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Assessing urban sustainability of slum settlements in Bangladesh: Evidence from Chittagong city

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ABSTRACT

This paper examines the sustainability of urban development through the livelihood conditions of slum dwellers in Bangladesh. The empirical data were collected through interview schedule and FGD from 97 respondents in two slum areas of Bangladesh. The respondents were selected purposively from the second largest city of Bangladesh namely, Chittagong. The results clearly indicate that there exist significant diversity and differences of sustainability indicators, particularly household and housing characteristics, health, drinking water, waste disposal system and security. More specifically, the finding shows that slum dwellers have been experiencing with a wide range of substandard, overcrowded and unhealthy housing conditions in one hand. On the other hand, they have scarce and insufficient health, sanitation, water and waste disposal services which are unswervingly impeding to sustainable development in urban areas. Although the majority of slum dwellers have access to electricity, they are still threatened by the insecurities of women, drug dealing, eviction and natural disaster. Therefore, the findings suggest a holistic approach to address the multi-faceted sustainability issues that affect the livelihoods of slum dwellers within the framework of context-driven development policy of the country.

1. Introduction

Living in a city gives people greater hope and optimism than in the countryside because of all the opportunities and amenities (CDE, 2014). At the same time, cities are considered unsustainable sources of resource consumption and waste production, greenhouse gas emission, and are a key contributor to climate change (Van der Heijden, 2017). However, shelter in a slum is affordable and appropriate for people on low and irregular incomes due to well-location in terms of urban jobs and livelihoods (Turok & Borel-Saladin, 2016). Furthermore, the slum is regarded as high-flying for a cost-effective zone for poor communities. Moreover, the slum settlements in urban settings have distinct features across the world. The expedition of urban slums in the developing world is nothing but as a result of informal, illegal and unplanned urban growth. Slum development is fuelled by a combination of rapid rural-to-urban migration, spiralling urban poverty, the inability of the urban poor to access affordable land for housing and insecure land tenure (UN-Habitat, 2003). However, rapid urbanization, lack of urban planning and housing policies have led to the creation of slums and informal settlements in urban areas. Remembering that the United Nations (2017) calls on governments to "make cities and human settlements inclusive, safe, resilient and sustainable" recognizing the impact of rapid urbanization. More recently, the United Nations adopted a New Urban Agenda, a blueprint for achieving sustainable urbanization, to help tackle this issue with the goal of upgrading slums and granting slum dwellers access to safe and affordable housing with basic services by 2030 (United Nations, 2017). Upgrading slum settlement is requisite for sustainable urban development. Therefore, there is a need for sustainable

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housing solutions for the poor in the urban global south. Unfortunately, affordable housing is out of reach for millions of low-income families, as a consequence of their limited incomes, and because of national and local housing policies that fail to reach the urban poor (UN-Habitat 2012; Smets & Lindert 2016; Ahmed, 2016). Meanwhile, the global community has gradually been started working on upgrading slums and informal settlements.

Bangladesh is the 7th largest populous country in the world with a population of more than 158 million people inhabiting a small area of 147,570 km^2. The population of Bangladesh is equal to 2.19% of total world population with a density of 1101 people per km^2 (BBS, 2011). Albeit, the country has a noticeable achievement in poverty reduction, there still exists a substantial portion (24.3%) of people live in below poverty line, where urban poverty is recorded at 18.9% (BBS, 2017). After the independence of Bangladesh, the urban areas have experienced massive population growth due to urban opportunities and rural calamities resulting rapid growth of urban squatter settlements across the country. While still predominantly rural with about 34% of its population living in urban areas, Bangladesh is urbanising rapidly and is expected to have more than 50% urban population by 2050 (United Nations, 2014). About 55% of urban population lives in urban slums: there are intra- and intercity variations in population size, density, the percent of the urban population living in slums, and sanitation conditions (Angeles et al., 2009; UN-Habitat, 2016).

Chittagong is the second largest city in Bangladesh which is located on the outskirts of Bay of Bengal. It is a low-lying city with the country's principal seaport. The city is the steadily expanding and densely populated city in Bangladesh. It is the hub of country's economic and industrial activities. Furthermore, the city has undergone a firmly growth in its slum settlements as a consequence of escalating economic actions and rural-urban migration. Chittagong has experienced a rapid reduction in urban poverty in recent years, which is estimated at 13.7% in 2016 (BBS, 2017). Residents in slums and squatter settlements, where around one-fourth of the city's population lives, are worst affected in terms of quality and access to services and facilities (Ashraf, 1995; Burton, 1999; BBS, 2015). Additionally, citizens face different types of regional environmental burdens, notably air pollution, noise pollution, traffic congestion and surface water pollution (Rahman, Haughton & Jonas, 2010). However, cities are struggling to accommodate their rising populations and address the multidimensional challenges like infrastructure and urban sprawl developments (Soyinka, Siu, Lawanson & Olufemi, 2016).

