights to clean, sustainable energy as well as pursue viable collective economic schemes cannot be quantified.

This means that energy access is integral to development and the ability of individuals, particularly women to meet their goals and objectives and live a wholesome, productive and healthy life.

Therefore, “achieving Sustainable Development Goal 7—SDG7—will be essential to meeting the other Sustainable Development Goals.”

Therefore getting energy to last mile communities and off-grid communities has a direct impact on goods, works and services and is a function which involves series of processes that should of necessity involve women as champions, as users and as distributors of renewable energy products and services.

*CSOs ought to be playing a key role in the democratization of the energy sector, development of the off-grid market and elimination of energy poverty.*

## **Civil Society – What Role To Play?**

Civil Society Organizations ought to be playing a key role in the democratization of the energy sector, development of the off-grid market and elimination of energy poverty.

The 2010 Nigerian Power sector road map provides a framework for this when it urges for 'a more participatory and inclusive approach to reforms in the sector. Civil Society's role is key in ensuring the democratization of energy access architecture to include women political, economic, and social and to develop society.

With decades of focus on the centralized grid network, it might be slow and difficult for the government to take the timely and necessary steps in creating the enabling environment for women to fully participate in shaping the energy sector in a way that optimizes any benefits to them.

In addition, although a number of international development agencies have highlighted and nudged the government on looking at the energy access issues through a gendered lens; most of these international agencies still have to align their efforts with the government's priority

areas and focus.

Civil societies therefore can be "intermediary institutions" or a third sector, distinct from government and business with the ability to positively influence certain decisions, policies and activities for women in rural and deep rural communities to ensure that their rights are protected.

Similarly CSOs especially working on community issues have a significant role to play in helping to promote the behavioral change on energy efficiency issues, for economic productive use, towards electricity payments and active community ownership of energy access infrastructure – especially renewable energy infrastructure.

## Engendering the Energy Systems – framing new alternatives

Across the clean energy value chain; there exists significant opportunities for women to play both leadership roles. Key gender empowerment opportunities in the DRE market include key government roles in policymaking and implementation, women-led renewable energy enterprise and networks.

There is also a growing demand for soft and hard skilled opportunities in the DRE sector, including roles such as community leadership/ community engagement; climate impact specialist, clean energy advocacy and civic engagement through civil societies, and woman-to-woman engagement on clean energy adoption.

As the largest consumers of energy products, especially in homes, there ought to be specific, practical and measurable efforts geared at and targeting women to be a core part of the emerging energy access eco-system in Nigeria.

More specifically, is the fact that lack of access to energy and the effects of a changing climate system affect the ability to build sustainable development of SMSEs and rural communities which are mainly powered by women. These programs and policies should be specifically tailored to empower women to in the following ways:

*As the largest consumers of energy products, especially in homes, there ought to be specific, practical and measurable efforts geared at and targeting women to be a core part of the emerging energy access eco-system in Nigeria.*

- I. Promote gender based advocacy and policy changes for energy access initiatives by engaging women to contribute significantly to economic discourse and building economic equality in the emerging green economy.
- II. Take on leadership roles in the emerging clean renewable energy industry and green economy sector in Nigeria.
- III. To be knowledgeable and proficient as small business owners (Women in SMSE) in the use of renewable energy systems; specifically decentralized renewable energy to reduce their costs and commercial overheads.
- IV. Empower women at the bottom of the pyramid and at the community level on the economic and health benefits of transitioning to decentralized renewable energy system by giving women more of a voice and active roles and economic opportunities in the energy sector will ensure that women develop expertise in the sector, and create better economic opportunities boost their savings, foster local entrepreneurship.

## CONCLUSION

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Electricity (or the lack of it) constitutes a significant proportion of gross national product and overall expenditure in Nigeria.

Finally, Nigeria has set an ambitious power generation target of 40,000 MW by 2020. However, realizing this target will depend heavily on political will, adequate funding of the sector, and serious implementation of the Roadmap for the Power Sector Reform Program.

The high-risk/high-reward nature of a truly functional Energy Access reform requires a holistic integrated approach. The Nigerian government will also need to continue providing support to ensure investors remain comfortable with the creditworthiness of key government agencies that are intrinsic to the system's proper functioning.

On a positive note, Nigeria is becoming internationally recognized for its vast renewable energy potentials, which needs to be "harnessed" in order to meet the country's Energy mix projections.

The government is already escalating both the renewable energy sources towards attaining this goal for all Nigerians. Many other countries, including "energy rich" countries are innovating with renewable energy to enhance their energy capacity or meet their climate governance goals. Nigeria should not be an exception.

As the largest consumers of energy products, especially in homes, there ought to be

specific, practical and measurable efforts geared at and targeting women to be a core part of the emerging energy access eco-system.

More specifically, is the fact that lack of access to energy and the effects of a changing climate system affects the ability to build sustainable development of SMSEs and rural communities which are mainly powered by women.

The ability of women to meet their goals and objectives and live a wholesome, productive and healthy life is somewhat predicated on clean, affordable and sustainable energy resources.

It also constitutes a major determinant in health outcomes. Electricity (or the lack of it) constitutes a significant proportion of gross national product and overall expenditure in Nigeria. It is central to the efficient delivery of services as well as infrastructure and has been identified as "sine qua non" for good governance.

Lastly and most importantly, Nigerian women have a right to energy access and the safety, security, and economic opportunities that come with such access. Therefore, a proposed sustained model of civic and economic engagement in Nigeria driven through a feminist lens will provide an opportunity for everyone; especially



women to participate in the new emerging energy architecture earlier highlighted. These women focused groups must also ensure that projects are not abandoned and they must remain engaged in project monitoring of projects, aimed at ensuring "Access to Energy" for all.

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