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Barriers to Energy Access in the Urban Poor Areas of Dhaka, Bangladesh: Analysis of Present Situation and Recommendations

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ABSTRACT: Energy is a crucial input to promote socioeconomic development. In Bangladesh, about 96 million people (59%) do not have access to electricity and 143 million people (88%) still depend on biomass for cooking. The urban poor living in slum areas with lack of access to clean and modern sources of energy have not been addressed comprehensively. The main objective of this study is to identify the barriers faced by the urban poor in the slum areas of Dhaka in accessing different fuels and provide specific recommendations to overcome the barriers to enable energy access. The study is mainly based on field survey covering 185 households of the four major slum areas of Dhaka, literature review, and stakeholder interviews. Many barriers have been identified through this research where urban poor face problems in accessing legal energy services due to illegal settlement, lack of explicit policy on energy and housing, lack of dedicated institution, the pervasive role of Mastaans, poor infrastructure and lack of monitoring and evaluating system. Barriers specific recommendations are also suggested based on the experiences from the field visit and the best practices outside Bangladesh are also identified.

Keywords: Urban poor; Energy access; Energy policy; Slums; Dhaka
JEL Classifications: C83; G28; R28

1. Introduction

Energy is considered as one of the crucial inputs to eradicate poverty and promote socioeconomic development of a country. According to UNDP and WHO (2009), 1.3 billion people did not have access to electricity and almost 2.7 billion people relied on the traditional use of biomass for cooking in the world. Modern, affordable and improved access to energy and its services are crucial to stimulate social, economic and environmental development. Bangladesh is one of the densely populated nations in the world with a population of over 150 million in 2011 and more than 1,143 people live per square kilometer (World Bank, 2011). About 31.5 percent of people are living below the national poverty line (HIES, 2010). The country's per capita GDP was US$ 1690 (World Bank, 2010) where the GDP growth rate is only 6.7 percent (WEC, 2012). BPDB (2011) reported that, due to scarcity of natural gas reserve and unavailability of electricity supply, US$ 3478.26 million are lost every year. The annual energy consumption is 209 kgOE/capita in 2010 which was very low compared to world's average of 1790 kgOE.

Dhaka, the capital city of Bangladesh is one of the fastest growing cities in Southern Asia has a population of more than 13 million people, and is expected to accommodate more than 20 million by 2025 (UN-HABITAT, 2009). However, after independence of the country there was a substantial influx of low income people from rural to urban areas. Around 300,000 to 400,000 people migrate to Dhaka city from rural areas annually. They squatted on government lands, road side lands, abandoned lands and buildings. From 2001 to 2005, the total urban population of Dhaka has increased from 6.5 to 9.1 million while the total number of slums have risen from 3,007 to 4,966. Besides, the percentage of population living in the slum areas of Dhaka increased from 20% to 37% during the same period (CUS, 2006).

Table 1. **Number of wards, area, total population and slum population of five study cities, 2005**

City	Number of Wards[1]	Total Area in sq. km[1]	Total City Population 2001[1]	Total City Population 2005 (Estimate)[2]	Slum Population 2005[3]	Slum Population as % of City Population (2005)
Dhaka Metropolitan Area (DMA)	90 Wards and 12 Unions	306	6,550,209	9,136,182	3,420,521	37.4
Chittagong	41	177.39	3021,618	4,133,014	1,465,028	35.4
Khulna	31	47.52	732,720	966,37	188,442	19.5
Rajshahi	30	51.29	367,314	489,514	156,793	32
Sylhet	27	27.50	265,372	356,440	97,676	27.4
Barisal	30	51.04	273,384	365,059	109,705	30.1
Total six cities	**249**	**660.74**	**1,121,0617**	**15,447,04**	**5,438,165**	**35.2**

Source: [1]BBS, 2003, Population Census 2001; [2]Estimated by CUS Slums Study Team, 2005; [3]CUS Slums Study, 2005

The population density of Dhaka slum was 891 persons/acres in 2005 which is 7 times higher than the overall gross population density (121 persons/acre) of Dhaka (CUS, 2006). In 2010, about 31.5 percent people lived below the poverty line and most of them are expected to live in the slum areas (HIES, 2010). There are many reasons which are responsible for high growth rate of slum[1] settlements in the city. Due to its topography, the city has limited habitable lands which are not sufficient to accommodate all its citizens. The poor people who migrate from rural areas to find a suitable job do not have sufficient income capacity to rent houses in the formal sector. Besides, due to the differences in land price between core and peripheral areas, growth of slums is higher in peripheral areas of the city. (CUS, 2006). However, 96% of urban poor get connected to electricity and 58% have access to natural gas. The majority of them use firewood for cooking. Due to illegal settlement, urban poor are either facing the threat of eviction or have been evicted (7%) (CUS, 2006).

The paper highlights some of the common obstacles facing by the urban poor in accessing different energy services. The article also delivers some possible instructions and recommendations regarding policy direction in accessing different fuels used by the urban poor. Besides, barrier specific good practices i.e. successful policies/initiatives that have supported energy access for the urban poor has also been collected and complied.

2. Methodology

Household survey was conducted among slum dwellers of Dhaka city in four different Thanas: Gulshan, Pallabi, Hazaribagh, Shaympur. These four Thanas were purposely selected for the study since they have the largest slum communities of Dhaka considering population, area size and number of years people lived. 185 households from ten different slum communities namely as Korail, Beunia

[1] In Bangladesh, the definition of slum by the Bangladesh Bureau of Statistics (BBS) is, "Predominantly very poor housing structure, Jhupri, Tong, chhai, tin shed, semi-puccca flimsy structure, dilapidated building in bad condition, very high housing density, grow on govt./semi govt. vacant land and public owned places, abandoned buildings/places or by the side of the road, having poor sewage and drainage or even it has no such facilities, inadequate, unhealthy drinking water supply, prevailing unhealthy atmosphere, insufficient or absence of street lighting, little or no paved street, inhabited by poor, uneducated and below poverty level people".

Badh, Bihari Camp, Beri Badh Balur Ghat, Lau Tola Balur Ghat, Rayer Bazar Boddho Bhumi (front, behind & east), Nampara Soba Potti, Rail Gate were surveyed. First, Purposive sampling method was used to select the location of the study area. Then, a random sampling method was applied to select sample household in each slum communities. Each selected household is considered as a unit of sample in this study. The random sampling technique was chosen to avoid any kind of bias in the study.