The paper justifies how and why examining the sustainability of slum squatters have become imperative in order to achieve sustainable urban development. The study is a distinctive as it finds and assesses key sustainability indicators in the context of developing countries based on the Chittagong city in Bangladesh. As the city is highly vulnerable to natural and human-induced hazards, hence the upgrading slum initiatives are mandatory that needs to be linked with sustainability indicators. Finally, this paper provides the sustainability gap to work on slum improvement and upgrading for policy makers and implementers, and opens up avenues for academics for further investigation in this field. Moreover, other than fragmented studies on Dhaka city, no comprehensive study on sustainability of urban slum in Chittagong city has been carried out.

2. Conceptualizing urban sustainability and slum settlement

The United Nations (2014) report shows that developing regions have been witnessing a faster rate of urbanization than that experienced by the developed regions. About half of the world's population is residing in urban areas. Most of them are taking place in burgeoning squatter settlements as many countries are unable to accommodate this surge in decent living conditions (Turok, Budlender & Visagie, 2017). In most of developing Asia, urbanization has been accompanied by slums and shelter deprivation, informality, worsening of the living conditions, and increasing risks due to climate change and exclusionary urban forms (Mathur, 2013; Ahmed, 2016). The UN-Habitat (2015a) report shows that the trend of urban population residing in slum around the world is changing round the year. The document also shows that the absolute number of slum dwellers continues to increase in developing countries. In case of developing countries, approximately 30% (881 million) of urban inhabitants lived in slum settlements in 2014 whereas it was 689 million (46.2%) in 1990 (UN-Habitat, 2015b). Therefore, the sustainable development concept appears to have been one of the driving forces of world history in the period around the end of the 20th century. By the late 1960s and early 1970s the melting pot of different ideas about progress, sustainability, growth and development which had developed over many years started pointing in a new direction, that of sustainable development (Pisani, 2006). Ferguson, Smets, and Mason (2014) viewed as the alternative to traditional patterns of development that can avoid problems such as exhaustion of natural resources, ecosystem destruction, pollution, overpopulation, growing inequality, and the degradation of human living conditions. However, the Brundtland Commission (1987) made the sustainable development clear as sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs. Kahn (1995) addresses that the paradigm of sustainable development described in Agenda 21 rests on three conceptual pillars: economic sustainability, social sustainability and environmental sustainability. Pugh (1996) evaluates sustainability in practice, assessing Agenda 21 and subsequent developments. In terms of practical planning guidance, Agenda 21 proposes a number of concrete measures to achieve sustainability in the socio-economic realm. These include access to land, security of land tenure, tenants' rights, liberalized credit policies, and low-cost building material programs to sustainable urban living for the homeless and for the urban poor (Hall & Pfeiffer, 2000).

The last two decades have witnessed considerable growth in the literature on sustainability and cities as sustainable urban development has often been used interchangeably with urban sustainability and sustainable city (UNDESA, 2013; Soyinka, et al. 2016). Sustainability has also become an important concept in relation to environmental integrity. There exist multi-faceted nature of the sustainability debate in towns and cities where large concentrations of people and activities have created a myriad of complex social and economic challenges with often severe environmental consequences (Keivani, 2010). In its application to cities, sustainability adopts the metaphor of metabolism; a city can be defined as becoming more sustainable if it is reducing its resource inputs (land, energy, water, and materials) and waste outputs (air, liquid, and solid waste) while simultaneously improving its liveability

(health, employment, income, housing, leisure activities, public spaces, and community) (Newman & Kenworthy, 2003).

Edwards and Turrent (2000) and Hal Anke van (2000) examine the relationships of sustainability to housing and suggest for sustainable housing, while Winston (2010) outlined the key characteristics of sustainable housing in terms of location, construction and design, use, and regeneration. Garner (1996) discussed the role of housing and social housing in improving a city's competitiveness as well as the revitalization and reintegration of areas of economic and social exclusion in urban renewal.

Recently, the United Nations (2017) in the new urban agenda proposed that the slum dwellers should be able to access safe water, access primary health care, access safe sanitation and so on. Additionally, UN-(2015b), global community, the government of Bangladesh and researchers have also used different indicators to measure the livelihood conditions of slum dwellers. Globally, the UN-Habitat (2003) uses slum settlement a run-down area of a city characterized by substandard housing and squalor a densely populated temporary residential house built lawfully or unlawfully having no water supply, sanitation facilities or electricity supply. In the same way, the Centre for Urban Studies (CUS, NIPORT & MEASURE Evaluation, 2006) and BBS (2015) characterized an urban slum in the context of Bangladesh as a cluster of compact settlements of five or more households that generally grow very unsystematically and haphazardly in an unhealthy condition and atmosphere on government and private vacant land. A slum is a settlement of households with inferior condition of housing and other civic amenities.

