Final Report on Sustainable Urban Transport Index (SUTI) for Dhaka, Bangladesh

Prepared By: NOOR-E-ALAM
Superintending Engineer
Roads and Highways Department
Dhaka, Bangladesh

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Executive summery

Dhaka, the capital of Bangladesh, is one of the most populous emerging megacities in the world. Dhaka has a population of almost 14.4 million with a density of 47537.3 per km² (2011). Due to this huge population pressure, Dhaka suffers from various problems like lack of accommodation and other basic facilities, pollution and most importantly lack of efficient transportation system. To assess this existing transportation system of Dhaka city an index developed by UNESCAP named as “Sustainable Urban Transportation Index (SUTI)” is used which has 10 indicators. Through 10 indicators an urban transport system of a city can be evaluated. Through SUTI, a quantitative analysis of Dhaka city’s transportation system, is done in this report and the basic benefit of this study is it can provide the authority a direction to focus on the necessary sectors. All the 10 indicators of SUTI are weighted equally, and performance of each indicators is compared on a scale of 1-100. UN ESCAP has provided a well proved guideline regarding the data collection and data analysis process of this indicator. Number of meetings took place in Ministries and ‘Dhaka Transport Coordination Authority (DTCA)’ with academicians and experts on Transportation sector for collecting and analyzing data. The data for these indicators were collected through field surveys and analyzing many authorized documents for Dhaka City. After the data collection and analysis many experts and academicians validated the analysis procedures and results of the indicators. The result of the index is represented through a geometric mean and a spider diagram. The geometric mean of the index is 46.27 which interprets that overall transport system is in moderate situation. This spider diagram can provide the city transport authority a precise direction on which areas need to be focused on and this represents the beauty of SUTI.
CHAPTER 1: INTRODUCTION

1.1 Introduction

Dhaka is one of the most densely populated cities in the world which has a population of almost 17 million and is expected to rise to 35 million by 2035 (World Bank). The city currently suffers from various impacts caused by lack of affordable, inclusive, efficient and safe transport mode for mobility. Transportation system in Dhaka relies heavily on road transport which is characterized by a chaotic mixture of cars, buses, auto-rickshaws, rickshaws, motorcycles, CNGs, bicycles etc. Absence of any mass transit system and presence of insufficient malfunctioning old small buses together with some informal paratransit against demand of such an enormous population cause several externalities like; congestion, accidents, air pollution and climate change. According to World Bank analysis, this chaotic mixture of high-speed vehicles and low speed vehicles has brought down the average vehicle speed in Dhaka to 7 km per hour. The increasing travel time and complexities may reduce the average travel speed to 4 km per hour by the year 2035 (Daily Sun, 2018).

1.2 Study area

Dhaka, the capital city of Bangladesh has a geographic area of 1463.60 sq. km and the coordinates of this city lies between 23°42'37.4'' North 90°24'26.8'' East (Español, 2018). According to Dhaka Zilla Statistics, 2011, Dhaka Metropolitan Area (DMA) covers 302.92 square kilometer and taken as study area (Figure 1.2-1).

Dhaka has one of the highest population densities in the world. Number of urban populations in Bangladesh in 2010 was 42.11 million of which Dhaka city consists of 40% and is increasing every year (Ahmed & Muntasir, 2014). According to the data of Bangladesh Bureau of Statistics (BBS), in 2011 the population of Dhaka city was 14.4 million. Being a mega city, Dhaka faces huge migration pressure because in Bangladesh most of the living facilities and employment opportunities are capital centered. From the census of 2011 it has been identified that among the people living in Dhaka, 38.7% arrived from different districts of the country (BBS; SID, 2015). Major economic activity of the country is focused in and around Dhaka City. Dhaka alone consists of 80% of the total garments industry (World Bank, 2005) which is highly responsible for migration. Again, there is huge freight movement from, to and within
Dhaka City. Moreover, most of the administrative headquarters, educational institutions, modern medical facilities and trade and commerce centers are situated in Dhaka City and to

(Source: Research Gate)

Figure 1.2-1 Dhaka metropolitan area

get these facilities people are attracted towards this city. This condition has resulted to serious traffic gridlocks and problems in the DMA which in turn has added to the city’s growing social and economic problems, such as posing serious health hazards to its citizens due to air pollution. With Bangladesh’s continued development and the continued increase of population the number of privately-owned automobiles is expected to rise in the coming years and will worsen the traffic gridlock and pollution problem of the city.
For mitigating the above transportation complexities, Revised Strategic Transport Plan (RSTP) of Dhaka to be implemented over the next 20 years (2015-2035) has proposed a public investment of $34.5 billion. To improve the traffic condition there are proposals for 5 metro-rail lines, 2 Bus Rapid Transit (BRT) lines, 6 elevated expressways totaling 126 km, three ring roads and 730 km of other main roads in the metropolitan area (Gallagher, 2016). Appropriate assessment of existing DMA transportation system and subsequent planning in the factual area can improve the movement of people and goods in Dhaka city.

