Energy access in dhaka city economics essay

Economics

Chapter 4

This chapter presents the result of the analyses of energy access in the city of Dhaka, Bangladesh, in four main slum areas.

4. 1 General observations

Some general analysis of primary and secondary data collected at Dhaka city during the field survey are presented in this section. The primary data is based on questionnaire survey through standardized questionnaire, while the secondary data is based on government and private agencies like Centre for Urban Studies (CUS), Bangladesh Bureau of Statistics (BBS), Bangladesh Institute of Development Studies (BIDS), BRAC NGO, NDBUS NGO, Dhaka City Cooperation (DCC), National Housing Authority (NHA), Petrobangla, Bangladesh Energy Regulatory Commission (BERC), Dhaka Power Distribution Company (DPDC) and Dhaka Electricity Supply Company (DESCO).

4. 2 Profile of urban poor in Dhaka city

Dhaka which is known as the capital city of Bangladesh as well as one of the fastest growing cities in Southern Asia has an population of more than 13 million people, and is expected to accommodate more than 20 million by 2025 (UN-HABITAT-2009). Around 300, 000 to 400, 000 people migrants to Dhaka city from rural areas annually. The population of the city was 335, 928 in 1951 and it increased to 10. 7 million in 2001 and further to 12. 0 million in 2007. Besides, the average annual growth rate during the last three decades was increasing at an alarming rate which was over 7% (BBS, 2001). Furthermore, population growth rate of the city, slums and squatters have

also went up very fast. However, after independence of the country there was substantial influx of low income people from rural to urban areas. They squatted on government lands, road side lands, abandoned lands and buildings. There were 1 million squatters lived in 2, 156 clusters in the Dhaka metropolitan area in 1991 and the number climbed to 1. 5 million in over 2, 800 clusters over the next 6 years (Prashika, 1996). The total slum population of Dhaka has become double from 1. 5 to 3. 4 million from 1996 to 2005, while the figure of slum risen by roughly 60%, i. e., from 3, 007 to 4, 966. The proportion of the population of Dhaka living in slums increased from 20% to 37% (CUS, 2006, p. 12). Table 4. 1: Number of wards, area, total population and slum population of five study cities, 2005

City

Number of

Wards1

Total Area

in sq. km1

Total City

Population 20011

Total City

Population 2005

(Estimate)2

Slum

Population 20053

Slum Population

as % of City

Population (20005)

Dhaka MetropolitanArea (DMA)90 Wardsand 12Unions3066, 550, 2099, 136, 1823, 420, 52137. 4Chittagong41177. 393021, 6184, 133, 0141, 465, 02835. 4Rajshahi3051. 29367, 314489, 514156, 79332Sylhet2727. 50265, 372356, 44097, 67627. 4Barisal3051. 04273, 384365, 059109, 70530. 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, 2005Only 5. 1% of the city's total land (1, 542 hectares) is occupied by urban poor in Dhaka city which is accommodating 37. 4% of the total city population. The overall gross population as a whole density for Dhaka is less than 121 persons/acre while the number is 891persons/acre in Dhaka slums, which is at least 7 times higher than the average for the city as a whole. As the government has become more vigilant in guarding its land against squatters and slums, there is a substantial increase of slums and squatters in private lands compared to public lands. Regarding hosing pattern, 52. 3% live in semi-pucca houses while 39. 7% live in kutcha and jhupries (flimsy impoverished dwellings) (CUS, 2006). There are two reasons which are responsible for growth of slum settlements in the city. Firstly, due to its topography, the city has limited habitable land as well as limited infrastructure and public services which failed to respond to the high demand. Secondly, the poor people who migrant from rural areas to find a suitable job in the low-paid informal sector do not have enough income to pay for the housing in the formal sector. As a result, they look for cheaper housing in slum areas. So, a regular influx of