Additionally, the relationship of sustainability with urban slum is diverse and distinct in according to the economic condition of a county. As slum growth has apparently allied with poverty in developing nations, therefore, the causes and consequences of urban growth are essentially important to understand and analyze the sustainability of urban slums. In the industrialized countries suburban sprawl and diffuse population density complicates the pursuit of sustainability measures (Naess, 1995), but in the developing countries high population density amidst insufficient provisioning of drinking water, sanitation, electricity, management of solid wastes, storm water run-off and various other dimensions presents substantial challenges to social and environmental sustainability objectives. Jorgenson and Rice (2016) also argued that the magnitude of urban slum conditions in the developing countries now constitutes a structural characteristic shaping inequality in health and wellbeing indicators.

3. Methodological approach

The main objective of this paper is to assess the sustainability of urban slum considering the livelihood indicators used by the global community regarding sustainable development in cities. Based on available literature, this paper carefully develops some indicators under the broad six variables to assess the sustainability of urban slums in Bangladesh (Table 1). First of all, household and housing characteristics are the important elements in analysing the socioeconomic characteristics of the population as the socio-economic development of a country has direct bearing on housing condition and household facilities of the people (BBS, 2015). Thirdly, access to primary health care and reliable supplies of safe drinking water are the most important means of improving human health (WHO, 2009; Panda, Chakraborty & Misra, 2016). Fourthly, sanitation and waste disposal facilities are also treated as good indicators for hygienic environment of slum dwellers (WSSCC, 2014; Coffey & Coad, 2010).

Fifthly, access to electricity and gas for the slum dwellers is an indicator for a better life. As most of the slum dwellers live in urban areas they have the access to electricity and gas to sources of light and cooking. Finally, Security and hazard: slum living involves a wide range of risks and human hazards, including violence against women, drug dealings and threat to eviction. Urbanization, particularly in the developing world, has been accompanied by increased levels of crime, violence, and lawlessness (UN-Habitat, 2013). Therefore, access, location, living conditions and services of slum dwellers have taken into account while showing the relationship with sustainability.

The data for this study has been collected from both primary and secondary sources. The primary data have been collected from Chittagong city, Bangladesh which is the second largest city in the country after the capital city. The city has a population of more than 2.5 million, while the metropolitan area has a population of more than 4 million with a density of nearly 1500 people in per km^2 (BBS, 2011). There are approximately 2215 slums with 127,585 households within the city corporation area, inhabited by about 1.8 million dwellers which are about 22% of total city populations (IMF, 2013; BBS, 2015). For the investigation, only 2 slums at *Tulatuli* Railway (*Khulshi*) and *Sholashahar* Colony (*Panchlaish*) were selected purposively. It is noted that there are 592 households with 2090 population in *Tulatuli* whereas, in *Sholashahar*, the number of households and population are 286 and 972 respectively. Here, both

Table 1
Variables, indicators and sustainability results of the study.

Variables	Indicators	Sustainability results
Household characteristics	Age; sex; educational qualification; sources of income; and monthly income	Proportion of household head having better socioeconomic indicators;
Housing characteristics	Different housing structures; and sharing of house/ room	Percentage of household having affordable housing facility
Access to health and water services	Health facilities received from various sources; sources of drinking water	Percentage of household having consultations with a licensed provider; safely drinking water
Access to sanitation and waste disposal	Using different toilet facilities; sharing of latrines; and places of dumping waste	Percentage of household using basic adequate sanitation; disposed waste properly
Access to electricity and gas	Electricity; and gas facilities	Proportion of household connected with electricity and gas
Security and hazard	Women security; thread to eviction; drug dealing; and natural disaster	Perception about enjoying securities and free from hazard

qualitative and quantitative data were collected through interview and focus group discussion. A structured interview schedule was used to get data from the 'household heads'. In absence of the household head, the second-significant member of the family was interviewed. Besides, two focus group discussions (FGDs), including 17 participants were conducted out in both areas. The total number of interviewees was 97, including FGD participants. The collected data were edited manually and entered into the computer. Finally, percentage and average were used for the presentation of information.

It is noteworthy noted that the indicators used in Bangladesh for defining and measuring 'urban area' and 'slum area' are the same across the different regions. As an example, population threshold and population density and occupational status of population are commonly used indicators to be considered as an urban area, whereas the used the similar criteria to identify slums that include housing, sanitation, sewerage, drainage, water, eviction and so on. It can also be said that the household size and housing structure of slum areas and the patterns and rates of urbanization are almost similar in the Chittagong. Although there are some of the inhabitants living dilapidated buildings and railway-tracks are slightly different. Moreover, the experiences of migration influx and poverty trend are alike in comparison with other cities in the country. Therefore, the characteristics of the investigated households in this study represent the Chittagong city and other parts of the country' slums. This research, moreover, is not out of drawbacks as data was collected from small sample size and sample units. In addition, some of the sustainability indicators were also exempted intentionally due to the specific objective of the study and contextual nature of the study area.

