Walkability and Accessibility Audit:

Case study of low income communities in Dhaka

Sustainable Transport Equity Partnerships (STEPs)

Prepared by

Sharmin Nasrin and Farzana Rahaman

University of Asia Pacific, Bangladesh

Contents

List of Tables

List of Figures

List of Photographs

1 STUDY CONTEXT

1.1 Overview

This chapter will formulate the context of study. It begins by discussing the rationale behind the study and transport policies. Later it examines the study's objectives and research questions to address those objectives.

1.2 Background

Walkways have provided a means to move around since ancient times. Walking is the oldest form of human transportation: the most affordable, accessible, and the most important aspect of creating sustainable and livable urban settlements. In recent years there have been initiatives in metropolitan areas throughout the world to create more livable communities where walking is encouraged and accepted as a legitimate form of transportation.

Dhaka, the capital city of Bangladesh, is one of the most densely populated cities in the world. As of 2016, it has a population of over 18 million (World Population Review, 2016) and the highest growth rate in the world. More than 4 million people in Dhaka live in low income settlements, without secure accommodation and under frequent threat of eviction. According to Bangladesh Labour Foundation (BLF) (2018), low-income populations are made up primarily of garment and textile workers; domestic workers; street vendors; agricultural workers; waste pickers; retail, logistics, jute and cotton, leather and shoe, handloom, ship breaking, security, and other casual workers.

In the metropolitan areas of Dhaka city, which have the greatest urban growth and where the majority of poor populations live, walking is the only transport available to a sizeable proportion of the population. Most people cannot afford an alternative and so the pedestrian walking environment is crucial for access to everyday necessities.

Even though walking is an essential mode of transport, it is often ignored and undermined in Dhaka. Despite the high incidence of walking, the condition of side-walks is extremely poor in most of the parts of the city. This in contrast to the many cities around the world adjusting to become more walkable.

As more and more people move into cities, the benefits of walking are clear. As well as making the urban environment more pleasant, safer, and less polluted, improving a city's walkability can ease traffic congestion and improve public health.

Walkability in slums and informal settlements, the key focus of this scoping study, is a key element of urban transportation. In Dhaka city, most of the slum dwellers walk up to 40 minutes to reach their place of work. Although walking is clean, easy, and healthy for city residents and integral to community livability, many slum and informal settlement dwellers face challenges due to limited infrastructure and services for walking.

Globally, through the Sustainable Development Goals (SDGs), the world is committed to ensuring sustainable transport although experiences vary across regions, countries and cities. Bangladesh is no exception. According to SDG 10 and SDG 11, Bangladesh has to reduce inequality within cities and to develop sustainable cities and communities. It is therefore necessary to assure mobility for slum and informal settlement dwellers.

As significant percentages of population walk, upgrading conditions for pedestrians in Dhaka is vital. Firstly, the myth that walkability is all about footpaths has to be dispelled. As much as walkability relies on safe, convenient, interesting, and pedestrian-friendly sidewalks, it is also about cultural attitudes toward the environment, urban life, class structure, gender, and social identity. The combined efforts of the traffic engineer, the architect-planner, the mayor, the policy maker, the urban anthropologist and, finally, the good citizen are required to create a walkable city. To this end, a national footpath policy and a social campaign to champion it as the right choice should be implemented.

This research will explore the challenges that slum and informal settlement residents face when they commute on foot. Three study areas have been selected to assess the walkability of low-income populations: Jhauchar, Kamrangichor and Korail.

1.3 Slums and Accessibility

Walking is an important issue for the people of Dhaka. The city is the ninth largest and the fastest growing megacity of the world by population, and 62% of daily trips are conducted by on foot (Shumi, 2015). The road is a basic requirement for housing development although it is also important to provide other services and facilities. Rapid urbanization and the inadequate capacity of the relevant authorities to manage the housing needs of people in urban areas have contributed to the development of informal settlements. Living in these settlements often poses significant health risks. Sanitation and the quality of drinking water in the slums are often poor. Most of the slum areas of Dhaka city are unplanned and unauthorized; residents experience a multitude of problems such as the absence of proper accessibility

and mobility, a lack of adequate services and facilities, and orientation and zoning problems. Pedestrians are affected by 72% of all road accidents (ARI, 2012).

The study's targeted sample was from the slum areas of Jhauchor, Kamrangichor and Korail where no bus services are available. However, special attention has been given to issues of access and mobility, and in particular walking, the main mode of transport for the majority of the urban poor. It was not until the era of the SDGs and calls for inclusion that the issue of access and mobility, especially among poor urban communities, started being visible in development literature and practice. Unsafe conditions prevailing in roads dictate the urgent need for improving overall walkability.

1.4 Transport Policies, Regulations and Programs

1.4.1 National Integrated Multimodal Transport Policy (NIMTP)

The National Integrated Multimodal Transport Policy (NIMTP) 2013 was approved by the Government on 26th August 2013. The purpose of NIMTP is to achieve a wider dissemination of the Policy, particularly amongst the international community involved in the multimodal transport sector in Bangladesh. The intention of this policy was to ensure equal importance on inland water transport, railways and air transportation along with road transport. All sectors have been mentioned in the policy separately. Road safety has been given importance. ***The 'Pedestrian First' program is mentioned in the policy. It focuses on removing unauthorized encroachment from footpaths in urban areas.*** Special emphasis is given to ***separate bicycle and non-motorized transport lanes***. The policy also stated that labour intensive methods of construction and maintenance of transport projects will be encouraged where appropriate. ***The policy addresses social equity by mentioning that transport facilities and services will, in future, be designed with consideration to the particular needs of women, children, elderly and physically challenged people. However, no specific indication has been provided as to how this will be achieved.***

The policy objectives and policy emphasis are as follows (Almec Corporation, Oriental Consultants Global, & Katahira & Engineers International, 2015):

Policy Objective:

- Reduce cost of transport goods to make goods and services within Bangladesh less costly;
- Aid export competitive, through lower transport costs;
- Improve safety;
- Reduce accident rate;

- Take advantages of Bangladesh's geographical position to trade in transport services and induce efficiency in transport sector;
- Reduce the worst environmental effects of transport;
- **Ensure that transport meets social needs in terms of cost accessibility to all sectors of society;**
- Improve integration of the overall transport network and foster measures to make interchange between modes easier;
- Reduce the need for travel by better land use planning;
- Use transport as means to assist poverty reduction;
- Improve fuel and energy security; and
- Increase alternative options for passenger and freight transport.

Policy Emphasis

- Adopting strategies for integrated transport policy;
- Ensuring best utilization and maintenance of existing assets and infrastructure;
- Encouraging more investment in rail and inland water transport;
- Adopting integrated and interchange between modes of transport;
- Improving regional connectivity;
- Fostering the role of multimodal transport operators (MTOs);
- Setting specific targets for improving air quality, road safety, public transport provision and efficiency, and road traffic growth reduction;
- A firm commitment from the government to provide adequate levels of funding;
- Greater private sector participation in the sector;
- Upgrading traffic management;
- Innovative funding mechanisms, including road user charging and levies to fund road maintenance and proper and efficient use of Road Fund;
- Establishing rational tariff for international traffic to ensure quality service in regional connectivity;
- Ensuring physical and operational integration between different modes of transport;
- Establishing a more rational regulatory framework;
- New coordinating mechanisms to advise on integration at the national level and act as a force for change;

- ***Meeting the transport needs of women and girl-children****;*
- Applying digital technology in the management of integrated transport policy
- Improved research, education, training and technology to support integrated transport objectives.
- Limiting damage of roads through enforcement at axle load control stations on highways;
- Modernizing dry ports to enhance efficiency in the management of freight and passenger movement; and
- Bringing navigability of rivers through enforcement, removing encroachment of river banks, permanent stopping of river pollution, upgrading of river ports and ensuring an environment conducive to transportation through river ports.

1.4.2 National Transport Plan (NTP)

The National Transport Plan has been prepared to provide a long term vision of at least 30 years, making the role of transport in economic activities more significant and underpinning continued economic and social development.

According to National Land Transport policy, (2004) objectives of NTP are as follows:

Plan Objectives:

- To provide a safe and dependable transport service
- Removal of unnecessary control and formulation of laws and regulations conducive to providing service.
- Government will preserve the right to regulate fares to protect the interests of the common man. But Government, if needed, will arrange for subsidies if there is a discrepancy between the cost of operation and revenues.
- To maintain an economic and environmental balance the investment environment will be improved to attract private entrepreneurs. Roads will be constructed with appropriate designs, and the operation of vehicles will be controlled to minimise adverse effects on the environment. Compared to rail and water transport, the pressure on road transport is gradually increasing, but there is a need for intervention in the policy to encourage the use of rail and water transport, as they are comparatively more environment friendly.
- Reduction of transport cost of goods for export. An unrestricted and integrated transport system is essential for trade.

- Formulation of transport system for Dhaka city (Greater Dhaka). Provision will be made for a transport system suitable for working people of Dhaka city which will eliminate traffic jams, control environmental pollution, will have modern traffic system, with provision of high capacity vehicles, fly-overs, elevated expressways, etc.
- An integrated transport system will be introduced integrating rail, bus, taxi and water services and terminals, to assist economical transport and ease of interchange.
- Government will encourage the introduction of alternative transport systems so that customers may choose the appropriate system according to their needs.
- Creating of awareness regarding better standard of life and safety: Greater awareness of better standards of safety in transport will be created. Works programme will be taken up in this policy to increase awareness regarding the subjects of housing system in urban planning, community transport system, safe walking for pedestrians, traffic training, etc.
- One of the goals of this policy is poverty alleviation as policy said that the transport sector will be highlighted within the overall planning and programme of the Government so that lower income groups also enjoy the fruits of development.

