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Productive Uses of Energy in Enterprises in Slums in Ghana

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Abstract

Slums' exclusion from the energy access planning process is often rationalised by the claim that they cannot afford tariffs because they are poor. The aim of this paper was to provide an insight into the productive uses of energy in enterprises in Ghanaian slums. The researchers purposively selected and interviewed 88 enterprise owners from three slums in Ghana. Analyses of the responses revealed that several energy services are used in the slums for myriad productive purposes despite their disregard from the energy planning process. Their disregard as stakeholders in the energy access planning process, the result of exclusivity perpetuated by energy policies in Ghana, engenders illegal tapping which has had adverse implications for revenue losses to the utility companies in Ghana.

Keywords: Productive, Energy Use, Enterprises, Slums, Ghana.

1. Introduction

1.1. Background to the Study

In recent years, cities in Ghana have witnessed an increasing incidence of slum development, a phenomenon believed to be caused by rural-urban migration (Government of Ghana, 2003; Wateraid, 2008). Opere (2003) and Van den Berg (2007) observed that due to limited economic opportunities in the rural areas in northern Ghana, and the perception that employment opportunities abound in the south, labour migrates to cities in the

southern part of Ghana with the objective of enhancing their livelihoods through decent employment. Lee's Push and Pull theory of migration, which argues that deprived or deteriorating conditions in migrants' places of origin and/or attractive opportunities in their destinations are the main triggers of migration explains the incessant mass exodus of labour to the cities of the south (Lee, 1966 cited in Yeboah, 2008).

Due to their low economic status which inhibits them from renting decent shelter in the cities, the migrants live in very deprived conditions and choose to settle close to their places of work. They often squat on lands that are not considered prime or reserved for future development. Without legitimate claim of ownership to the lands, the migrants are often deprived of services and thus live in inhumane environmental conditions (Government of Ghana, 2003; Tindigarukayo, 2004). The continuous influx of labour from the deprived areas to the cities is also resulting into what Ravillion terms "*urbanisation of poverty*" (Ravillion, 2001). The slums are believed to be the living hub of the urban poor but determined to make a living, they have established several enterprises to obtain some livelihood sources. The slum dwellers are therefore economic migrants living in the slums with the hope of getting out of poverty.

The Government of Ghana has adopted a holistic approach towards poverty reduction, which includes but not limited to the provision of social and economic infrastructure and services at both the macro and micro levels (Government of Ghana, 2003; Government of Ghana, 2005a). For poverty reduction to be effective in the slums, enterprises which give the slum dwellers their livelihoods would have to be the targets of poverty reduction strategies.

Several studies have also revealed a positive nexus between access to energy and sustainable development especially in emerging economies (Food and Agricultural Organisation, 2000; Institute for Development Studies, 2001). Premised on this relationship and coupled with the widely-held perception that the slums are the living hubs of the urban poor, this paper argues that promoting the slum dwellers' access to energy could be an effective tool for promoting economic activities that can ultimately contribute to reducing urban poverty.

The paper is structured into five parts. Part one provides an overview of the study with details of the study's background and research questions. Part two presents the results of the author's desk study which sought to identify the typology of enterprises in Slums. Part three provides details of the methodology used by the authors to elicit the required responses to the research questions. Part four presents the findings of the survey in the slums while part five examines the way forward in enhancing the slums' access to energy service.

1.2. Research Questions

The paper examines the factors that affect the deployment energy services to enterprises in slums in Ghana. The authors thus analysed the issues that provide answer to the following questions:

- What are the types of enterprises owned by the slum dwellers?
- What energy services do they use and for what purposes?
- What issues surround the enterprises' access to energy services in the slums?
- How can these issues be addressed to enhance their access to energy services?

2. Typology of Enterprises in Ghanaian Slums

Underpinned by the claim that the slum dwellers are economic migrants, this section of the paper identifies the typology of enterprises that provide the slum dwellers their livelihoods.

Globally, slums are home to the poor - mostly in urban areas - majority of who have been priced out of the formal sector and are employed in the informal urban economy where they play a significant role. Notwithstanding the significance of their roles, state institutions in Ghana (such as the Ministry of Local Government and Rural Development (MLGRD) and the Town and Country Planning Department (TCPD)) have failed to recognise the roles they play and subsequently plan to better their living conditions. Consequently, their productive activities are often unaccounted for in national statistics (Peoples Dialogue Ghana (PDG), 2010a; *unpublished*). Due to this, precise data on the slum dwellers' sources of livelihood from national database are unavailable. As a result of this limitation, the study relied on civil society organisations (such as PDG and Ghana Federation of the Urban Poor (GHAFUP)), who are playing advocacy roles on behalf of slum dwellers in the country, for information on the typology of enterprises in slums.