### 1.3 Objectives of the study

The objective of this study is to develop Sustainable Urban Transportation Index (SUTI) for DMA area. This index was developed by United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) to measure, compare and evaluate the performance of sustainable urban transport and related sustainable development goals of Asian cities. In this project, using 10 predefined indicators, overall existing DMA transportation system will be evaluated and depicted in a spider diagram which will identify the required fields of improvement and assist policy maker and planners to take appropriate measures.
CHAPTER 2: CURRENT STATE OF URBAN TRANSPORT SYSTEMS

2.1 Major transport network and systems

Dhaka's road network comprises around 7 percent of the total built-up area which covers approximately 3,000 km (200 km primary road, 110 km secondary road, 50 km feeder road and 2,640 km narrow road) with few alternative connector road (Tahmid, 2017). Bangladesh railway carries a small portion of passengers travelling inside the DMA area. From the mobility analysis published in Dhaka Structure Plan 2016-2035, it was found that on an average working day about 21 million trips take place in the DMA area. The average length of bus trip is 9.7 km and rickshaw trip is 3.6 km (JICA & DTCA, 2015). Out of all trips taking place each day, trips to school constitute 17.7%, to home 12.6%, and to work is 44.7% (RAJUK, 2015). There are 152 bus routes with 237 bus stops in the DMA, among which only 5 bus routes are in the East-West direction. Inside this whole network, there is only 400km of footpaths and nearly 40% of these footpaths are illegally occupied and filled with dirt (BRT, 2015). Recently the trend is changing as the authority is working to create a connected footpath network and building wide with universal accessibility facility footpaths (Figure 2.1-1).

![Figure 2.1-1 Recent redeveloped footpath at Gulshan area](image)

Beside the road networks, water transportation system is getting popular in the urban sector. Hatirjheel Water Taxi service has provided another dimension of a cost effective and quick
transportation system inside Dhaka city. It is getting popular as people are using this service not only for recreational purpose but also in their day to day life to get rid of traffic congestion. Four water taxis are now available in two routes which are from Hatirjheel’s FDC landing station to Badda Link Road and to Rampura Bridge stations.

![Image of a water taxi at Hatirjheel](image)

Figure 2.1-2 Water taxi at Hatirjheel

Circular Bus service in Hatirjheel area has also been launched in 2015 to provide utmost facilities to the passengers and establish an East-West link. Initially there was 4 buses with specified bus stops and now the number of buses has been increased. “DHAKA CHAKA” another new initiative taken by Dhaka north city corporation also ease the movement in and around Gulshan and Banani area.

Besides improving public transport facilities, Government also put much emphasis on providing pedestrian facility. Footpaths are being designed even sometime taking road width. To facilitate crossing of pedestrian 90 foot over bridge and 4 underpasses has been built at major intersections.

### 2.2 Key connection points of DMA

Dhaka is well connected to the different parts of the country. The connection has been maintained by road, by rail, by water and by air. The key connection points of Dhaka City are discussed below:

**Road connectivity**
Being the capital of the country Dhaka has to maintain strong road connectivity with part of the country. The bus hubs are located inside DMA. There are basically three main road connection points. Sayeedabad Bus Station serves as the depots for to and from buses for eastern part of the country including Sylhet and Chittagong Division. Gabtoli Bus Station is for the buses to and from the western part of the country including Jessore, Khulna and Rajshahi Division. Mohakhali Bus Station is for buses for the areas north of Dhaka, including Tangail and Mymensingh. There are several other bus depots inside the city like Kallyanpur bus station, Fakirapool bus station, Gulistan bus station, Kolabaghan bus station which also serves as important connecting points.

**Railway connectivity**

Kamplapur railway station, which is the center point of railway connectivity is right in the middle of DMA area. All the train routes start and ends here. There are five railway stations in DMA which are: Kamplapur railway station, Tejgaon railway station, Cantonment railway station, Banani railway station and Airport railway station. Among those two rail stations are highly used: Kamplapur Railway Station (Central Station) and Airport Railway Station (North of Central Station). From three directional lines Dhaka is connected with the rail stations of the whole country. First, from the central station to Narayanganj in south-eastern part. For the northern part, from Tongi junction, one section goes through Narsingdi towards Chittagong and Sylhet other section covers the northern parts of the country.