Both primary as well as secondary data on energy access of the urban poor in slum areas of Dhaka were collected as follows. The data collection was taken place during November and December, 2012. The primary data were collected by using observations, and by both formal and informal interviews. It was also necessary to meet key informants who are responsible to provide services like electricity, natural gas in slum areas as well as with different stakeholders, NGOs, slum leaders. Both standardized questionnaires and checklist based on the research questions were used. The survey was mainly aimed at identifying major barrier in accessing different fuels. Primary information was collected through **Reconnaissance Survey, Direct observations, Key informant Interview, Households survey and focus group discussion.**

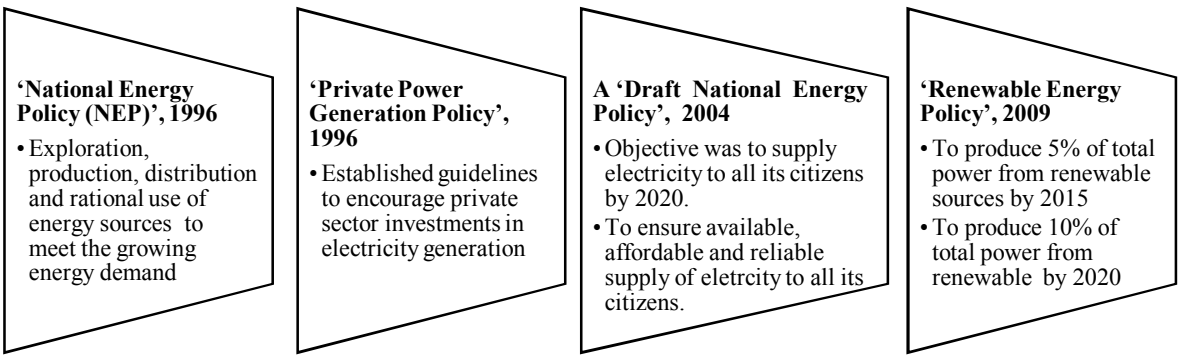
Secondary data and information was collected from various sources like annual reports, previous thesis, research papers, journals, recognized website and documents available in different agencies like BBS, LGED, BIDS, BRAC NGO, NDBUS NGO, DCC, NHA, Petro Bangla, BERC, DPDC and DESCO and other concerned agencies. Some international articles (UNDP, World Bank) regarding energy and poverty of Bangladesh were also reviewed.

3. Barriers to Energy Access

3.1 Energy policy barrier

The government has introduced several energy policies since 1996, but none of the policies highlighted the need of energy for the urban poor as a part of the basic service.

Figure 1. The major energy sector policies (UNDP, 2007)



Besides, wide-ranging policy on urbanization specifically urban poverty is missing. Also, there is no policy in relation to improving cleaner energy or energy efficiency. The government has set up policies which are more towards expanding electrification rather than being focused on end uses or energy applications (UNDP, 2007). However, the interview with key informants[2] also supported the literature which means there is no explicit energy policy for the urban poor.

UNDP (2007) also reported that, policies for each sub-sector, such as Power Policy, Petroleum Policy, Private Sector Policy and now the Draft Renewable Energy Policy have no linkages with the policies and programs of other sub-sectors which means that, there is no coordination in policies and programs in the functioning of sub-agencies or companies under the ministries of these sub-sectors. For instance, sub-sectors such as energy and minerals do not coordinate their policies and programs with each other, but they do coordinate with the power sector independently. As a result, lack of

[2] Interview by the author with **Engr. Imdadul Haque**, Chairman, Bangladesh Energy Regulatory Commission (BERC), Dhaka, 02.11.2012

collaboration among the institutions with several policies not only lead to policy confusion in the energy sector, but also weaken the regulatory environment.

3.2 Housing policy barriers

Legal settlement is a pre-requisite to get legal energy services. In order to have legal energy access, the provision of affordable housing for urban poor should be emphasized first. The government has already emphasized the need for providing affordable housing for urban poor and therefore, has introduced several policies in order to establish housing rights for the urban poor.

The National Housing Policy (NHP) was first introduced in 1993. After a long time break, the government came forward to modify the NHP (1993) in 2004. But the modified version is still in the draft stage and awaiting for the government's final approval. Hence NHP, 1993 is considered to be the available approved official policy for housing provision. The key policy statements under the NHP, in line with housing for the urban poor, is *"The urban poor will be given the advantages in receiving the housing rights where different prices will be offered according to their affordability"*. But in reality, the strategic provisions of the NHP, 1993 have not been executed. There is no regulatory laws or legislations which have been enacted to support NHP (1993). As a result, no government has been successful in establishing housing rights and preparing plans that truly take care of the affordable housing needs of the urban poor living in the slums of Dhaka (Rahman, 2009).

Shafi (2005) reported that, in line to provide affordable housing to the urban poor, a project was introduced by a private development company called North South Property Development as well as the Ministry of Land (under the 2001-2006 Government) in 1999 with an aim to build 15,000 small flats for the 'poor and landless' which has still not been implemented.

Bari and Efroymson (2009) found that RAJUK started to prepare the Dhaka Metropolitan Development Plan (DMDP) for Dhaka city through a strategic planning approach in 1995. First, Urban Area Plan (UAP) (1995-2005) was proposed which emphasized the relocation of the urban poor to safer and healthier places in Dhaka city. But the policy did not specify the possible time duration for such relocations. Although, it was emphasized by DAP policy to provide affordable housing for the urban poor near their workplaces, what it happened was exactly the opposite in reality. Approximately 4.5 million slum dwellers relocated to surrounding areas outside the central Dhaka city which were less attractive to the urban poor in terms of opportunities of finding a job and other facilities.

Later, the Detailed Area Plan (DAP) (2005-2015) was proposed to upgrade the existing slums as well as to develop low cost housing in different parts of Dhaka city. But the slum upgradation approach was limited in some areas including Jhilpar slum, Islambagh, and Shahid Nagar (DAP, 2008). Bari and Efroymson (2009) claimed that, the proposals for low-cost housing development are hypothetical in nature. In reality, this proposal does not answer the important land use questions, such as: How much land will be assigned for slum development? How many people will be rehabilitated under low-cost housing development initiatives, and from where? Are the slum dwellers willing to move to the allocated lands? Will the slum dwellers be given tenure/property rights at their existing locations with the right to transfer? If so, how?

However, interviews with key informant[3] also gave information on various policies and programmes regarding housing rights of the urban poor. But the major problems reported by the key informant in implementing the policies are the limited availability of resource land and the high price of land in Dhaka city. Also, a huge number of urban poor make it difficult for proper rehabilitation.

