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in Dhaka City*

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Access to Urban Basic Services and Determinants of Satisfaction: A Comparison by Non-slum and Slum Dwellers in Dhaka City

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&

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Abstract

Dhaka has experienced rapid urbanization in recent decades. However, the city's infrastructure and basic utility service provisions lag behind its physical expansion making it one of the least livable cities in the world. The government of Bangladesh provides various utility services viz., water, electricity, waste collection, among others, to urban dwellers. However, the satisfaction level of those utility services among the recipients varies widely. This paper has examined the end-users' satisfaction level- considering both slum and non-slum consumers- of three key utility services namely, water and sanitation, waste management and electricity in Dhaka city. The study has also identified the determinants of satisfaction level of those services. Based on survey data, the current level of satisfaction is examined through Likert data analysis (median and mode reported) and the determinants of the level of satisfaction are identified through regression analysis. It is found that majority of the households' satisfaction level for the aforementioned services are lower irrespective of slum and non-slum consumers. It is also observed that people living in non-slums are better-off vis-à-vis their counterparts living in slums. However, the satisfaction level of the latter is relatively higher than the former. Determinants of satisfaction for individual utility services are reported in the paper.

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I. Introduction

The living and working conditions of human being changed profoundly following the invention of, among other things, electricity (and its spin-offs), running water, indoor plumbing, and central heating system during 1870 to 1900. It took over a century following 1870 to complete their full impact, notably in urban America (Gordon, 2012). The wave of these inventions has spread all over the world leading rapid urbanization. Bangladesh, a late comer in urban catch-up game, has witnessed steady rise in urbanization in recent decades. The pattern and pace of urbanization in the country have changed markedly in the 1980s with sharp rise in population in its major cities. At present, there are nearly 34 million (23.3%) people live in cities (BBS, 2011). One of the notable features of Bangladesh's urbanization is that there is an overwhelming primacy of Dhaka city that alone accommodates 27.7% of urban population and hosts a quarter of economic activities (Islam and Khan 2012). This has led to rapid increase in demand for urban services both in slum and non-slum areas.

The government of Bangladesh provides different utility services to urban dwellers through numerous public entities. These services include water and sanitation, electricity, gas and waste management. They are termed as 'merit goods', which means that these services may be undersupplied if produced entirely by the market. Moreover, access to basic utility services is essential for meeting internationally agreed development agenda such as Millennium Development Goals (MDGs).

However, the satisfaction level of those utility services among the recipients varies widely. Owing to the lack of adequate infrastructure and urban basic services, notably utilities, Dhaka is consistently rated as the least livable location among the 140 cities surveyed by the Economist Intelligence Unit, among others (Daily Star 2012).

It is in this backdrop this paper examines both the level of satisfaction of three key urban services--water and sanitation, waste management and electricity--as well as the factors that determine satisfaction level of those utility services in Dhaka city. The reminder of the paper is

organized as follows. Section II offers an overview of the utility services in Dhaka city. Section III outlines research objectives and methodology. In section IV we have presented and analyzed the satisfaction level of end-users as well as identified the factors that determine the satisfaction level with the help of urban services data. The final section concludes.

II. Utility services in Bangladesh: An overview

Historically, utility service provision has tended to be institutionally embedded within the state, whether at the central or municipal level (Foster et al 2006). State's role in providing utility services is common even in advanced economies. Nevertheless, public-private partnership is also a popular model in providing urban utility services. In the case of Bangladesh while a number of state-owned entities supply utility services, there is also an increasing trend to involve private sectors in service provisions. Moreover, one notices the growing role of private sector in the area of waste management. In this section we briefly discuss the role and mandate of various utility service providers, particularly focusing on water and sanitation, waste management and electricity.

Water and Sanitation

Bangladesh has made remarkable stride in increasing the share of its population with access to basic water supply and sanitation services. According to the Sanitation and Water for All (2010), as of 2010, the incidence of open defecation has reduced to 4%, primarily owing to community-led total sanitation movement and those without access to a protected source has reduced to just 2%. However, this considerable success is challenged by quality of service issues with as many as 25% of the population using shared latrines and an estimated 12.6% of the population still consuming arsenic contaminated water. Consequently, only 56% of the populations have access to improved sanitation and 81% enjoys an improved source of drinking water.² In Dhaka city, the Dhaka Water Supply & Sewerage Authority (DWASA) provides water and sanitation services. DWASA was established in 1963 and the drainage system of the city had also been to its disposal since 1989. Water, Drainage and Sanitation service of Narayanganj city was handed over to DWASA in 1990. At present the service area of DWASA extended to Mirpur and Uttara

² Sanitation and Water for All (2012).

in the North and to Narayanganj in the South. For better operation, maintenance and customer care, the total service area of DWASA is divided into 11 geographic zones, which includes 10 in Dhaka City and 1 in Narayanganj (see Dhaka WASA website for details). Currently, DWASA produces 2150 million litre water per day against the demand of 2240 million litre and 87% of this water is sourced from underground and only 13% comes from surface level.

The sewerage system of Dhaka city was initiated in 1923 and was improved over the time. Infrastructure of the existing sewerage system includes a sewerage treatment plant, 30 lift station, 882 km sewer line and 61349 sewer connections. Table 1 shows the trends in water supply and demand in Dhaka and Narayanganj.