1.4.3 Strategic Transport Plan (STP) and Revised Strategic Transport Plan (RSTP)

The Clean Air and Sustainable Energy Project (CASE) was funded by the World Bank to address the reduction of air pollution at source. The Strategic Transport Plan (STP), which is the most comprehensive transport study, was recommended by the CASE project (Bhuiyan, 2007).

The STP (2005) serves as the current basis for urban transport planning in Dhaka. It considers aspects of multimodal transport, safety, pricing, environment, travel demand management and land use for improving the transport situation with a long-term vision. Previous planning studies, including Dhaka Integrated Transport Studies (DITS), Dhaka Urban Transport Plan (DUTP) and Dhaka Metropolitan Development Plan (DMDP), have been updated in the STP for proposing a long-term transport plan in a time-period spanning from 2004 to 2024. This study projected future growth by considering the planned land use presented in DMDP (The Louis Berger Group and Bangladesh Consultant Ltd, 2004). To update the plan and to continue the development of transport system in Dhaka a Revised Strategic Transport (RSTP) has been approved in the year 2015 (RSTP, 2015).

According to the RSTP for Dhaka (2015) eight specific objectives in the master plan are identified:

- Promotion of social understanding about urban transport problems and issues
- Effective management of urban growth and development
- Promotion and development of attractive public transport
- Efficient traffic control and management
- Effective management of transport demand
- Comprehensive development of transport space and environment
- Enhancement of traffic safety and reduced environmental impacts
- Strengthening of urban transport administrative and management capacities

1.4.4 Greater Dhaka Sustainable Urban Corridor Plan (GDSUTCP)

As proposed in the STP a 20 km Bus Rapid Transit (BRT) corridor is being constructed from the International airport in Dhaka to Gazipur, connecting Gazipur City Corporation and Dhaka City Corporation. It is anticipated that about 20,000 passengers will travel per direction per hour and travelling time will be reduced by about half. The Gazipur City Corporation (GCC) area is a garment hub with 272 garment factories in the immediate vicinity of the corridors, employing approximately 1 million workers among them mostly are women. In the Greater Dhaka Sustainable Urban Corridor Plan women's issues have been mentioned directly:

- A user-friendly Fare Regulation policy is one of the criteria mentioned in this plan. For garment workers and students, the fare will reduce by half on production of a valid identity card issued by the authority of the concerned organization/s.
- There will be separate queuing systems for male and female passengers to allow ticket sales on an equal basis.
- Gender-friendly On Board Safety Rules will be set. Drivers will be educated about basic safety issues. On board, announcements will be made so that passengers are aware of the bus service rules. In addition a female steward/crew will work alongside male colleagues on the bus.
- A user-friendly, decorated foot over bridge (FOB) with a roof will be provided.
- Lighting facilities /underpasses near RMG industries will be assured.
- Police patrols, including female police, at FOB and bus stops will be increased to enhance road safety.
- The provision of public toilets with adequate facilities and privacy for both men and women.

- Increase women workers' participation in road construction and maintenance.
- Employ female staff for BRT.
- Employ one male and one female staff member at BRT bus stations during peak hours and on special days.
- Provide equal wages for equal work.
- Provide water and sanitation facilities for female workers.
- Maintain the provision of shops for women in BRT terminals

1.5 Does walkability Issues for low income commuters' addressed in transport plan?

As discussed previously, social and financial constraints make low income commuters vulnerable on Dhaka's roads. Due to financial constraints most low income commuters tend to walk to their work places (Nasrin, 2015). The NIMTP, NTP, and RSTP mention, albeit indirectly, that travel should be affordable for all types of road users. Specifically, the NIMTP states that subsidies should be given to those who are disadvantaged and poor. However, at present, there is no subsidy or discount for low-income commuters' travel. Additionally, inadequate alternative modal options force low income female commuters to walk in order to reach their destination despite Dhaka's exceptionally poor walking environment. In NTP and NIMT alternative transport provision is emphasized; indirect references in the NIMTP and NTP state that travel time should be in proportion to the distance travelled.

Overall, the lack of safety on the roads is attributable to the difficulties pedestrians' face dealing with narrow roads, poor conditions, and flooding. Female commuters face harassment while walking as well as while travelling by bus. Newspapers report many incidents where women have been physically assaulted (Daily Sun, 2017; Daily Star, 2015). Safety is a factor addressed on NIMTP, NTP, RSTP respectively.

From previous research, it has been found that significant percentages of low income commuters walk to their work place even though they are not satisfied with the walking facility (Nasrin, 2015). However, none of the policies or plans mention improving walking conditions directly.

Most of the transport and infrastructure projects in Dhaka are encourage a car-based transport system, such as flyovers, and elevated expressways. However, according to RSTP several on-going projects managed by the Dhaka City Corporation focusing on improvements to pedestrian walk ways (RSTP, 2015). In March 2014, Dhaka North City Corporation (DNCC) inaugurated the construction of the first ever foot-over bridge and escalator (upwards only) at the intersection of Banani Road Number 11 and Airport Road.

DNCC plans to construct seven more similar bridges if the existing construction is proved popular. In the long run, these types of projects will help women commuters to walk freely and safely, particularly those who are disabled (both men and women) or pregnant.

1.6 Objectives of the Study

In order to gain a detailed understanding on the extremity of walkability (access and mobility) in the selected settlements, a walking and accessibility audit of the slum community was undertaken, guided by the following objectives:

I. Observe and understand the general mobility patterns in the settlement
II. Explore residents' attitudes and perceptions of the walking environment
III. Determine the link between activity spaces and walkability
IV. Understand and benchmark the mobility needs of residents in informal settlements
V. Encourage participants to utilize novel research methodologies and to include community co-investigation
VI. Encourage debate among diverse actors and build networks and coalitions to address the challenge

1.7 Research Questions

Research questions that will be answered to achieve the objectives of this research are:

1. What is the general mobility pattern of low income commuters in slums?
2. What are the perceptions and attitudes of residents towards the walking environments inside and outside slum?
3. Is the link between activity space and mobility well established for slum residents?
4. What are the mobility needs of low income commuters in slum?

1.8 Description of Study Areas

Dhaka is divided into two parts, North and South. The slums inhabited by the greatest numbers of low income commuters have been selected as study areas. In the South, the study areas are Jhauchar and Kamrangichar (section 1.7 and 1.8) and in the North, the study area is Korail (section 1.9). Figure 1.1 illustrates the locations of the study areas within Dhaka city.

Figure 1.1 Location of Study Areas with Respect to Whole Dhaka City

1.8.1 Jhauchar

Jhauchar is the part of the Hazaribagh Thana (Dhaka metropolitan). It has an area of 3.94 sq. km, and a total population 103482 of whom 57044 are male 57044 and 46438 are female. It is bounded by Mohammadpur Thana to the north, Kamrangirchar Thana to the south, Mohammadpur, Dhanmondi, New Market and Lalbagh Thanas to the east, and Keraniganj Upazila to the west. Figure 1.2 illustrates the position of the study area in Jhauchar.

Forty two per cent of residents are land owners, while 58% do not own any land. Low-income people from Jhauchar commute to various places in Dhaka city to work and earn money to meet their daily needs. Researchers collected data at different locations along the Jhauchar to Rayerbaza route. Most of the slum dwellers travel up to 40 minutes to reach their work place, though travel time is sometimes more. As only paratransit is available in Jhauchar, their travel costs are slightly higher than the average.

Figure 1.2 Position of the study area in Jhauchar

1.8.2 Kamrangichar

A survey of slums in Bangladesh found that the single largest concentration of slums in the Dhaka Metropolitan Area was in Kamrangirchar, and reported that of the (approx.) 300,000 people living there, 265,000 are slum dwellers (NIPORT, 2006). Figure 1.3 illustrates the position of the study area in Kamrangichar.

Kamrangirchar Thana (Dhaka metropolitan) has an area 3.63 sq. km, a total population (2017) of 0.4 million, and a population density of 23,000/sq. km. It borders Hazaribagh and Lalbagh Thanas to the north, Lalbagh and Chawkbazar Model Thanas to the east, Keraniganj Upazila to the south and west. Agricultural land is owned by 32.54% of the population while 67.46% are landless 67.46%.

As a result of comprehensive consultations with the Kamrangichar communities and other stakeholders, the Plan will address challenges which include but are not limited to poor accessibility, poor sanitation, poor drainage, poor quality services and insecurity. The road conditions and sidewalks in Kamrangichar are same as Jhauchar.

Figure 1.3 Position of the study area in Kamrangichor

The poorest among the urban citizens live in slums or squatter settlements. Low-income people from kamrangichar spread out to various places in Dhaka city to perform the work and earn money for meting their daily demand. Enumerators collect the data at different locations from kamrangichar to Dakeshwari mondir route. Most of the slum dwellers go to work by walking up to 40 minutes. Because, in this area have only available paratransit and the travel cost is slightly high.