3.3 Institutional Barriers

It was observed that, there is no centralized institutions which can truly take care of the energy services in the slum areas. In the early 90s, Dhaka City Co-operation (DCC) established a Slum Development Department with an aim to improve the physical infrastructure in the slum areas of Dhaka city. But, there are no linkages between the slum development department of DCC and energy service providers at national or local levels, thereby hindering the growth of slum energy services. However, the key informant[4] stated that, only program the department has related to energy access of slum areas is to improve street lighting. But there is no explicit plan and program for improving

[3] Interview by the author with **Engr. Md. Nurul Huda**, Chairman, Rajdhani Unnayan Kartripakkha *(*RAJUK*),* Dhaka, 06.11.2012

[4] Interview by the author with **Anwar Hossain Patwary**, Chief Slum Development Officer, Dhaka City co-operation (DCC), Dhaka, 07.11.2012

energy access in term of proving clean fuels, meter electricity connection, etc. at an affordable price. The key informant also mentioned that, one of the major problems of the department has, is the lack of fund which has always been very small, has delayed the execution of the programs, Besides, other agencies who are responsible to take care the urban development do not address slum energy needs.

Islam et al. (2009) mentioned that, urban policy gets conflicted due to dual metropolitan power and control between DCC and other agencies. Although the DCC is an autonomous body, but it is controlled by the Ministry of Local Government, which means that, there is sufficient control and leadership of municipal government over municipal affairs. The DCC cannot alone provide services to the urban poor related to electricity supply and natural gas but to depend on DPDC, DESCO and Petro Bangla for their acknowledgment and support for final decision making to implement the plan. The overall scenario results not only the poor urban governance but also causes major urban problems. Due to this problem, DCC has been unable to make a fruitful plan and program to improve the energy accessibility in slum areas.

Institutionally, there is little or no understanding/appreciation of the relationship between energy and poverty. Energy sector institutions behave autonomously and interact little among themselves, and thus their policies and programs are non-synergistic and often contradict with each other. Also, the institutional management structure is highly centralized where decision making is top-down, which inhibit participation of private sector players and other stakeholders (UNDP, 2007).

3.4 Lack of NGOs involvement in housing and energy access issues

NGOs are the major institutions in providing the basic services to slum dwellers. Habib (2009) found that, most of the NGOs are working to deliver health services, supply clean drinking water as well as arrange different small educational and academic programs to teach the children. Some NGOs also work on improving sanitation, and help urban poor by giving credit. The above information clearly suggests that, affordable housing provision as well as supplying clean fuels is not considered as the basic needs of the urban poor.

However, the key informant[5] explained the reasons for limited involvement to work in slum areas of Dhaka. The very high land prices in Dhaka are one of the main reasons. In addition, working in Dhaka is found high risk by different NGOs due to the interference of the middleman to extract money from the poor, legal complications of land ownership and the lack of willingness, support and commitment from the Government.

Besides, slum development programs always get halted due to the government evictions. Lankatilleke (2002) mentioned that, High Court cases were filed by some of the NGOs which was against the government on the subject to slum eviction. Without giving proper rehabilitation, the government will not allow to evict any slum dwellers, ordered by the High Court, but the judgment was not strictly followed. Due to this unpredictability on slum settlements, NGOs do not come forward to provide credit and other support services to slum dwellers.

In terms of supplying electricity and natural gas in urban slums, the government agencies such as DPDC, DESCO, Titas gas are the major service providers to the city dwellers. The key informant also mentioned that, NGOs do not have sufficient legal authorization in providing legal electricity supply as well as to supply clean fuels for cooking. It is the responsibilities of the different government agencies to look after the energy issues of urban poor, but most of the cases the government fails to do so. In addition, slum upgrading activities were governed by the DCC along with coordination of other agencies. Many NGOs as well as concerned authorities and ministries also depend on DCC, but very often, the DCC failed to work together (Rashid, 2009). To achieve institutional as well as infrastructural support, there should have strong cooperation between NGOs and government agencies.

3.5 Illegal settlement

Legal recognition of the settlement is the pre-requisite for a household to access legal energy services like electricity. The key informant[6] reported that, due to the illegal nature, urban poor automatically get excluded from the formal delivery services as they do not have a valid residence address and other pre-requisite documents.

[5] Interview by the author with **Ms. Maria A**. Programme Manager, BRAC NGO, Dhaka, 12.11.2012

[6] Interview by the author with **Eng. Sha Alam,** Director (Engineering), Dhaka Electricity Supply Company (DESCO), Dhaka, 05.12.2012

Barrett and Dunn (2006) found that, 80 percent of the land is authorized by 30 percent of the city's population while the remaining 70 percent of the population have access to only 20 percent of land. The result suggests that, accommodating land to all the city dwellers in Dhaka city would be a serious challenge for the government. As majority of poor migrated from rural areas for economic reasons, most of them have very little assets which cannot help them to afford a legal tenure ship. Mahbub and Islam (1991) also noticed that, the land price in residential areas especially in the central zones of Dhaka city is increasing at an alarming rate which forced the slum and squatter communities to be moved towards the city's peripheries in search for cheap shelter.

3.6 Evictions of slum residents

Due to the illegal settlement of urban poor, there is always a fear of eviction. Slum eviction is the main constraint of delivering energy service to slum dwellers. The government agencies, NGOs and donors show reluctance to invest capital in slum settlements if they lost the capital which was invested. World Bank (2007) reported that, around 135 instances of slum evictions have been occurred in Dhaka from 1975 to 2004. The number clearly suggests that evictions have not been decreased after the National Housing Policy (NHP) was introduced in 1993. Moreover, the period between January 2004 and June 2004, slum eviction has been occurred at a regular interval where 17 incidents has been occurred in which 13 were done by the government while others by private groups. Wakely (2007) found that, the large-scale eviction has been taken place in Agargaon which affected 40,000 urban poor. The reasons behind the eviction was the building commercial structure like hospitals, offices and shopping complex as well as environmental cleanup.

3.7 The Pervasive Role of Mastaans

Rashid (2009) reported that, the basic services which delivered to the slum dwellers, are provided by individuals which is called "mastaans". These are the unofficial local leader in slum areas who draw upon their power through political affiliation. Most often, the maastan provides services illegally to slum dwellers by circumventing the system and are also involved in violence and extortion.

However, the focus group discussion during the field survey pointed out that the mastaans are the only service providers in slum areas. Most of them build networks and links with mastaans, to get access to basic services for a high fee. Slum dwellers are helpless in this situation and cannot complain about the high charge of accessing energy services due to fear of physical harm or eviction. Moreover, NGOs cannot work effectively due to the dominance of maastans in the slum areas because maastan feel that, NGOs could be their competitors to the service delivery to the urban poor.