Table 1: Trends in water supply and demand in Dhaka and Narayanganj

Year	Population (Million)	Water Demand (Million Litre)	Water Supply Capacity (Million Litre)	Shortage (Million Litre)
1970	1.5	260	180	80
1980	3.0	550	300	250
1990	5.6	1000	510	490
2000	9.5	1500	1130	370
2005	12.2	1940	1460	480
2006	12.7	1900	1540	460
2007	13.2	1980	1660	320
2008	13.7	2050	1760	290
2009	14.2	2120	1880	240
2010	14.5	2180	1990	190
2011*	15.0	2240	2150	90

*up to 30 June 2011

Source: Dhaka WASA Annual Report 2011.

According to the DWASA, the qualitative standard of underground water and surface water is tested by its quality control and research division and the qualitative standard meets the requirement of the Bangladesh Standards and Testing Institution. In addition, arsenic analysis on deep tube-well water is carried out every month and other toxic substances are also analyzed for such as chromium, lead, zinc, mercury and aluminum. Moreover, river water used in water treatment plant is tested once in every three months.

However, there is a striking difference between slum and non-slum areas in terms of water service delivery. A recent DSK report finds that only about 30% families in the slum areas get adequate water (300 to 350 litres per day per family). Another 50% families generally get about 200-250 litres of water per day. According to the same report, roughly 30% families suffer from acute water shortage to meet their daily necessities.³

Similarly, according to the Unicef Bangladesh, urban slum dwellers have very limited access to safe water, sanitation and waste management services. The 2009 Multiple Indicator Cluster Survey, for example, showed that only 8.5 per cent of households in slum areas were using improved sanitation facilities that met the UNICEF monitoring standards.⁴

Waste Management

Given the rapid rise in urban population both in slum and non-slum areas of Dhaka city, generation of waste materials are also on the rise. The megacity generates around 3000 to 4000 tons solid waste everyday, of which 40-50 percent is disposed in the landfills and the rest left unattended and locally dumped. It is broadly estimated that between 14% to 17% of the total municipal budget is used for solid waste management which is approximately Tk. 26 (\$0.35) per capita per year. Around 7,500 cleaners are engaged in street sweeping and waste collection activities. Waste densities (350 to 450 kg/Cu.M) and moisture contents (50% to 70 % by wt.) in Dhaka city are much higher than the wastes in developed countries.

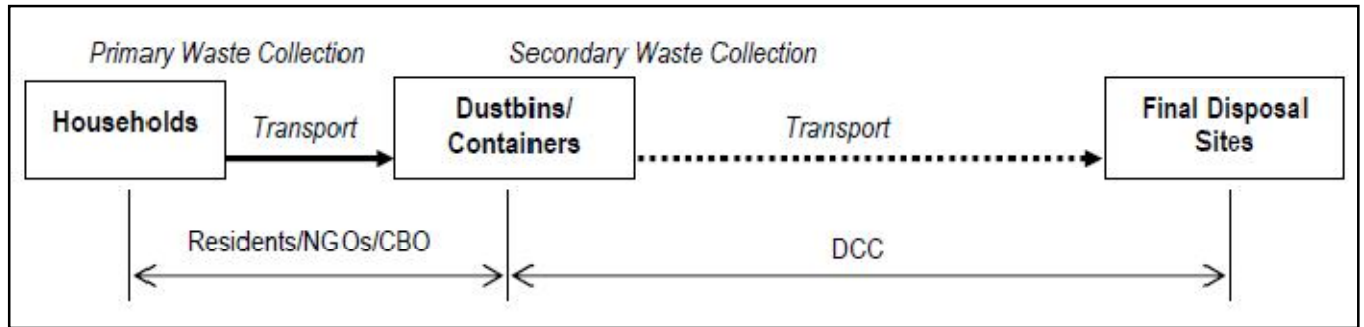
Dhaka City Corporation Ordinance is the basic law regarding street/drain cleaning, waste collection and transportation. Dhaka City Corporation (DCC) is primarily responsible for secondary waste collection removing waste from dustbins/containers, and transporting the waste to final disposal sites. Moreover, community based organizations (CBO), non-governmental organisations (NGO) and private entities are allowed to provide door-to-door waste collection services in all wards (Pacific Consultants International 2005). Figure 1 shows waste collection system in Dhaka city. In fact, CBOs are increasingly playing significant role in the primary collection of the solid wastes. Nevertheless, most of the domestic, commercial and industrial

³ Dhaka Wasa Organisation for low income and slum community water service delivery (2010).

⁴ Francis, Jeannette (2011).

solid wastes are being accumulated into the dustbins/containers by households/owners themselves.

Figure 1: Waste collection system in Dhaka city



Source: Pacific Consultants International (2005).

Electricity

As Bangladesh economy is growing steadily for the past two decades, there is a concomitant rise in demand for electricity. Table 2 shows the demand and supply scenarios of electricity in the country. The generation capacity of electricity has increased in recent years. However, owing to mismatch between generation capacity and actual generation of electricity as well as growing demand for power, consumers face load shedding (power cut) on a routine basis. Nevertheless, there is a sign of improvement in power supply in recent years.

Bangladesh Power Development Board (BPDB), a statutory body created in 1972, is responsible for major portion of generation and distribution of electricity, mainly in urban areas (except Dhaka) and the West Zone of the country. The power distribution is controlled by a number of public sector entities i.e., Dhaka Electric Supply Company Limited (DESCO), Dhaka Power Distribution Company Limited (DPDC), Rural Electrification Board (REB), Power Grid Company and BPDB. DPDC is responsible for providing electricity to the South part of Dhaka city⁵, whereas DESCO serves the Northern part.⁶

⁵ Dhanmondi, New Market, Shaymoly, Demra, Ittefaq intersection, Wari, Jatrabari, a section of Mirpur and some others parts in the city.