1.8.3 Korail

Korail is one of the largest slums in Bangladesh both in terms of area (364,230 m2) and population (over 100,000). Opposite the slum, to the south, is the BRAC Head Office in Mohakhali; two of the most affluent areas in Dhaka, Gulshan and Banani border Korail's northern side.. Most of the people who live in Korail have migrated to the city from the poorest parts of Bangladesh. Figure 1.4 illustrates the position of the study area in Korail.

Figure 1.4 Extent of Study Area in Korail Slum

The majority of Korail's inhabitants live below the poverty line and work in a variety of extremely low income jobs. Most of them are maids, drivers, caretakers, garment workers or work as assistants in small shops. They play a vital part in local life, as well as the city as a whole. Korail one of the oldest slums in the Dhaka. It was founded in 1961, under Pakistani Governance. Table 1.1 lists the different occupations of Korail's population.

Table 1.1 Occupation of Korail Residents

Male	Female (23+)	Young Girls (Age 18 to 22 Years)	Children (Age 5 to 18 Years)
Rickshaw-puller, day laborer, small business owner, garment worker, cleaner	Part time domestic worker, day laborer, garment worker, cleaner	Generally, work in the garment industry.	Generally, work in shops or on construction & transport sites.

2 METHODOLOGY

2.1 Overview

This chapter will describe the study's research method. The research methodology involved both primary and secondary data collection, data analysis, interpretation and synthesis, and subsequent recommendations to address the mobility challenges identified. A conceptual structure was developed to systematically highlight all the steps that guided the process of collecting, analyzing and interpreting study outcomes.

2.2 Research Design

Research design is defined as a conceptual framework of methods and techniques chosen by a researcher to combine various components of research in a reasonably logical manner so that the research problem is efficiently handled (Selltiz, 1962). It describes how to conduct research using a particular methodology. Every researcher has a list of research questions which need to be assessed – this can be done with research design.

Figure 2.1 illustrates the research design adopted for this research. Research design for this research is divided into several stages and a detailed discussion is provided below:

Stage 1- Formulate Context of Research: Research background, objectives and questions have been formulated based on previous research (Section 1.1,1.2,1.3).

Stage 2 - Study Area Selection: To cover a wider area, three slums, Jhauchar, Kamrangichar and Korail were selected from North and South Dhaka. All three slums are very significant in terms of population and area. In section 1.7 provides a description of the study areas.

Stage 3- Primary Data Collection: Primary data has been collected through focus group discussions and a walkability audit. For the walkability audit, the STRIDE app, developed by Walk21 and the University of Cedeus, was used. Focus group discussions gave insights into participants' perceptions of walkability through discussions while the walkability audit would looked at participants' perceptions through their experiences. Details of the focus group discussion and the STRIDE tool are given in chapters 3 and 4 respectively. There were three focus group discussions involving three different groups of commuters: working women; elderly residents; and young children (see sections 3.2, 3.3 and 3.4). Walkability audits were conducted in all three study areas: Jhauchar, Kamrangichar and Korail.

Stage 4- Qualitative Data Analysis: Qualitative analysis is the development of a concept to understand social phenomena in a natural setting giving due emphasis to the meanings, experiences, and views of the participants. Qualitative analysis of the focus group discussions is described in Chapter 3, analysis of the walkability audit survey is given chapters 5 and 6. For this research, the dimensions of the qualitative analysis methods are:

Understanding Context: How financial, political, social, cultural and environmental organizational factors influence low income commuters' travel patterns;

Understanding People: How people make sense of their experiences of walkability, both inside and outside of the slum area.

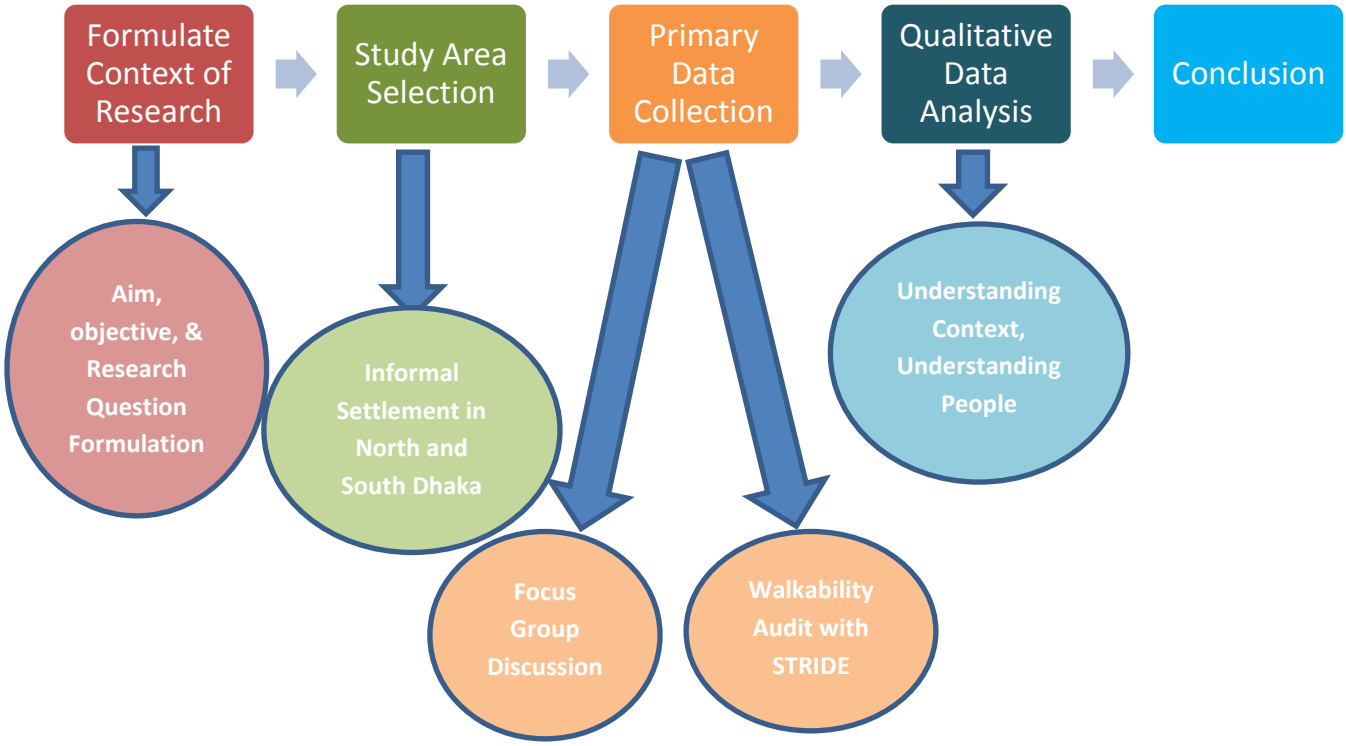

Figure 2.1 Research Design of the Study

3 Analysis and Findings - Focus Group Discussion (FGD)

3.1 Overview

This chapter will discuss the findings of the focus group discussion (FGD) conducted in Korail. The Chapter starts with an introduction of three groups of participants: working women; elderly residents; and children. Later we discuss their responses, which help to achieve the objectives stated in section 1.5.

3.2 Focus Group Discussion (FGD) 1: Mobility Issues of Working Women

Location: Korail Slum, Gulshan, Dhaka

The FGD was conducted on working female commuters on June 5th, 2018 (Photograph 3.1 and Photograph 3.2).

In Korail most of the women undertake domestic work in households in the surrounding areas though some work in the Ready Made Garment (RMG) sector. As their travel patterns vary, two separate FGDs were conducted, one with domestic workers and another with the women working in the RMG industry.

The objective of the discussions was to understand low income, women commuters' travel behaviours and walkability issues. Participants gave detailed information about their financial situations, transportation usage, mobility-related problems, and about the facilities from Government or Non-Government Organizations (NGO) as factors which directly or indirectly impact on their travel behaviours. They were also asked about their expectations in terms of improved mobility options.

At present, due to a lack of transportation facilities, residents of Korail – particularly women and children - face difficulties with their commute. Most people walk to reach their destination as there is no alternative, cheap transport. However, facilities for walking are almost nil within the slum area. Until recently, most of the women used a boat service over the Gulshan Lake. The fare was between 2 and 5 BDT. However, the government has imposed a ban on boats on the lake because of security concerns.

The information revealed from the discussion is summarized as follows:

Discussion with Household Women Workers:

There were 20 participants in the group (photograph 3.1) with an average income of ranges from 3,000 to 4,000 BDT. Their main mode of transportation is walking. The participants work in houses and apartments near to the slum. It takes about 30 minutes to walk an approximate distance of between three

and five kilometres to their places of work. When the participants cannot walk to their final destinations for some reason, they generally walk to catch the city buses. Their income means they have limited resources to spend any extra money to meet their transportation needs. Other available modes include rickshaw and auto-rickshaw (CNG) which are expensive and limited in number. Since the boat service over Gulshan Lake was halted, people have to travel by longer routes, increasing their travel time to work. This has a negative effect on their social and family lives.