3.8 Financial Barriers

3.8.1 Electricity

- **High upfront cost**

The most significant barrier to access electricity among the poor is the connection fee. Currently, the electricity connection fee for a household is 34,350 Tk. (US$430)[7] which covers the cost of the meter, installation cost and security deposit. This amount is equivalent to about 5-6 months' estimated household monthly income of urban poor in Dhaka city.

- **High electricity bill**

To acquire a legal electricity supply, a proof of residence address is required. As the slum dwellers do not have a valid residence address, they cannot apply for the metered connection. However, despite of the illegality, DPDC and DESCO allow them to apply for legal electricity connection through the pole and shared meter. But to sanction a pole meter, a high amount of advanced electricity bill (3-4 month) is needed as a security deposit which is quite difficult for slum dwellers to afford. Usually, the local leader (maastan) who has strong links with local politicians, municipal authorities, and the police, take charge to provide electricity services to slum areas by taking control on the pole meter. But, the urban poor pay electricity by type of appliances used rather than by unit consumption. Regular price for using one CFL bulb and one ceiling fan is 95 Tk. per month[8] where the urban poor are asked to pay 150 Tk. for each appliance, which means they are paying three times higher than regular price. The extortion practices by Maastan causes more economic disadvantage to slum

[7] 1 US$ = 80 Tk (November, 2012).

[8] Consider a typical slum house where a CFL (25 W) and a ceiling fan (70 W) is used. Assuming 10 hours daily usage time and 30 days a month a slum house consumes {(25 W×10 h×30 day/1000) kWh/month + 70 W×10 h×30 day/1000) kWh/month)} = 28.5 kWh/month × 3.33 Tk./kWh (0-75 unit) = 95 Tk.

residents. Moreover, due to the limited and irregular income, urban poor are unable to afford either the required upfront cost for legal energy access or pay the bills in a continuous or consistent manner.

3.8.2 LPG

- **High upfront cost**

Presently, five private firms called Totalgaz, Kleenheat, Bashundhara, Jamuna Spacetech and Linde import combined 80,000 million tonnes of LPG a year. Besides, the state-owned LP Gas Ltd, a subsidiary of the Bangladesh Petroleum Corporation also produces 20,000 million tonnes of LPG per year which takes the total available LPG supply in the country to nearly 100,000 million tonnes/year. But, LPG demand in Bangladesh has increased to around 500,000 million tonnes/year in fiscal 2011-12 (BPC, 2012). Demand of LPG is growing rapidly due to the scarcity of natural gas.

Though Bangladesh Petroleum cooperation (BPC) sets the price of LPG for domestic usage, but none of retailers maintain the price strictly. The government is unable to control the price due to the high demand of LPG against the low supply. A 12.5 kg LPG cylinder is now being sold at around 1,750 Tk. in the local market though BPC subsidiary rate is 850 Tk. which means that the consumer pays two times higher than the price set by BPC. In order to have new LPG connection, 6,050 Tk. is required including the price of a cylinder (3500 Tk.), LPG gas (1750 Tk.), regulator (600 Tk.) and pipe (200 Tk.). A family consisting of 5-7 member needs two gas cylinder per month which worth is 3,500 Tk. and this cost is higher than firewood and natural gas. The high upfront cost, lack of innovative pricing options and lack of targeted subsidies does not encourage the slum dwellers to use LPG as primary fuel for cooking.

3.9 Physical Barriers

It was observed from the field survey that physical constraint of the poor communities which are usually very crowded with narrow walkways, poor quality of housing material often causes difficulty in the installation, delivery and monitoring of electricity services. Also, slum dwellers find it difficult to place the LPG cylinder due to the small area of the room. As the majority of them use traditional cook stove with a shared kitchen, people feel insecure to locate the LPG cylinder inside their house due to safety concerns.

3.10 Awareness Barrier

Cooking food using firewood is a traditional practice and urban poor are more comfortable to continue with customs which they have been following for many years. It was observed from the survey that, most of the slum dwellers are uneducated and very few of them had completed the primary school. They are more concentrated on economic benefits rather than health benefits. So, the low level of education and limited awareness regarding health and financial benefits of clean and efficient fuels resist the slum dwellers to switch from the firewood consumption to cleaner, less polluting energy sources. Moreover, with limited awareness levels and lack of sufficient knowledge of the urban poor on available energy costs, options and efficient utilization, very often their demand cannot receive priority to the higher authority.

3.11 Lack of Infrastructure

- **LPG**

In order to improve energy access, market transformation as well as appropriate infrastructure is required. It was found that lack of access to LPG cylinder outlet is also a constraint to obtain a LPG cylinder. There are only twenty official Mobile Retail Dealers (MRD) operating in Dhaka while the unofficial number of MRD is approximately 75 (BPC, 2012). This number is very much insufficient to meet LPG demand as well as to encourage the urban poor to use LPG as primary fuel for cooking.

- **Electricity**

Scarcity of electricity has always been a severe problem since the country got its independence in 1971. Bangladesh has not become self-sufficient so far to deliver regular and quality of electricity supply due to low plant efficiencies and high system losses. However, the fundamental problems associated with lack of power generation are the inadequate supply of modern fuels, constraints of adequate foreign exchange, budget constraints for making large investment to generate electricity, inadequate institutional and personnel capacity to implement policies and lack of appropriate national and regional partnerships. Power sector reforms have been carried out over the years but, in practice, these were not happening in effective measures (UNDP, 2007). According to the DESCO (2011), load shedding occurs at least 6-7 hours daily in cities and 12 hours in the villages. The existing demand is

nearly 2,000 MW in Dhaka city, but around 1,000–1,200 MW of electricity is supplied. As a result, load shedding takes place at regular intervals in a day. Now, the question has left to answer is whether this inefficient power plants can meet demand in slum areas while it has already failed to deliver regular and quality of electricity services to residential, commercial and industrial areas.