rural migrants into the city contribute to the densification of slums that leads to further shelter crisis and deterioration of living environment. Several attempts have been undertaken by the national government and local authorities since 1975 to address the slum/ squatter situations in the city. However, other than fragmented studies, no comprehensive study has been carried out to evaluate these attempts in order to arrive at appropriate policies. Due to differences in land price between core and peripheral areas, there was more conspicuous growth of slums in peripheral and suburban areas (CUS, 2006). The comparison of population growth among urban, slum and rural has been shown in Figure 4. 1, which reveals that, growth rate of slum is higher than urban and rural areas. Figure 4. 1: Population growth in Bangladesh (1971-2005)(Source: Slums of urban Bangladesh: Mapping and Census, 2005 & World Bank, 2012)Using a household income of BDT 5, 000 (US$ 715. 00) per month as a reference of poverty line, the study (CUS, 2006) reported that, 85. 4% residents living below the poverty line in Dhaka city. The largest single slum in Dhaka was found at Korail in Mohakhali, with more than 100, 100 people. Only 10% of slums had sufficient drainage to avoid water-logging during heavy rainfall. Over half were typically fully or partially flooded during monsoon. More than 50% of the slums had no fixed place for garbage disposal and no mechanism for regular garbage collection. However, 96% have access to electricity. A similar proportion had access to safe water. The Dhaka slum residents mainly rely on municipal taps for drinking water. Only around 5% of slum households did not share their drinking water source, while 40% shared it with more than 11 families. Almost 58% of the slums of Dhaka did have access to cooking gas. Most (65%) of Dhaka slums had no access to safe latrines. In nearly all slums,

latrines were shared and in 50% slums, it was shared by at least 6 families. Roughly 6% of slums had experienced fire at some point. Around 7% slums had either been evicted at least once from their present location or were facing the threat of eviction. 56% of residential structures in the slums were made of low quality materials. Another 42% featured brick walls with a tin roof. Less than 1% of slum structures were made of materials that could be considered high quality. Over 70% of the slums had at least one NGO providing some sort of service to them (CUS, 2006).

4. 3 Sample size

The study is based on primary data collection among poor inhabitants from ten slum communities namely as Korail, Beunia Badh, Bihari Camp, Beri Badh Balur Ghat, Lau Tola Balur Ghat, Rayer Bazar Boddho Bhumi (front, behind & east), Nampara Soba Potti, Rail Gate. 185 households and 35 SMEs (Small and Medium Enterprises) from four different Thanas namely Gulshan, Pallabi, Hazaribagh, Shaympur were surveyed. The sample size was determined by using below equation: Where, Z = Based on confidence level: 1. 96 for 95% confidence, 1. 64 for 90% and 2. 58 for 99%P = Estimated variance in population (degree of variability), as a decimal: (0. 5 for 50-50, 0. 3 for 70-30)C = Level of precision desired (sampling error), expressed as a decimal (i. e., 0. 03, 0. 05, 0. 1 for 3%, 5%, 10%)For this study, confidence level, Z is chosen as 95%, P is 0. 36 for Dhaka slums reported in a study conducted by ICCDDR, B (Jamil et al., 1993) and sampling error is taken as 7%. Therefore, the number of family surveyed is 185 according to above sampling formula. Sample size was divided according to the number of households in each Thana. Thana with higher number of households has

higher sample size. Table 4. 2 gives the number of households surveyed in each district. Table 4. 2: Number of houses and sample size of Thanas in Dhaka city

Thana

No. of households

Sample size

Gulshan20, 84060Pallbi17, 84054Hazaribagh12, 00041Shaympur10, 80030

Total

61, 480

185

(Source: CUS slum study, 2005)The survey was mainly aimed at finding the household details in terms of family size, total income; identifying the major fuels used for lighting and cooking purposes, and the key issues (accessibility, affordability, reliability) related to fuel usage and expenditure in the households. A questionnaire survey was conducted with household head. ‘ Household head’ means the person who plays the main role in the decision-making process of a family. In absence of the household head, the second-important adult member of the family was interviewed. Households were surveyed randomly. The survey was conducted in Bengali language and each survey lasted for approximately 20-25 minutes. F: AITMY thesis_ Energy Access @ Dhaka Cityslum map & data4 locations. jpgKorail slumGulsahn Thana (sample size= 60)Baunia Badh, Bihari Camp slum, Pallabi Thana (Sample size = 54)Beri Badh Balur Ghat, Lau Tola Balur Ghat, Rayer Bazar

Boddho Bhumi (front, behind & east) slumHazaribagh Thana (sample size= 41)Nampara Soba Potti, Rail Gate slum Shaympur Thana (sample size= 30)

Dhaka city Map

Figure 4. 2: Location of surveyed slum areas

Occupation

It is observed that, 25. 9% male are Rickshaw/Van/Pushcart Puller, 10. 8% are Day Laborer, 28. 6% are Petty Trader/ Shop Keeper, 13. 5% of them are working in garments and other factories and 8. 1% are working as drivers. In case of female workers, majority (59. 5%) of them are housewives. Some of them are working as housemaid/servants (14. 1%) and others (11. 4%) are involved in small business. The surveys conducted by LGED in 2002 also showed that, majority of male were working as a rickshaw/van/pushcart puller (27. 8%) and day laborer (16. 22%) and female were involved in doing household activities (43. 87%). Table 4. 3: Occupational status of slum dwellers