In terms of safety, the participants feel safe within the slum area. Outside slum, in areas such as near Banani Bridge, incidents of snatching, hijacking and eve teasing are in evidence. The condition of the pathway connecting the slum with the surrounding area is not good enough, however, their limited perceptions of good quality roads mean that the participants did not have significant objections to this. During the rainy season, due to the lack of a proper drainage system, water logging is common, exacerbated by refuse discarded by the slum dwellers. The water level of lake rises 2 – 3 feet during monsoon period making it impossible to use the pathways. Women and children are most affected by this. The situation is made worse by the increased fares charged by rickshaws and CNGs in these conditions. Waterborne diseases are more common during flooding - in cases of health-related and other emergencies, some special transport services are made available by a number of NGOs.

Slum dwellers want the boat service across the Lake to be reinstated - they could easily use it to travel to their work places. The women stated that traveling by boat to the surrounding area would save time, allowing them to spend more time with family and friends. The lower income women also expected the provision of transport to enable their children to attend school.

Photograph 3.1 Focus Group Discussion with Household Worker

Discussion with RMG Workers:

Discussions were held with 15 RMG workers (Photograph 3.2). The average income of RMG workers in Korail ranges from 4,200-5,000 BDT. However, those with more experience might earn up to about 10,000 BDT.

For this group, the main mode of transportation is walking and most of the time they go to their work place on foot. Usually, they work in the garment factories near to their homes and it takes them about 30 to 40 minutes to reach their places or work. Most of the time they travel to work in small groups, mainly because traveling in group makes them feel safer, especially at night. They also share rickshaw rides with colleagues but could barely afford any additional expenditure for transportation. No affordable public transport is available for them. There is evidence of unwanted incidents (snatching, hijacking, eve teasing etc.) at specific places outside Korail, such as Road 8, Road 9, Road 11 in Banani and near Banani Bridge. In emergencies NGOs provide them with additional support.

Similar to the domestic workers, participants in this group also wanted the boat service to be resumed. The boat route was free from traffic congestion and saved them time. The group also expect the provision of transport to allow their children to travel to school.

Low income people, both men and women, usually have limited funds to pay for travel to work. Almost all of their earnings are spent covering their basic needs. Some commuters spend only 2 to 5 BDT per day. Most low income women who participated in the focus group mentioned that they think using any mode of travel (other than walking) would be a luxury for them. Cultural circumstances in Bangladesh mean that the women would rather save money for their family or spend it on their child's travel to school rather than on themselves. They'd be very interested however, in a transport facility provided free of charge.

Photograph 3.2 Focus Group Discussion with RMG Worker

3.3 Focus Group Discussion 2: Mobility Issues of Elderly People (Male and Female)

There were 20 participants in this group, all aged over 50 (photograph 3.3). Most of them were dependent on their spouse or children to meet their needs. Some also owned road side small business or earned a living by renting out rooms. This group of people seldom leave Korail. Their family incomes range from 10,000 BDT to 30,000 BDT. Due to the unaffordability of other modes of transport, they mostly walk to reach their destinations. As they have lived in Korail for a long time, have good knowledge of the area. According to these participants, some routes in Korail have only recently been upgraded into proper paved roads, with the support of various NGOs.

This group also expressed their frustration that the boat crossing service has been stopped. For some of the participants, the boat was their means of livelihood. As with the group of working women, the group

also stated that inadequate drainage, water logging, and the unpaved lanes in Korail are some of the challenges they face when walking.

Photograph 3.3 Focus Group Discussion with Elderly People

3.4 Focus Group Discussion 3: Mobility Issues of Young Children (Male and Female Children)

This focus group was made up of 15 children (both male and female) between 15 and 18 years of age (Photograph 3.4). Participants in the group were mainly secondary and high school students and attend schools both inside and outside Korail. Those who leave Korail to attend school travel about 3 to 6 km to get there. Those who travel to schools nearby (within 1 km) usually walk while those who travel further take the bus. The children mostly travel alone. Parents of these children have a limited ability to provide money to enable their children to use any mode of transport and so, even in bad weather, they walk to school. Similar to other groups they also mentioned that water logging as a serious problem in the slum. During rainy season, due to water logging, sometimes children are unable to go to school for several days at a time. Those who walk through flood water are exposed to infections which affect their legs and feet.

Overall the children feel safe inside Korail although eve-teasing is significant issue for female children, even inside the settlement. Girls cannot walk freely at night.

Photograph 3.4 Focus Group Discussion with Children

3.5 Analysis of Responses from Focus Group Discussion

Responses from the participants were analyzed under seven themes. Figure 3.1 illustrates the themes of the analysis.

Figure 3.1 Themes of Analysis for Responses from the Focus Group Discussion

Table 3.1 lists the responses of participants under theme 1.

Table 3.1 Responses of Participants under theme 1 'Am I getting my rights?'

Responses	Group
There is only one proper access road at the moment to enter into the Korail Slum.	1, 2, 3
Don't have money to travel by rickshaw or bus.	1, 2, 3
Even when I feel sick or it's raining, I am forced to walk.	1, 2, 3
Even though there are no facilities for walking, there is no option other than walking.	1, 2, 3
During fire or any other incident, I don't have access to safe places.	1, 2, 3

Table 3.2 lists responses of participants under theme 2.

Table 3.2 Responses of Participants under the theme 2 'Is Travelling Comfortable?'

Responses	Group
I need to wake up very early to travel to school/ work. I need to be prepared for any adverse situation, such as bad weather or road closure etc.	1, 3
During the rain, I need to walk through standing water (even 6/7 days after rain) that causes infections in my leg and feet.	1, 2, 3
After walking long distances on bad roads at night, I feel exhausted and tired.	1, 3
When there was boat I could travel very easily. I could cross the Lake for 2 BDT. For students the boat was free! Even those without money could travel. Now I don't have this facility as the boat service has been stopped by the authority.	1, 2, 3
For my child's comfort, I saved money to buy a bicycle.	1, 2

Table 3.3 lists responses of participants under the theme 3.

Table 3.3 Responses of Participants Under the theme 3 'Am I safe when I travel?'

Responses	Group
I feel safe inside Korail, but near the access road (near Banani) it is unsafe (as a result of theft, snatching, burglary etc.). When I (garment worker) come home from work at night, I prefer to travel in a group.	1, 2, 3 (male children)
With the initiative of Korail community, security guards are appointed at night. So inside slum we feel safe to walk at night.	1, 2, 3 (male children)
As a female teenager, I don't feel safe inside Korail. This is mainly because eve-teasing predominately occurs inside the slum.	3 (female Teenager)
As there are no motorized vehicles in Korail, I feel safe cycling.	3 (male teenager)
There have been several fires in Korail. Fire fighting vehicles cannot access the centre of the slum, where most people live, and fire fighters are very reluctant to enter this area. Most of the time they come 2 or 3 hours after the fire has started so I don't feel safe. I feel I may die at any time.	1, 2, 3
When there was boat service, when a fire started, people could escape easily, even with their belongings. Now they don't have that facility and cannot escape very easily.	1, 2, 3

Table 3.4 lists the responses of participants under the theme 4.

Table 3.4 Responses of Participants Under the theme 4 'Am I Inclusive Traveler?'

Responses	Group
I do not belong to the system, as I don't have access to good facilities for walking and have limited ability to afford public transport.	1, 2, 3
For reaching main roads, I need to walk through my neighbours' house, as houses are built next to each other with no space in between.	1, 2, 3
No one thinks about us. We are the burden of the society.	1, 2

Table 3.5 lists the responses of participants under the theme 5.

Table 3.5 Responses of Participants Under the theme 5 'My day at dawn?'

Responses	Group
After walking long distances, especially on bad roads inside Korail, my day at dawn is exhausting and tiring.	1, 3
After walking almost an hour, when come home I need to do household chores.	1
As I am tired after long walks on bad roads, I cannot give any quality time to my family.	1

Table 3.6 lists the responses of participants under the theme 6.

Table 3.6 Responses of Participants Under the theme 6 'Am I Free?'

Responses	Group
I don't feel able to walk/travel freely. This is mainly because inside and outside slum, I experience harassment and eve teasing every day.	1 (young female), 3 (female teenager)
Before we had boats that served people and we could earn money by offering this service. Now, as it is stopped, we cannot use this service and cannot earn money. I do not have any control of my life. We are not free here. We are getting the blame for the acts of outsiders.	2
As a female teenager, I cannot cycle, even inside slum.	3 (female teenager)

3.6 Overall Findings from Focus Group Discussion

- Slum dwellers' main mode of transport is walking.
- Commuters in slum are captive walkers.
- There are strong bonds in the slum dwelling community.
- Inside slums, most slum residents do not have any security concerns. However, young females do not feel safe.

- Cycling is not very common for slum residents. Paying for a bicycle is difficult for them.
- The boat was very popular among the Korail residents - it was a very efficient mode of transport.
- Water logging is a serious issue inside the slum.
- There is no fire extinguisher available for the slum.

4 DESCRIPTION OF SHARED TRAVEL REALITY OF INDIVIDUAL DEFICIENT ENVIRONMENTS (STRIDE) TOOL

4.1 Overview

This chapter starts with discussion of the walkability audit and its importance. Later we discuss the Shared Travel Reality of Individual Deficient Environments (STRIDE) tool and its application method. In chapter 5 and 6 the STRIDE results for walkability audits in Korail, Kamrangichar and Jhauchar are provided.