People's Dialogue Ghana (PDG) and Ghana Federation of the Urban Poor (GHAFUP) (2006; *unpublished*) identified 15 different categories/types of enterprises in the year 2006. Similarly, an enumeration at Akwatia Line by GHAFUP in September 2010 revealed a total of 29 different enterprises operating within the community (see Table 1).

Table 1. Types of Enterprises in the Slums

Enterprises	Number	Enterprises	Number
Amui Dzor		Akwatia Line	
Bathhouses (showers)	208	Mechanics	3
Chop bars	35	Scrap metal works	150
Restaurants	41	Hair dressing	11
Provision store	77	Sawmills	14
Scrap metal works	1	Dressmaking	8
Hair salons	33	Food Vending	23
Grinding mills	6	Video centres	2
Factories	6	Provision	9
Forex bureaux	1	“Chop” bars	16
Petty trading	32	Groundnut mills	3
Spare part shops	11	Vulcanising	3
Tailoring	41	Sale of Sachet water	10
Vulcanising	2	Communal toilets	1
Animal farms	21	Communal/commercial bathhouses	13
Veterinary	3	Shoes making	25
Herbal shops	6		
Clothes shops	3		
Filling stations	1		
Wood selling	1		
Charcoal selling	5		
Shoe repairs	7		
Mechanics	33		
Electrical and electronic shops	23		
Mobile phone cards shops	3		
Mobile phone call service (mobile-to-mobile)	33		
Landline	27		
Schools	9		
Water points	33		
Toilet	6		

Source; Source; PDG and GHAFUP, 2006; EAFUP, September, 2010

Most of the enterprises operating within the slums are energy-dependent using several energy forms for their operations. Thus, effective operation of the enterprises towards sustainable poverty reduction is contingent upon their access to affordable, reliable and safe energy forms. It is against this background that the researchers investigated the issues surrounding the slum dwellers' access to energy for productive uses.

3. Empirical Strategy

Three slums were purposively selected for the study. These are Old Fadama from the Accra Metropolis, Amui Dzor from Ashaiman Municipality and Akwatia Line from the Kumasi Metropolis. Old Fadama was selected because it is the largest and most populous slum in Ghana. The population of Old Fadama is about 79,684 (PDG, 2010b; *unpublished*). The Ashaiman Municipal Assembly (2006) indicates that about 60 per cent of the communities in the Ashaiman Municipality are slums. Thus, Amui Dzor being one of the oldest slums in the Ashaiman Municipality was purposively selected as one of the study communities and Akwatia Line, by virtue of its location within the central business district of the Kumasi Metropolis, was also purposively selected.

The authors used information from both secondary and primary sources to examine the productive uses of energy in enterprises in the three slums. The secondary sources of information provided the theoretical and conceptual reasons for slum development in Ghana. Additionally, the nexus between energy access and poverty reduction was established with information from secondary sources through a desk study. The desk study also revealed the typology of enterprises in the slums based upon which the energy intensive ones (see Table 2) were purposively selected for the research. Their selection was based on the following criteria:

- Potential effect of energy intervention on women and children;
- Extent of energy usage by different types;
- Replicability of intervention and potential impact on employment;
- Health imperatives (e.g. Indoor air pollution);
- Long-term prospects of enterprise (e.g. Enterprises that thrive on an ongoing construction project will have to fold-up once the construction is over); and
- Peculiarity of enterprise to slums.

Table 2 indicates the typology of enterprises selected for the study and the uses to which they put.