3.12 Lack of monitoring and evaluation system

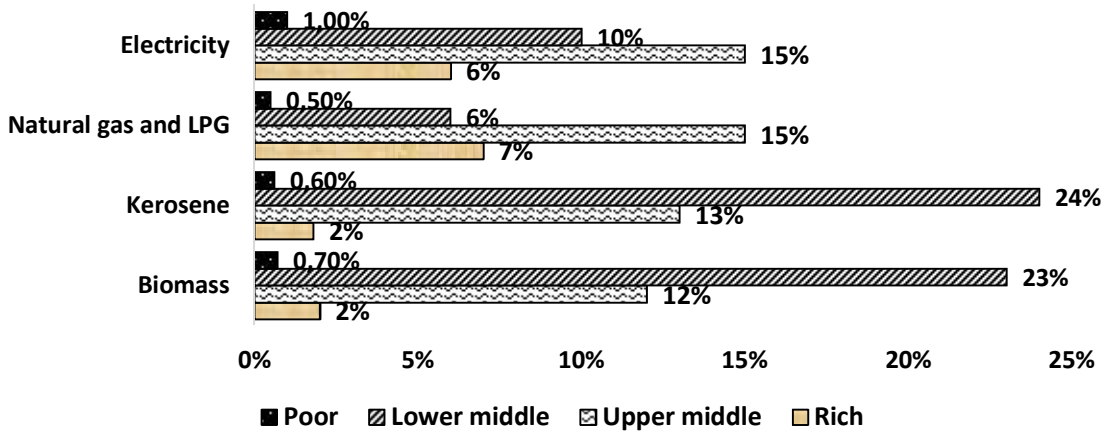
It was observed that utility companies do not get directly involved with slum communities, but rather they work via medium known as maastans. The responsibility of the utility companies is restricted only to sanction a pole meter. Mastaans takes control of the pole meter and provides electricity supply from pole meter to households where they charge slum dwellers very high price for using different appliances. The utility company do not concern about the billing methods (payment by equipment type) of urban poor. The above scenario clearly suggests that, there is a lack of effective monitoring practice as well as transparent approach by the utility companies including purchasing power, ensure quality control and optimal resource utilization.

There is no central agency which can review the energy use in the slum areas. Besides, identification of influencing parameters related to energy, assessment of energy saving opportunities, adaptation a strategic approach to improve energy efficiency and optimization of energy supply in slum areas is also missing. Also, there is no energy management system that can provide information on energy in slum areas regarding planning, monitoring, and implementing measures to improve energy performance. Besides, there is no baseline database which can be used as a benchmark to make plans for future initiatives (UNDP, 2007).

3.13 Lack of effective subsidies targeting the poor

Successful implementation of the energy subsidy mechanism has been always a question in Bangladesh. The government has introduced the subsidy of different fuels to all its citizens resulted less benefit to the urban poor. There is a subsidized electricity lifeline tariff which does not appear benefit to the urban poor because of payment by equipment type. Also, the subsidy is given to LPG, but vendors sell the 12.5 LPG cylinder at Tk. 1,750, which is almost double the subsidized price (Tk. 850) which clearly suggest that, there is a lack of control and power of the government over vendors.

Figure 2. Fuel consumption share by different income groups (BBS, 2010)



According to the BBS (2010), the lower-middle-income group (monthly per capita income 1,500–7,999 Tk.) consumes a small share of fuels, except kerosene. It is also seen from the figure, the largest shares of different fuels is consumed by the rich and upper-middle-income households. As a result, they have received the highest share of associated subsidies.

3.14 Lack of information related to energy and poverty (Information Barrier)

According to the HDI (2012), people who lived below the US$ 1.25 PPP a day in Bangladesh was approximately 43.3 percent. The key informant[9] mentioned that, to measure poverty, most often direct calorie intake method or the Cost of Basic Needs (CBN) method are used officially and poverty is

[9] Interview by the author with **Mr. Alaudddin Al-Azad**, Project Manager, Bangladesh Bureau of Statistics (BBS), Dhaka, 28.11.2012

often linked to income, food insecurity, nutrition and water supply rather than related to energy use. Therefore, there is a dearth of information on energy service provision, particularly for slum areas. UNDP (2007) reported that, there are two major reasons which are responsible for this lack of information. The first reason is the lack of understanding in energy programs and projects related to poverty. The second one is the lack of energy initiatives by the government as well as different NGOs. Besides, a common platform at the national or local level to share the experiences and exchange information on the benefits of slum energy intervention has also been missing.

4. Barrier Specific Recommendations

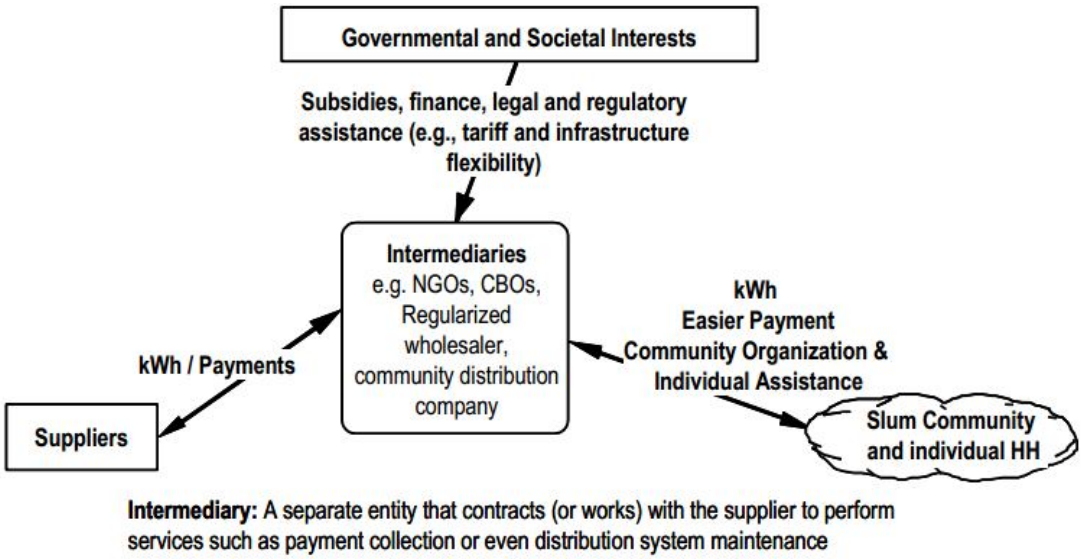
Urban poor in Dhaka city faced a lot of problems in accessing to modern energy services. There are some barriers discussed earlier, should be properly addressed and directed in a feasible way for getting better accessibility of energy in the slum areas.

4.1 Electricity

- **Charged by consumption basis**

Urban poor pay three times higher than regular tariff rate. So it is recommended that, urban poor be charged on the unit basis rather than charged on by equipment type. It could be done by providing individual households metered connection. Metered electricity connection would help the urban poor not only in reducing electricity bill but also create awareness about its careful consumption.

Figure 3. A Model for Successful Slum Electrification Programs (USAID, 2004)



- **Upfront cost reduction**

High upfront of connection is one of the major barriers to provide electricity service to the urban poor. So, it is recommended to reduce the initial connection cost by providing easy installment on the monthly basis could make it easier for slum dwellers to get an electricity connection at an affordable price.