4.2 Walkability Audit

A walking audit is a simple and systematic tool to assess the walking conditions in any city. A walking audit can give us information about things that are working and things that need improvement; and provides a record of the environment that helps us to understand changes over time. The Government of Western Australia (2011) walking strategy has four aspects:

- **Access –** easy to reach walks and attractive public open spaces for people of all physical activity levels and abilities. Facilities should be accessible to seniors, people with disabilities, and people with prams through such treatments as ramps, wide pathways, large signs and unisex toilets. Access issues may also include the suitable provision of bus stops, car parking and bike racks.

- **Aesthetics –** a walking environment should offer pleasant, clean surroundings. The location has a natural or developed attractiveness that encourages people to use it. Considerations may include heritage preservation, litter control and excellence in landscaping.

- **Safety and security –** while walking walkers must feel safe. People need to feel that they can relax and enjoy their walk on paths that are well maintained, stable and built with personal safety as a priority. Security is also important and walking environments should be created or enhanced using the principles of ‘designing out crime’ (adapting environmental design principles for crime prevention).

- **Comfort –** walkers can be confident of shelter, conveniences and rest stops. Amenities such as drinking water, seating and shade or shelter must be available.

4.3 Description of STRIDE

The walkability audit was conducted using the Shared Travel Reality of Individual Deficient Environments (STRIDE) app. STRIDE was developed by WALK21 and The Sustainable Transport Research Department of the University of CEDEUS, Chili, Santiago to evaluate walkability in the field.

Figure 4.1 illustrates the STRIDE interface. There are three buttons: red, yellow and green. The participants who were not at all happy with the walking conditions pressed the red button, those who were happy pressed the green button and those who thought walking environment was average (has some issues) pressed the yellow button. Each participant's perception of their walking environments were recorded in the app. Participants were accompanied by researchers to better understand their perceptions.

Figure 4.1 STRIDE Interface

4.4 Data collection using STRIDE App

Before the walk:

Step 1 - Install the app which works on Android phones less than 2 years old. The app uses the phone's GPS.

Step 2 – Create a new user account.

Step 3 – Check the GPS location: its shows the participants' current location

Step 4 – Click on the button: 'My Walking Experience'

Step 5 – Register the walkers' profile

Step 6 – Start walking and mapping.

Figure 4.2 illustrates the steps for users' registration before walk.

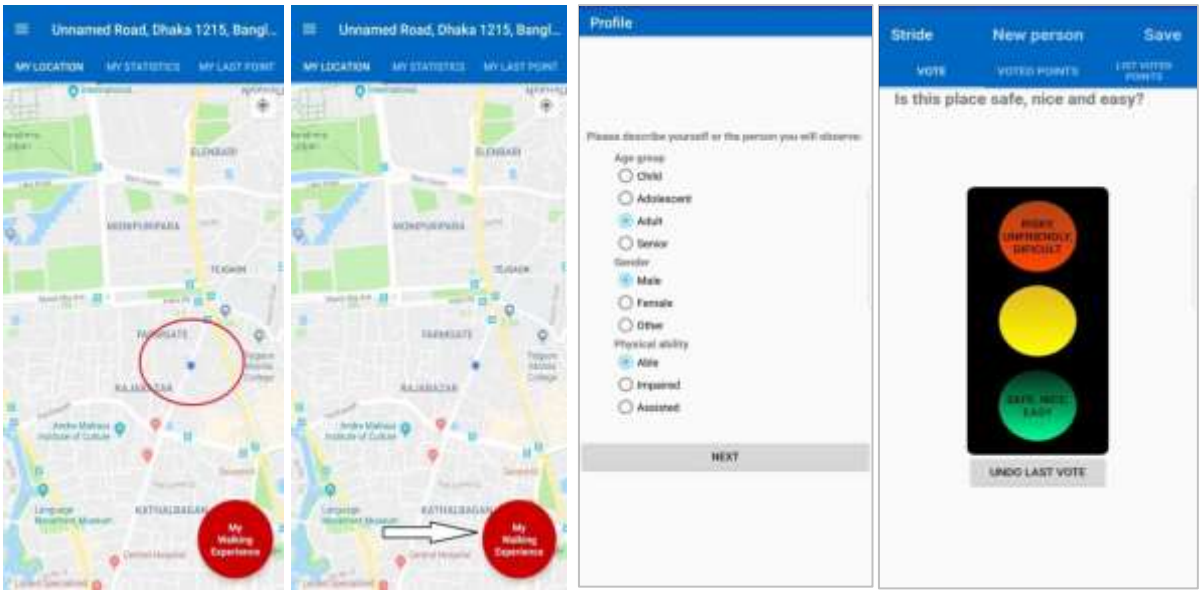

Figure 4.2 User Registration in STRIDE

During the walk:

Step 7 – Check the points (position);

Step 8 – Save points to the server;

Step 9 – New person or trip (or segment)

Figure 4.3 illustrates steps for voting for walking condition during walk.

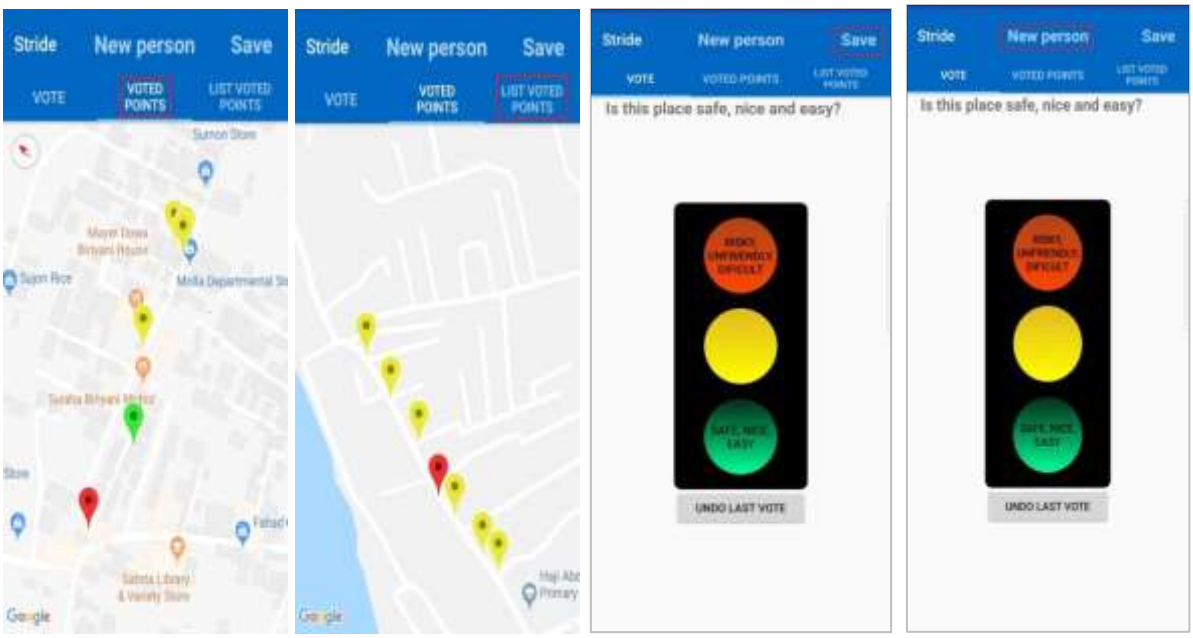

Figure 4.3 Voting for the Walking Condition

5 ANALYSIS AND FINDINGS: WALKABILITY AUDIT IN KORAIL

5.1 Overview

This chapter opens with a discussion of the framework for the walkability audit in Korail and characteristics of the participants in the walkability audit. Later, it discusses the results of the walkability audit in the slum.

5.2 Framework for Walkability Audit in Korail

Figure 5.1 illustrates the framework for the walkability audit of the study area.

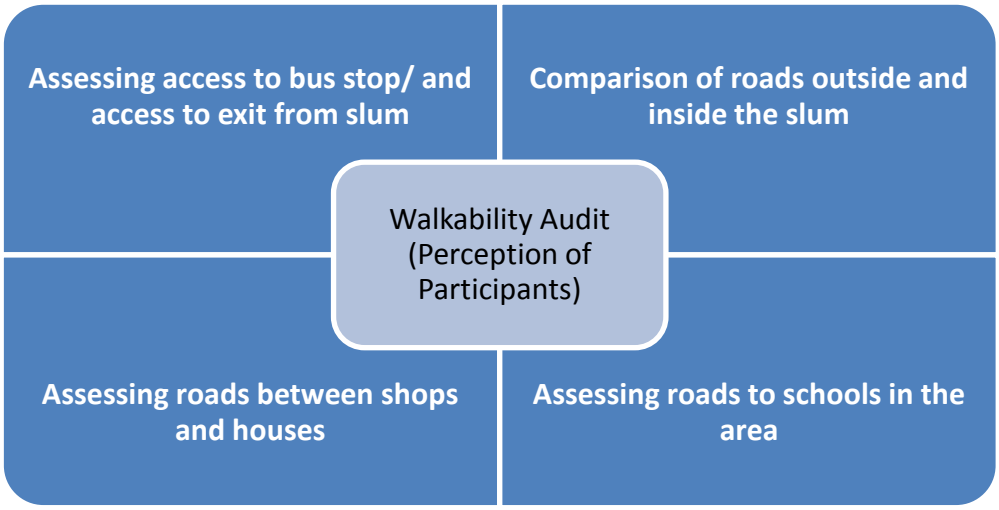

Figure 5.1 Walkability Audit Frameworks for Korail

5.3 Parameters to Measure Walkability in Korail

For the purposes of this study, a number of parameters were considered to measure the walkability of the study area. The parameters that participants considered to measure walkability are:

1. Availability of footpath
2. Safety
3. Security
4. Inclusivity
5. Infrastructure availability
6. Comfort/convenience
7. Personal preference
8. Time of travel

5.4 Participants' Characteristics

Figure 5.2 illustrates the characteristics of participants in the walkability audit survey. The walkability audit survey was carried out on 11th March 2019, 12th March 2019 and 13th March 2019 between 12 pm and 5 pm. All three days were sunny, with good weather conditions. However, five days before the survey started, it rained and some lanes in Korail were still muddy. Participants were selected randomly and researchers accompanied them while they gave their responses.