4. Sustainability of urban slum in Bangladesh

The process of urbanization in Bangladesh has overwhelmingly increased after the emergence of Bangladesh as a nation state in 1971. At that time, the large cities like Dhaka, Chittagong and Khulna had to undergo with the influx of landless, homeless and jobless people coming from across the country in the search of their livelihood. Moreover, the urban population growth has remained consistently above the national population growth rate. Evidence shows that there was a staggering increase in urban population from 1951 to 2011; it has increased by about 18 folds (Islam, 2013). Currently, the level of urbanization in Bangladesh had knocked at 34.3% with a 3.60% rate of change of the urban population (UN-Habitat, 2016). This level of urbanisation had made tremendous pressure in the provision of basic infrastructure and services and on natural resources of the city. The efficient and equitable provision of improved sanitation, safe water and the collection of solid waste are important elements contributing to sustainable settlements, as is the supply of serviced land that is suitable for housing the urban poor while avoiding urban sprawl (World Bank, 2013). However, citizens in Chittagong city are frequently dissatisfied with the quality of service facilities provided by different urban authorities, and report acute shortages of water and power, sanitation problems, mismanagement of the garbage disposal system, lack of access to medical and healthcare facilities and inadequate roads and drainage infrastructure (Rahman, Dewan & Islam, 2001).

4.1. Household characteristics

4.1.1. Age and sex

There exist a wide variety of people in terms of socioeconomic indicators, particularly age, sex, education and occupation in slum areas. When it comes to age and sex (Table 2), it appears noticeable differences between age and sex distribution of the household head. It is clearly revealed that the age of household head ranges between 15 years and more than 65 years. The dominant figure regarding the age of household head is the age group 26–30 years and 36–40 years, followed by age group 46–50 years, 21–25 years, 41–45 years and 31–35 years. In addition to, a substantial diversity is revealed regarding gender consideration. In case of male, the age group 26–30 years and 46–50 years are the dominant figures, followed by 21–25 years and 36–40 years age groups. Regarding female, conversely, the age group 36–40 years is the leading segment, which is followed by age groups 26–30 years, 21–25 years, 31–35 years, 41–45 years and 46–50 years. It is evident that the household head, considering both sexes across the areas are comparatively young and ability to work. Therefore, inclusion of these age groups in slum development policy needs to be ensured as they are often excluded.

Table 2
Proportion of age ranges and sex of household head.

Age ranges	Column A (Male)	Column B (Female)	Column C (Total)	Column D (%)
15–20 year	3	2	5	6.25
21–25 year	5	5	10	12.5
26–30 year	6	8	14	17.5
31–35 year	3	5	8	10.0
36–40 year	5	9	14	17.5
41–45 year	4	5	9	11.25
46–50 year	6	5	11	13.75
51–55 year	1	2	3	3.75
56–60 year	2	1	3	3.75
61 year & above	1	2	3	3.75
Total (N = 80)	36	44	80	100.00

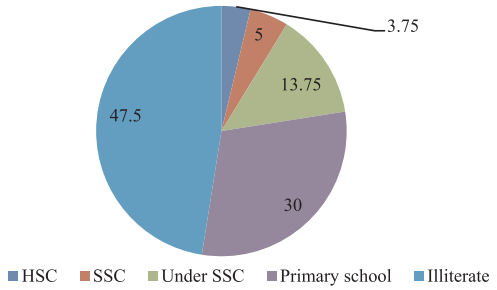

Fig. 1. Proportion of educational qualifications of household head.

4.1.2. Educational qualification

Bangladesh has achieved a significant development in education sector particularly, increasing literacy rate, school enrolment rate, access to higher education and student-teacher ratio. Apart from that, there appears an enormous disparity regarding educational qualifications between slum and non-slum dwellers. The perception of slum dwellers regarding education is nothing imperative, but a lavish substance and waste of time of their children. This perception is also evident by the literacy rate of slum and the educational qualification of the household head.

It is clearly revealed that almost all of the household head of respondents are under SSC and below (Fig. 1). No evidence is found regarding better educational qualifications like graduation and above. It is obvious that just under a half of the respondents are illiterate without having any formal education. Further to this, only 30% of the household head of slum dwellers have primary education, followed by incomplete SSC (13.47%). Only about 9% of the household head is found who have formal educational certificates like SSC and HSC. It is observed that the physical environment of slum not favorable for children's education. Although urban literacy rate is quite high as compared to nation average, the literacy rate in the slum is low in comparison to national average (BBS, 2015).

Most of the FGD participants in *Sholashahar* agreed that "female folk is lagging behind more than the boys". They further mentioned the reasons as "early marriage, gender discrimination, negligence of female children, various social myths and superstitions against female education and social insecurity of female". However, it is quite plausible to assume that the persons who migrate to the cities and settled in the slums are mainly the most disadvantaged section of the rural people, who were bereft of education and employment opportunity (WHO/HEU/IHE, 2015). Therefore, the approach for their education should be non-formal. It is, therefore, essential to develop good quality non-formal education and explore ways of adopting primary schools according to the needs of working children.