Table 2: Energy-Dependent Enterprises in Slums in Ghana

Enterprise	Type of energy and the purpose for which they are used
Bathhouses (showers)	Firewood for heating water; electricity and kerosene for lighting.
Chop bars/food vendors/Restaurants	Firewood, charcoal and LPG for cooking; electricity and candles for lighting, kerosene for lighting and/or starting fire; electricity for ventilation.
Petty retail shops/Hair salon	Electricity or/and generator –petrol or diesel for lighting, ventilation and freezing/cooling.
Scrap metal works	Oxyacetylene torches for cutting metals into smaller pieces for ease of transportation to sales points.
Grinding mills/factories/sawmills	Electricity and gas oil for milling or sawing.
Herbal preparation	Firewood and charcoal for boiling concoctions; kerosene for lighting and/or starting fire; candles for lighting.
Tailoring/Forex bureaux/mobile phone call	Electricity or/and generator –petrol or diesel for sewing, ventilation and lighting.
Vulcanising	Electricity for lighting and compressed gas for refilling of tyres.
School	Electricity for lighting and ventilation; fuel wood, charcoal and LPG for cooking.

Source; Adopted from PDG and GHAFUP, 2006

The primary data were gathered through direct interviews using structured questionnaires and interview guides administered to enterprise owners and community leaders in the slums. A total of 88 enterprise owners (see Table 3) were interviewed from the three purposively selected slums. Three focus group discussions (FGDs) (one from each slum) were held to elicit qualitative data from groups of enterprise owners. Key informant interviews were also held to gather information from community leaders.

Table 3: Number of Enterprises Selected from Each Slum

Category of enterprise	Slum						Total	Per cent
	Amui Dzor	Per cent	Old Fadama	Per cent	Akwatia Line	Per cent		
Public bathhouses	6	6.8	10	11.4	5	5.7	21	22.6
Petty retail shops	4	4.5	5	5.7	0	0.0	10	10.8
Food vending	9	10.2	8	9.1	5	5.7	22	23.7
Chop bars	4	4.5	6	6.8	2	2.3	12	12.9
Fish and meat mongering	3	3.4	0	0.0	0	0.0	3	3.2
Groundnut paste	5	5.7	0	0.0	1	1.1	6	6.5
Bakery	3	3.4	0	0.0	0	0.0	3	3.2
Hair salon	0	0.0	2	2.3	0	0.0	5	5.4
Video centre	0	0.0	5	5.7	0	0.0	6	6.5
Scrap metal dealers	0	0.0	0	0.0	5	5.7	5	5.4
Total	34	38.6	6	40.9	18	20.5	88	100.0

Source; Field survey, 2010

Direct observation complemented by interviews was used to identify the enterprise owners' access to the various energy forms. The researchers observed the nature of electricity connections to the enterprises, smoke emission from fuel wood usage and the nature of end-use equipment used for the conversion of energy in the enterprises (see Figures 4 and 5).

4. Results and Discussion

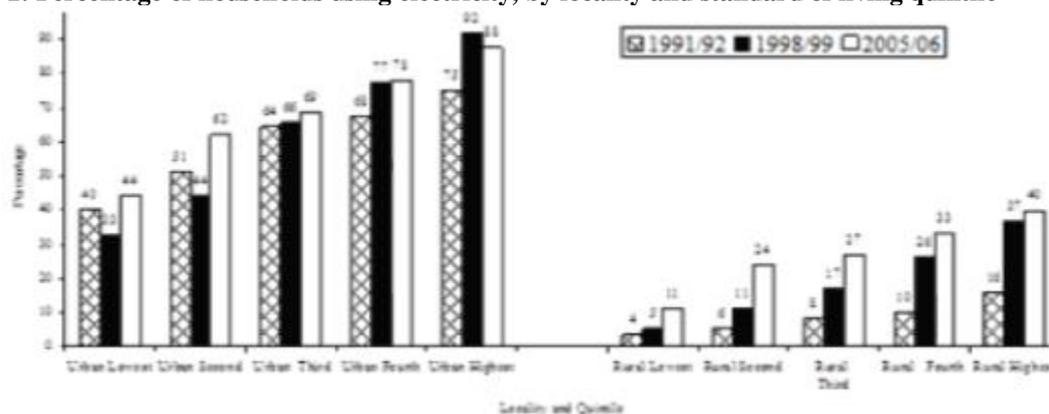
4.1. Energy Access and Productive Uses in the Slum Enterprises

The Ghana Statistical Service (2008) identified that electricity is the main source of lighting for 79 per cent of urban households and 53 per cent of these households use charcoal for cooking. A larger proportion of urban households (20%) use Liquefied Petroleum Gas (LPG) for cooking than rural households (9.5%). The proportion of households using LPG as cooking fuel in Accra is the highest (34.5%), compared to other areas of the country (Ghana Statistical Service, 2008).

