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Energy security and safety implications of traditional Energy sources in KogiState: A focus on the adoption of renewable energy.

MuhammedBappa Adamu
Omejeh Timothy Enejoh (SOE)
Engr. Ibrahim Haruna
Engr. Stephen AromeAkubo
Rufai jibrin

Abstract
Fossil fuel depletion, price volatility, global warming, greenhouse gas emissions, air pollution, and detrimental health consequences are all characteristics of Nigeria's traditional energy sources, particularly the burning of biomass and fossil fuelsThis proposed study intends to critically analyze the health impacts of biomass burning in homes with an emphasis on the health of women and girls who are primarily responsible for gathering firewood and cooking in the home. A study evaluated many of the potentials of solar energy photovoltaic in order to reduce the personal risks that women face from predatory males and other animals when they leave their homes to collect wood, as well as the physical effects of carrying loads of several kilograms over several kilometers, which can result in compression injuries to the neck, back, and hips. All of these issues would be greatly diminished by the widespread adoption of renewable energy. It included a summary of the several renewable energy sources, the implications of climate change, and the health effects of energy sources.
Keywords: *Energy Source, Petroleum, Natural Gas, Coal, and Renewable Energy.*

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I. Introduction

According to the United Nations Sustainable Development Goals, especially SDG 7, place a strong emphasis on reducing environmental impact, increasing access to energy, and ensuring affordability (UN, 2015; Schwerhoff&Sy, 2017; UNECE, 2017). Energy is essential to social and economic existence, which explains why it is so important. Energy generation, which is primarily produced from fossil fuels (oil, gas, and coal), has had disastrous repercussions on human health in light of the rapid population rise and industrialisation (Buonocore et al., 2015). WHO (2019) stated that residential fuel burning accounts for 20% of urban ambient air pollution, industrial electric generating accounts for 15%, other natural sources account for 18%, and unidentified sources account for 22%. (Karagulian et al., 2015).

Because traditional energy sources cause health problems, research and development for renewable energy has increased (Kose, Bekun and Alola, 2020; Khalate, Kate and Deokate, 2018). In order to decrease the negative effects of fossil fuels and encourage the rise of renewable energy, clean and renewable energy has acquired relevance in current literature, legislation, and campaigns (Perera et al, 2017). Less polluting energy must be used to combat climate change and its adverse effects on human health. To lessen energy pollution and increase energy efficiency, policies and practices are linked.Using these renewable energy sources is widely acknowledged to minimize emissions, whether they be carbon dioxide emissions or other toxic gas emissions and pollution that has a detrimental effect on human health (Perera et al., 2017). In Nigeria, 56% of urban families use firewood as their main energy source, followed by kerosene (27%), and charcoal (6%), according to a profile of household energy usage produced by Salau (2018). Nigeria's capacity for renewable energy is underutilized.

II. Aim and Objectives

This study aims to critically examine the health impacts of traditional energy and biomass combustion in homes with an emphasis on the health of women and girls, who are primarily responsible for gathering firewood and cooking in the home. The study will determine the potential of renewable energy sources to assist in achieving the Sustainable Development Goals by lowering the personal risks that Kogi State inhabitants are exposed to when utilizing traditional energy sources.

This study's secondary goal is to assess the possible health benefits of converting household heating, lighting, and cooking from traditional biomass and fuel burning to solar photovoltaic energy.
Taking into account the aim stated in the preceding part, the following precise goals are sought to be attained by this research:
I Assessing how traditionalfossil fuel energy generation affects health in emerging nations
(ii) To determine how home biomass burning affects women and girls in developing nations in terms of health and safety.

III. Literature Review

Energy Sources

Primary energy sources come in a variety of forms, including renewable energy sources like wind, solar, geothermal, hydropower, and tidal energy, as well as fossil and nuclear energy like coal, gas, and oil.

Primary Energy Sources (Non-Renewables)

Because we can only harvest or extract so much energy from the earth, these sources are referred to as nonrenewable. The fossilized remains of ancient marine plants and creatures that existed millions of years ago gave rise to coal, natural gas, and petroleum over thousands of years. That is why these energy sources are also referred to as fossil fuels.

The majority of petroleum products used in the United States are derived from crude oil, but coal and natural gas can also be used to create petroleum liquids.

Uranium is a nonrenewable energy source that may be used to divide its atoms into heat and eventually electricity through a process known as nuclear fission.According to scientists, the formation of stars billions of years ago produced uranium. Although uranium is present throughout the earth's crust, most of it cannot be mined or processed into fuel for nuclear power plants because it is too expensive or difficult to do so.

Petroleum-Based Fossil Fuel Sources

Because crude oil and petroleum are mixtures of hydrocarbons that originated from the remains of plants and animals (diatoms) that lived in a marine environment millions of years ago before dinosaurs existed, we refer to them as fossil fuels. The skeletal remains of these creatures and plants were covered by layers of sand, silt, and rock over millions of years. These layers' heat and pressure transformed the remaining materials into what is currently known as crude oil or petroleum.Petroleum is short for "rock oil" or "earth oil."

After being extracted from the earth, crude oil is transported to a refinery where various components are divided into usable petroleum products. These petroleum products include jet fuel, diesel fuel, heating oil, gasoline, waxes, lubricating oils, asphalt, and distillates like diesel and heating oil. Understand more about the input and output of crude oil refinery.

Gas Naturally

A fossil fuel that developed deep within the earth's crust is natural gas. Many distinct chemicals can be found in natural gas. Methane, which is a molecule with one carbon atom and four hydrogen atoms, makes up the majority of natural gas (CH4).In lower levels, natural gas also contains non-hydrocarbon gases including carbon dioxide and water vapor as well as natural gas liquids (NGLs), which are also hydrocarbon gas liquids. Natural gas is used as a fuel, to create materials, and to create chemicals.