⁶ Uttara, Tongi, diplomatic zone in Baridhara, Gulshan, Banani and Mirpur intersection.

As indicated in Table 2, owing to higher demand for electricity vis-a-vis its actual generation, both the slum and non-slum dwellers face power cut.

Table 2: Demand and supply scenarios of electricity in Bangladesh

Year	Installed capacity, MW	Demand, MW	Maximum peak generation, MW	Maximum load shedding, MW
2005-06	5224	4693	3782	1312
2006-07	5202	5112	3717	1345
2007-08	5201	5569	4130	1049
2008-09	5719	6066	4162	1269
2009-10	5823	6454	4606	1459
2010-11	7264	6765	4890	1335

Source: Annual Report 2010-11, BPDB.

However, there is a seasonal variation in electricity demand. Moreover, there is an illegal market for electricity, notably in the slum areas. According to a report, given the absence of a formal electricity market, slum residents end up using illegal electricity. In Dhaka, this illegal consumption amounts to approximately 275MW of electricity per year.⁷

III. Objective, rationale and methodology of the study

Given the growing number of urban population and the concomitant rise in utility services, it is imperative to assess the state of various utility services in Dhaka city. The study aims to assess the state of different indicators of service delivery like availability, accessibility, quality and reliability from the end users level. The research in particular assesses the end-users' satisfaction of water and sanitation, waste management and electricity services and the factors that determine their satisfaction level.

Data and methodology

Study settings

The Institute of Governance Studies (IGS) conducted a countrywide survey with the help of AC Nielsen Bangladesh, a market research outfit, in August 2011 on three aspects of urban service

⁷ Anderson, Scott (2012).

delivery--water and sanitation, waste management and electricity, covering both slum and non-slums.

Study design

In line with the objectives of the research a quantitative study was designed. The survey was designed in accordance with ‘Citizen’s Report Card’, pioneered by the Public Affairs Centre, Bangalore. The study populations are the inhabitants of Dhaka city who buy various types of utility services, namely water and sanitation, electricity and waste management. In order to find an aggregate picture of Dhaka city’s utility service delivery, the study considered its sample frame from different socio-economic clusters. The population sample includes both house-owners and tenants. The sample was collected from four geographic locations and different types of socio-economic status of Dhaka city. The households that have been interviewed are classified as follows:

Cluster	Area
A. People of middle and upper sections residing in	Dhanmondi, Lalmatia, Gulshan, Banani and Uttara
B. People of middle and lower sections residing in	Madartek, Goran, Hajaribagh, Moghbazar, Mohammadpur and Mirpur
C. People of rich and poor sections residing in	Old Dhaka
D. People residing in slums.	Different slums of Dhaka city (appendix table A.1)

Sampling and Tools

There were 1635 respondents/households with 62.4% (1020) representing non-slum areas and 37.6% (615) from slum areas. Table A.2 in appendix describes the sample from each cluster. From every sub-cluster, comprising both slum and non slum area, 25 respondents are considered in the sampling frame. The average age of the respondent is 33.8 years for non-slum and 30.9 for slum area, and nearly 60% respondents are female. Education pattern significantly varies among the respondents--slum dwellers are generally illiterate whereas the non-slum respondents are either literate or attained very low level of education. The occupation pattern of the households

shows that unskilled workers are the key bread-earners among slum households, whereas businessmen dominate as far as non-slum households are concerned.

Structured questionnaires were used to collect information. Current status of the utility services and respondents' perception about the services were captured. Information were collected about the demographic profile of respondent and households, access to and usage pattern of water service, satisfaction with several indicators of water service, disposal place of household waste, characteristics of garbage facility, satisfaction with several indicators of garbage service, characteristics of electric service and satisfaction with electricity service. Likert (1932) scale data (5 scales) was collected regarding households' satisfaction over utility service (ranging from perfect satisfaction to perfect dissatisfaction).

Data collection and analysis

The data collection process was overseen by AC-Nielsen Bangladesh. Three layer monitoring system (team leader, monitoring and field supervisor) was in place to ensure the quality of data collection. The data was processed by SPSS 17 and then analyzed by STATA 11 SE.

Descriptive statistics of different variables were computed. Bi-variate and univariate analyses were carried out. The current level of satisfaction was examined through the Likert data analysis (median and mode reported). In addition, the determinants of the level of satisfaction were identified through regression analysis.

IV. Data Analysis and results

Water and sanitation Service

To examine the existing state of water and sanitation services, the study looked into the source, quality and frequency of water supply. It is found that there is a significant difference between slum and non-slum areas as far as access to and usage pattern of water services are concerned. This is reflected in probability values (P values). Table 3 suggests that consumers in non-slum areas use tap-water for bathing, washing and cleaning, whereas a significant portion of slum

dwellers use tube-well water for the same purpose. There was hardly any significant difference in color of water both in slum and non-slum areas. In non-slum area, foul scent of water was more prevalent and predictability of water supply is better than the slum area. As far as water purification method is concerned, households--irrespective of non-slum and slum areas—use mostly boil water notwithstanding the practice is more common among non-slum households.