2012 Survey1

2002 Survey2

Occupation

Male

%

Female

%

Male

%

Female

%

Rickshaw/Van/Pushcart Puller4825. 9%

-

-

27. 8%Day Laborer2010. 8%42. 2%16. 22%7. 6%Petty Trader/ Shop Keeper5328. 6%2111. 4%11. 2%2. 23%Vendor/Hawker73. 8%

-

-

3. 9%1. 7%Garment/Other Factory Worker2513. 5%179. 2%5. 94%15. 75%House Maid/Servant52. 7%2614. 1%8. 35%12. 78%Auto Scooter/Baby Taxi/Tempo/Bus/Truck Driver158. 1%

-

-

6. 2%

-

Others73. 8%73. 8%13. 83%10. 23%Unemployed52. 7%

-

-

6. 56%5. 84%Housewife

-

-

11059. 5%

-

43. 87%

Total

185

100%

185

100%

100%

100%

(Source: 1Field survey, 2012, 2LGED, slum improvement project, 2002)

4. 5 Monthly income

It can be seen from the table 4. 4 that, the predominant range of monthly income is between 5001 and 7500 BDT, which constitutes 42. 2% of the total sample of households. About 22. 7% of families have monthly income between 2500-5000 BDT and 20% of families earned between 75001 and 10, 000 BDT per month. Only about 5. 3% of respondents have incomes above 12, 500 BDT per month. The LGED survey (2002) showed that, around 74% families' monthly income range was between 1, 000-3, 000 BDT. Only about 21% of respondents have incomes above Tk. 3, 500 per month. Compare to the result of field survey, 2012, it is understandable that, monthly income has been increased over the ten years period (2002-02012) due to high inflation rate (2. 2%-7. 8%). Table 4. 4: Monthly income of slum dwellers

2012 Survey1

2002 Survey2

Monthly income (BDT)

Percentage

Monthly income (BDT)

Percentage

<2, 5001. 1 <1, 0003. 812, 500-5, 00022. 71, 000-1, 50018. 365, 001-7, 50042. 21, 501-2, 00016. 027, 501-10, 000202, 001-2, 50022. 2710, 000-12, 5008. 62, 501-3, 00017. 3812, 500> 5. 33, 500> 21. 08

Total

100%

Total

100%

(Source: 1Field survey, 2012, 2LGED, slum improvement project, 2002)

4. 6 Type of Houses

The quality of housing is one of the most basic indicators characterizing slum settlements. The majority of slum houses (56%) in the six cities of Bangladesh were of very poor quality (weak and temporary structures or kutcha units), while another 42. 4% were semi-pucca type (homes with brick walls and tin roofs) (Table 4. 5). A very small proportion (1. 1%) was dilapidated older buildings, while only 0. 5% was good quality homes. The physical quality of slum housing was generally better in Dhaka and very poor in Khulna and Barisal. However, the fact that slums in Dhaka and some of the other towns showed a relatively high prevalence of semi-pucca structures does not automatically allow one to conclude that the overall housing situation there was good since such houses normally had very high room crowding and very low per capita floor space (CUS slum study, 2005)Table 4. 5: Housing structure (Percentage of households)CityShacks, Jhupris, MudKutcha flimsy structureSemi pucca flimsy structureDilapidated older buildingsOthers (better quality)All housesNumber of householdsDhaka6. 339. 752. 31. 20. 5100673, 883Chittagong12. 554. 132. 60. 30. 5100266, 182Khulna36. 948. 512. 31. 70. 510037, 665Rajshahi30. 920. 245. 23. 50. 110027, 665Syslhet0. 965. 133. 10. 50. 410018, 313Barishal24. 162. 911. 60. 40. 910019, 460