The remains of plants and animals (such as diatoms) piled up in thick layers on the earth's surface and the ocean floors over a long period of time, occasionally mixed with sand, silt, and calcium carbonate. These layers were eventually covered by rock, sand, and silt. This substance was rich in hydrogen and carbon, and pressure and heat transformed some of it into coal, some into petroleum, and some into natural gas.Natural gas occasionally moved into huge fissures and voids between underlying rock strata. Natural gas from these kinds of formations is occasionally referred to as ordinary natural gas. In some formations of shale, sandstone, and other sedimentary rocks, there are microscopic pores (spaces) that contain natural gas. Shale gas, tight gas, and occasionally unconventional natural gas are terms used to describe this gas. Moreover, natural gas can be found in crude oil deposits; this natural gas is known as related natural gas. Natural gas resources can be discovered offshore and deep beneath the ocean's surface, as well as on land. Coal-bed methane is a kind of natural gas that is present in coal beds.

Geologists, who research the composition and functions of the earth, are the first to look for natural gas. They identify the several geologic formations that are most likely to have deposits of natural gas.

To locate the ideal locations for drilling oil and natural gas wells, geologists frequently utilize seismic surveys on land and in the ocean. Seismic surveys produce seismic waves in the earth and measure their amplitude to learn more about the geology of rock formations. A thumper truck, which has a vibrating pad that pounds the ground to generate seismic waves in the underlying rock, may be used to conduct seismic surveys on

land. Explosives in modest doses are employed occasionally.Exploration of the geology beneath the ocean floor is done by use of blasts of sound that produce sonic waves.

An exploratory well is dug and tested if the results of seismic studies show that a location has potential for generating natural gas. The test's findings reveal details about the kind and quantity of natural gas that is present in the resource.

One or more production wells are dug if the findings of a test well indicate that a geologic formation has enough natural gas to generate and turn a profit. In natural gas-bearing rocks, natural gas wells can be dug both vertically and horizontally. With typical natural gas deposits, the gas often rises without difficulty through wells to the surface.Natural gas is extracted from shale and other sedimentary rock formations in the US and a few other nations by pushing water, chemicals, and sand down a well under intense pressure. Hydraulic fracturing, often known as fracking or unconventional production, is the procedure that fractures the formation, releases the natural gas from the rock, and permits the gas to flow to and up wells to the surface. Natural gas is poured into gathering pipelines at the surface of the well and transported to processing facilities for natural gas.

Wet natural gas, which includes ethane, propane, butanes, and pentanes as well as methane, is the type of natural gas that is extracted from natural gas or crude oil wells. Natural gas from wellheads may also contain nonhydrocarbons including carbon dioxide, helium, nitrogen, hydrogen sulfide, and sulfur, the majority of which must be removed before the gas is supplied to consumers.

Natural gas is transported from the wellhead to processing facilities where water vapor and non-hydrocarbon chemicals are eliminated, NGL is separated from wet gas, and NGL is sold separately. Often, some ethane remains in the natural gas after processing.The processed natural gas is known as dry, consumer-grade, or pipeline quality natural gas, and the separated NGLs are known as natural gas plant liquids (NGPLs). Some natural gas from wellheads is sufficiently dry and meets requirements for pipeline transit without further processing. Natural gas is mixed with substances known as odorants to help locate pipeline breaches. Pipelines carry dry natural gas from underground storage facilities or distribution firms to users.

The associated natural gas produced by oil wells can be reinjected into the oil-bearing deposit in locations where natural gas pipelines are not available, or it can be vented or burned (flared).Maintaining pressure in oil wells can help to increase oil production by reinjecting unmarketable natural gas.

Before or during coal mining, coal deposits can be mined for coalbed methane, which is then easily added to natural gas pipelines.

The majority of the natural gas used in the US comes from domestic production. Pipelines are used to import some natural gas from Mexico and Canada. Moreover, a minor amount of liquidized natural gas is imported.

Coal

A flammable sedimentary rock with a high concentration of carbon and hydrocarbons, coal is often black or brownish-black in color. Because it takes millions of years for coal to develop, it is categorized as a nonrenewable energy source.Coal is made up of the energy that was once locked up in plants that inhabited marshy forests hundreds of millions of years ago.

Over millions of years, the plants were covered by layers of rock and mud. The heat and pressure that followed transformed the plants into what we now refer to as coal.

Type of Coal

The four primary types or ranks of coal are lignite, bituminous, subbituminous, and anthracite. The coal's ranking is based on the types and concentrations of carbon it contains as well as the amount of heat energy it can provide. The amount of pressure and heat that operated on the plants throughout time determines the rank of a coal deposit.

Anthracite has the highest heating value of all coal grades and contains 86%–97% carbon. Less than 1% of the coal mined in the United States in 2020 was anthracite. Northeastern Pennsylvania has all of the anthracite mines in the United States. Anthracite is primarily utilized by the metals industry in the United States.

Bituminous coal has a carbon content of 45%–86%. Between 100 to 300 million years have passed since the formation of bituminous coal in the United States. The most prevalent type of coal in the United States is bituminous coal, which in 2020 made up around 44% of all coal produced in the country.In addition to being a crucial fuel and raw material for the production of cooking coal and for use in the iron and steel sector, bituminous coal is also utilized to produce electricity. At least 18 states produced bituminous coal in 2020, although only five states—West Virginia (28%), Pennsylvania (14%), Illinois (13%), Kentucky (10%), and Indiana (8%)—accounted for around 74% of the total production.

Subbituminous coal has a lower heating value than bituminous coal and typically includes 35%–45% carbon. In the United States, the majority of subbituminous coal is at least 100 million years old. In 2020, Wyoming produced 88% of the subbituminous coal produced in the United States, and Montana produced 8%. The

remaining was created in New Mexico, Colorado, and Alaska.**Lignite** has the lowest energy content of all coal grades and contains 25%–35% carbon. Lignite coal deposits are frequently rather recent and were not subjected to high temperatures or pressures. Due to its high moisture content and brittle nature, lignite has a low heating value. In 2020, 9% of all the coal produced in the US was lignite. A little over 39% was mined in Texas, while around 54% was mined in North Dakota. The remaining 7% came from Montana, Louisiana, and Mississippi. The main use of lignite is to produce power. Moreover, lignite is transformed at a facility in North Dakota into synrhetic natural gas, which is then transported via natural gas pipelines to consumers in the eastern United States.