Disaggregating access to electricity by income levels (see Figure 1) shows that access rates are quite low for the urban poor. The percentage of the urban poor at the lowest level of the income quintile that had access to electricity as of 2005/2006 was 44 per cent, whereas 88 per cent of those at the highest level of the income quintile had access to electricity (Ghana Statistical Service, 2008). This points out that there is disparity in access to electricity between the rich and the poor in urban areas. The case for LPG may be similar to that of electricity. Though disaggregated on people's economic status, AMA (2010; *unpublished*) argues that there are pockets of poverty in all parts of the metropolis (including affluent residential areas in Accra such as Airport, East Legon and Dzorwulu residential areas). Thus, the statistics presented on the urban poor's access to energy services are not specific to the slums but the urban poor in general who have widespread locations in the urban

areas. Furthermore, the nature of productive activities the urban poor use the energy forms for is unclear in the available information.

Figure 1: Percentage of households using electricity, by locality and standard of living quintile



Source: Ghana Statistical Services, 2008

Vital as these data are, they point out the knowledge gap on slums' access to energy services for productive activities. The knowledge gap can be attributed to the slums' location. In Ghana, majority of the slums are located in the cities and therefore their energy access is usually aggregated with general access in the urban areas (Accra Metropolitan Assembly, 2010, *unpublished*; Kumasi Metropolitan Assembly, 2006, *unpublished*; PDG and GHAFUP, 2006, *unpublished*). Attempts to examine the poor's access to energy services for productive activities consider the urban poor in general but not specifically the slum dwellers where level of poverty and peculiar needs are unique (Ghana Statistical Service, 2008).

Consequently, there are no specific policy targets on the slum dwellers' access to modern and safe energy services to support productive economic activities. The slum abatement policies in the Growth and Poverty Reduction Strategy (GPRS 2) do not consider energy access as a strategy to improving the plight of the slum dweller (see Government of Ghana, 2005b). The emphasis of the slum abatement policies have thus been on eviction rather than improvement.

Underpinned by the slum energy access data gap, the researchers examined the productive uses of energy within the slum with the overall intention of addressing the data gap and informing policy formulation and implementation towards enhancing the living conditions of the slum dweller. The paper's intent is justified by the consensus that clean, efficient, affordable and reliable energy services contribute massively to creating resilient local economies necessary for effective poverty reduction. It follows therefore that productive uses of energy depend on many factors including availability, accessibility, affordability and acceptability of the form of energy service in question.

4.2. Energy Supply and Utilisation in Slum Enterprises

The researchers identified that the enterprise owners in the slums used a wide range of energy for several purposes including lighting, freezing, cooking, baking and heating.

The authors identified that all the provision shops used electricity for lighting and 55 per cent of them used electricity for keeping water and beverages frozen. Food vending enterprise owners used diverse energy forms for multiple purposes. The study identified that 75 per cent, 20 per cent and 5 per cent of the food preparation and vending enterprises which run their enterprises at night used electricity, kerosene and candle, respectively for illumination. The use of electricity for lighting purposes was limited to the food preparation and vending enterprises which operated in permanent structures with canteens where customers usually sit to dine. The food preparation and vending enterprises which used electricity for illumination also used kerosene (65%) and candle (35%) for lighting purpose in times of power outages which were frequent and often unannounced in the slums. The end-use equipment for the conversion of electricity to light energy were electricity bulbs (incandescent, 50%, fluorescent, 15% and compact fluorescent light, 35%) and kerosene lamps (hurricane lamps 35% and simple wick lamps, 65%) for lighting.

The food preparation and vending enterprises used firewood and charcoal in traditional stoves and coal pots, respectively, for the preparation of food. The survey identified that the food preparation and vending enterprise owners preferred to use firewood for cooking some of the local dishes (such as 'banku, tuo zaafi, rice, fried and boiled yams and fufu), the preparation of some of which require vigorous stirring which makes the local cook stoves more preferable. Further, cooking large quantities of food requires the use of large cooking pots and

again the traditional cook stoves are preferred for cooking these large quantities of food. A further probe revealed that firewood was considered as the most efficient energy type relative to LPG and charcoal. The response below from a food vendor who employs about 20 workers in Old Fadama is used to elucidate the enterprise owners' perception about firewood.

"Firewood cooks faster than any other energy type I have come across. LPG and charcoal can serve the same purpose but at a higher cost which will increase my operational cost".