Total

11. 3

44. 8

42. 4

1. 1

0. 5

100

1, 043, 329

(Source: Slums of urban Bangladesh: Mapping and Census, 2005)There are three types of houses which have been seen while conducting the questionnaire survey. These are jhupri, kutcha and semi pucca house (Figure 4. 3). Among them, Jhupri was the lowest quality of housing structure which is made of materials with bamboo/clay/polyethylene. This type of house was predominant in Hazaribagh (48. 78%) and Shaympur Thana (70%). Besides, majority of the houses were made by C. I sheet, wood which was called kutcha type house (74. 59%). In some households, floors and walls are made of bricks and cement but roof is made of wood/C. I sheet. This type of house (2. 70%) is called semi-pucca house (Figure 4. 4). C: UsersLipuDesktopjhupri. jpgJhupriC: UsersLipuDesktopkutcha. jpgKutchaC: UsersLipuDesktopsemi-paca. jpgSemi-puccaFigure 4. 3: Different type of houses in slum areasFigure 4. 4: House pattern in four slum areas of Dhaka city(Source: Field survey, 2012)Slum dwellers lived in very small, mostly single room homes. The mean size of a house/room in the six cities was 102. 8 sq. ft., the median being 100 sq. ft. (9. 55 m2 and 9. 29 m2 respectively). In many of slums (46%), the average room size varied between 76 and 100 sq. ft. Slum dwellers in Dhaka

usually lived in smaller homes/rooms compared with other cities. In one-fifth of Dhaka's slums (20%), room size was below 76 sq. ft. (7. 06 m2), while in three-fifths of clusters (61%) size varied between 76 and 100 sq. ft. Only 2. 2% of slums in Dhaka had an average room size above 125 sq. ft., compared with 34 % in Chittagong, 25. 6 % in Khulna, 33 % in Rajshahi, 15 % in Sylhet and 43. 9 % in Barisal (CUS slum study, 2005).

4. 7 Land and House ownership pattern

The distribution of the slum population by land ownership patterns is presented in Table 4. 6. Two-thirds of the slums were located on private land, while 27% were on government land and the rest on land owned by various other agencies. Table 4. 6: Percentage distribution of slum population by land ownership type

Land ownership Type

DhakaChittagongKhulnaRajshahiSyslhetBarishaAll Cities

Government Land (%)

25. 732. 627. 121. 42. 530. 527. 1

Private Land (%)

70. 358. 754. 360. 397. 263. 466. 7

Others (%)

4. 08. 88. 818. 30. 36. 16. 2

Total (%)

100100100100100100100(Source: Slums of urban Bangladesh: Mapping and Census, 2005)As majority of slum dwellers migrate to Dhaka city, so they are

looking for renting houses at the cheapest cost. Almost three-fourths (73. 9%) of slum householders have rented their residence, a figure which varied from 17. 7 % in Rajshahi to 96. 3 % in Sylhet (Table 4. 7). In Dhaka and Chittagong, the figures were 77. 2% and 73. 6 %, respectively. In Rajshahi, a high proportion of slum households (58. 9%) were owner occupied. A significant proportion of households (around 25%) in Barisal, Khulna and Rajshahi did not pay any rent. Table 4. 7: Rental Pattern of Slum Households by City (percentage of households)

Rental Pattern

DhakaChittagongKhulnaRajshahiSylhetBarishalAll Cities

Owner (%)

11. 716. 517. 558. 90. 524. 914. 5

Rented (%)

77. 273. 659. 417. 796. 349. 273. 9

Rent free (%)

11. 19. 923. 123. 43. 125. 911. 7

Total (%)

100100100100100100100(Source: Slums of urban Bangladesh: Mapping and Census, 2005)However, the survey also showed that, majority of the surveyed householders (68%) live as tenants. About 27% of urban poor live in the houses without payment. Some householders (5%) did not have land ownership as their houses were built on rented lands owned by private or

government (Figure 4. 5). Figure 4. 5: The distribution of housing tenure in low income households(Source: Field survey, 2012)

4. 8 Access to electricity

Out of the 185 slum households interviewed during the field survey in 2012, Gulshan (N= 60) and pallabi (N= 54) Thana have 100% electricity access. Besides, Hazaribagh and shaympur Thana have 68. 3% and 83. 3% electricity access respectively (Table 4. 8). In total, 90. 3 % households have electricity supply. But the slum areas have very limited access to electricity supply in terms of affordability, availability and reliability. Table 4. 8: Frequency and percentage of households have access to electricity

Area

Frequency & percentage

Electricity Access

Total

Yes

No

Gulshan (N= 60)

Count60060% within area100%0%100%

Pallabi (N= 54)

Count54054% within area100%0%100%

Hazaribagh (N= 41)

Count281341% within area68. 3%31. 7%100%

Shaympur (N= 30)