Biomass

Throughout most of human history, biomass from plants was the main energy source, which was burned for heat and to feed animals used for transportation and plowing. Nonrenewable sources began replacing most of renewable energy use in the United States in the early 1800s, and by the early-1900s, fossil fuels were the main sources of energy. Use of biomass for heating homes remained a source of energy but mainly in rural areas and for supplemental heat in urban areas. In the mid-1980s, use of biomass and other forms of renewable energy began increasing largely because of incentives for their use, especially for electricity generation. Many countries are working to increase renewable energy use as a way to help reduce and avoid carbon dioxide emission

From 2009, Member States have been authorized to subsidize electricity produced by burning biomass thanks to the EU's **Renewable Energy Directive (RED)**. The objective was to reduce emissions, however it ignored the numerous drawbacks of bioenergy: Members have converted coal power plants to burn woody biomass, harvested wood from their own woods, and even imported trees from the USA and other countries. The reverse of this is what must take place in order to accomplish a low-carbon Energy Transition.

In Europe, bioenergy has had terrible effects on the environment, forestry, and public health. These essential ideas are disregarded by the EU's Renewable Energy Directive: that forests act as a natural carbon sink, that wood is a finite resource, and that burning wood produces carbon dioxide.Several bioenergy researchers have cautioned that increasing the amount of wood burned is incompatible with the emergency posed by climate change, as we only have ten years left to significantly reduce our CO2 emissions. Furthermore, the EU's ambition to become carbon neutral by 2050 is incompatible with its reliance on forest biomass for renewable energy.

Sources of Renewable Energy

Renewable energy comes from natural sources that replace themselves more quickly than they are used up. Examples of such sources that are continuously replenished are the sun and the wind. There are many different types of renewable energy available to us.

On the other hand, non-renewable fossil fuels like coal, oil, and gas require hundreds of millions of years to create. When fossil fuels are used to create energy, they emit dangerous greenhouse gases like carbon dioxide.

More emissions are produced by burning fossil fuels than by producing electricity from renewable sources. The key to solving the climate catastrophe is switching from fossil fuels, which now produce the majority of emissions, to renewable energy.

In most nations, renewables are now more affordable and provide three times as many jobs as fossil fuels do.

A global objective to advance sustainable electricity generation has arisen through the recently unveiled Sustainable Development Objective.This objective strives to transmit energy sources that are less damaging to society, the economy, and the environment in terms of clean and healthy living to the next generation. (2016) Assumadu-Sarkodie and Owuse A healthy environment, a variety of economic, social, and environmental benefits, including healthier living, the development of new jobs, higher living standards, and greater social participation, are all provided by renewable energy sources, according to IRENA (2017). Alternative energy research has a lengthy history, beginning in the 1990s when oil prices rose sharply (Owuse and Asumadu-Sarkodie, 2016; Abbasi et al., 2011).Research opportunities in solar energy (Lewis, 2016), the negative effects of fossil fuels on climate change, pollution, and health (Peter, 2017), and many other findings in the literature show that renewable energy has replaced fossil fuels in order to achieve sustainability in a number of areas. These include the provision of electricity in rural communities (Ghebreyesus and Espinosa, 2018; Matungwa, 2014; Opoku et al., 2020). (Pradhan et al., 2016; Shahsavari and Akbari, 2018).

According to Zohuri (2018), who makes the distinction between renewable and non-renewable energy sources, fossil fuels are non-renewable since they deplete finite resources like fuel, gas, and coal.The four vital services of electricity, rural off-grid power generation, heating and cooling of water or air, and all four, are frequently supported by renewable energy, which is free and continually renewed by nature. Alternative energy sources include solar, wind, hydropower, geothermal, tidal, wave, nuclear, and biomass (renewable energy). Because the majority of the other renewable energy sources are dependent on the sun either directly or indirectly, some

experts claim that solar energy stands out among them (Owuse and Asumadu-Sarkodie, 2016; Zohuri, 2018).Since sunshine encourages evaporation, which results in rain, it is commonly known that sunlight is the source of solar energy. Nevertheless, sunlight also indirectly contributes to the production of wind and hydroelectric power. In order to produce power, hydroelectric dams use the force of the rain as it falls into rivers or floods rivers that are flowing downward. Moreover, the sun causes plants to produce biomass as a result of photosynthesis.

SURFACE ENERGY

The most plentiful source of energy is solar energy, which may even be used under cloudy conditions. The rate at which the Earth absorbs solar energy is around 10,000 times higher than the rate at which people use energy.For a wide range of applications, solar systems can provide heat, cooling, natural lighting, power, and fuels. Solar technologies can use photovoltaic panels or solar radiation-concentrating mirrors to turn sunlight into electrical energy.

Although not all nations have the same access to solar energy, direct solar energy can nevertheless make a major contribution to any nation's energy mix.

Solar panels are now not only accessible, but frequently the cheapest source of electricity because to a sharp decline in the cost of solar panel production over the past ten years. Solar panels come in a range of colors based on the type of material used in their manufacture and have an average lifespan of 30 years.

Figure 1: Solar Energy

WIND ENERGY

Using enormous wind turbines that are installed on land (onshore), in saltwater, or freshwater, wind energy captures the kinetic energy of flowing air (offshore). Although wind energy has been used for thousands of years, onshore and offshore wind energy technology have advanced recently to maximize the amount of electricity produced, using higher turbines and bigger rotor diameters.

Despite the fact that average wind speeds vary greatly from place to place, most locations of the world have the potential for considerable wind energy deployment. In fact, the technical potential for wind energy is more than the global power production.