Table 3: Access and usage pattern of water service

Indicators	Non-slum	Slum	P value
Sources of Water			
Medium of use of water facilities (bathing, washing and cleaning)			
Piped water supply	98.9	34.0	0.000
Tube-well with water line	0.0	31.9	0.000
Supplier of water			
WASA	77.7	45.2	0.000
Landlord/Slum	20.0	35.0	0.000
Quality of Water			
Color of water			
Clear	63.82	62.28	0.763
Partly Muddy	31.27	32.2	
No particular taste of water	96.3	97.2	0.540
Foul smell of water	37.7	30.6	0.004
Adequate water pressure	17.7	54.0	0.000
Predictable of supplying water	33.6	15.1	0.000
Sources of Drinking water			
Main source of drinking water			
Piped water supply	96.6	33.7	0.000
Tube well	0.1	53.2	
Purification behavior for drinking water			
Purify water before drinking by source of water	96.8	16.1	0.000
Water purification method			
Boil	96.7	61.6	0.000
Use alum	1.5	14.1	0.000
Use water filter	18.6	21.2	0.533
N	1020	615	

Note: P value indicates probability value for the chi-square or t-test.

The satisfaction indicators of water service show that (Table 4) more respondents in non slum areas were dissatisfied about regular supply of water compared to those in slum areas. Respondents of non-slums were less-satisfied (either partially or completely) about the behavior

of the staff and quality of maintenance and complaint redress system vis-à-vis slums. The pattern of satisfaction as far as water availability and water pressure are concerned was significantly different among people living in non-slum and slum areas.

Table 4: Satisfaction with several indicators of water service (%)

Variable	Non-Slum						Slum						P value
	CS	PS	NS ND	PD	CD	N	CS	PS	NS ND	PD	CD	N	
Indicators													chi-square test
Distance to the facility	36.7	35.7	11.0	7.6	9.0	968	36.4	39.4	9.8	6.7	7.7	612	0.554
Time taken to fetch water	31.5	39.5	9.1	9.3	10.5	987	30.7	39.7	10.7	11.3	7.7	610	0.224
Regularity of water supply	23.5	33.1	17.0	13.9	12.6	946	22.7	39.4	16.6	14.2	7.2	586	0.006
Water supply timing	30.4	37.1	11.4	11.0	10.0	980	28.6	37.4	16.0	10.8	7.3	602	0.055
Adequacy of water	33.7	32.1	12.9	11.4	9.9	993	31.8	35.8	14.8	10.8	6.8	601	0.134
Water available	21.8	31.1	17.5	17.0	12.8	808	30.3	30.1	19.6	13.3	6.7	551	0.000
Water pressure	34.1	32.5	12.2	11.8	9.4	1,007	36.5	35.5	10.5	12.9	4.6	603	0.006
Quality of water	24.6	25.9	12.1	17.7	19.7	1,003	30.7	30.7	11.3	17.1	10.3	610	0.000
Behaviour of the staff who comes to maintain/repair	15.8	26.4	27.2	17.1	13.5	889	22.1	39.2	23.3	9.4	6.0	566	0.000
Quality of maintenance	15.2	26.8	26.4	18.4	13.3	883	22.0	40.6	22.5	10.7	4.2	569	0.000
Satisfaction with complaint redress system	16.0	26.9	23.1	17.1	16.9	912	21.2	46.2	17.3	11.0	4.3	584	0.000

*Completely satisfied =CS; Partially satisfied=PS; Neither Satisfied nor dissatisfied= NSND; Partially dissatisfied=PD; Completely dissatisfied=CD.

Note: P value indicates probability value for the chi-square or t-test.

Most common reason of dissatisfaction involving water services both in slum and non-slum areas were dirt water, water with bad odor and unavailability of water.

We construct a simple econometric model to identify the determinants of satisfaction over water services. The study hypothesises that satisfaction over water services is positively related with

predictability of water timing, water color (clear), no foul scent in water and income level of households. Whereas, satisfaction level is adversely related if the respondents are house owner, large household size, no adequate pressure in water and consumers drinking of pipe water. Moreover, satisfaction level of water services is negative if households live in non-slum area. Table 5 reports the results.

Table 5: Determinants of satisfaction with water service

Satisfaction over water service	Coef.	P>t
Total Household number	-0.00367	0.772
If respondent is house owner	-0.26102	0.000
Drink pipe water	-0.01613	0.867
If face any seasonal scarcity	-0.70353	0.000
If water timing is predictable	0.136105	0.096
No adequate pressure in water	-0.32388	0.001
Water color is clear	0.29927	0.000
No foul smell in water	0.297048	0.000
Annual Income is 50,000 to 1 lac	0.219677	0.012
Annual Income is 1 lac to 2 lac	0.288458	0.007
Annual Income is more than 2 lac	0.173801	0.118
Residence is in the non slum area	-0.11941	0.209
_cons	3.661802	0.000
	Number of observation	1508
	F (12, 1495)	27.84
	Prob > F	0
	R-squared	0.1826
	Adj R-squared	0.1761

In the model, dependent variable is mode response from different responses regarding water service delivery and if there are two mode, the observation is not considered in the analysis. The diagnostic test of regression suggests that the model has no multi-collinearity problem. However, it suffers from omitted variable case (RESET test is significant) indicating that more information is needed to fit the model. This is also one of the key limitations of the model.