Count25530% within area83. 3%16. 7%100%

Total (185)

Count

167

18

185

% within area

90. 3%

9. 7%

100%

(Source: Field survey, 2012)Although 90. 3% of the slum households in the surveyed areas have access to electricity, it does not mean that every slum households has individual metered electricity connection. Dhaka Electricity Supply Company (DESCO) is in charge to provide electricity supply in Gulshan and Pallbi Thanas. Slum areas under Gulshan and pallabi Thanas were connected by meters which are situated at the pole (Table 4. 9 and Figure 4. 8). Many slum households were electrified through a single pole meter. On the other hand, electricity supply in Hazaribagh and Shaympur Thana’s slum areas were distributed by Dhaka Power Distribution company (DPDC) through shared meter (Table 4. 9). The shared meter was situated at the convenient place and it was placed inside the room. Table 4. 9: Status of connection in slum areas

Thana

Gulshan

Pallabi

Hazaibagh

Shaympur

Connection statusPole meterPole meterShared meterShared meterNo. of single phase meter (< 8 kW)5

-

3020No. of three phase meter (> 8 kW)1519

-

-

Total no. of meter20193020

Total load

196 kW

138 kW

60 kW

40 kW

(Source: Field survey, 2012)The utility companies give them legal electricity connection regardless of the illegal status of the slum areas, by taking highly amount advanced electricity bill as security deposit. The meter is authorized under the name of the slum representative/local leader/area committee of the slum areas. However, a small portion of slum households in Hazaribagh Thana (1. 6%) were connected by diesel generator. Figure 4. 6: Connection

status in low income households(Source: Field survey, 2012)Though utility company allows the slum dwellers to use pole/shared meter, but the lack of governance and accountability in slum settlements results in residents paying heavily for access to electricity service. Banks, N. (2008) stated that, local government officials do not engage directly with slum communities. Instead, they work via intermediaries known as mastaans. These are unofficial local leaders in each slum, who draw upon their political affiliation to legitimate their power. The literal translation of mastaan is ‘" muscleman", and these figures play a role somewhere between a local strongman and a local leader. They act as intermediaries, making connections between under-served informal settlements and political leaders. Rashid (2009) reported that, usually local mastaans or other influential leaders within the slum settlement extort money for electricity, supply gas, water and access to other facilities. The mastaans take control of the meters where they charge the residents at exorbitant prices for using different appliances. C: UsersLipuDesktopDSC00490. JPGMeter is situated at the poleC: UsersLipuDesktopDSC00494. JPGPole meterC: UsersLipuDesktopDSC00229. jpgShared meterFigure 4. 8: Different types of connection statusTable 4. 10: Obtaining electricity connection in slum areas of different cities

City, Country

Connection status

Source

Buenos Aires, Argentina

Electricity is considered as the universalized energy service. However, its quality and reliability is not stable in all the slum areas. The reason behind it

is the phenomena of illegal connections which aggravate the situation. Some productive activities like welding machines and small electric motors inside the slum areas used domestic connections, which is better to be served by three-phase supply with higher power capacity. Other types of activities such as tailoring and commercial cooking which has less severe effect can also cause problems. Bravo, G., et al. (2008)

Dhaka, Bangladesh

Around 90. 3% of the slum households in the surveyed areas have access to electricity. Slum areas under Gulshan and pallabi Thanas were connected by meters which are situated at the pole. On the other hand, electricity supply in Hazaribagh and Shaympur Thana’s slum areas were distributed through shared meter. The utility companies give them legal electricity connection regardless of the illegal status of the slum areas, by taking highly amount advanced electricity bill as security deposit. The meter is authorized under the name of the slum representative/local leader/area committee of the slum areas. Local government officials do not engage directly with slum communities. Instead, they work via intermediaries known as mastaans who extort money for electricity, supply gas, water and access to other facilities. The mastaans take control of the meters where they charge the residents at exorbitant prices for using different appliances. Field survey (2012)

Delhi, India

Still electrification rate in most of the slum areas is not satisfactory and practices of hooking are common in such areas. Out of 8700 surveyed, 6500 was identified to have illegal access to power. Hooking practices are done by own and sometimes, the contractors helped them to do so. To get illegal

connection, urban poor were charged from Rs. 1000 to Rs. 1500 as upfront costs and Rs 100 as monthly costs which were to be paid to the contractors. The utilities took initiative to electricity the slum areas through legal connections by taking initial deposits from the residents having residential proofs. But, the delays in getting actual connection and installation of meters forced the slum dweller to pay twice- first, to the contractors for illegal hooking and the second, to the utilities to get legal connection because a minimum charge were still generated against the residents who had already applied and deposited money in order to have legal connections. Nevertheless, the initiative taken by the utilities to electrify the slum areas in Delhi was recognized as a positive action. Dhingra, C., et al. (2008)