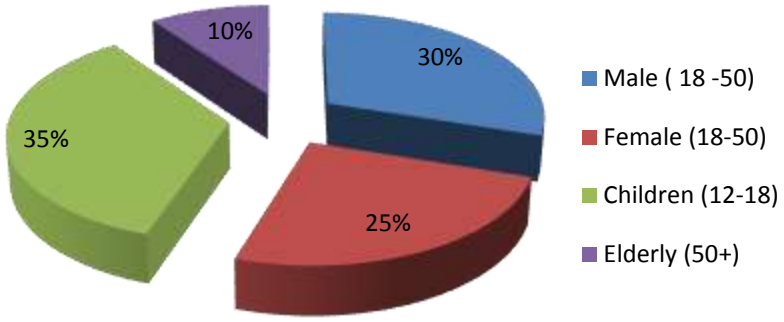

Figure 5.2 Participants Characteristics who participated in Walkability Audit Survey (Percentages)

5.5 Analysis with STRIDE Tool

5.5.1 Audit 1 Access Road to Bus Stop

From Korail the nearest bus stop is Wireless Gate bus stop (Photograph 5.1). The access road from the bus stand to Korail is used by most types of vehicles (except the bus) for going towards Banani (Photograph 5.2). Figure 5.3 illustrates the route examined during the walkability audit. This road is between 1.5 and 5 metres wide. Vehicles or pedestrians who want to go inside Korail take a right turn near the T & T Playground. This is the only proper access road (6 metres) into Korail. As it is so narrow, it is difficult for ambulances and fire engines to drive on this access road.

Photograph 5.1 Wireless Gate Bus Stop

Photograph 5.2 Access Road to Korail

Figure 5.3 Google Earth View from Mohakhali Bus Stand to Korail

Figure 5.4 illustrates the STRIDE result for the audit from the bus stop to Korail. Most participants voted red and yellow for the route, meaning that participants perceived that there are some issues. As pedestrians and vehicles share the same space, the road is dangerous and the chances of pedestrians becoming involved in accidents are very high. Most sections of the road were dirty, with garbage strewn everywhere.

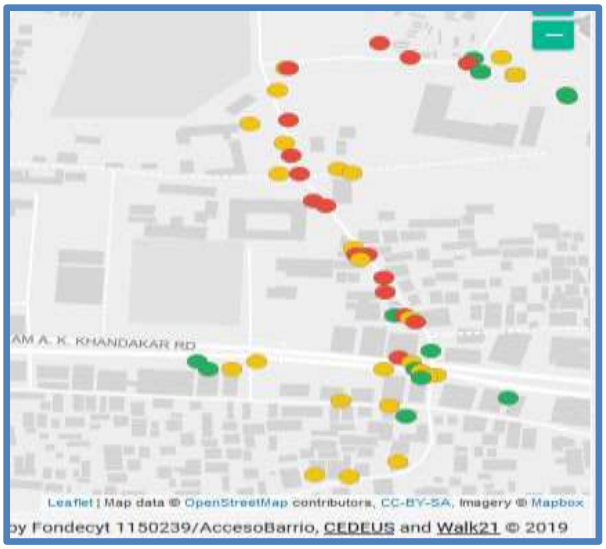

Figure 5.4 Stride Result to Assess Walkability from Bus Stand to Korail

5.5.2 Audit 2: Roads near Bou Bazar (Market)

Bou Bazar is the biggest market inside Korail. Photograph 5.3 shows Korail's Bou Bazar road. It is used by non-motorized vehicles, such as rickshaws, bicycles and vans. The road is narrow, muddy, taken up with piles of stuff from the shops, and has no drainage facility. Due to the absence of drainage, water logging during rainy season is very common and because there is no proper paving the road quickly becomes very muddy. Figure 5.5 illustrates the Google Earth view of Korail Bou Bazar road that was considered in the walkability audit, it shows that the audit started from the Korail access road, moving east and ended at the edge of the bazar.

(a)

(b)

Photograph 5.3 Bou Bazar (Market)

Figure 5.5 Google Earth View of Bou Bazar Road in Korail

Figure 5.6 illustrates the stride result to assess the walkability of Korail's Bou Bazar Road. It shows that almost all participants voted red and yellow, and consider Bou Bazar Road to have severe issues for pedestrians. This road is one of the most important roads inside Korail as many people from outside Korail come to Bou Bazar to do their grocery shopping. As the road serves the market, it has a significant impact on the economic productivity of Korail residents. Unfortunately, during the rainy season, the road becomes unusable due to flooding and muddy condition. The road is less than five metres wide and after emergency vehicles leave the access road, they cannot continue any further into the slum.

Figure 5.6 Stride Result to Assess Walkability of Korail Bou Bazar Road

5.5.3 Audit 3: Access to BRAC School or Jamai Bazar (Market)

Jamai Bazar is another small market place in Korail. BRAC School is also located in the area. Figure 5.7 shows how the road was assessed by survey participants in the presence of researchers. Photographs 5.4, 5.5, 5.6 and 5.7 show the condition of roads to Jamai Bazar and BRAC School. The roads are less than 3 metres wide and, in most places, are not properly paved.

Photograph 5.4 Home to School Road

Photograph 5.5 Home to Bazar Road

Photograph 5.6 In front of BRAC School

Photograph 5.7 Road to Jamai Bazar

Figure 5.7 Google Earth View for Walkability Audit of Jamai Bazar/ BRAC School Destination

Figure 9 illustrates the STRIDE result for Jamai Bazar and BRAC school roads walkability audit. It shows that most of the participants voted red and yellow for the routes, meaning that the participants perceived that there are serious issues which need to be resolved. As these roads are very narrow rickshaws cannot enter the area. The roads are extremely densely populated and ambulances or fire fighting vehicles cannot use them. However, according to the survey participants, there are no safety issues. Their main concerns are water logging and the dirty, unpaved roads. Overall, they do not feel the included in the system.

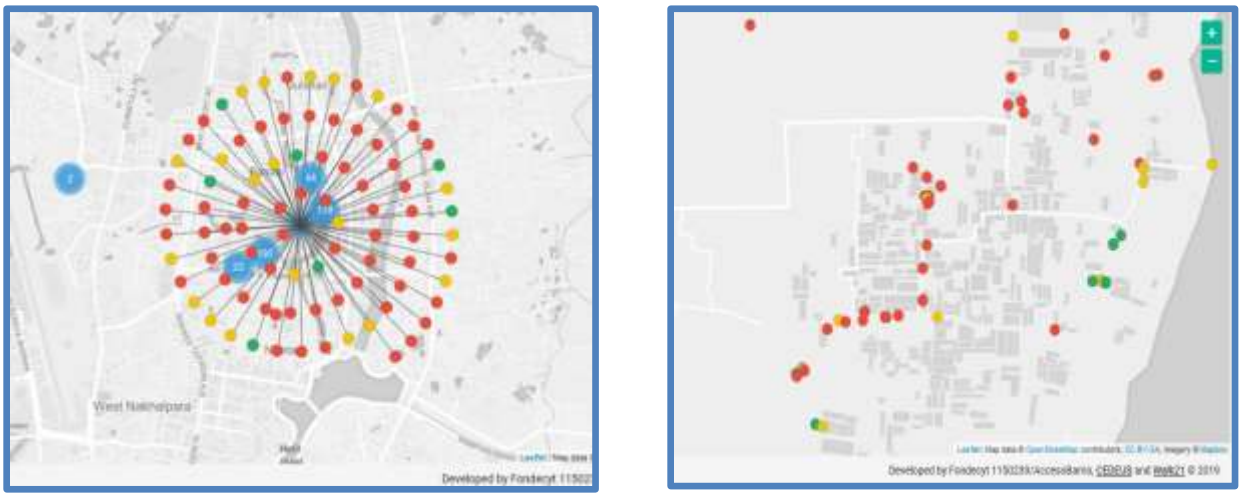

Figure 5.8 Stride Result for Walkability Audit of Jamai Bazar/ Brac School Destination

5.5.4 Audit 4: Access to JAGO Foundation School

Jago Foundation school is located near Banani Road Number 5, which is in an affluent area. Therefore, this side of Korail is cleaner than the other areas included in the audit. Figure 5.9 illustrates the route of

the walkability audit around JAGO Foundation School. Photograph 5.8 shows the road between one participant's home and the school, and Photograph 5.9 shows the area in front of Jago Foundation School. The roads were mostly uneven, half paved, and narrow. Rickshaw cannot enter the area and even riding a bicycle is difficult. However, these participants also stated that they don't have safety or security concerns inside Korail. Their main areas of concern are the unavailability of pedestrian infrastructure and facilities.