4.2 Firewood

- **Initiatives for Improved cook stove**

As firewood is still the baseline cooking fuel in slum areas, so it is recommended to provide the improved cook stove at an affordable price to reduce indoor air pollution. As some of NGOs already supplied improved cook stove at subsidized price in some slum areas, but it needs more initiatives from the government as well as NGOs so that urban poor can easily get the improved cook stove at an affordable price. It also requires to raise awareness about health hazard issues of using traditional cook stove and encourage them to use improved cook stove. It is also responsibilities of government as well as NGOs to work with the local group and community networks to promote awareness of economic and health benefits of using improved cook stove and provide workshops, training and technical help for improvement.

4.3 Kerosene

- **Ensure efficient Use**

It was found that, in the absence of electricity, kerosene was the major fuel used by urban for lighting and it was used inefficiently by burning it in traditional "Kuppi" or "Hurricane" which emit a lot smoke. As load shedding occurs frequently three to four times in day and usage of secondary fuel for lighting is necessary for household needs, so it is recommended usage of kerosene can be replaced by a rechargeable LED lamp or solar lantern.

4.4 LPG

- **Provisions for reduction in costs**

High upfront cost of LPG connection (6,050 Tk.) and also the refill cost (1,750Tk.) are the major barriers in accessing LPG. It can be dealt by introducing installment in a monthly basis. Installment can be made twice or thrice in a month which would help in promoting the usage of LPG.

- **Promoting smaller cylinder**

Currently, 12.5 LPG cylinder was sold for domestic uses. But the government could consider the small size of LPG cylinder for domestic usage (say 5 kg) in order to make affordable to the urban poor. It will help the urban poor in accessing LPG as the upfront cost is reduced. It could also help the urban poor by keeping two cylinders, in case when gas of one cylinder is running out, others can be used without having any delays in gas refill.

- **Need awareness to increase usage of LPG**

The usage of LPG is still perceived as unsafe fuel to use by the urban poor. Lack of kitchen, poor quality of housing materials, and the presence of children, lack of knowledge about handling LPG cylinder as well as lack of awareness are the main factors which discourage the urban poor to use LPG. It is recommended that, awareness needs to be created about the usefulness and cleanliness of the LPG. In addition, urban poor need appropriate guidelines about the handling of LPG cylinder. Community agent, slum representative or educated people in the slum community can take the responsibility to encourage the slum dwellers to use LPG as primary fuel.

4.5 Need control of market and market transformation

The 12.5 LPG cylinder is sold at 1,750 Tk. in the local market but the government subsidized rate is 850 Tk. Besides, only 20 official dealers and 75 unofficial dealers of LPG are operating in Dhaka. It is suggested that the government should have a team whose task will be to monitor the market at regular interval. The government should give appropriate power to the monitoring team so that they can take appropriate action against those retailers who sell the 12.5 LPG cylinder more than 850 Tk. Also, it is recommended that the government should ease the restriction on setting up LPG plant and set up appropriate rules and regulation to boost up the LPG market by encouraging various private sectors.

4.6 Regulation of land tenure

The illegal status of slum settlement and lack of valid residence address was found as one of the major barriers to access clean energy. Access to legal energy services is inherently linked with valid residence address. So, it is recommended that the government should give emphasis on this issue with high priority. To address this issue, it is required to recognize the slum settlement and give them the authorization of permanent status as a first step. But, in case if it is difficult to give legal status, tenure regulation can be achieved by issuing temporary residential proof which make them eligible to apply for legal energy services.

4.7 Need proper relocation and upgradation of slum settlement

Slum eviction has been taken place frequently due to the illegal settlement of urban poor. Due to the frequent relocation nature of urban poor, they are hesitant to apply for legal electricity services. Though RAJUK proposed the relocation of the urban poor to safer and healthier places documented in UAP (1995-2005) and DAP (205-2015), but the policy did not have specific time frame for such relocation. So, it is recommended that the government should make comprehensive policy for proper relocation of urban poor so that, interest may arise among them to apply for legal energy services with the assumption grown up in their mind that, there will be no fear of eviction. In addition, it is also suggested that, initiatives need to be taken to promote secondary cities surrounding of Dhaka with providing sufficient job opportunities in order to reduce the growth rate of slum population. Besides, urban development and slum upgradation should be running parallel as both targets towards sustainable city development. It is proposed that the community organization can also play a major

role in uniting poor people to improve the settlements, and act a bridge of communication between the poor and government authorities.

4.8 Need specific policy for urban poor on energy access

From the literature review, it was found that the government has introduced some policies for the urban poor. But these policies only concentrated on the improvement of slum infrastructure. Some policies also focused on slum resettlement but none of them highlighted energy access. So, it is necessary that the policy should target the urban poor specifically in the field of energy access. Also it requires proper coordination among various sub agencies in order to avoid any policy confusion. It needs to require the proper collaboration among the various institutions in order to make the regulatory environment effective and strong. It is also suggested to change or revise the policies related to slum development.

4.9 Need specific policy for improving housing rights

As discussed earlier, NHP was introduced in 1993, with an aim to provide the affordable housing to the urban poor. But the government is unsuccessful to establish the housing rights for the urban poor. As affordable housing is a compulsory need for the urban poor, so it is suggested that, the government can introduce the affordable housing to the urban poor for long time installment basis. At the same time it needs to implement NHP and also needs revision based on the current situation.

4.10 Need proper co-ordination among institutions to address energy access issues in slum areas

DCC has a slum development department who only focuses on improvement on the physical infrastructure. It is recommended that slum development department of DCC should focus on providing modern energy services to the urban poor by proper coordination between Dhaka city cooperation and energy service provider in planning and dealing effectively the energy issues of urban poor. It needs to strength the performance of RAJUK and DCC. DCC should have sufficient control and power over DPDC and DESCO, Petro Bangla so that, it can make plans and programmes on improving the energy access in the slum areas with proper coordination. It is also recommended that proper co-ordination should be established between DCC and RAJUK as well as planning ministries in urban development project in Dhaka.

4.11 Need effective role from NGOs to promote awareness on energy access

It was observed that NGOs are not interested to work in slum areas due to tight government rules and regulation as well as legal complication of land ownership. As NGOs are the only service provider in slum areas, so the government should give priority and should give sufficient legalization power to NGOs in implementing their different projects. Besides, NGOs do not consider energy as basic need as they have to depend on different government agencies and also DCC to execute the program. As distribution of electricity supply and other modern fuels is implemented by the different government agencies, so it is recommended that NGOs can raise awareness about the usefulness of using modern fuels instead of using traditional fuels. In addition, they can involve in slum community organizations to raise awareness regarding informing and helping them in the application process of getting legal electricity connection. They can also make attention to the policy makers about the various problems and barriers.