Nairobi, Kenya

The levels of electrification among the urban poor were still very low and the majority of the houses had either illegal connections or tapped from a single point. Some households were found to pay electricity bill to the landlords as part of their monthly rent. High upfront cost of legal electricity connection was beyond the purchase limit for the slum dwellers. Frequent and sudden power outage made it an unreliable source of energy for use both domestically and in SMEs. Besides, urban poor were deeply concern about safety of the energy source due to high number of cases of electrocution and death caused by misuse of or tampering with the supply. Illegally tapping electricity from the supply lines not only exposing user to potential risks but also cause inefficient use of electricity by not employing energy efficiency and saving measures. Karekezi, S., et al. (2008)

Dakar, Senegal

Socio-economic status, political influence and local community lobbing ability had a significant impact to have access to electricity. There were two main categories of people who are able to access electricity; those who have authorized individual or shared meter with an established account; and others who got the connection from the neighbor illegally or had direct illegal supply being connected form the grid. This connection is illegal because SENELEC utility company does not allow to use electricity from the neighbor or from households that are in the vicinity. The electricity bill did not reflect the true consumption of legally connected households as the supply was shared between user and neighbours. Connection fee was paid by the 52 % of the illegally connected households and the others (48 %) did not. Fall, A., et al. (2008)

Cape Town, South Africa

Unelectrified, meter-electrified and mixer of meter-electrified and extension cord connected households were found in Imizamo Yethu, a poor urban area outside Cape Town. None of the sampled households were found to use illegal connection in the sense of getting electricity which was not paid for. Metered electricity access has a positive correlation with the number of years lived in the locality. Extension cord connection (i. e. via a wire from a neighbouring building) was very much costly because users not only paid electricity bill but also were charged for electrical cord, labour and installation cost. The urban poor who used ‘ extension cord connection’ were found to be charged almost ten times that of a metered connection, and

monthly electricity expenditure was around 60 per cent higher than for metered users. Visagie, (2008)

Bangkok, Thailand

Although almost 100% households in slum areas of Bangkok have access to electricity, but not all the household had a legal connection to the Municipal Electricity Authority (MEA). In 2007, Out of the 100 households surveyed, 32 houses are found to be connected to the grid through their neighbors, and out of 40 households interviewed during the survey in 2012, the percentage of households which were connected through their neighbors is 25%. The users, who got connected form the neighbor, paid the monthly electricity bill based on per unit consumption. But the high unit price was paid by the users at the rate of 5-8 baht/kWh while the residential customers paid Baht 3. 07/kWh and 2. 5 baht/kWh for whose users who were benefitted from the reduce tariff. Field survey , UPEA III (2012)The first reasons for accessing this type of connection in slum areas of Dhaka city is that, to acquire a legal individual connection that requires a sets of documents like registered deed of ownership/occupancy, mutation document for land, attested copy of Rajuk/ City Corporation approved building plan, attested copy of document regarding holding no. issued by City Corporation/ competent authority. The second reasons is the high upfront cost of connection which consists of security deposit, meter cost (single phase= 1500-2000 BDT, three phase= 8000-10000 BDT) and installation cost including labor charge and wiring cost. In addition, the utility company will not allow any new connection more than 100 feet (30 meter) from the substation which is one of the barriers to give them power supply as most of the slum areas are located on the

periphery of the city. Lastly, since the drive of resettlement of many slums has not been undertaken in a planned manner by the government and is largely driven by the availability of land for resettlement at any point in time in the city, slum-dwellers do not feel encouraged to pay for permanent and legal electricity connections and consequently bear the high upfront costs. Instead they find it cheaper to pay the local contractor for pole/shared metered connection. The payment for the electricity for pole/shared meter connected households is made in many ways. The most popular payment modes for electricity services are payment by equipment type (83. 8%) (Figure 4. 9). Slum dwellers pay a fixed amount according to the type of appliances used. Table 4. 11 shows the average electricity charge paid by the urban poor in different slum areas. According to the table, it shows that, the price is not only depends on equipment type but also on different areas. For example, people living in the Korail slum, Rayer Bazar Boddho Bhumi (Behind) slum and Rail Road slum pay higher amount electricity bill for different appliance compared to other slum areas surveyed. Table 4. 11: Unit price for use of electrical equipment in slum areas, Dhaka cityThana

