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Socioeconomic Considerations in the Demand for Domestic Energy by Households in Southern Cross River State

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Abstract

The study explores the socioeconomic factors influencing the demand for domestic energy among households in southern Cross River State. The specific objective was to access the variety of energy sources available to households in southern Cross River and to investigate the reasons for different energy choices by households in southern Cross River. The study adopted a survey design where the area of study was split into three categories and the questionnaire was employed to generate data for the analysis. The results show that electricity, firewood, cooking gas and kerosene are the main varieties of energy sources available to households in the southern Cross river state. The study further revealed that, availability and affordability energy sources including incomes level and awareness of households were part of the reasons for certain choices of energy sources. It was Recommended among others that the authorities should invest in Infrastructure by developing and upgrading energy infrastructure, including power plants, transmission lines, and distribution networks. This can help reduce energy losses, improve efficiency, and expand access to underserved areas

Keywords: Domestic Energy, Energy Sources, Households, Southern Cross River.

Introduction

Energy demand by man started early which coincided with his discovery of fire and the commencement of sedentary life. The early forms of energy in use were simple and rudimentary and involved majorly the use of biomass such wood fuel and liquid sources like palm oil and animal fat. With changing technologies as a result of corresponding change in civilization, the scope and variety of energy sources have increased significantly.

Due to advances in technology, there have been societal progress which has led to the introduction of one or two forms of energy or others. For instance, coal and other forms of biomass including wind and hydro powered energy were the earliest forms of energy predating the industrial revolution. It should be noted that the discovery of coal in very viable quantity in association with iron ore reserve was foremost among factors that gave impetus to the industrial revolution. Since then, numerous energy types have been explored and utilized at different levels including domestic sources. Today some of the readily available ones include hydrocarbons such as kerosene, petrol, gas (liquefied), diesel, etc. There are also non hydrocarbons sources which include solar, firewood, charcoal, electricity, nuclear, etc.

Socioeconomic considerations are fundamental to understanding and addressing the diverse needs and challenges related to household energy demand. They help in designing policies and interventions that are equitable, sustainable and effective in improving energy access and quality of life for all households. These considerations in in the view of World Bank (2011) cuts across many factors like income levels, education and awareness, access to energy infrastructure, cultural practices, government policies, etc.

The demand for domestic energy by households therefore is intricately linked to various socioeconomic factors which play a crucial role in shaping energy consumption patterns. Socioeconomic considerations such as income levels, education, household size and employment status significantly influence how much energy a household consumes and for what purposes. For instance, higher income households tend to use more energy due to greater access to energy consuming appliances and larger living spaces, whereas lower income households may consume less energy but spend higher proportion of their income on energy costs (Boardman, 2012). In the view of Sovacool (2014) educational attainment can as well impact energy use behaviours and attitudes towards energy efficiency. It is however very important that understanding these socioeconomic dimensions is essential for policy makers aiming to design effective energy policies that promote sustainable consumption and address energy poverty.

Domestic energy refers to the energy consumed within households for purposes such as heating, cooling, lighting, cooking, and powering various appliances. This energy can come from a variety of sources including electricity, natural gas, heating oil, and renewable sources like solar or wind power. Efficient use of domestic energy is important for reducing costs, minimizing environmental impact, and improving sustainability. Key considerations

include implementing energy efficiency measures, adopting renewable energy sources, and utilizing smart home technologies to optimize energy consumption.

Energy efficiency measures can significantly reduce energy consumption in homes. These measures include improving insulation, using energy-efficient appliances, and implementing smart thermostats and lighting systems (U.S. Department of Energy). Renewable energy sources, such as solar panels and wind turbines, can also be integrated into domestic energy systems to reduce dependence on fossil fuels and decrease greenhouse gas emissions (International Energy Agency, 2020).

Smart home technologies play a significant role in optimizing domestic energy use. These technologies allow for automated control and monitoring of energy usage, helping homeowners to manage their energy consumption more effectively (European Commission, 2018).

The importance of energy to household and for economic advancement cannot be overemphasized, which is why the main objective of this work was to examine the socioeconomic considerations in the demand for domestic energy by households in southern Cross River State.

The specific objectives are:

1. To access the variety of energy sources available to households in southern Cross River
2. To investigate the reasons for different energy choices by households in southern Cross River

The following questions would guide the study:

1. What are the variety of energy sources available to households in southern Cross River?
2. What are the reasons for different energy choices by households in southern Cross River?

Literature Review

The demand for domestic energy in Nigerian households is influenced by several socioeconomic factors, reflecting the complex interaction between income levels, household size, education, and access to alternative energy sources. This review synthesizes key findings from recent literature on these socioeconomic considerations.

Income Levels and Energy Demand

Income is a critical determinant of energy demand among Nigerian households. Higher-income households tend to consume more energy due to their ability to afford more energy-intensive appliances and their preference for modern energy sources like electricity and liquefied petroleum gas (LPG). Conversely, lower-income households often rely on traditional energy sources such as firewood and kerosene, which are less expensive but more harmful to health and the environment (Ogwumike & Ozughalu, 2016; Farsi, Filippini, & Pachauri, 2007).