4.1.3. Income and employment

The employment scenario in slum areas is quite different and complex. Most of the employed sections are engaged with low grade jobs in informal sectors due to the dearth of employment opportunities. The average income of household head of slum dwellers is much lower than non-slum (Table 3). The estimation shows that 57.2% of slum dwellers are employed mostly involved with informal and trivial works where the proposition of male and female is 57.14% and 42.86%. About 43% of population, including children and students are unemployment due to having no specific job.

The occupational structure and level of income of household head is different from one to another because of the variation in the employment patterns. It is estimated that nearly 20% of household head among slum dwellers are rickshaw pullers and their average monthly income (8000–10,000) is also higher among other occupations. The second position in terms of the occupation of household head is maid/home servants (15%) which are in essence considered a trifling and odd job and their average monthly income

Table 3
Sources of income with monthly income.

Occupations	Column A (F)	Column B (%)	Column C (Monthly income[a])
Garments worker	10	12.50	6000–9000
Rickshaw puller	15	18.75	8000–10000
Maid/home servant	12	15.00	3000–5000
Hawker	8	10.00	7000–9000
Begging	6	7.70	2000–4000
Day labor	10	12.50	7000–9000
Driver (Van, CNG)	4	5.00	8000–10000
Small business	7	8.75	7000–9000
Service holder	5	6.25	8000–11000
Others (sweeper, mason)	3	3.75	–
Total (N = 80)	80	100.00	–

[a] The monthly income is provided in Bangladeshi Taka. This data was not truly representative in nature as the data was collected though FGD by providing the names of occupation list to participants. The aggregated data is presented based on the conscious of the participants on particular occupation.

(3000–5000) are intensely substandard in comparison with other occupations. After that there are substantial figures of household heads who are involved with formal employment sectors like, garment's worker (12.50%) and their average income is 6000–9000; and service holder (6.25%) with income of 8000–11,000, followed by day labor and small business. It is noteworthy mentioned that most of the respondents are engaged with informal sectors and seasonal occupation who have to face obscurity to run their household. As a respondent (48) who is a rickshaw puller by profession live in *Sholoshahor* said that "during the heavy rainfall, water logs onto the roads. At that time we had to sit inside the house without working which leads our family to the starvation". It is obvious that urbanization creates more space of business as well as demands for urban inhabitants, which further leads to create informal jobs like street vendors, waste pickers, informal transport providers, construction works, and so on. In the process of urbanization, the growth of the informal sector is inevitable because the informal sector is the primary job generation. There is a close link between working in the informal sector and poverty due to the fact that the urban informal sector absorbs most of the urban labour force in one hand. On the other hand, the informal economy workers earn far less than in the formal economy (Mathur, 2013). Slum dwellers may find themselves trapped in a low-skilled, low-income equilibrium as the continuous influx of rural migrants maintains wages at near-subsistence levels, hindering the investments in human capital that would be required to offset the adverse effects of slum living (Marx, Stoker & Suri, 2013).

4.2. Housing characteristics

Access to housing is an integral part in today's society. Residence in a standard house, in an integrated habitat, opens the door to resources and services, while favoring coexistence and social cohesion (Carmen & Isabel, 2015). The need for affordable housing for marginalized community has led to the creation of slums in developing countries like Bangladesh. Access to housing includes both durable dwellings and sufficient living area. As an example, a house is considered as durable if it is built on a non-hazardous location and has a permanent structure and adequate enough to protect its inhabitants from the extremes of climatic conditions such as rain, heat, cold, humidity (World Bank, 1993). On top of that, a dwelling unit is considered to provide a sufficient living area for the household members if there are fewer than four people per habitable room (UN-Habitat, 2003).

The housing structures in both areas are constructed either with tin or mud. The nature of slums is generally very tinny such as *jhupri*, tong, chai, tin-shed, semi-*pucca* structures and dilapidated buildings (Table 4). It is estimated that 45% of the house is found *kutcha* constructed with bamboo stick walls and thatch roof, whereas only 5% of house is found *pacca*. In addition, about 23% of house is found semi-*pucca* constructed with tin shaded shanty house, followed by 16.25% of *jhupri*/mud (polythene or plastic sacks) made with makeshift low shacks and dilapidated buildings (11.25%). Some of interviewees in *Tulatuli* mentioned that "most of the housing structures are fabricated with cheap materials in temporary basis". It indeed mentioned that "the proposition of tin structured houses has become comfortable to all and is increasing sufficiently and the number of *jhupris* is decreasing in both areas". Similar statistics are found in the slum census (BBS, 2015). It is also observed that some of the unauthorized houses are constructed on abandoned land in *Tulatuli* and government land along highway sides and within rail stations along the railway-tracks in *Sholashahar*.