Gulshan

Pallabi

Hazaribagh

Shaympur

Name of slum (Bastee)KorailBaunia BadhBihari CampBeri Badh Balur GhatLau Tola Balur GhatRayer Bazar Boddho Bhumi(Front)Rayer Bazar Boddho Bhumi(Behind)Rayer Bazar Boddho Bhumi (East)Nampara Soba PottiRail Road BasteeIncandescent lamp

(bulb)150100202001001002001008020 0Florescent tube light150100202001001002001008020 0CFL (Energy saving light)150100202001001002001008020 0TV150120N/A100N/AN/AN/AN/AN/A100Fan150200402001001002001008020 0Refrigerator300N/A150N/AN/AN/AN/AN/AN/A(Source: Field survey, 2012)The others (16. 2%) paid the electricity bill, house rent and other charges all together and this mode of payment was fixed (agreed sum) through negotiation. The people who rented house from the house owner got the electricity supply without paying any upfront cost. Poor people are paying more for the electricity service than the people who have an individual legitimate account with DESCO and DPDC. Figure 4. 9: Mode of payment in slum areas, Dhaka(Source: Field survey, 2012)

4. 9 Fuel used for lighting

The primary sources of energy used for lighting in the slum households in Bangladesh are electricity, kerosene and others (candle, charge light etc). Table 4. 12 presents the construction of housing structures of the slum households and by source of lighting. It is observed from the table that, a total of 33. 86% of slum households lived in the tin (CI sheet) made houses, 14. 35% lived in the housing structure made of cement and tin, 8. 42% in mud and tin made houses, 3. 06% in tin and wooden and 3. 06% in pucca houses. Regarding energy access, tin made households had higher percentage usage of kerosene (22. 71%) and electricity (41. 6%) for lighting than other category households. Table 4. 12: Construction material of main structure of slum households by source of light, 2004

Construction material of slum households

Percentage of households

Source of Light (%)

Kerosene

Electricity

Others

Cement-Cement3. 061. 54. 122. 9Cement-Tin14. 355. 7120. 3111. 62Cement/Others0. 02N. A0. 04N. AMud/Tin8. 4212. 845. 458. 29Mud/Others0. 110. 29N. AN. ATin/Tin33. 8622. 7141. 629. 05Tin/others0. 560. 350. 72N. AWood/Tin3. 065. 181. 77N. AWood/Others0. 160. 230. 12N. AOthers/Others36. 451. 1825. 8748. 14

Total

100

100

100

100

(Source: population census-2001, Socio-economic and demographic report, National series-4, 2004)Electricity (88. 6%) was the primary source of lighting in the majority of households surveyed in 2012. But, those who did not have access to electricity used kerosene (9. 7%) as the primary source for lighting. The survey also identified 7. 3% households in Hazaribagh thana to be dependent on diesel generator for lighting (Table 4. 13). Table 4. 13: Slum households use primary fuel for lighting

Area

Frequency & percentagePrimary source for lightingTotalElectricityKeroseneDiesel (Generator)

Gulshan

Count600060% within area100%0%0%100%

Pallabi

Count540054% within area100%0%0%100%% of Total29. 2%0%0%29. 2%

Hazaribagh

Count2513341% within area61%31. 7%7. 3%100%

Shaympur

Count255030% within area83. 3%16. 7%0%100%

Total

Count164183185% within area88. 6%9. 7%1. 6%100%% of Total88. 6%9. 7%1. 6%100%(Source: Field survey, 2012)However, in the absence of electricity during the time of load shedding, slum dwellers used kerosene, candle and charge light for lighting purposes. The average monthly expenditure for kerosene is 120 BDT (70 BDT/liter) and candle is 100 BDT (5 BDT/candle). The most common kerosene lamp used by the slum dwellers is traditional wick lamps (Kuppi and Hurricane). For lighting, as figure 4. 10 shows, electricity was the predominant energy options followed by kerosene, candle and charge light. Figure 4. 10: Percentage of households using different energy sources for lighting(Source: Field survey, 2012)Compare with the slum areas of other cities, it is seen form the figure 4. 11, Electricity

is the main source of lighting in most of the slum areas. Among them, Bangkok, Buenos Aires and Khon Kaen have 100% electricity access. Urban poor in Cape Town, Dakar, Delhi, Dhaka and Nairobi used kerosene where 55 % households in slum areas of Nairobi used kerosene for lighting. Some slum resident in Delhi, Dhaka and Nairobi were also found to use candle for lighting. Figure 4. 11: Percentage of households using different energy sources for lighting in slum areas of different cities(Source: Field survey, 2012 and GNESD, UPEA study, technical country reports, 2008)