Figure 5.9 Google Earth View for Walkability Audit of Jago Foundation School Destination

Photograph 5.8 Road from participant's home to School

Photograph 5.9 In front of Jago School

Figure 5.10 illustrates the STRIDE results for the walkability audit of roads near the JAGO foundation school. Results show that most of the participants voted red and yellow. However, some also voted green on the roads near to Banani Road Number 5.

Figure 5.10 Stride Result for Walkability Audit of Jago Foundation School

5.5.5 Audit 5: Gulshan and Banani Access Roads

At present there is no proper access road to Gulshan. Korail is separated from Gulshan by Gulshan Lake. However, a walkway from Korail to Gulshan is currently being constructed. T and T Colony road, Korail to Banani Road 5, and roads beside the lake in Gulshan (photograph 12, 13 and 14) have been considered for walkability audit (Figure 5.10).

Figure 5.11 Google Earth View for Walkability Audit of Gulshan Access Roads

Photograph 5.11 T and T Colony Road

Photograph 5.12 Near Banani Road 5

Photograph 5.13 Road in Gulshan

Figure 5.12 illustrates the STRIDE result for the walkability audit of Gulshan and Banani Access roads. Unlike in our other audits, participants voted green and yellow for these roads, mainly because roads in Banani and Gulshan are significantly better than roads inside Korail. In particular, participants felt safer and more comfortable when walking on the roads in Gulshan.

Figure 5.12 STRIDE Result for Walkability Audit of Gulshan and Banani Access Roads

5.6 Walkability Audit Summary for Korail

- People's Perceptions mostly fall into the red and yellow categories. They think roads are not inclusive, not designed properly and unplanned.
- Some male participants assessed roads as falling into the green category, even inside Korail where they are paved.
- Young female participants voted in more negatively - they are the most vulnerable commuters.
- There is only one access road to the slum.
- Significantly dense locality.
- No proper access for emergency vehicles.
- The centre of slum cannot be accessed by emergency vehicles.
- Most of the roads are accessible to any vehicles.
- Most of the residents need to walk through another house to reach a bazar area, go to school or to enter the main part of Dhaka.
- Most of the paved roads are occupied with grocery or tea shops.
- Roads are covered with dirt.
- Even two or three days after rain, the roads are waterlogged and covered with mud.

6 ANALYSIS AND FINDINGS: WALKABILITY AUDIT IN JHAUCHAR AND KAMRANGICHAR

6.1 Overview

This chapter looks at the walkability audit in Jhauchar and Kamrangirchar slum areas of Dhaka city. A description of the study area is provided in section 1.7. Here we report on the audit outcomes based on the types of road: arterial roads, feeder roads and local roads.

6.2 Walkability Audit Outline

The walkability audit was carried in the Kamrangichar slum using the STRIDE tool as the second phase of community involvement in mapping environmental deficiencies. Students accompanied slum dwellers as they don't have access to the technology required to use the tool. The survey was conducted by 15 University of Asia Pacific students who collected survey data on 11th March 2019 from 10:00 am to 3:00 pm. The survey covered pedestrians' everyday walking routes, for example work trips, educational trips, shopping trips etc. Schools, factories, markets and community halls were selected as predetermined destinations. STRIDE maps pedestrian experiences and then uses this information to understand any issues and find solutions considering safety, design and infrastructure of walking environments. The survey covered around 1050 points, recorded on a map, which also shows the predefined destinations.

Photograph 6.1 Survey team from University of Asia Pacific

Figure 6.1 Total survey points

Researchers walked with residents of the study area and asked them to rate the current condition of arterial, feeder and local road. Respondents provided their opinion while walking on the range of red (risky, unfriendly, difficult), yellow (there are some issues) and green (safe, nice, easy) based on their walking experience.

Photograph 6.2 Walkability Audit of the selected route

6.1 Walkability Audit Locations

The walkability audit was done along arterial roads, feeder roads and local roads. The surveyors walked with the pedestrians on the way to their work, school, shopping or a social visit to audit the walking condition of the roads.

Figure 6.2 Survey points for STRIDE

Figure 6.3 Study area with street layout

6.1.1 Arterial road

The respondents were asked to rate the walkability conditions along the arterial roads. Most of the arterial roads do not a sidewalk. Where sidewalks do exist, they are fully occupied by various obstacles such as push carts and vendors.

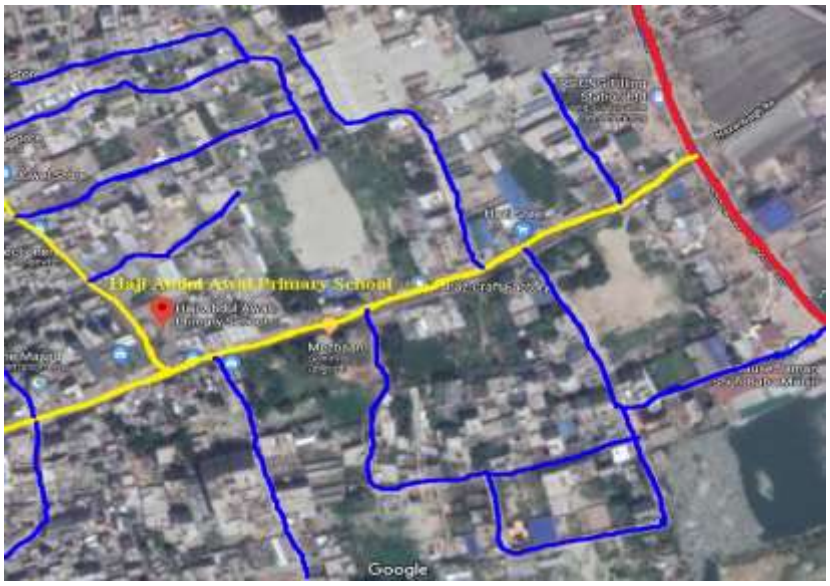

Figure 6.4 Walkability Audit for Arterial Road (Red Line)

Photograph 6.3 Walkability Audit in Arterial Roads

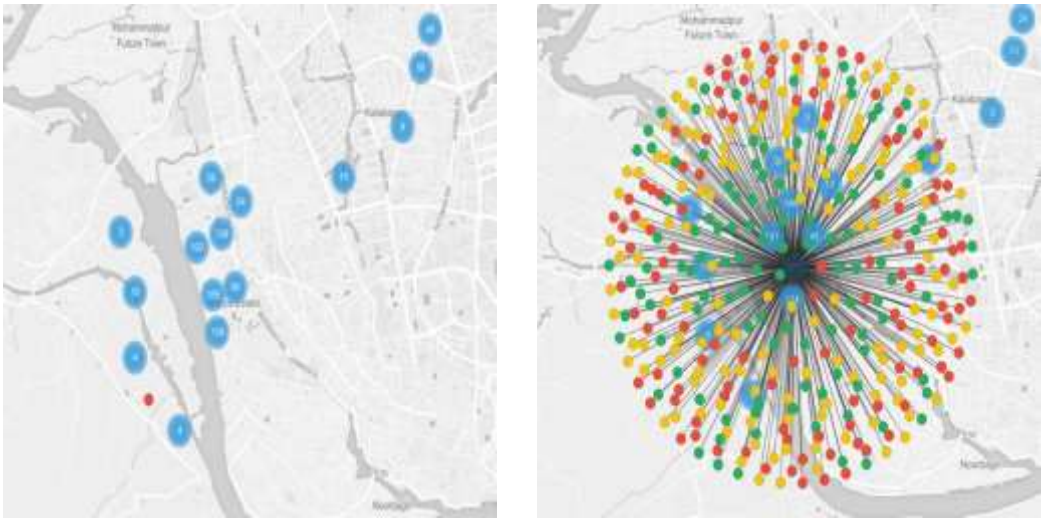

Figure 6.5 Stride Output for Walkability Audit for Arterial Roads

The results of walkability audit for the arterial road show mixed ratings. A total of 355 points were checked for the arterial road audit. In most cases, respondents rated them as red and yellow in areas around 900 meters away from the pre-determined destination. People felt more comfortable with the roads when walking closer to the destination and here respondents stated that they don't feel unsafe although the road is used by heavy vehicles and doesn't have a sidewalk.

6.1.2 Feeder road

The respondents were asked to rate walkability conditions along the feeder roads. Most of the feeder roads do not have sidewalks and extremely poor surfaces.

Figure 6.6 Audit for Feeder road (Yellow lines)

Photograph 6.4 Walkability Audit in Feeder Roads

Figure 6.7 Stride Output for Walkability Audit in Feeder Roads

The results of the walkability audit for feeder road show that respondents provided mostly red and yellow ratings in areas far away from their destinations. A total 108 points were checked for local road audit. In most cases the road was rated as green as it came close to the respondents' destinations. However, generally people do not feel comfortable walking on these roads and the red points are higher in number. Respondents feel unsafe due to hazards such as large piles of garbage, the absence of sidewalks and the poor road surface.

6.1.3 Local road

The respondents were asked to rate the walkability conditions along the local roads. Most of the local roads have extremely poor surface conditions and no sidewalks. No walking facilities are available on these roads.