In terms of living area, the study found that almost all of members in a family stay in one room with limited space. More than one room in a single house is rarely found in slum areas. The estimation shows that just under half of respondents have one room having 4–6 family members staying together. It is also hard to note that 23.75% of house having 7–10 members have been sharing one room. In addition, 27.5% of respondents opined that they have one room allotted for their family members composed of 1–3 members. It is further noticed that most of the house in the slum is rented with high prices. The physical looking of rented houses is not attractive without having ventilation and stay. The slums in Chittagong are generally grown on government land, particularly Bangladesh railway in *Tulatoli* area. On many occasions, though people have access to housing, this property does not meet the minimum conditions of habitability. Despites housing shortage, the price of land and the housing on unauthorised land is significantly increasing in Chittagong city. Moreover, crowded and poorly-serviced low-income settlements provide a ripe breeding ground for disease transmission, and this is compounded by a dependence on labour-intensive employment in a context of under- and malnutrition (Rashid 2009). However, depending upon contextual conditions, environmental-friendly yet durable and affordable

Table 4
Proportion of housing structures and room sharing.

	Column A (F)	Column B (%)
Housing structure		
Pucca	4	5.0
Semi Pucca/Tin shed	18	22.5
Kutcha	36	45.0
Jhupri/Mud	13	16.25
Dilapidated house	9	11.25
Living in room		
1–3 members	22	27.5
4–6 members	39	48.75
7–10 members	19	23.75
Total (N = 80)	80	100.00

Table 5
Proportion of household having health services and drinking water.

	Column A (F)	Column B (%)
Sources of health facilities		
Government medical hospital	13	16.25
Community clinic	7	8.75
Pharmacy/Quack	49	61.25
Kabiraj	11	13.75
Sources of drinking water		
Public standpipe	37	46.25
Deep tubewell	29	36.25
Supply water	14	17.50
Total (N = 80)	80	100.00

construction materials may be produced locally, based on relatively simple technologies. Bamboo, timber, adobe bricks, compressed earth blocks and interlocking stabilised soil blocks are just some of such materials that may be used in self-managed housing and in low-cost housing schemes (Hannula & Lalande, 2012; UN-Habitat, 2014). Yet, the government has inadequate visible intervention in the development of housing sectors for urban poor rather largely limited to eviction threats and practice to them. Therefore, adequate public housing policy performance becomes critical to achieving sustainable and socially equitable cities (Carmen & Isabel, 2015).

4.3. Access to health and water

Access to primary health care services is necessary for achieving the health targets. Bangladesh has witnessed remarkable progress over the last few decades in health and population indicators in terms of reducing infant, child and maternal mortality rate, significant disparities exist within urban areas, between slum and non-slum-dwellers (NIPORT 2015; Roy et al. 2014). Additionally, a noticeable progress has been observed in increasing health infrastructures, including medical hospitals, public health centres, community clinics, and dispensaries across the country. The estimation shows that the majority of slum dwellers have limited access to health services (Table 5). It is evident that the majority of slum dwellers is apathy about their diseases, nutrition and vaccination. They receive advice from the quake and *kabiraj* and go to the pharmacy for treatments. A negligible number of them are used to go to community clinics or government hospitals. It is also revealed that most of slum dwellers have suffered either one or more diseases from diabetes, hypertension, anemia, acute diarrhea, skin infections, and acute respiratory syndrome and physically handicapped.

The estimation shows that about three-fourth of the household has experienced with bumbling health services like local quack or *kabiraj* for their treatment. Among them, 61.25% of household are accustomed to take health advice from the pharmacy. Conversely, only one-fourth of household is found comfortable with government health services like government medical college and community clinics. Though, the government has special provision of public health equipment for slum dwellers, but they receive facilities from the public health workers. The respondents from both areas complained that “they do not get the vaccines provided by the government or they have to pay an amount to take these vaccines”. Although the government provide vaccines with free of charge”. Expensive health services and facilities in private clinic and hospital are far beyond the reach of the poor. On the other hand, health service rendered by the charitable clinic is minimal.

Households are considered to have access to safely managed drinking water service when they use water from a basic source on premises. Basic drinking water sources can include: piped drinking water supply on premises; public taps/stand posts; tube well/borehole; protected dug well; protected spring; rainwater; and bottled water (WSSCC, 2014). The deficiency of safe drinking water is a major cause of illness and mortality, as a result of exposure to infectious agents, chemical pollutants and poor. In Chittagong city, public standpipe and deep tube-well are the major sources of drinking water. The table is clearly revealed that about 46% of household depend on public standpipe for the collection of drinking water. It is also evident that 36.25% of household have access to drinking water to deep tube-well (hand-pump), followed by municipal water (20.67%). It is furthermore noted that more than four-fifth of them is not concerned about purifying drinking water. Moreover, slum dwellers have to depend on piped water supply (public standpipe) provided by the Chittagong Water Supply and Sanitation Authority (CWASA) - a government agency responsible for water supply of city dwellers. Additionally, there are no direct legal connections of water to slum. It is worthy noticed that access to improved water and sanitation facilities within slums are often comparable or lower than access in rural areas. The community people argued that “this city will face significant challenges in near future regarding sources of drinking water. They argued for reduction of heavy pollution and domestic waste and improvement of sewerage system. They further link it to the contamination of water bodies and surface water.