Household Size and Energy Consumption

The size of a household also plays a significant role in energy demand. Larger households generally have higher energy consumption due to the increased number of energy-dependent activities such as cooking and heating (Adenikinju, 2003). However, per capita energy consumption may decrease as household size increases, indicating economies of scale in energy use (Ademola et al., 2020).

Education and Energy Preferences

Education influences household energy preferences and the adoption of modern energy sources. Educated household heads are more likely to understand the health and environmental benefits of cleaner energy options, leading to higher demand for electricity and LPG (Yakubu & Jelilov, 2017). Additionally, education fosters better energy management practices, which can reduce overall energy consumption.

Access to Energy Infrastructure

Access to reliable energy infrastructure is a significant factor in energy demand. Households in urban areas with better access to electricity are more likely to use it as their primary energy source, while rural households with limited access continue to depend on biomass and other traditional fuels (Babatunde & Shuaibu, 2009). The unreliability of power supply in Nigeria further complicates the demand patterns, as households often resort to backup sources like generators, which increase the overall cost of energy (Oyekale et al., 2012).

So in essence, socioeconomic factors such as income, household size, education, and access to energy infrastructure significantly influence the domestic energy demand in Nigerian households. Understanding these factors is essential for formulating effective energy policies that address both the energy needs and the socioeconomic realities of different household groups.

Empirical Literature

Empirical Literature Review on Socioeconomic Considerations in the Demand for Domestic Energy was examined under the following headings

Household Income and Energy Demand

Household income is one of the most significant determinants of energy consumption. Studies consistently show that as household income increases, energy consumption also rises, albeit at a decreasing rate. For instance, Filippini and Pachauri (2004) found that higher-income households tend to consume more energy due to greater ownership of energy-intensive appliances and larger homes. Similarly, Baker, Blundell, and Micklewright (1989) demonstrated that income elasticity of demand for energy is positive but less than one, indicating that energy is a normal good, but not a luxury.

Education and Awareness

Education and awareness also significantly impact energy demand. Empirical studies suggest that higher levels of education lead to greater awareness of energy efficiency and conservation practices. A study by Labandeira, Labeaga, and López-Otero (2017) found that more educated households are more likely to invest in energy-efficient appliances and to engage in energy-saving behaviors. This suggests that education not only influences the quantity of energy consumed but also the efficiency with which energy is used.

Housing Characteristics

The characteristics of housing, such as the size, type, and age of the dwelling, play a crucial role in determining domestic energy demand. Older homes typically require more energy for heating and cooling due to less efficient insulation and outdated energy systems (O'Neill & Chen, 2002). Moreover, single-family detached homes tend to have higher energy demands compared to apartments or multi-family units because of their larger size and greater exposure to external temperatures (Yakubu, 2014).

Energy Prices and Elasticity

Energy prices are a critical factor in the demand for domestic energy. Price elasticity of demand measures how sensitive consumers are to changes in energy prices. Empirical studies show that the demand for energy is generally price inelastic, meaning that changes in price have a relatively small effect on the quantity of energy consumed (Espey & Espey, 2004). However, income level can mediate this effect; lower-income households tend to be more price-sensitive because energy costs constitute a larger portion of their total expenditures (Reiss & White, 2005).

Availability of Alternative Energy Sources

The availability and adoption of alternative energy sources such as solar and wind can significantly influence domestic energy demand. Studies indicate that the penetration of renewable energy technologies reduces the demand for conventional energy sources like electricity and natural gas (Wiser, Bolinger, & Barbose, 2007). The adoption of alternative energy is often influenced by government policies, financial incentives, and public awareness, which are in turn shaped by socioeconomic factors such as income and education (Zhang, Yang, & Shi, 2011).

Regional and Cultural Variations

Socioeconomic considerations in energy demand also vary by region and culture. In developing countries, access to energy is often limited, and energy consumption patterns differ significantly from those in developed countries. For example, households in rural areas of Sub-Saharan Africa often rely on traditional biomass for cooking and heating, which presents different socioeconomic challenges compared to urban areas where electricity is more accessible (Kowsari & Zerriffi, 2018). Cultural practices, such as collective living arrangements or traditional cooking methods, can also influence domestic energy demand (Onoja &Idoko, 2015).

Policy Implications

Understanding the socioeconomic determinants of domestic energy demand has significant policy implications. Policies aimed at reducing energy consumption, such as subsidies for energy-efficient appliances or taxes on energy use, must consider the varying impacts on different socioeconomic groups. For instance, energy taxes may disproportionately affect low-income households, while subsidies for energy-efficient technologies may benefit higher-income households who can afford the initial investment (Friedrich et al., 2001).