Strong winds can be found in many locations around the world, but often distant areas are the greatest for producing wind energy. Offshore wind energy has a lot of potential.

GEOTHERMAL ENERGY

Geothermal energy makes use of the thermal energy that is available from the Earth's interior. Geothermal reservoirs can be heated using wells or other methods.

Hydrothermal reservoirs are those that are naturally sufficiently hot and permeable, whereas enhanced geothermal systems are those that are naturally adequately hot but improved by hydraulic stimulation.

Different temperature fluids can be used to produce electricity once they reach the surface. Since it has been in use for more than a century, the technology for producing energy from hydrothermal reservoirs is established, dependable, and mature.

HYDROPOWER

The energy of water flowing from higher elevations to lower elevations is captured by hydropower. It can be produced by rivers and reservoirs. Run-of-river hydropower facilities rely on the river's available flow, whereas reservoir hydropower plants use water that has been stored in a reservoir.

In addition to supplying energy, hydropower reservoirs frequently serve as sources of drinking water, irrigation water, flood and drought control, navigation services, and energy.

The largest renewable energy source in the electricity sector at the moment is hydropower. It depends on relatively consistent rainfall patterns, which can be adversely affected by droughts brought on by climate change or by changes to ecosystems that affect rainfall patterns.The infrastructure required to produce hydropower may also negatively affect ecosystems. Because of this, many people view small-scale hydro as a more ecologically sound choice that is well suited for remote populations.

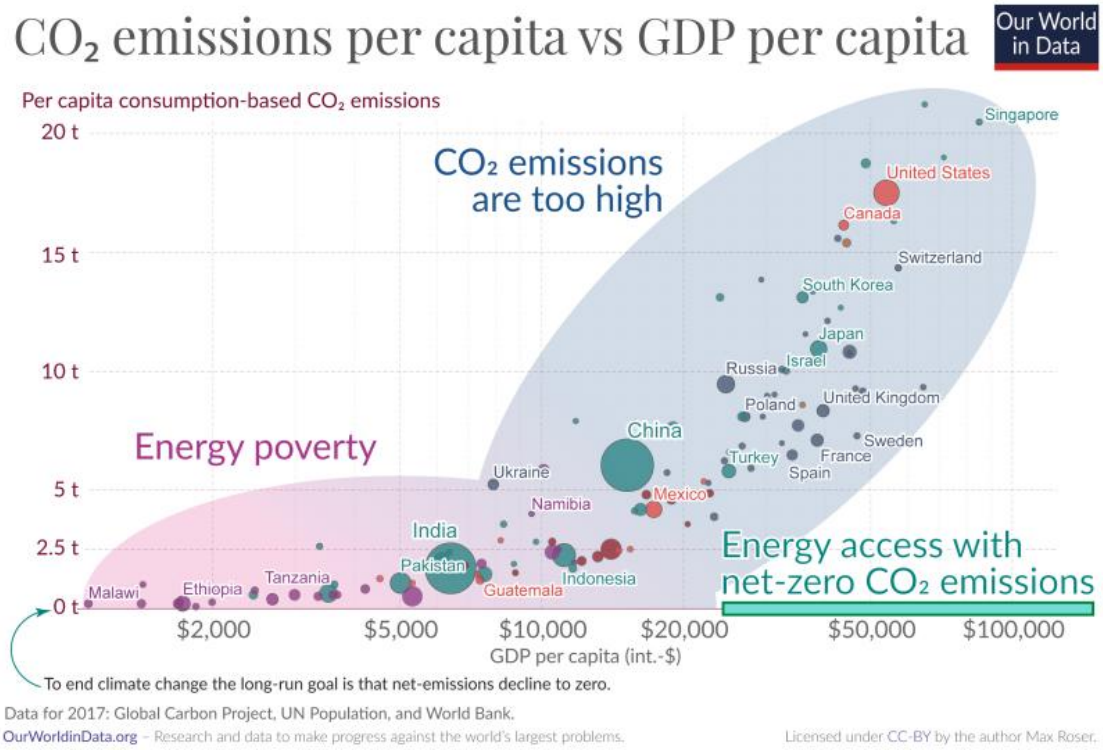
Ocean ENERGY

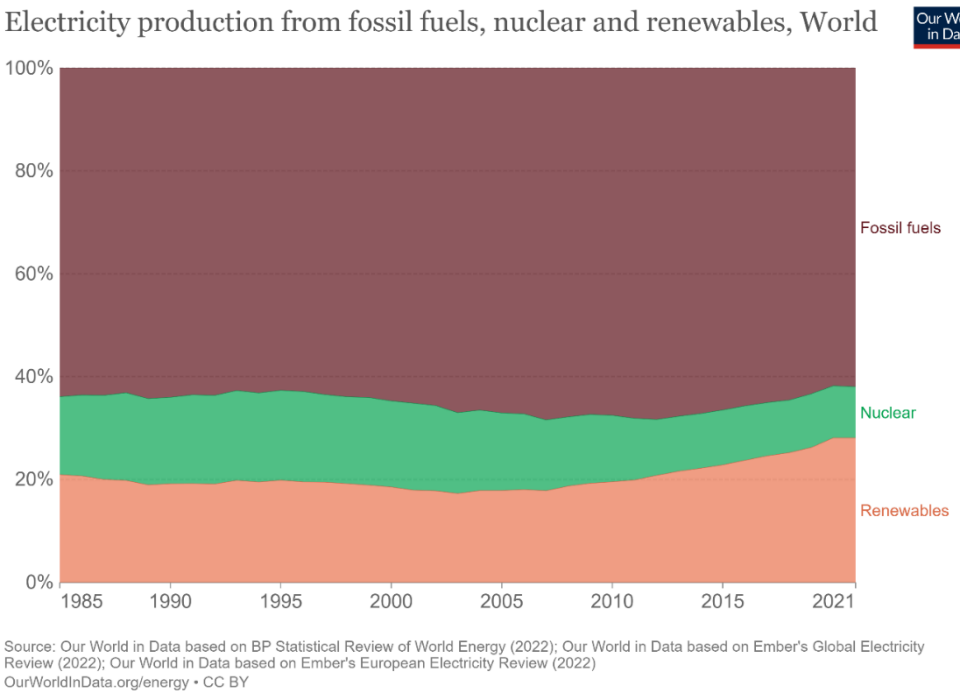
Ocean energy comes from processes that use the kinetic and thermal energy of the ocean's waves and currents to generate heat or electricity.