4.4. Access to sanitation and waste disposal

Sanitary disposal of excreta is fundamental to reduce health hazard and diseases. It is highly associated with socioeconomic background, including education and income of the inhabitants. Sanitary services are considered as a significant indicator of a hygienic environment of the slum dwellers. A household is considered to have access to improved sanitation, if an excreta disposal system, either in the form of a private toilet or a public toilet shared with a reasonable number of people, is available to household

Table 6
Proportion of toilet facilities and waste disposal.

	Column A (F)	Column B (%)
Nature of toilet		
Sanitary latrine	39	48.75
Pit latrine	33	41.25
Hanging/Open space	8	10.00
Sharing toilet		
4–6 family	16	20.00
7–9 family	61	76.25
10–12 family	3	3.75
Places of waste dumping		
Dustbin	3	3.75
Water body (drain)	46	57.5
Ground (street)	31	38.75
Total (N = 80)	80	10.00

members (UN-Habitat, 2003). Furthermore, each of the following types of facilities is considered adequate if the facility is not shared with other households: a pit latrine with a superstructure, and a platform or squatting slab constructed of durable material (composting latrines and pour-flush latrines); a toilet connected to a septic tank; or a toilet connected to a sewer network (small bore or conventional) (WSSCC, 2014).

The majority of household uses hygienic latrines in slum areas (Table 6). But the problem entails with the usages of these latrines. It is evident that just under half of the toilets in the slum are sanitary (water sealed) in nature, whereas pit latrine's users are 41.25% of household. Additionally, a significant proportion (10%) is found who disposes excreta in open space/hanging. It is noteworthy mentioned that most of the household share one toilet facilities with other families. The estimation shows that 76.25% of respondents share one toilet by 7–9 families. In addition, 20% of respondent are found who told that they share one toilet by 4–6 families. Moreover, there also exit 10–12 families who use one toilet. It is notably mentioned that there are some sanitary latrines for slum dwellers provided by the NGOs. Some of FGD participants from both areas agreed that "human waste gets washed into water bodies during the wet season, which leads to proliferation of viral and communicable diseases in the slum areas". In replying to a question, one of the FGD participants stated that "nobody can pass through the public thoroughfares without putting a handkerchief on their nose because of the constant bad smells".

Slum dwellers produce substantial quantity of solid waste that must be collected regularly and disposed of properly in order to maintain healthy living. UN-Habitat has specified that solid waste collection can include formal or informal collection from individual households and regular dumpster collection, but not local dumps to which households must carry garbage (Coffey & Coad, 2010). The estimation shows that about 58% of household dispose waste into the water bodies, especially into the drain while 38.75% of household dispose on the ground, mainly on the street. Only 4% of household have been found to dispose wastes in the dustbin. A question was asked about the cleanliness of road, one of respondents replied as "the roads and street are dirty and nobody bothers to maintain sanitation". Additionally, the role of Chittagong City Corporation (CCC) is observed teeny regarding waste disposal of slum areas. The finding also indicates that there is no designated place for waste disposal in the study area. Generally, wastages are disposed on the ground where slum dwellers live either in open space or above water bodies. It argued for adequate places for waste disposal and collection with the initiation of CCC and community participation. Moreover, absent or deficient water and sewage systems translate into a broad range of health and sanitation issues, whether through direct exposure to bacterial agents, contaminated drinking water, or other channels (Marx, 2013).

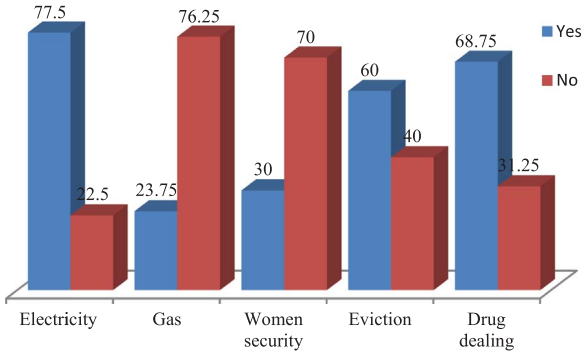

Fig. 2. People's perceptions regarding electricity and gas and security.

4.5. Access to electricity and gas

Providing necessary facility to city dwellers is the fundamental attitude of the state mechanisms. In terms of gas facilities (Fig. 2), about one-fourth of household have the privileges to gas connection in their houses, whereas 76% of household have not enjoyed any gas facilities in their houses. The estimation shows that 77.5% of household have found with electricity connections in their houses, whereas, 22.5% of houses are found without electricity. In addition, the most of the discussants indicate that “the majority of household have illegal and/or bypass electricity connection”. They further pointed that “due to poor and unplanned electric connection, short-circuits and breaking out of fire are occurred more frequently in these areas”. However, low-income urban housing cannot be made sustainable unless the themes of ecology and energy are taken into consideration (Smets & Lindert 2016).