It can rightly be said therefore that the demand for domestic energy is shaped by a complex interplay of socioeconomic factors, including income, education, housing characteristics, energy prices, and the availability of alternative energy sources. Empirical studies consistently demonstrate that these factors have significant but varied impacts on energy consumption patterns across different contexts. Policymakers must consider these socioeconomic dimensions when designing interventions to manage energy demand and promote sustainable energy use.

Methodology

The study adopted a survey design with the use of questionnaire to generate data. The study area is Cross River Southern Zone made of seven local government areas which include Biase, Akamkpa, Odukpani, Calabar Municipality, Calabar South, Akpabuyo and Bakassi, the study area was stratified into three categories; A, B and C. Category A is rural, B is urban while C is semi urban. A total of seventy households were sampled from each local government leading to a sample size of 490 family heads. Descriptive statistics was employed for the analysis.

Table 1: Energy types and varieties

Energy Types	Category A	Category B	Category C	Total
Electricity	28	51	40	119
Solar	5	13	7	25
Cooking gas	10	40	30	80
Kerosene	27	15	35	75
Gasoline	4	8	9	21
Diesel	2	14	5	11
Firewood	108	5	9	122
Charcoal	24	2	4	30
Others	2	2	1	5
Total	210	140	140	490

Source: Field work

Table 1 above show the energy types available to the households

Table 2: Energy choices by availability and affordability

Types	Category A	Category B	Category C	Total
Electricity	25	42	35	102
Solar	6	25	17	48
Cooking gas	19	59	35	113
Kerosene	25	7	15	47
Gasoline	10	3	10	23
Diesel	2	2	-	4
Firewood	111	1	18	130
Charcoal	10	-	8	18
Others	2	1	2	5
Total	210	140	140	490

Source: Field work

Findings

Household choices of domestic energy in southern Cross River are influenced by a variety of factors, reflecting both economic and social conditions. Here are some possible reasons:

1. Cost and Affordability:

Income Level: Lower-income households may opt for cheaper energy sources like firewood, charcoal, or kerosene, while higher-income households might afford more expensive options like electricity or gas.

Cost of Energy Sources: The relative cost of energy sources can dictate choices. For example, where electricity tariffs are high or unstable, households might opt for cheaper alternatives.

2. Availability and Accessibility:

Geographic Location: Urban households may have better access to electricity and gas, while rural households might rely on firewood or kerosene due to limited access to the national grid or gas supply.

Energy Supply Infrastructure: Areas with unreliable electricity supply may see households using generators, kerosene, or solar energy as backups.

3. Cultural and Social Preferences:

Cooking Habits: Cultural preferences for certain types of cooking (e.g., traditional methods using firewood) can influence energy choices.

These factors often intersect, meaning that household energy choices in southern Cross River are typically a product of multiple, overlapping considerations.

Conclusion and recommendations

Socioeconomic factors play a crucial role in shaping the demand for domestic energy amongst households in southern Cross River. Factors such as income levels, education and urban – rural disparity significantly influence the type of energy sources used, with wealthier households more likely to access and afford cleaner energy options while poorer households often rely on traditional, less efficient sources. Understanding these dynamics is essential for developing policies that promote equitable access to sustainable energy, reduce energy poverty and support the country's broader economic and environmental goals.

Based on the foregoing, the following recommendations were made:

To ensure the availability and accessibility of domestic energy to citizens in Nigeria, authorities can take several key actions which include:

1. Invest in Infrastructure: Develop and upgrade energy infrastructure, including power plants, transmission lines, and distribution networks. This can help reduce energy losses, improve efficiency, and expand access to underserved areas.

2. Diversify Energy Sources: Promote the use of a mix of energy sources, including renewables like solar, wind, and hydropower, alongside traditional sources like natural gas and oil. Diversification reduces dependency on a single energy source and enhances energy security.

3. Encourage Private Sector Participation: Create an enabling environment for private sector investment in the energy sector by providing incentives, reducing bureaucratic hurdles, and ensuring a stable regulatory framework. This can lead to more innovation, efficiency, and capital in the sector.

4. Subsidies and Support for Vulnerable Populations: Implement targeted subsidies or financial support programs to make energy affordable for low-income households while ensuring these measures are sustainable and do not distort the market.

5. Strengthen Regulatory Frameworks: Enhance the regulatory framework to ensure transparency, accountability, and fair pricing in the energy market. This includes enforcing contracts, protecting consumer rights, and ensuring competition among energy providers.

6. Expand Rural Electrification: Prioritize rural electrification projects to extend energy access to remote and underserved communities. Off-grid and mini-grid solutions, particularly using renewable energy, can be effective in these areas.

7. Research and Development: Invest in research and development to explore new technologies and methods for improving energy production, storage, and distribution. Innovation can drive down costs and improve energy accessibility.

By implementing these strategies, Nigerian authorities can improve the availability and accessibility of domestic energy, thereby supporting economic growth, improving the quality of life for citizens, and promoting sustainable development.

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