The development of ocean energy systems is still in its infancy, and several wave and tidal current prototypes are being investigated. Theoretically, ocean energy could easily provide all of the world's energy needs.

Problems with Using Conventional Energy and Biomass

Using conventional energy sources, such as fossil fuels, exposes the ecosystem to a number of risks, such as exposure to toxic chemicals, CO2 poisoning, respiratory problems, and infections that can damage vital bodily organs and weaken the immune system. Indoor burning of fuel or biomass also provides a substantial health concern in developing countries, where women, girls, and children are particularly vulnerable due to the load of acquiring wood for cooking, lighting, and heating the home. Burning fossil fuels has an adverse effect on health that, if not addressed, could lead to epidemics and pandemics in the long run, it has become evident.It has been shown in numerous studies (Kanagawa and Nakata, 2008; HEI, 2017; WHO, 2017, WHO, 2014) how crucial it is to employ solar photovoltaic energy to generate affordable, healthy electricity. This study aims to safeguard the public's health by addressing a knowledge gap and creating the framework for solar energy adoption in developing countries. This will make it possible for this study to conduct a more thorough analysis of the cumulative effects of the biomass collection and combustion process in Nigeria.





Contribute to climate change

Fossil fuels are the main driver of global warming. When they are burned, they release vast amounts of harmful byproducts called greenhouse gases (especially carbon dioxide (CO2)), into the atmosphere.

CO2 traps an unnatural amount of heat into the atmosphere which leads to changing weather patterns, such as hotter temperatures, more droughts, more erratic rainfall, and an overall less hospitable planet.

2. Non-renewable

Fossil fuels are non-renewable sources of energy - unlike solar power, geothermal, and wind energy.

This means that there are finite resources available and its reserves are not replenished naturally. While fossil fuels are made up of decomposed organic matter, like dead plants and animals, they take millions of years to form.
And when they are burned for energy, they pollute unlike their renewable counterparts.
3. Unsustainable
We consume fossil fuels far too quickly.
There is no safe level of fossil fuel consumption because the burning of fossil fuels in vehicles or power plants results in the release of CO2 and other air pollutants.
Fortunately, fossil fuel prices are rising and renewable energy sources are becoming more competitive.
4. Incentivized
The history of government subsidies is one of the main factors contributing to the perception that fossil fuels are inexpensive. We must start subsidizing renewable resources and alternative energy sources more than fossil fuels if they are to ever compete with the fossil fuel sector in a meaningful sense.
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Alternative energy sources are getting increasingly affordable, dependable, and advantageous in that they don't release CO2 while supplying our daily needs.

Traditional Energy sources and their environmental damages.

IV. Methodology

Selection of Method

In order to create a theory, the qualitative research approach looks at the root reasons of a phenomenon (Creswell and Creswell, 2017). is most appropriate for a study of this kind that seeks to understand the negative impacts of burning fossil fuels on health and how solar photovoltaic systems can reduce those effects based on information from other researchers' perspectives.

The first grounded theory to be applied in research was created by Glaser and Strauss in 1967 and was the one that the researcher employed for this project (Glaser and Strauss, 1967). It blends constructivist and positivist inclinations and helps research move from individual to collective knowledge (Stake, 2010:17).The researcher considered the current and dominant perspectives in the subject area while choosing the data, taking into account the subtleties of distinctness, similarity, and divergence in the data that were available from the literature.

Data Gathering

Using the search teams listed below Data for this study would be gathered from the academic journal database in accordance with the research questions - mitigating the risk of fossil fuel using renewable energy, particularly solar energy, benefits of transition from fossil fuel to renewable energy, and health impact of fossil fuel for domestic energy consumption. Energy sources, renewable energy, health impact of solar photovoltaic energy, effect of fossil fuel on climate change.The search terms were entered for each category in a number of academic journals and peer-reviewed articles that were made available as full text between 2010 and 2020. The search produced 105 articles, which were organized into relevant subject categories. For the thematic analysis, ten carefully chosen peer-reviewed publications were used, and 79 of them were looked at for the study project. Renewable energy was the main area of focus, with a special emphasis on solar photovoltaic energy for the electrification of developing countries. Mendeley, Google Scholar, and software from the DMU library were used to gather and organise the relevant material.

The following inclusion and exclusion criteria would guide the choice of literature.Quantitative studies that examined the intersections between these several issues—renewable energy, solar photovoltaic, climate change, air pollution, and health implications in developing countries—were the most important to include. The inclusion of articles that explored the connections between any of the subjects (renewable energy, solar photovoltaic, climate change, air pollution, and health concerns in developing countries) was thought to be especially significant.

The article's abstract was evaluated for relevance when choosing the literature for the project. If the article addressed any of the teams (renewable energy, solar photovoltaic, climate change, air pollution, health impacts in developing countries), or if there was a crossover, it was taken into consideration and used.