Nevertheless, the coefficients of the model show expected signs. The results suggest that if the respondents are house-owners, there is higher number of household members, seasonal scarcity in water supply and no adequate pressure in water, then level of satisfaction of the customers reduces significantly. On the other hand, if water color is clear and there is no foul smell in water, then the satisfaction level increases. The other variables are found to be insignificant as far the consumers' satisfaction level is concerned.

Sanitation:

In Dhaka city, households in slums mostly use common toilets (82.5%). However, in non-slum areas attached toilet (77.5%) dominates. Moreover, very few respondents from the non-slum areas (5%) had the experience of using common toilets (Table 6).

Table 6: Access and utilization of sanitation pattern in urban area (%)

Utilisation of sanitation*	Non Slum	Slum	P value
Attached toilet	76.47	42.07	0.000
Composting latrine/Eco-san	0	0.17	0.770
pit/ eco-san toilet	19.61	28.71	0.164
Latrine with open pit, no slab	0	1.84	0.329
Hanging latrine	0	17.36	0.001
No facility/ bush/ field (open defecation)	0	0.33	0.679
Public/Common toilets	56.86	82.47	0.000
N	1020	615	

*Note: *multiple response, P value indicates probability value for the chi-square or t-test.*

It was found that in slum areas those who have to use common toilet, the provision of water was irregular and the cleanliness of toilet was rarely maintained. Besides, more people in slum areas had to wait in a queue to avail sanitation facilities (Table 7).

Table 7: Characteristics of common toilets

Characteristics	Non Slum	Slum	P value
<i>Provision of water</i>			
Always	68.6	29.7	0.000
Most of the times	3.9	16.2	
Rarely	9.8	13.5	
Never	17.7	40.6	
<i>Cleanliness</i>			
Always cleaned	51.0	22.9	0.000
Cleaned in most of the time	27.5	29.6	
Rarely cleaned	9.8	31.6	
Never cleaned	11.8	16.0	
<i>Queue in using</i>			
Always	0.0	13.2	0.000
All the times	13.7	40.4	
Rarely	56.9	39.1	
Never	29.4	7.4	
Pay to use			
Yes	1.96	31.89	0.000
N	51	599	

The satisfaction pattern with sanitation service varies in slum and non-slum areas (Table 8). In non-slum areas, the survey found very few respondents used common toilets. About 47% of people in slums, either partially or completely dissatisfied over the location of common toilet. Cleanliness of common toilet is the major source of dissatisfaction both in slum and non-slum areas. The survey strongly suggests that the number/availability of common toilets is inadequate, particularly in slums.

Table 8: Satisfaction with several indicators of sanitation service (%)

Variable	Non-Slum						Slum						P value
	CS	PS	NSND	PD	CD	N	CS	PS	NSND	PD	CD	N	
Satisfaction Indicators													chi-square test
Location of common toilet	12.4	15.3	14.3	16.9	41.1	621	18.6	19.6	14.3	20.5	27.1	469	0.000
Cleanliness of common toilets	8.7	6.8	11.9	12.5	60.1	622	11.1	12.6	18.1	21.2	37.0	476	0.000
Emptying of septic tanks in common toilets	13.2	9.4	15.2	22.8	39.4	521	15.3	12.3	24.4	22.0	26.0	431	0.004
Adequacy of common toilet	8.8	10.9	11.1	23.6	45.6	588	6.9	8.8	16.6	29.7	37.9	464	0.000
Emptying of septic tanks in private toilets	35.2	21.0	12.9	8.8	22.1	657	17.7	19.4	26.4	16.7	19.7	299	0.000
satisfaction with problem solution	24.1	13.6	15.4	19.7	27.3	855	18.7	9.4	25.8	21.2	24.9	534	0.000

**Completely satisfied =CS; Partially satisfied=PS; Neither Satisfied nor dissatisfied= NSND; Partially dissatisfied=PD; Completely dissatisfied=CD.*

Section C: Garbage Service

In non-slum areas, municipality authority (or other public entities) as well as private agencies provide door to door garbage collection facilities, whereas most slum dwellers dispose their waste to drains, roadsides or vacant places (Table 9).

Most reported reason for not using door-to-door garbage collection facility in both slum and non-slum areas was that the city corporation staffs do not collect garbage from the house (Table 10). However, a large proportion of slum dwellers felt that they did not require the service. A very few proportion (0.6% in non-slum areas and 3.2% in slum areas) thought that the door-to-door garbage collection facility was costly indicating that most respondents pay (willing to pay) for that service.

Table 9: Disposal place of household waste

Disposal place (%)	Non Slum	Slum	P value
Thrown into the drains	4.8	35.1	0.000
Thrown on the road side	4.1	14.6	0.000
Thrown on the vacant space	3.4	17.7	0.000
Door to door collection by municipality	50.8	14.2	0.000
Door to door collection by a private agency	35.4	19.7	0.000
Household compost pit	0.1	1.1	0.004
Dustbin	4.2	3.7	0.636
Others	0.1	3.3	0.122
N	1020	615	

Table 10: Reasons for not using door-to-door garbage collection facility

Reasons	Non Slum	Slum	p value
City corporation staffs don't collect garbage from the house	53.5	38.7	0.001
Garbage van couldn't come to the house because there's no road	7.0	9.1	0.431
House maid dispose the garbage to the drain	6.4	5.6	0.74
Not regular to collect garbage	8.9	15.4	0.043
City corporation dustbin beside the slum	3.8	3.7	0.935
Expensive	0.6	3.2	0.081
There is no people available	0.6	0.0	0.107
Doesn't need the service	17.2	23.5	0.102

According to the survey, the most recent problem regarding garbage collection is that people become sick due to the bad odor of garbage. Besides, garbage creates water logging problem in the city.