4.12 Need effective subsidy targeting urban poor

The subsidy system in Bangladesh has received criticism for its inequality. There is no effective subsidy highlighted the urban poor. It is suggested that, some innovative mechanism can be proposed which would target the urban poor to provide subsidy more effective. Use of smart cards or energy stamps could be the one of the possible ways to ease the access to cleaner fuels to the urban poor. But, it needs to identify the genuine urban poor so that no one can get the cards illegally. Besides, it also needs a strong monitoring mechanism as well sufficient control and power of government over the various distributors or retailers to make sure the customer feel comfort and convenience of the system.

4.13 Need proper control and involvement in slum communities by government

It was explained earlier in this research that urban poor depend on maastan to get access to various energy services like electricity, natural gas. The government suppliers usually do not involve directly with slum communities. That's why, there is an exclusive domination of maastan in the slum areas. As the services are only delivered by maastan in the slum areas, they take this opportunity by charging slum dwellers an exorbitant price. It is recommended that the government itself can directly control this issue by introducing a community agent in each slum community who would be responsible to provide energy services to slum dwellers. The community agent could act as a medium between the

urban poor and various government supply agencies like DPDC, DESCO and petro Bangla. Slum dwellers get energy services directly from the community agent where the charge will be made at regular tariff rate. Slum dwellers can also claim demand and make complaints which will be conveyed to the supply agencies by community agent. The supply agency along with higher authority should look after the issues and set up appropriate policy and guidelines or revise the existing policy on slum development chaired by the prime minister.

4.14 Need to maintain a comprehensive database for better targeting

In order to target and identify urban poor, it needs to have a strong database. Lack of information on urban poor deprive them from the basic service. It was found from the study that the Center of Urban Study (CUS) is the only institution who has information on the urban poor in the slum areas of Dhaka. But, they update their information at interval of ten years. As the slum settlement is not permanent, and urban poor are frequently moving from one place to another, so it needs to collect data up to date so that it will be easier for the concerned authority to make a plan based on that updated information.

5. Good Practices

A detailed literature review has been conducted to identify how the project related to energy issues was conceptualized, formulated and implemented while highlighting problems and solutions. The example could be taken as a good practice to promote energy access in the slum areas of Dhaka. Table 6.1 illustrates some of the good practices outside Bangladesh on energy related issues from South Africa, Philippines, Sweden, India, Brazil, Senegal, Sweden, Thailand, China, Laos and Rwanda. Although these countries have diverse social-economical, environmental, cultural and political background, initiatives in addressing some energy related issues have been successful. Bangladesh could learn and replicate similar efforts in dealing with its issues related to energy access improvements and efficiency for the urban poor.

Table 2. Barriers specific good practices

Type of Barrier	Description	Example of Best Practice
Energy policy Barrier	• Several policies have been introduced to improve the overall energy situation, but none of the policies specifically targeting the urban poor as a part of basic service. • There is a lack of policy for energy conservation and efficiency improvements.	***Best practice 1: Integrated National Electrification Program (INEP), South Africa (Bekker et al. 2008)*** A white paper energy policy was introduced in 1998 which emphasized to provide affordable energy services to the urban poor by improving energy governance and economic stimulation. The success behind the electrification program was the widespread energy policies, the effective role of the government, encourage the private sector players to invest in electrification program. ***Best practice 2: Energy efficient homes in Puerto Princesa City, Philippines (ICLEI, UNEP & UN-Habitat, 2009)*** The rising urban population of Puerto Princesa has led to congestion in the city's bay area, threatening the people's quality of life and coastal reserve areas. The government has introduced Housing Project to build new houses for the poor people which have been designed to reduce energy demand by allowing daylight into the houses, improved ventilation, proper insulation of roofing material, and planting at least one fruit tree per household. Replacement of incandescent lamps with CFL saved 21,414 kWh energy per year and reduced energy bills by 64%. The potential annual carbon savings are estimated to be at least 72 tonnes for the 330 households.
Hosing policy Barrier	• None of the policies have been implemented in reality which clearly establish	***Best practice 1: Quasi housing identity in slum areas of Thailand (AIT, 2012)*** To help the poor population of the cities in Thailand, the Housing Registration Act was formulated in 1992 in order

	housing rights for the urban poor.	to have better access to infrastructure. Housing registration was classified into two types. One is permanent type and another is the temporary housing registration which is called quasi-household ID. The Quasi households ID not only help the urban poor to apply for legal energy services like electricity, water but also reduce illegal electricity connections (connection through a neighbor).
Illegal settlement	• Due to the illegal nature, urban poor automatically get excluded from the formal delivery as they fail to show service providers the requisite documents that would enable legal energy.	***Best practice 1: Regularization of tenure: Vishakhapatnam, India (Banerjee, 2002)*** In Vishakhapatnam, India, an integrated approach to informal settlements has been implemented in order to regularize the tenure as well as to improve housing and infrastructure. Tenure regularization is achieved by issuing land entitlement documents called "pattas". The urban poor who has been living in the government land for more than five years can apply for "pattas" without any charge. Others also can apply for "pattas" but they have to pay charges. ***Best practice 2: Non-eviction certificates given by Municipal Corporation, Ahmedabad (ESMAP, 2011)*** A non-eviction certificates was provided by the Ahmedabad Municipal Corporation (AMC) for ten years to each household, which helped to apply for legal electricity connection. In return of this facility, Ahmedabad Electrical cooperation (AEC) asked the urban poor to sign an indemnity bond to ensure that, they will not claim the tenure ship at any stage on the basis of the bills and other electrical connection they provided.
Financial Barrier	• . The electricity connection fee for a household is 34,350 Tk. (US$ 430) which is about 5-6 months' estimated household monthly income of urban poor. • The high upfront cost, lack of innovative pricing options and lack of targeted subsidies does not encourage the slum dwellers to use LPG as primary fuel for cooking.	***Best Practice 1:*** ***Subsidized the installation of new connections by COELBA, Brazil (ESMAP, 2011)*** In Salvador, Brazil, an agent called COELBA subsidized the new electricity connection and encouraged the community to participate in a social tariff program which was run by the Government to ensure affordability of regular bills. COELBA also worked with low income clients where affordable payment plans are made through negotiation, particularly those who had payment defaults or outstanding debts. ***Best Practice 2: Butanization (LPG) Program, Senegal (Se'cou et al., 2008)*** The LPG program called ''Butanization'' was introduced in Senegal with an aim to provide subsidies to the peri-urban and urban poor. The subsidized program dropped the retail price for LPG cylinder by 38 percent. The subsidy on LPG not only reduced deforestation by decreasing the charcoal consumption but also help the poor to access LPG cylinders at affordable prices.
Physical Barrier	• Physical constraint of the poor communities which are usually very crowded with narrow walkways often causes difficulty in the installation, delivery and monitoring of electricity services.	***Best Practice 1: Jawaharlal Nehru National Urban Renewable Mission (JNNURM), India (Dhingra et al. 2008)*** Jawaharlal Nehru National Urban Renewable Mission (JNNURM) was initiated during 2005-2006 to renovate and upgrade infrastructure development in the cities. It has a fast track planned development by using efficient use of available resources and community participation. It had plans and programs for the urban poor through integrated