Data Analysis

For data examination, the thematic process was applied. This process is used to analyse datasets that contain a qualitative pattern that gives the data meaning. The following steps were taken to conduct the thematic analysis (Braun and Clarke, 2013) for this study:

Step 1: Acquaintance of data
Step 2: organisation
Step 3: theme improvement
Step 4: revision (or reviewing)
Step 5: definition (naming)
Step 6: write up

Chapter Four

Results and Discussion

Data Presentation

Health Implication of Traditional Energy Sources

Desalu, Adekoya, and Ampitan (2010) conducted a cross-sectional study on 123 non-smoking women in their work on biomass and fuel burning by women in Ekiti State, Nigeria, and if it is linked to respiratory symptoms and chronic bronchitis. The results of the spirometry tests on the women revealed that none of them used renewable energy, with 99 women (80.5%) using biomass and 23 women (19.5%) using kerosene. Women who used biomass exhibited the following symptoms more frequently than women who used kerosene: cough (biomass: 13.7% vs. kerosene: 3.7%), wheezing (biomass: 8.7% vs. kerosene: 2.8%), chest pain (biomass: 7.5% vs. kerosene: 1.9%), breathlessness (biomass: 11.8% vs. kerosene: 6.5%), and nasal symptoms Chronic

bronchitis (kerosene: 2.8% vs. biomass: 10.6%). Results of a comparison between women's use of biomass and kerosene in Nigeria's Ekiti state are shown in Table 3 and Figure 5.

Diseases	Biomass	Kerosene
Cough	22	4
Wheezing	14	3
Chest pain	12	2
Breathlessness	19	7
Nasal symptoms	15	5
Chronic bronchitis	17	3
Total	99	24

Table 1: Comparison of Biomass and Kerosene burning by women in Ekiti State, Nigeria. (Source: Desalu, Adekoya and Ampitan, 2010).

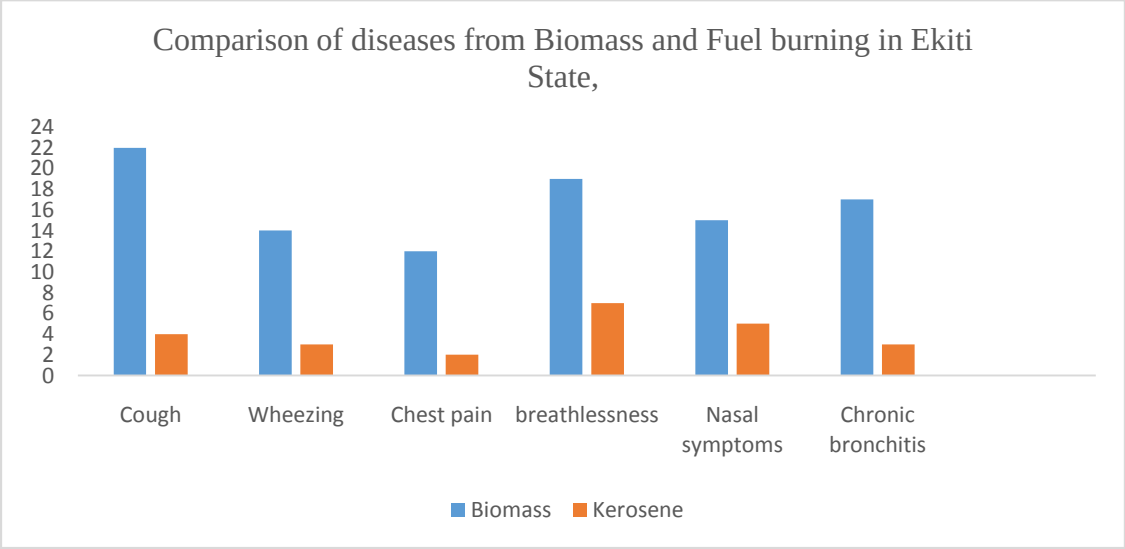

Figure 1: Comparison of diseases from Biomass and Fuel burning by women in Ekiti Nigeria (Source: Desalu, Adekoya and Ampitan, 2010).

Ibhafidon et al. (2014) recruited 90 participants, 21 of whom used LPG, 34 used kerosene, and 35 used firewood for cooking, heating, and lighting in a comparative study to examine respiratory illnesses and particulate matter pollution caused by biomass burning in Ile Ife, Osun State, Nigeria. According to test results, 95.2% of LPG users, 82.4% of kerosene users, and 71.4 percent of firewood users had normal ventilatory lung function. LPG users have a restrictive lung function of 4.76%, kerosene users 11.4%, and firewood users 11.4%. Participants who used LPG exhibited no obstructive lung pattern, while those who used kerosene and firewood displayed 2.94% and 17.1%, respectively. Table 4 and Figure 6 serve as illustrations of this.

Lung Function Pattern	LPG (%)	Kerosene	Firewood (%)
		N (%)	
Obstructive	—	1 (2.94)	6 (17.1)
Restrictive	1 (4.76)	3 (11.4)	4 (11.4)
Normal	20 (95.2)	28 (82.4)	25 (71.4)

Table 2: Lung function pattern for fuel and biomass usage by women in Ile Ife (Source: Ibhafidon et al., 2014).