Another food vendor in Akwatia Line also indicated that;

"Firewood is readily available because of our proximity to the saw mills in the community. We are assured of a constant supply at affordable prices".

The survey also identified that food preparation and vending enterprises which provided service to not more than 100 customers in a day used charcoal for the preparation of soups and stews. The reason given was that:

"Smoke from the firewood gets absorbed in the soups and stews and changes the taste. The bad taste of the food triggers complaints from customers. I, therefore, use charcoal to prepare my soups and stews".

Electricity and firewood were the major energy types used by groundnut paste production enterprises for the processing of groundnut into groundnut paste. The groundnut paste producing firms in Amui Dzor used electricity for lighting only when dusk fell. The study noted that the groundnut paste enterprises in Amui Dzor were operated as home-based enterprises and thus used the same electricity source for both domestic and commercial purposes. Those working at Akwatia Line used electricity for lighting purpose throughout the day due to the dark environment the workers operate in. The need for cleaner energy options in the enterprise was explained by the dark environment caused by the smoke accumulation as shown in Figure 2.

Figure 2: Smoke from Firewood engulfs the Working Area



The groundnut paste enterprise owners used firewood to boil water to soak the groundnuts and to set fire to roast it. Due to low moisture content of the groundnut during certain periods (i.e. after harvest) of the year, the groundnut paste producers at Akwatia Line use LPG to roast the groundnut. The main energy conversion equipment identified in the groundnut paste enterprises was the three-stoned stoves and groundnut roasters. The three-stoned stoves were used to boil water while the roasters used firewood and LPG in processing the groundnuts (refer to Figure 3).

Figure 3: Groundnut Paste Processing Chain



Running of public bathrooms was identified as major and active enterprises in the three slums. Public bathroom operators used firewood, which they think is most efficient for heating water to serve customers who requested for warm water to shower. They used firewood to heat water using metallic barrels and three-stoned traditional cook stoves as indicated in Figure 4.

Figure 4: Firewood is used to heat water for use in commercial bath houses



The public bathroom enterprise owners used electricity to light up their premises in the evenings. Water heating was done at all times (wet and dry seasons) at Akwatia Line and Old Fadama but was done only in December and early parts of January when the temperatures dropped below normal temperature levels (between 15 and 18 degrees Celsius) in Amui Dzor. The water-logged environment occupied by the inhabitants of Akwatia Line and Old Fadama partly explains the inhabitants' desire for warm water for showering.

The fish and meat processors working in the slums used firewood to smoke fish and meat, using a special type of stove manufactured by local artisans from metallic drums as depicted in Figure 5. Fish and meat smoking was done in the open and in the day time. Thus, the enterprise owners did not require any form of lighting to run their commercial activities.

Figure 5: Traditional Firewood Stove for Fish Smoking and Grilling



It was observed that the bakers used LPG as the main energy type in their enterprises with LPG ovens as the end-use equipment. The need to use the mobile LPG stoves in the slums is due to the tenure insecurity.

In the case of the scrap metal dealers, petrol and kerosene were identified as the major energy types used for their operations. The two energy types are used to set insulators ablaze in order to expose the metallic content. The scrap metal dealers also used LPG to cut bulky scrap metals into portable sizes for onward sale to steel manufacturing companies mostly in the Tema industrial area.

The hairdressers used electricity to run their businesses. The energy conversion equipment used by the hairdressing enterprises were hair dryers and electric bulbs for hair drying and lighting, respectively.

The results of the survey showed that the main energy forms used by the video centre operators were electricity and petrol. Electricity was used to power televisions sets, video cassette disc (VCD), digital versatile disc (DVD) and satellite dishes. Petrol is used during power outages to run generators which are always on the standby to keep the video centres running.

4.3. Expenses on the Energy used by the Slum Enterprises

The authors identified that enterprise owners who used electricity in their enterprises and operated in Old Fadama and Akwatia Line paid an average of GH¢8.2 and GH¢7.0, respectively as their monthly electricity bills. The enterprises included video centres, food preparation and vending, provision stores and public bathrooms. It was noted that 63.7 per cent and 89.8 per cent of the enterprise owners in Old Fadama and

Akwatia Line, respectively, did not have their own electricity metres and thus were connected to other people's electricity metres¹. The metre owners collected monthly bills from the enterprise owners who did not have their own electricity metres. The owners of the electricity metres used the number of dwellings connected to the metre to determine the bills to be paid. A comparative analysis of the monthly bills paid in the slums revealed that enterprise owners in Amui Dzor paid an average of GH¢14.8 as their monthly electricity bills. Electricity bills in Amui Dzor were higher due to the high proportion (92.1%) of electricity metre ownership. Thus, bills paid by enterprise owners in Amui Dzor could be said to be more realistic than the other two slums since the metre reading is the determinant of electricity consumed and therefore the amount to be paid.