		development approach towards slums, housing and infrastructure, environmental improvement. ***Best Practice 2: Installation of prepaid electricity meters as a part of Integrated National Electricity Program (INEP), South Africa (Bekker et al., 2008)*** Under the INEP, prepaid electricity meters were implemented with an objective to substitute "conventional" credit meters to reduce the monthly costs. At first, credit meters were hanged on the external walls of residential buildings. But suspicion was raised extensively that the meter was accessed by unauthorized users. Hence, for security concern, prepaid meters were mounted inside dwellings. It has the advantages by giving consumers the opportunity not only to monitor the consumption of the appliances they used but also to reduce the problem of non-payment.
Awareness barrier	• Due to their preference of cooked food on firewood, many slum households are still using the traditional cooking stove. • Lack of education and limited awareness regarding health and financial benefits of clean and efficient fuels.	***Best Practice 2: COELBA community agent project in Salvador, Brazil (ESMAP, 2011)*** The COELBA Community Agent project was initiated to improve the electrification and energy-efficiency in low income areas where execution of the projects was done with high level community participation. It was carried out by one of the local NGOs and was coordinated and financed by the electrical distribution company COELBA. The objective of the COELBA Community Agents project was to reduce the number of illegal connections by adjusting the electricity bill according to the affordability of the poor. Besides, it also emphasized on improvement of energy efficiency together with increased utilization of government subsidies (social tariff). Moreover, the project established a balanced relationship of mutual trust between customers and the company.
Lack of Infrastructure to deliver energy services	• Inadequate supply of modern fuels, constraints of adequate foreign exchange, budget constraints for making heavy investment to generate electricity, narrow program focus to improve equitable energy accessibility, lack of appropriate national and regional partnerships. • Lack of access to LPG cylinder outlet is the constraints of obtaining LPG cylinder. There are only 20 official Mobile Retail Dealers (MRD) operating in Dhaka.	***Best Practice 1: Energy Service Delivery- Sri Lanka (Drupady and Sovacool, 2011).*** A project called Energy Services Delivery (ESD) was proposed in Sri Lanka to minimize the gap resulting from a serious shortage of investment in the energy sector. ESD project successfully installed 21,000 solar home systems and 350 kW capacity of hydro within six years. Besides, a 31 MW of grid connected mini hydro capacity and a 3 MW pilot wind farm was also installed. ESD project provided benefits for its stakeholders by no longer using kerosene, and improved affordability by not having to pay monthly electricity bills. With the help of this project, the renewable energy sector continued to flourish in Sri Lanka with hundreds of organizations and thousands of people directly involved in making or selling renewable energy equipment. ***Best Practice 2: LPG distribution program, Thailand (AIT, 2012)*** In Thailand, LPG distribution shops are required to take permission from local Department of Energy Business (DOEB). According to Decree of Ministry of Energy 2006, the distribution LPG shops need to be isolated (300 meters away from adjacent buildings) and built from refractory materials. However, the grocery shops do not require

		permission from DOEB. The grocery shop owners are eligible to sell LPG but they can keep not more than four 15 kg LPG cylinders in their shops, reported by DOEB, This system helps the owners of grocery shops to avoid the complex process of application and to have less investment cost. The availability of LPG cylinders in the grocery shops has led to increased and easy access of LPG to the population, including the urban poor. Currently, there are about 10,000 grocery shops and 5,000 retail outlets registered with DOEB (Thairath, 2011). The statistics from EPPO for 2001 (ten years ago) shows that there are over 600 retail LPG outlets in Greater Bangkok. This system enables LPG supply to be easily accessible for households as grocery shops are extensively distributed in Thailand.

6. Conclusion

From the experience obtained from field visit and interview with different key informants, it is clear, there is no comprehensive policy which relates to urban poverty, more specifically energy policy for slum people is really missing. Besides, there is no centralized institutions which look after energy access issues in the slum areas. Lack of sufficient control and power by DCC over various national utility agencies like DPDC, DESCO and Petro Bangla has resulted poor urban governance. Moreover, Due to the illegal nature, urban poor cannot apply for legal energy services. NGOs find difficulties to work in slum areas due to illegal settlements of slums and interference of middlemen. Also, lack of awareness does not help urban poor to learn about financial and health benefits of cleaner fuels. Moreover, inefficient power plant and poor market transformation regarding LPG are also the major hindrance to promote energy access in the slum areas.

The paper also gives an idea about the barriers specific recommendation based on the experiences obtained from field visit. It was found from the field survey that poverty is not the only main cause for limited energy services in the slum areas. The policy failure, bad governance and ineffective legal and regulatory framework, corruption and lack of political will are also the major hindrances to provide various energy services in the slum areas. Therefore, provide appropriate suggestions and recommendations to address the different barriers related to energy access is a very complex task. To address the barriers, the government should come forward to closely look after each barrier and at the same time initiate fruitful plan, program, and policies to solve the problems. Also, it would be beneficial to learn from good practices related to energy issues from other regions/countries. The good practices could be taken as recommendations/suggestions to address different barriers in slum areas of Dhaka.

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Abbreviation

BBS	Bangladesh Bureau of Statistics
BERC	Bangladesh Energy Regulatory Commission
BPDB	Bangladesh Power Development Board
BRAC	Bangladesh Rural Advancement committee
CBN	Cost of Basic Needs
CUS	Center of Urban Studies
DAP	Detailed Area Plan
DCC	Dhaka City Co-operation
DESCO	Dhaka Electricity Supply Company Limited
DMDP	Dhaka Metropolitan Development Plan
DPDC	Dhaka power Distribution Company
ESMAP	Energy Sector Management Assistant Program
GDP	Gross domestic Product
HIES	Household Income and Expenditure Survey
INEP	Integrated National Electrification Programme
LGED	Local Government Engineering Department
NGO	Non-Governmental Organization
NHA	National Housing Authority
RAJUK	Rajdhani Unnayan Kartripakkha
UAP	Urban Area Planning
UNDP	United Nation Development Programme
USAID	The United States Agency for International Development
WEC	World energy council
WHO	World Health Organization

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