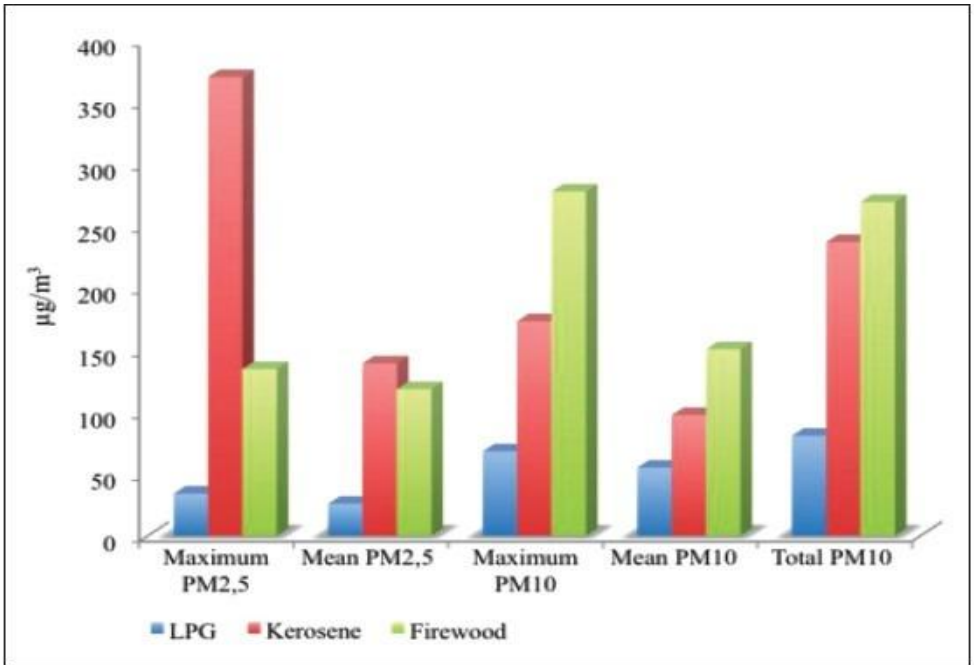

Figure 2: Lung function pattern for fuel and biomass usage by women in Ile Ife (Source: Ibhafidon et al., 2014)

210 women who were 15 years of age or older were the research subjects for a study on the respiratory effects of women who dry smoke fish as a trade in Port Harcourt Rivers State, Nigeria (Dienye, Akani, and Okokon, 2016). According to the questionnaire and interview results on various respiratory disorders (Table 5), catarrh was reported by 159 people (75.1%), sneezing by 153 people (72.86%), coughing by 138 people (65.71%), dyspnea by 7 people (3.33%), and chest pain by 59 people (28.10%).

Symptoms	Catarrh		Sneezing		Cough		Breathlessness		Chest pain	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Responses	159	51	153	57	138	72	7	203	59	151

Table 3: Respiratory disease of women who smoke dry fish for sale in Rivers State, Nigeria

Ozoh et al. (2018) conducted a study to learn more about the respondents' knowledge of the negative health effects of kerosene, liquefied petroleum gas, and biomass used by women in Lagos, Nigeria, for household energy supply. Results (Table 6) show that 465 participants, or 89.6%, were aware of the negative health effects of using biomass, while 138 respondents, or 26.6%, were aware of the negative health effects of using kerosene.

Harmful Health Effect	Participants with Knowledge of Association with Biomass Use (%)	Participants with Knowledge of Association with Kerosene Use (%)
Pneumonia	245 (47.2)	76 (14.6)
Tuberculosis	309 (59.5)	80 (15.4)
Breathing problems	429 (82.7)	77 (14.8)
Lung cancer	269 (51.8)	111 (21.4)
Asthma	376 (72.4)	93 (17.9)
Bronchitis	333 (64.2)	80 (15.4)
Running nose	403 (77.6)	104 (20)
Watery eyes	443 (85.4)	133 (25.7)
Any health effect	465 (89.6)	115 (29.9)

Table 4: Awareness of harmful health impact associated with biomass and kerosene (Source: Ozoh et al., 2018)

Oluwole et al. (2013) conducted a study on rural women and children to evaluate air pollution from biomass smoke exposure, pulmonary dysfunction, oxidation antioxidant imbalance, and inflammation. They conducted a thorough examination to look into serum nutrient levels in a lung function analysis. Table 7 displays the results of the mother and children's testing.

		Mothers				Children			
	Ref. range	**N**	**Mean (±SD)**	**Min-Max**	**%Def.**	**N**	**Mean (±SD)**	**Min-Max**	**%Def.**
Albumin (g/dL)	34–54	55	43.07±5.99	30–60	1.8	55	43.41±7.24	37–68	0
Transferrin (mg/dL)	1.2–2.6	55	1.74±0.53	0.92–2.8	5.5	54	1.61±0.56	0.7–2.8	11.1
Pre-albumin (g/dL)	1–3	55	0.21±0.14*	0.04–0.60	100	54	0.19±0.13*	0.04–0.60	100
RBP (g/dL)	0.2–0.64	55	0.03±0.03*	0.00–0.17	100	54	0.01±0.01*	0.00–0.05	100
SOD (Unit/L)	2.9–6.7	55	2.53±0.99	1–5.8	41.8	54	2.39±0.99	1–5.9	50.9
Vitamin C (mg/dL)	0.4–1.5	42	1.26±0.95	0.68–7.13	0	40	1.04±0.30	0.58–2.11	0
Vitamin E (mg/dL)	5–18	42	13.64±2.34	9.11–17.32	0	40	12.46±2.79	7.24–17.98	0

Table 5: Nutritional biomarkers in sampled mothers and children in Oyo State, Nigeria. (Source: Oluwole et al. (2013)

V. Discussion of Findings

Transition from Conventional to Renewable Energy

According to Desalu, Adekoya, and Ampitan's (2010) research, out of 321 Ekiti women, 99 utilise biomass (firewood) to satisfy their energy needs, while 23 use kerosene. This shows that most rural communities in Nigeria rely mostly on biomass (firewood) burning to meet their energy needs. According to the report, women are mostly in charge of gathering firewood and cooking in Nigerian villages. The majority of Nigeria's villages and rural areas lack access to the national grid's electrical supply. the over reliance on biomass The findings also show that women who use biomass have a higher prevalence of respiratory problems than women who use kerosene. This study also shows that chronic bronchitis, wheezing, chest pain, dyspnea, nasal symptoms, and cough are more common in women who use biomass than in women who use kerosene. This is consistent with Cao and Hu's research (2016). According to these women's exposure to smoke, C02, particulate matter, organic oxygenated or chlorinated chemicals, and free radicals during the biomass burning process, these respiratory ailments can be caused (Moorkens and Dauwe, 2019; IPCC, 2014). The type of energy used in houses also depends on the economic circumstances of rural women. Only a small number of Ekiti, Nigerian women who can afford kerosene utilise biomass. But this is a small portion of people.