4. 10 Electrical appliances ownership

Urban poor people had limited access to amount of power supply as well as different type of electrical appliances. Majority of them used one bulb for lighting and one fan for cooling as minimum basic need. The Table 4. 14 shows a total of 83% slum households owned CFL (25 W), 38% owned incandescent bulb (60 W), 11% owned fluorescent tube light (40 W). Fans are used by all income groups in the summer season and 77% of households owned fan. TV is usually owned by middle income groups and 34% of the households owned TV. The refrigerator is owned by high income households and only 3% households owned refrigerator. Table 4. 14: Percentage of households owning different appliances in urban poor households of Dhaka and Bangkok

Appliance type

Dhaka-2012*

Bangkok-2012**

CFL83N. AIncandescent lamp38N. AFluorescent tube light11N. AFan77100Television34100Refrigerator390Washing MachineN. A57. 5Air conditioning unitN. A25Electric water heaterN. A45Rice cookerN. A87. 5ComputerN. A32. 5Microwave ovenN. A20Video playerN. A57. 5{Source: *Field survey, 201, **Field survey (UPEA III)}Table 4. 14 also shows that, people living in slum areas of Bangkok owning more appliances than the slum residents of Dhaka city. Urban poor in Bangkok owned washing machine, air conditioning unit, electric water heater, rice cooker and computer which urban poor of Dhaka city did not have.

4. 11 Estimating basic energy needs for the average households

The main energy services that are in demand in households are listed in the Table 4. 15. It also calculates the minimum energy requirements to meet these basic needs in terms of either useful or end-use energy. It should be noted that the power requirements in Table 4. 15 do not refer to the installed power of the equipment, but to the averaged power required to deliver the specific energy services. Following in the tradition of Goldemberg, unit of power (energy per unit time) in watt (watt = Joules per second) is used to measure energy needs per person. By using the unit watt, the average power consumed by a person during any given time interval is measured. In order to estimate basic energy needs, at first end-use energy requirements for specific energy services is calculated. For instance, assume a CFL with

capacity of 25W is used on average for 15h per day. Therefore, a CFL consumes 375 Wh per day (15h × 25W). Then the averaged power requirement for lighting with a CFL is calculated by dividing the energy requirement by the time span in which the energy is consumed: 275Wh/24h = 16W. For preparing daily meal for a five-member household using fuelwood, energy requirement of about 34MJ is assumed which refers to an averaged power per day of 34MJ/(24h*3, 600s/h)= 393W. The estimated of end-use energy requirements for specific energy services are then converted into useful energy by assuming certain efficiencies of the end-use equipments. Real requirements vary from household to household, depending on several factors like household size, device type, intensity and mode of use, etcTable 4. 15: Power requirement of energy services (for average sized 5 member households)

Energy services

Average power per households (in W)

Useful energy

End-use energy

Lighting, one CFL (15h/day, 25 W)a1216Lighting, one Incandescent lamp (15h/day, 60 W)a2838Lighting, one Fluorescent Tube light (15h/day, 40 W)a1925Lighting, 1-2 kerosene lampsb, c, d, e, f, g919Cooling, 1 ceiling fan (15 h/day, 70 W)b3344Cooking traditional biomass 1 meal dailyb, d, e, f, h, i, j55393Cooking kerosene stove 1 meal dailyb, d, e, f, h, i, k55123Cooking LPG stove 1 meal dailyb, d, e, f, h, i, k5593TV (Color)n2229Refrigerator smalll, m95127Refrigerator largel, m105140Sources: aBockhorst (2001). bLeach and Gowen (1989). cPlas and de Graaff (1988). dReddy (1996). eReddy

(2003). fUS Congress (1991). gNatarajan (1998). hRavindranath and Hall (1995). iRavindranath and Ramakrishna (1997). jGupta and Rao (1979). kRamachandraet al. (2000). lHuser and Spalinger (1992). mBayrisches Staatsministerium fu¨r Wirtschaft (1995).