Enterprise owners in Akwatia Line and Old Fadama are constrained from accessing electricity metres from the Electricity Company of Ghana (ECG) due to their lack of permits to reside at these premises. They are squatters who occupy lands outside the planning zones. King (2010) argues that utility companies are unwilling to extend their services to the illegitimate slums for fear of being seen to be legitimising the slum settlements.

Bakers who used LPG spent between GH¢30-50 per week on the fuel for baking. Scrap metal dealers spent an average of GH¢15 on LPG. The expenditure on LPG was low because they cut and weld the metal as and when bulky metals were received and these were seldom. They acquired the LPG from fuel filling stations located in the cities. By the slums location in the cities, physical access to LPG is not challenging despite the fact that LPG suppliers do not consider the slums as important sources of market in their market surveys.

Public bathroom and food vending enterprise owners in Akwatia Line spent an average of GH¢4.0 per day on firewood for heating water and cooking, respectively. Sawmills located in Akwatia Line supplied the public bathrooms and food vending enterprises with wood fuel. Public bathroom owners and all other users of firewood in Old Fadama and Amui Dzor bought their wood fuel from sellers within the slums. Sale of wood fuel is a major economic activity for a section of the slum dwellers, since many of the slum enterprises relied on it for cooking.

Groundnut paste producers in Amui Dzor spent between GH¢150-200 per month on firewood for boiling water and roasting groundnut. However, due to its relatively larger size, the groundnut paste production enterprise in Akwatia Line spent between GH¢500-600 on firewood per month for the same activities. The firewood was supplied by another group of economic actors whose occupation it is to buy and transport firewood from the rural farming communities to the urban areas. Supply is done fortnightly. The firewood is stored in the open at the mercy of the rain and sun as shown in Figure 6.

Figure 6: Heaps of Firewood Stored in the Open for Future Use



4.4. Problems Associated with Supply and Utilisation of Current Energy

The study identified that enterprise owners regarded the supply of kerosene, firewood and charcoal as regular and always available. General shortages in the supply of LPG in Ghana, at certain times, however affect the operations of bakers. Similarly, the supply of electricity was irregular. According to the enterprises, electricity supply was characterised by frequent and unannounced interruptions and low voltages. During the key informant interviews, community leaders disclosed that *“a day has never passed without power outage. As for low current, it is a ritual in Akwatia Line”*. This is explained by the fact that apart from the genuine power outages where ECG takes responsibility for, the illegal electricity connections associated with slums also contribute to the frequent power outages in the slums.

Recounting her frustration, a hairdresser operating in Old Fadama also had this to say:

“During periods of low voltage, my customers patronise the services of other hairdressers who may have normal power supply or use generators as standby sources but that becomes income lost to me for the period”.

¹ Enterprise owners who were connected to others electricity metres were known as BACK-PASSERS in the local parlance.

The findings show that low voltage and power outages were pervasive in Old Fadama and Akwatia Line due to ²illegal electricity connections. The Electricity Company of Ghana (ECG) does not plan to meet the electricity needs of the slum dwellers because of their location outside the planning zone and that the supply is probably inadequate to meet the needs of electricity users in the three slums. Enterprises such as hair dressing, petty retail stores and video centres were the major businesses that were affected by inadequate power supply. A probe to clarify why the slum dwellers do not acquire electricity from ECG revealed that due to their lack of building permits, ECG refuses their applications for electricity connections. This however, has not prevented them from accessing electricity as some enterprises are connected to the electricity metres of enterprise owners who successfully obtain electricity metres. The owners of the electricity metres (i.e. those who successfully obtained electricity metres) in turn levy a fixed charge for the supply of electricity to their counterparts. Other enterprises are connected directly to the electricity polls without recourse to regulations; implying losses to ECG.