In their study of citizen's health in Ile Ife, Osun State, Ibhafidon et al. (2014) found that those who use firewood and biomass have increased symptoms of ear discharge, eye irritation, nose irritation, and catarrh. Additionally, as anticipated, these groups were shown to be more vulnerable to the symptoms of cough, pulmonary and non-pulmonary illnesses, as well as other respiratory conditions when compared to those who could afford kerosene or LPG. This study demonstrates a high ambient air particle pollution level that is significantly higher than the recommended limits of the US Environmental Protection Agency's NAAQS (2020) and the World Health Organization's (WHO) maximum limit of 50 mg/m3 (WHO) (2020). Findings from the interpretation of the lung function pattern showed that users of firewood had the highest levels of respiratory and non-respiratory symptoms, followed by users of kerosene and then LPG. Although the level of smoking and potential traffic-related outdoor pollution, which may cause lungs diseases, were not taken into account in this study, the fact that the majority of women in local communities in Nigeria are non-smokers and that there are few vehicle movements in rural areas does not invalidate the study's findings.

In Port Harcourt, Nigeria, Dienye, Akani, and Okokon (2016) looked at 210 women who used biomass in their trade of dry-smoking fish. Their research demonstrates that drying smoked fish exposes women to smoke from biomass burning, which increases their susceptibility to catarrh, sneezing, and coughing. According to this study, biomass is also the least expensive method for drying fish in Nigeria because women there may not have access to power or ovens or may not be able to purchase other methods. Aside from drying smoked fish, the majority of businesses in Nigeria rely on traditional energy sources because electricity is inaccessible and the supply is characterised by seizures. This study is comparable to those done by Peter et al. (199) on women in Calabar, Cross River State, Nigeria, who dry smoked fish, and Adewole et al. (2013) in the northern region of Nigeria. They all agree that the diseases caused by using biomass to dry fish are brought on by the release of noxious and irritating compounds, which have a negative impact on the respiratory system. Although Dienye, Akani, and Okokon's (2016) research is consistent with earlier and related studies, one of its limitations is that the "cumulative exposure index," which accounts for the length of time participants were exposed to smoke during the smoked fish drying trade, was not taken into consideration. However, the findings are widely regarded as satisfactory due to their similarity with other comparable studies.

In the study by Ozoh et al. (2018), it was examined if women in Lagos, Nigeria, who utilised biomass, liquefied petroleum gas, and kerosene for home energy supply, were aware of the detrimental health effects of these fuels. According to responses, the majority of participants (89.6%) are aware of the negative effects that

biomass and fossil fuels have. This is to be anticipated from Lagos, the commercial hub of Nigeria and a cosmopolitan metropolis. This study showed that those who lived in Lagos were better educated, more enlightened, and had higher incomes than people who lived in villages. Women in Lagos also no longer have access to firewood as a result of development; as a result, they rely more on kerosene and LPG. This study supports earlier reports that rural women in Nigeria use a high proportion of biomass, while urban women use a higher proportion of kerosene and LPG for home energy (Ohimain, 2012; Adegbemi et al., 2013; Desalu et al., 2012). Due to low income, rural areas use a lot of biomass, but urban areas use a lot of kerosene and LPG due to the convenience of harvesting wood from forests and the associated risk to one's health and safety. However, this study and several others (Kate and Deokate, 2018; Shahsayari and Akbari, 2018; Kose, Bekun, and Alola, 2020; Perera, 2017) that advocate for the adoption of renewable energy sources view these three energy types as being filthy.

According to Oluwole et al(2013) .'s findings, who performed extensive tests to examine the levels of serum nutrition through a pulmonary function analysis on rural women to determine their level of oxidation, inflammation, and oxidative stress, as well as pulmonary dysfunction, in children and women who are exposed to smoke. The results from Table 7's serum biomarkers show that albumin, transferrin, vitamin C, and E ranges for the moms and kids who were tested were within normal limits. Pre-albumin concentration and RBP levels, however, were below the minimum allowable threshold. Similar to this, mothers and children have higher mean serum CRP concentrations than usual—1.89 g/ml and 1.54 g/ml, respectively—than the range of 1.3 g/ml. Additionally, it was discovered that the mean serum MDA concentration in mothers and their offspring (2.40 g/ml and 1.88 g/ml, respectively) was greater than the typical permissible range of 4.5 g/ml. This study supports previous research linking tobacco exposure to harmful health effects (WHO, 2015; Moorkens and Dauwe, 2019). Burning biomass is regarded as a significant contributor to smoke inhalation. This is supported by the study because neither the moms nor the kids who participated in it were smokers. According to Moorkens and Dauwe's research, biomass smoke is also associated with the high rate of lungs dysfunction that has been seen (2019).

VI. Conclusion

Since it satisfies the Sustainable development goals, the use and development of renewable energy is swiftly garnering attention on a global scale. Traditional non-renewable energy sources have produced significant pollution, offensive air pollution, and greenhouse gas emissions that are harmful to human health. Exposure to fossil fuel and biomass pollution has been linked to diseases like asthma, cancer, stroke, pulmonary, lung, and heart disease.

According to a critical analysis, solar photovoltaic (PV) energy is safe for reducing the harmful effects of conventional energy sources on human health. In light of this, a study was conducted to assess the health effects of burning fossil fuels and biomass in Nigeria, particularly as they pertained to women and girls. This study's thematic analysis was able to demonstrate that as women and girls are entirely responsible for gathering biomass and cooking at home, the majority of diseases brought on by exposure to fossil fuels and biomass burning affect them. The study also makes the case that solar energy, if fully adopted, developed, and implemented, has a significant potential to meet Nigeria's energy needs, reduce the negative health effects of the use of fossil fuels, and achieve the sustainable development goal of promoting the wellbeing of all people, including women, girls, and children.

VII. Recommendations

There is an apparent severe lack of research on transition from traditional energy sources to solar photovoltaic for sustainability while obtaining research materials from the body of existing literature. This is a result of the nation's over reliance on oil, which has turned its status as the sixth-largest oil exporter in the world into a curse. In order to address the country's current energy needs, this current study recommends deeper study of Nigeria's renewable energy potentials and its capacity to transform the energy industry.

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