Satisfaction level among the households living in slum and non-slum areas is significantly different as far as waste management service is concerned (Table 11). Nevertheless, most respondents--both in non-slum and slum areas--were satisfied (either partially or completely) when there is a door-to-door garbage collection facility in their neighborhood. However, lower level of satisfaction was found for other indicators, namely clearance of the dump bins, sweeping of roads, clearance of garbage from open space and addressing complains.

Table 11: Satisfaction with several indicators of garbage service (%)

Variable	Non-Slum						Slum						P value
	CS	PS	NSND	PD	CD	N	CS	PS	NSND	PD	CD	N	
Door to door collection	40.8	35.4	6.6	8.0	9.2	972	36.1	30.4	12.4	9.8	11.2	427	0.001
Clearance of dump bins	15.5	31.9	14.0	16.8	21.9	937	10.9	27.1	21.3	26.4	14.3	488	0.000
Sweeping of roads	19.2	26.9	15.2	17.7	21.1	990	14.3	26.5	16.8	26.5	15.9	559	0.000
Clearance of garbage from open space	15.0	28.7	13.0	18.4	24.9	1,000	7.3	25.6	16.0	27.9	23.2	574	0.003
Problem solution	11.9	27.3	21.0	21.6	18.3	987	6.8	28.2	25.0	24.9	15.1	571	0.000
*Completely satisfied =CS; Partially satisfied=PS; Neither Satisfied nor dissatisfied= NSND; Partially dissatisfied=PD; Completely dissatisfied=CD.													

We construct a simple econometric model to identify the determinants of satisfaction over waste management services. The study hypothesizes that satisfaction over garbage services is positive if there is a fixed time for garbage collection, road in front of house is swept, there is a door to door garbage collection and level of income. Whereas, satisfaction over garbage services is negative if the number of households is higher, residence is tenant and households live in non-slums. Table 12 reports the regression results.

Table 12: Determinants of satisfaction with garbage collection services

Satisfaction over garbage collection	Coef.	P>t
Total household member	-0.03215	0.067
Fixed time for garbage collection	0.433184	0.001
convenient~e	0.069572	0.813
Road in front of house is swept	1.005595	0.000
Door to door garbage collection	0.158865	0.194
income2 (,5 to 1 lac)	0.213353	0.081
income3 (1- 2 lac)	0.364757	0.016
income4 (more than 2 lac)	0.171634	0.256
If residence is tenant	-0.05871	0.519
If residence is in non slum area	-0.12738	0.316
_cons	2.783434	0.000
Number of obs	1317	
F(10, 1306)	14.34	
Prob > F	0	
R-squared	0.0989	
Adj R-squared	0.092	

The regression results indicate that if garbage is collected in a particular time and road in front of consumer's house is swept regularly then they draw better satisfaction from the service.

Moreover, households that earn between 1 to 2 lac taka annually are satisfied with garbage collection services.

Electricity Service

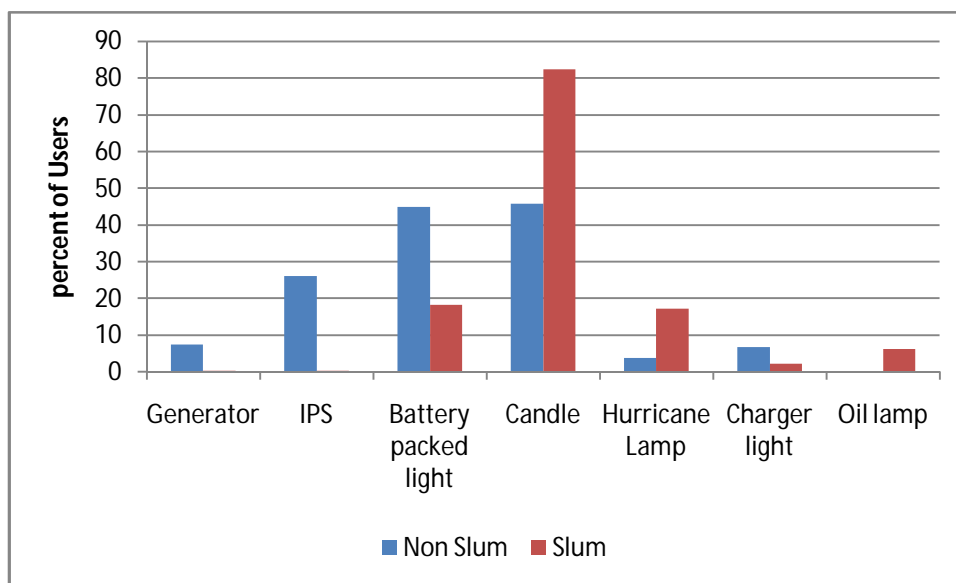
The state agencies are the only source of electricity in non-slum areas. In 76% cases households of non-slums has electric meter installed. Most of them responded positively about the meter reading. However, a large number of households are unaware about the current tariff structure of electricity. In non-slum areas, the survey shows that meter reading was done in 74% cases and half of the respondents were aware of the current tariff structure of electricity. However, in slum areas only 7.6% households had electricity meter installed as the service is generally provided by their house owners who buy electricity services from the DESCO and DPDC (Table 13).