4.6. Security and hazard

Such large concentrations of slums in which inhabitants live in inequitable and life-threatening conditions impose enormous burden on city authorities that are often cash-strapped and lack the institutional and technical capacity to provide even the most basic of urban services. These settlements are also known for their atmosphere of fear and violence (Bloom, Canning & Fink, 2008). The above table shows that 70% of respondents viewed about inadequate security for women and girls and almost similar opinion is found regarding drug dealing in slum areas. While talking about crime during FGD sessions in *Sholashahar*, they opined that “most individuals and households in slums are vulnerable with constant threats to their meager livelihoods from theft, physical threats, rape and abandonment of women and a safe place for drug dealers”. Regarding physical abuse of female, most of the participants expressed negative views as saying that “it is regular phenomena in slum areas”.

Additionally, the above estimation shows that 60% of household had experienced the threat of eviction during their tenure. One of the interviewees stated that “most of the eviction is forcibly carried out by agents of the state and sometimes by local muscle man”. As evidence, it can be said that a mobile court has evicted more than 300 slums from both sides of the railway tracks in Chittagong city’s *Dewanhat* and *Tigerpass* areas which were built by grabbing railway land (Dhaka Tribune, 2014). However, the tempo of evictions as mentioned by the majority of respondents has decreased somewhat than before. They further identified two reasons behind this. Firstly, “slum dwellers are more vocal and united against evictions, and finally, the government initiatives and development partner’s advocacy have played a significant role to upgrade slum and informal settlements with water supplies and sanitary facilities”. Secure tenure is the right of all individuals and groups to effective protection by the state against arbitrary unlawful evictions. It can be made evident through formal or informal mechanisms in codified law and in customary law (UN-Habitat, 2015a). The forced eviction without rehabilitation initiatives, the removal of people from their homes or land against their will (Olds, Bunnell & Leckie, 2002), is an urgent policy concern for government. Additionally, the Chittagong city witnessed the plight of the people flooded in slum dwellings. Floods and water-logging is regarded as the most serious hazard impacting slums. Though the city is surrounded by the river and coastal areas, the prone of flooding is erratic due to vulnerable drainage and embankment system, infrastructure constructed over the river and canals and low-lying areas.

5. Conclusion and recommendations

This paper tried to outline the numerous complex social and economic challenges of urban slums. The analysis reveals root issues of the slum problems and has shown how these problems are hampering towards a sustainable city. The finding clearly indicates that the livelihood condition of slum settings in Chittagong city is substandard and densely populated with scarce and limited public goods provision and poor quality of civic amenities. Apart from sufferings from malnutrition and insecurity and natural and human hazards, the lower life expectancy and higher infant mortality among slum dwellers have adversely threatened to sustainable livelihood condition of urban life. Moreover, there exists a huge disparity between the dwellers in slums and other inhabitants of the city. The housing quality and water and sanitation condition in slums appear to have improved somewhat in the recent years due to comprehensive interventions of government, non-government and development partners. The relentless growth of slum population calls for proper policy intervention with the consideration of the key elements of sustainable development. Meanwhile, the government and development partners have started a couple of initiatives and projects in order to address the squatter problems in the city.

On the top of that, poverty is becoming more urban; the ratio of urban poverty to total poverty incidence has risen with urbanization; and the poor have urbanized faster than the population as a whole (Ravallion, Chen & Prem, 2007). The ‘urbanization of poverty’ has become a common threat to the sustainability of cities. Therefore, rural urbanization is needed for rural poor for their better economic opportunities and employability in rural areas and intends to reduce migration flow.

Yet slums absorb the larger segment of the urban population, particularly migrants. Therefore, a comprehensive approach is needed to address housing demands in both rural and urban areas with civic facility. Additionally, gradual replacement of slums and squatter settlement with better residential quarters is also policy issue for government and local institutions. In this regard, government and private builders should come forward with down payments and loan facility and construct suitable apartments for low and middle income earners both in rural and slum areas.

There are various government institutions and NGO’s looking after social development activities, particularly education, health and sanitation. In addition to them, private sectors would adjoin with the concept of public-private partnership. Moreover, the city in recent days, observes the outgrowth of capital-intensive educational institutions and private clinics with a note of apprehension for the affluent society that also sharpens social discrimination. Controlling urban crime and insecurity has become a tricky task for law and enforcement agencies. Moreover, there is the requirement for community policing with voluntary participation in order to wipe

out miscreants. There is a huge information gap in the number of extreme poor and poor living in slums and non-slum areas. Slum dwellers also lack a critical piece of information on health, nutrition, child care, available services, and job opportunities (Uddin, 2016). Therefore, dissemination of information and awareness creation programs regarding government initiatives and services can be a way out. Moreover, the efficient and equitable provision of improved civic services, public utilities and amenities are important elements contributing to sustainable settlements. Therefore, a holistic approach with the cooperation and collaboration of various actors would be effective way for addressing the various challenges of urban slums.

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