The enterprise owners that used firewood perceived its usage as harmful due to smoke emission. The worse affected enterprises were those into food preparation and vending, public bathhouses and fish and meat processing. Many of the enterprises indicated that the problem is worsened with the onset of rain as it becomes not only difficult to lit the fire but also produce very thick smoke. Smoke and excessive heat from the combustion of the fuels used in the enterprises was also major worry to many owners of enterprises, particularly those that used the wood fuels.

4.5. Preferred Energy Types and Reasons for their Preferences

Recounting the frustrations the enterprise owners go through for the supply and use of the various energy forms, the study showed that most of the enterprise owners prefer alternative sources of energy.

Linked to its intermittency, video centre operators, petty retail store owners and hair salon owners expressed their desire for improvement in the supply of electricity. To them, there are no other alternatives that are better than electricity. They argued that the use of kerosene and diesel-powered generators are far more expensive than electricity. The enterprise owners who had no electricity metres would want ECG to relax their electricity acquisition requirements to enable them acquire their own electricity metres.

The owners of the food preparation and vending enterprises and public bathhouses expressed their desire for affordable alternatives that could supply uninterrupted power. Due to the hazardous smoke emission and excessive heat associated with firewood use, the food preparation and vending enterprises as well as public bathroom operators wished for alternative sources of energy that produce no or less smoke, and are affordable. Asked to explain why they desire to have alternative energy forms, a food vendor in Akwatia Line said:

"I cannot continue to use firewood due to the hazardous smoke and heat. I need an alternative because I think I cannot continue to be in business in the next few years due to health problems which I am likely to suffer from as a result of the continuous exposure to smoke and heat".

Owners of the bakeries preferred to use LPG to any other fuel but wished for a constant supply. Some food preparation and vending enterprise owners expressed their desire to use LPG because they are of the views that it would cook faster and would be easy to use, but the supply is not regular. They also argued that LPG generates a cleaner source of energy than firewood. Besides, the LPG cylinder requires a smaller space for storage compared to firewood. Despite these attributes, the LPG is considered to be dangerous and expensive by all the food vending enterprise owners. Frequent fire outbreaks in slums in Ghana and the accidents associated with the use of LPG discourage some slum dwellers from opting for it, irrespective of the benefits.

5. Conclusion and Recommendations

The analyses of the data from 88 enterprise owners in the slums have revealed that the slums enterprises use a variety of energy for their productive activities. Public bathroom and food preparation and vending enterprises each use firewood to heat water and prepare food, respectively. The food preparation and vending enterprise owners also use charcoal to prepare soup and stew. The public bathroom, groundnut paste producers and food preparation and vending enterprises use traditional cook stoves as the end-use equipment for the conversion of firewood to heat energy.

The rest of the enterprises (provision stores, hair dressing salons, and groundnut producers) use electricity for lighting purposes with fluorescent, compact fluorescent and incandescent bulbs as the end-use equipment. Besides lighting, hair dressing salons use electricity to power their dryers to dry the hair of their customers.

² Illegal electricity connection refers to connections from unauthorized sources such as from neighbours or tapped direct from the electric polls by the slum dwellers.

Video centre operators also use electricity to operate their enterprises. However, due to frequent unannounced blackouts, the video centre operators use diesel/petrol as backup energy forms in standby generators. Scrap metal dealers use petrol and kerosene to burn off insulators to expose the metallic content. The scrap metal dealers also use LPG to cut heavy and bulky metals into portable sizes.

In sum, the study has revealed that enterprises in the slums make use of variety of energy forms to support their economic activities. Energy is thus a major determinant of decent employment towards poverty reduction in the slums. Despite this conclusion, the enterprise owners are confronted with several challenges in their access to the various energy forms particularly, electricity.

The paper recommends that the slum dwellers' access to electricity for productive activities should be enhanced by the ECG relaxing its requirements for the acquisition of electricity metres. This move would not only enhance the enterprises' access to electricity for productive uses but also cut down the practice of illegally connecting to the national grid and the subsequent losses to the utility companies.

A further research into the viability of using solar (solar heaters) substitutes for electricity in the public bathrooms is recommended. The researchers further recommend the development of biogas systems in the slums to supply sustainable energy for food preparation, groundnut paste production and welding. But this should go with some education for the acceptance of the technology. This could be sustained by the public toilets (Kumasi Ventilated Improved Pit latrines) that abound in the three slum communities.

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