Figure 2 shows that contingent arrangement for power failure that shows a marked difference in non-slum and slum areas. In non-slum areas, the use of battery-packed-light and IPS were more common. In slums, most households rely on candles and hurricane-lamps when they experience power outage.

Table 13: Characteristics of electricity services

	Non Slum	Slum	P value
Source of electric connection			
Government/DESCO	79.9	10.08	
Landlord/ slum owner/	20.1	89.92	0.000
Have electricity meter installed	76.47	7.64	0.000
Meter reading at every month	74.12	6.99	0.000
Know the present tariff structure	48.92	7.48	0.000
N	1020	615	

Figure 2: Contingent arrangement for power failure



The satisfaction pattern varies in almost all indicators of electricity services between slum and non-slum households. Majority respondents of non-slum and slum areas expressed

dissatisfaction (either partially or completely) over the quality and reliability of power supply (Table 14).

Table 14: Satisfaction with several indicators of electricity service (%)

Variable	Non-Slum						Slum						P value
	CS	PS	NSND	PD	CD	N	CS	PS	NSND	PD	CD	N	
Indicators													chi-square test
Quality of power	5.4	18.7	7.8	25.7	42.5	1,020	11.7	19.1	10.2	21.6	37.4	607	0.000
Reliability of power	3.9	15.9	8.6	23.5	48.1	1,007	8.2	23.0	9.7	18.6	40.6	601	0.000
Billing	10.3	31.9	16.8	21.2	19.8	893	21.7	30.9	21.3	13.2	13.0	470	0.000
Mode of payment	20.6	38.1	13.8	16.5	11.0	877	26.2	34.0	20.1	10.6	9.1	462	0.000
Grievance redressal	7.5	25.0	17.4	25.8	24.4	881	15.2	27.8	19.8	23.9	13.3	540	0.000
Overall behavior of staff	6.5	23.8	19.7	27.5	22.5	841	9.2	27.4	27.0	20.9	15.5	489	0.000
*Completely satisfied =CS; Partially satisfied=PS; Neither Satisfied nor dissatisfied= NSND; Partially dissatisfied=PD; Completely dissatisfied=CD.													

The complaints over electricity services were different for slums and non-slums. Excess charge, fused line, disconnected line were the most reported complains in non-slum areas. But people both in slums and non slums complained about higher incidence of load-shedding and loose connection of electricity.

We constructed a simple econometric model to identify the determinants of satisfaction over electricity services. The study hypothesises that satisfaction over electricity services is positively related if the connection is provided by the government agencies, meter reading is done every month and households' annual income is more than 2 lac taka. Whereas, satisfaction level is adversely related if household size is large, the respondent is house owner, resident is aware of tariff, there is meter installed in the house, households need to face queue to pay bill. Table 15 reports the results.

The results suggest that consumers' awareness about electricity tariff affect their satisfaction level adversely. This is also true for the households that have higher family members. However,

earning more than two lac taka annually affects households' satisfaction over electricity services positively.

Table 15: Determinants of satisfaction with electricity service

Satisfaction over electricity service	Coef.	P>t
Total household member	-0.04	0.023
If respondent is housewoner	-0.16	0.120
Connection from Govt.	0.00	0.992
Aware about tariff	-0.44	0.000
Installed meter in the house	-0.34	0.014
Meter reading every month	0.00	0.173
Facing que for during bill pay	-0.20	0.184
Annual income more than 2 lacs	0.17	0.098
_cons	3.25	0.000
N	1072	
F	0.000	
R square	0.0838	
adjusted R suare	0.0769	

V. Conclusions

This paper has examined the end-users' satisfaction level of three key utility services viz., water and sanitation, waste management and electricity in Dhaka city. It also identified the determinants of satisfaction level of those services.

As far as water services are concerned, while majority of non-slum households have access to piped water, there is dissatisfaction over quality of water. This dissatisfaction is also quite common among slum households. Moreover, households in both slum and non slum areas are highly dissatisfied with the quality of services provided by the WASA and house-owners. It was also found that while people living in non-slums are better-off vis-à-vis their counterparts living in slum area, the satisfaction level of the latter is relatively higher than the former.

The research has also identified the determinants of satisfaction level of water services. It was found that if the respondents are house-owners, the number of household members is higher, and there is a seasonal scarcity in water supply, then the level of satisfaction of households reduces significantly. On the other hand, if water color is clear and there is no foul smell in water, then the satisfaction level increases.

The survey reveals the fact that the availability of common toilets in Dhaka city, notably in slums, is inadequate. This problem is particularly acute in slum areas. Lack of cleanliness of common toilet is the major source of dissatisfaction both in slum areas.

There is a stark difference between slum and non-slum areas when it comes to the provision of waste management services. Most households in non-slums avail the door-to-door garbage collection facilities provided by the public or private agencies resulting in higher level of consumers' satisfaction. Lower level of consumers' satisfaction was found when it comes to the clearance of the dump bins, sweeping of roads, clearance of garbage from open space and addressing complains. As far as determinants of satisfaction level is concerned, the regression results indicate that fixed time for garbage collection and regular cleaning of road influences customers' satisfaction positively. Moreover, households that earn between 1 to 2 lac taka annually are satisfied with waste management services.