Photograph 6.5 Walkability Audit in Local Roads

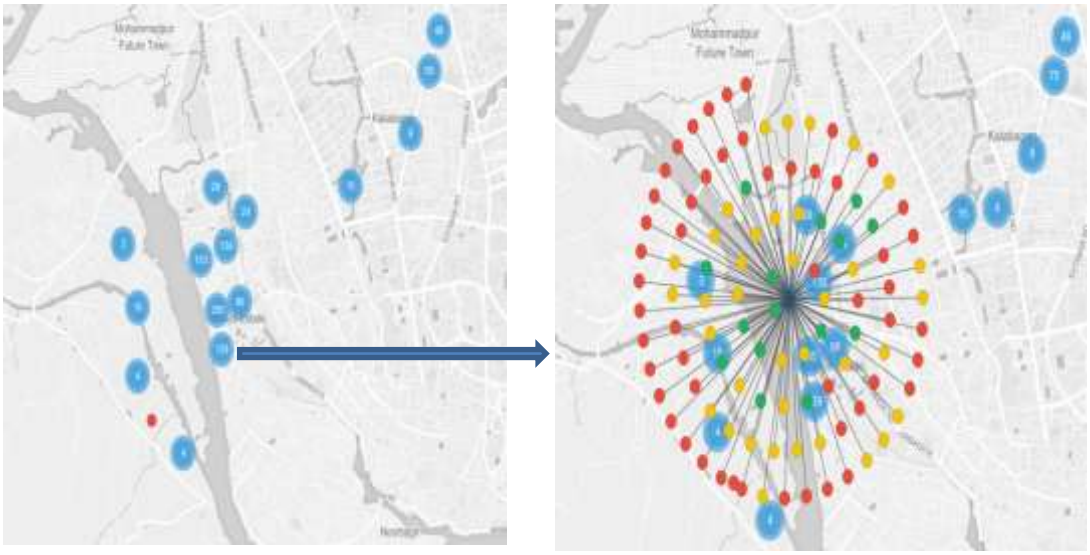

Figure 6.8 Stride Output for Walkability Audit for Local Road

The results of the walkability audit for local roads show that respondents provided mostly red and yellow ratings. A total 138 points were checked for local road audit and in most cases they rated red and yellow regardless of distance from the pre-determined destination. People feel uncomfortable walking on the roads and the red points are higher in number. Respondents feel uncomfortable while walking along the local roads due to untidy surfaces and a lack of pedestrian facilities.

6.3 Walkability audit summary

- Most of the respondents, residents of Kamrangirchar stated that the walkability of roads is risky, unfriendly, and unfinished, as indicated by the red ratings.
- The yellow ratings (second highest) show that there are some issues for pedestrians in Kamrangirchar.
- A minority say that walking the roads is safe, pleasant and easy.

6.4 Discussion

The prevailing walking environment in the slum is very poor: no pedestrian facilities are available in the slums. Peripheral and feeder roads do not have pavements and the surfaces are extremely poor; local roads and pathways are also poor and piled high with rubbish. Poor quality pedestrian facilities and walking environments in slum areas shows on an urgent necessity to improve the road environment to

reduce pedestrian accidents. Unsafe conditions prevailing on the roads dictate urgent need for research and investigation aimed at alleviating pedestrian difficulties and improving overall traffic safety.

7 CONCLUDING REMARKS

7.1 Overview

This chapter concludes the report, starting with looking at the findings as they relate to the research questions stated in section 1.5. This chapter closes with recommendations and comments on the project's limitations.

7.2 Findings

7.2.1 What is the general mobility pattern of low income commuters in slums?

From the focus group discussions (Chapter 3), it was found that low income commuters in slums mostly walk to meet their daily needs. They usually live near to their work place and walk for about 30 to 40 minutes each day. Women garment workers walk home in groups when they return to their homes after night shifts, primarily because of their safety concerns. Most of the children go to school either inside the slum or within 2 kilometres of it. Young people who study at university or college travel long distances, linking their trip by walking and using the bus or lagoona. However, the number of children continuing with their studies after secondary school is insignificant. Slum residents only choose to travel by rickshaw or auto-rickshaw in cases of emergency.

7.2.2 What are the perceptions and attitudes of residents towards walking environments inside and outside slum?

Participants in the focus group discussion mentioned that with assistance from several NGOs, the walking environment inside slum had recently been upgraded to paved roads. However, they do not think that the roads are constructed to the same standard as those in neighbouring Gulshan or Banani. Residents of the slums were very frustrated with walking conditions inside slums. During the rainy season, due to insufficient drainage facilities, walking inside the slums becomes even more difficult because of waterlogging. Residents who work outside slum, seldom have the opportunity to take part in social activities or spend quality time with their families. This is mainly because of long travelling times to reach their workplace, and return home. From the discussion it was clear that they are captive walkers, with no access to affordable, alternative modes even for longer distance such as 3 or 4 km. Even though residents in the slum are unhappy with walking conditions inside slums, they feel safer walking there than outside the settlement. Overall they don't feel that the transportation system in Dhaka is inclusive.

Participants in the walkability audit also showed similar levels of dissatisfaction towards walking conditions inside slum as participants in the focus group discussions. For most routes, respondents stated

that they don't like the walking conditions at all, or that there are some issues regarding them which need to be resolved. However during the audit in Gulshan, participants voted green, meaning they were happy with walking conditions there.

7.2.3 Is the link between activity space and mobility well-established for slum residents?

The activity spaces for the low income commuters are mainly within 3 or 4 km of their residence. Low income commuters mainly work in nearby shops, as domestic staff in nearby residences or in the garment factories as garment workers. Slum residents' are linked to activity spaces by the access road in an out of the slum. However, inside the slum, the roads are not very walkable. Apart from near the bazar areas, most of the roads are very narrow without any drainage facilities. Residents of Korail who work in Gulshan cannot go their directly, as there is no direct route; they need to walk via Banani to Gulshan. The government is constructing a new walkway around the lake near Korail. However, it is not yet known whether Korail residents will have access to it or not.

7.2.4 What are the mobility needs of low income commuters in the slum?

Low income commuters in slums or informal settlements have limited financial ability to use any mode of transport. They have a very low standard of living. Walking conditions inside and outside the slums have to be favourable for them in terms of safety, comfort and convenience. Residents, especially female residents, who work late are concerned about their security and need to walk in groups. Garment factories or other work places that require workers to stay late, should organize vehicles to help their workers' mobility. Alternatively, the government should subsidise bus fares.

7.3 Recommendations

- Slum uplifting (slum eviction should not be an option) by improving the mobility of slum dwellers
- Government and NGOs initiatives for improving the walking environments.
- Construction of proper drainage facilities.
- Provision of bicycle hire facilities by private companies.
- The access road to Korail should be widened.
- Water transport can be introduced and eventually extended across the entire city (i.e., to include areas such as Hatirzheel). An access road to water transport should be constructed for pedestrians.
- The overall walking conditions in Dhaka require improvement: amenities such as resting places, toilets etc. should be introduced.

- Walkways that are not vulnerable to flooding and sustainable drainage systems can be designed. A pilot project should be implemented, firstly in Korail and ultimately across Dhaka.

7.4 Project limitations

- Limited timeframe.
- No quantitative analysis has been conducted.

8 REFERENCES

Almec Corporation, Oriental Consultants Global, & Katahira & Engineers International. (2015). *The Project on the Revision and Updating of the Strategic Transport Plan for Dhaka.* Dhaka: Japan International Cooperation Agency (JICA), Dhaka Transport Coordination Authority (DTCA).

Bangladesh Government,. (2016). *Labour and Employment.* Retrieved from Bangladesh Bureaue of Statistics:http://www.bbs.gov.bd/site/page/111d09ce-718a-4ae6-8188-f7d938ada348/%E0%A6%B2%E0%A7%87%E0%A6%AC%E0%A6%BE%E0%A6%B0-%E0%A6%8F%E0%A6%A8%E0%A7%8D%E0%A6%A1-%E0%A6%87%E0%A6%AE%E0%A6%AA%E0%A7%8D%E0%A6%B2%E0%A7%9F%E0%A6%AE%E0%A7%87%E0%A6%A8%E0%A7%8D%E0%A6%9F

NIPORT (2006) Slums of urban Bangladesh: mapping and census, 2005. Centre for Urban Studies / Measure Evaluation / National Institute of Population Research and Training. Accessed 9 June 2007.

Nasrin, S. (2015) *Acceptability of Bus Rapid Transit (BRT) to commuters in Dhaka.* PhD thesis, Queensland University of Technology.

Shumi, S. , Zuidgeest, M. H.P. , Martinez, J. A., Efroymson, D., & van Maarseveen, M. F. A. M. (2015). Understanding the relationship between walkability and quality-of-life of women garment workers in Dhaka, Bangladesh. Applied research in quality of life, 10(2), 263-287.

The daily independent (2016), sad state of domestic workers in Bangladesh, Retrieved from: http://www.theindependentbd.com/printversion/details/37912

The Daily Star (2015). https://www.thedailystar.net/city/sexual-harassment-rampant-public-transports-128173,accessed October, 2018.

The Daily Star (2017). http://www.thedailystar.net/backpage/woman-killed-after-gang-rape-bus-1456054 ,accessed Nov 1, 2017.

The Louis Berger Group, & Bangladesh Consultants Ltd. (2005). *Prime Minister's Office Library.* Retrieved from http://lib.pmo.gov.bd/legalms/pdf/draft-urban_transport_policy.pdf.

World Population Review (2016), Dhaka Population: Retrieved from: http://worldpopulationreview.com/world-cities/dhaka-population/