**Waterway connection**

Sadarghat launch terminal and Gabtoli terminal are the two most important water way connection points with different parts of country particularly with the south-western part of the county. Sadarghat is in the southern part of Dhaka, on the river Buriganga. The Sadarghat River terminal the largest river ports in the country having around 300 large and small passenger river boats (motorized) depart and an average of 50,000 passengers use the terminal every day for arrival and departure (Y, 2015). At the same time this terminal handles huge volume of freight transportation. Gabtoli launch terminal serves as an internal terminal which also handles passengers and freight within DMA area. To improve the waterway transport system, Bangladesh Inland Water Transport Authority (BIWTA) planned a circular waterway service of 110 km surrounding Dhaka City along Buriganga, Turag, Balu, Shitakhya River.

**Airway connection**
Main airport of the country, Hazrat Shahjalal International Airport is located at the north part of DMA. This airport is the hub of most of the private airlines in Bangladesh, including Biman Bangladesh Airlines, Regent Airways, Novoair and US-Bangla Airlines. It is connected with the three other international airports, 6 domestic airports and 6 Short Take-off and Landing ports of the country.

2.3 Existing transport situation of Dhaka city

Existing transport situation can be judged from various perspectives. In fact, the modal share, transport modes, land use connectivity with transports, environmental and financial impact transport system can provide an idea of the existing situation.

2.3.1 Major transport modes of Dhaka city

The major modes of travelling in Dhaka City is motorcycle, rickshaw, public buses, legunlas, private car, CNG, minibus and taxi. The following figure 2.3-1 will show the percentage of registered vehicles of Dhaka City in 2018. The table represents that, number of motorcycle registration is very high, and the trend is also increasing.

![Figure 2.3-1 Registered vehicles in Dhaka](image)

Source: BRTA (2018, June)
The result shows public transportation modes (i.e., bus, laguna, microbus, CNG and rickshaw) account for more than 80% of the traffic in Dhaka Metropolitan Area and its adjoining areas in particular, buses dominate the share of public transport mode.

### 2.3.2 Modal share in Dhaka city

The modal share of the transports inside Dhaka City Corporation Area is vital part of existing transport situation of Dhaka. Figure 2.3-2 shows the results of Inner Cordon line survey, which covers Tongi Bypass Road; Tongi Bridge; First, Second and Third Buriganga bridge: Dhaka-Aricha, Dhaka-Chittagong, Dhaka-Demra Highway, Purbachal Express Highway (JICA & DTCA, 2015). These are all within the boundary of DMA. In this figure, Bus taxi, CNG and rickshaw are generally considered as public transports of Dhaka city and these account for more than 80% of the traffic in the DMA boundary.

![Modal share of passenger trips in DMA area](image)

Source: Cordon Line Survey 2014, JICA Study Team

Figure 2.3-2 Modal share of passenger trips in DMA area

In Dhaka city walking still remains as the dominant travel mode. In the absence of a dependable and adequate public transport system and financial constraints, people of middle and low-income group prefer walking as their mode of travel. In DHUTS report of 2009, it has been observed about 20% trips are generated through walking. Moreover, in recent studies and reports it is seen that more than 58% of the total trips are made by walking, bicycling, or riding on rickshaws, called non-motorized transport modes (NMT) which can be considered as a very positive indicator towards sustainability (Fang, 2014).
2.3.3 Environmental perspective

The existing transport situation of Dhaka city is very vulnerable from the environmental perspective. Measuring the transport sustainability of Dhaka City, it has been identified that, only for physical transportation network and vehicles CO\textsubscript{2} emission, the transport footprint is seventy times larger than the bio-capacity (Labib, Mohiuddin, & Shakil, 2013). It also characterized the existing transport situation through the following terms: traffic congestion and delays, low quality of public transport service, lack of comfort and safety for pedestrians and growing air pollution (Asian Development Bank, 2009).

To monitor air quality three Continuous Air Monitoring Stations (CAMS) are installed in Dhaka city under Clear Air and Sustainable Environment (CASE) project. CAMS are continuously recording PM2.5, PM10, NO\textsubscript{X}, SO\textsubscript{X} and other pollutants data. The data from this may help to manage the air quality, produce air quality abatement strategies and provide directions to set emission policies regarding transport sector. The following Table 2-1 shows the current condition of air of Dhaka along with the comparison of Bangladesh Standard and also the sources of pollution.