The satisfaction pattern of electricity services vary in almost all indicators between slum and non-slum households. Majority respondents of non-slum and slum areas were dissatisfied (either partially or completely) regarding the quality and reliability of power. The regression results suggest that consumers' awareness about electricity tariff affect their satisfaction level adversely. This is also true for large households. However, households' those earn more than two lac taka annually found to be satisfied with electricity services.

It is quite obvious from the analysis that the utilization patterns of various utility services are significantly different in slum and non-slum areas. This might be due to the existing infrastructure for these services as well as income level (effective demand) of households.

Nevertheless, the analysis underlies the fact that there is a supply-side constraint of various urban services that should be addressed by the concerned authorities.

Finally, the study acknowledges its limitations in explaining the determinants of satisfaction level of utility services. The regression results indicate that the urban service delivery models suffered from omitted variable case (RESET test is significant), indicating that more information was needed to fit the models. Further research on urban service delivery should consider this shortcoming.

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Dhaka WASA: www.dwasa.org.bd

Appendix

Table A.1: Demographic profile of respondent and households

Characteristics	Non-slum	Slum	P value
Respondent Characteristics			
Mean age (sd)	33.8 (± 9.77)	30.9 (± 8.69)	0.000
Gender of respondent- Female (%)	59.3	59.5	0.937
Education of main earner			
Illiterate	0.3	32.0	0.000
Literate with no form	1.5	28.3	
Class 4	1.5	11.5	
Class 5 to 9	22.7	25.9	
S.S.C / H.S.C	39.4	2.3	
Have some college education	5.0	0.0	
General Graduate or above	25.3	0.0	
Occupation of main earner			
Unskilled workers	0.0	53.5	0.000
Skilled workers	5.6	25.5	
Petty traders	4.5	14.5	
Shop Owners	13.8	3.1	
Businessmen / Industr	40.1	0.0	
Self employed profess	3.8	0.0	
Clerks / Salesmen	4.8	2.6	
Supervisory Level	17.5	0.8	
Officers / Executives	9.9	0.0	
Household Head- (Yes)	30.7	45.7	0.000
Household Characteristics			
Members	5.3(± 2.5)	4.4 (± 1.9)	0.000
Earning members in a family	1.6 (± 1.1)	1.7(± 1.0)	0.006

Income group based on annual income			
Less than or equal to 50000 Tk	5.7	40.8	0.000
50001 to 1 lakh Tk	19.9	49.3	
100001 taka to 2 lakh Tk	27.1	9.6	
More than 2 lakhs Tk	47.4	0.3	
Relationship with house (%) - Tenant	53.6	83.6	0.000
	N	1020	615

Table A.2

Cluster	Respondent Type		Total
	Non Slum	Slum	
Mirpur Sec-12 (block-	25	0	25
Kanthal Bagan	25	0	25
Rupnagar	25	0	25
Dakshin Madartek	25	0	25
Mirpur-1, Block-A	25	0	25
Mirpur Section-14	35	0	35
Banshbari	25	0	25
Purba Katasur	25	0	25
Paschim Katasur	25	0	25
Dakshin Sultanganj	25	0	25
Nilambar Saha Road	25	0	25
Lalmatia (block- b)	25	0	25
Purba Azimpur Estate	25	0	25
Nama Goran	25	0	25
Khaze Dalsing Lane	25	0	25
Chhota Katra	25	0	25
Imamganj	25	0	25
Bakshi Bazar	25	0	25

Chankharpool	25	0	25
Hazaribagh Lane	25	0	25
Malitola Road	25	0	25
Proshanna Podder Lane	25	0	25
Islampur (Part)	25	0	25
Nawabpur	25	0	25
Section 14	25	0	25
Dakshin Moshundi	25	0	25
Magh Bazar	25	0	25
Keshab Banarjee lane	25	0	25
Paschim Raja Bazar	25	0	25
Uttar Paschim Nakhalp	25	0	25
Begunbari	25	0	25
Bhasantek	25	0	25
Paschim Jatrabari	25	0	25
Kalachandpur	25	0	25
Dakshin Badda	35	0	35
Uttar Badda (hazipara	25	0	25
Bangla Motor	25	0	25
Pearabagh	25	0	25
Ahmedbagh	25	0	25
Purba Rampura	25	0	25
Sadek Khan Road,Rayer	0	25	25
Sadek Khan Road,Rayer	0	25	25
Aziz Khan Road,Rayer	0	25	25
Aziz Khan Road,Rayer	0	25	25
Aziz Khan Road,Rayer	0	25	25
Aziz Khan Road,Rayer	0	25	25
Aziz Khan Road,Rayer	0	25	25
Aziz Khan Road,Rayer	0	25	25
Jallad Khan Road,Mirp	0	25	25
Jallad Khan Road,Mirp	0	25	25
Cheria khan Road,back	0	25	25
Mirpur-1	0	15	15
Mirpur-1	0	25	25
Near Kallampur natun	0	25	25
Near BNP Police Fari	0	25	25
Near BNP Bazar polic	0	25	25
Gandaria,sutrapur,Dha	0	25	25
Mukdha,T T Para	0	25	25

Mukdha,T T Para	0	25	25
Sadar ghat,Dhaka	0	25	25
Mukdha,T T Para,Kamla	0	25	25
Pallabi, Jollad Khan	0	25	25
Mahakhali	0	25	25
Mohakhali	0	25	25
BNP Bosti	0	25	25
Total	1,020	615	1,635