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Current Status (Annual Average, 2017)</th>
<th>Bangladesh Standard</th>
<th>Major Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM 10</td>
<td>135.9 μg/m\textsuperscript{3}</td>
<td>150 μg/m\textsuperscript{3}</td>
<td>Brick, Kiln, Transport</td>
</tr>
<tr>
<td>PM 2.5 (24 hour)</td>
<td>76.8 μg/m\textsuperscript{3}</td>
<td>65 μg/m\textsuperscript{3}</td>
<td>Brick, Kiln, Industry, Transport</td>
</tr>
<tr>
<td>SO\textsubscript{2} (24 hour)</td>
<td>0.0152 ppm</td>
<td>0.14 ppm</td>
<td>Brick, Kiln, Industry, Transport</td>
</tr>
<tr>
<td>NO\textsubscript{2} (24 hour)</td>
<td>0.0512 ppm</td>
<td>0.053 ppm</td>
<td>Transport, Industry</td>
</tr>
<tr>
<td>CO (8 Hour)</td>
<td>1.9 ppm</td>
<td>9.0 ppm</td>
<td>Transport, Industry, Agriculture</td>
</tr>
</tbody>
</table>

Source: (DOE, 2016 and CASE Reports, 2017)
2.3.4 Financial perspective

Congestion is one of the biggest issues among the existing issues of Dhaka city transport. If time is equal to money in that case people of Dhaka City are in great loss and it can be depicted through the following numbers:

Table 2-2 Amount of monetary loss due to congestion

<table>
<thead>
<tr>
<th>Cause: Traffic congestion</th>
<th>Time converted to monetary value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial loss</td>
<td>Taka 19,555 crore (nearly $3 billion)</td>
</tr>
<tr>
<td>Environmental Loss</td>
<td>Taka 11,896 crore</td>
</tr>
<tr>
<td>Business Loss (passenger transport industries)</td>
<td>Taka 2,000 crore</td>
</tr>
<tr>
<td>Business Loss (freight industries)</td>
<td>Taka 2,000 crore</td>
</tr>
<tr>
<td>Excess Fuel Loss</td>
<td>Taka 575 crore</td>
</tr>
<tr>
<td>Accidents</td>
<td>Taka 50 crore (at the rate of CNG price)</td>
</tr>
</tbody>
</table>

Source: (Daily Star, 2010)

Moreover, wasted time on the streets accounts for nearly Taka 11,896 crore and 3.2 million business hours are lost every day, which is about one hour per working people (Daily Star, 2010).

2.4 Major transportation issues

Though many transport project works are on progress, still there are some major issues which people of Dhaka need to face almost every day during their daily travel. Some issues are described below:

- The transportation system of DMA area is not adequately environmentally sustainable. The environmental factor of Sustainability is highly violated, as around 1000 MT is regularly pumped into environment in which 70 percent is released from vehicles. This really affecting the 18 million inhabitants of Dhaka City badly (Mahmud, Rahman, & Rabbi). Moreover, according to Structure report of 2016-2035, about 82% of the buses are diesel fueled due to which air pollution is five times than the acceptable limit.

As Bangladesh do not have any major policies regarding the transport mode emission factor, so the problem is becoming severe day by day. Regarding the policy issues, one of the basic problems is the lack of vision followed by other problems like lack of coordination among the agencies and ministries responsible for transportation, lack of resources, inappropriate modal mix and weak framework.
• Lack of pedestrian facility is another main issue in Dhaka City. There are not enough well-connected footpaths to facilitate pedestrians of Dhaka. A major portion of Dhaka, about 1868 km of roadways have no footpath or sidewalk facility (Chowdhury, 2014). Number of pedestrian accidents are increasing day by day due to inadequate facility of crossing. Sometimes, pedestrians are often jump over road divider by risking their lives. According to a BBC report, during the last five years 950 people died in Bangladesh while crossing the street (Shifulla, 2016). Major issues for the foot over bridges are: Dirt, unpractical design, occupied by vendors, beggars, sex workers, thieves and criminals.

• The East West Connectivity of the core city area is not well developed. Severe traffic jam is regularly faced by the people and there is lack of public transport facility. Out of 152 bus routes only 5 bus routes operate east-west (RAJUK, 2015).

• Dhaka has extremely limited provision of Taxis. Last year almost 600 taxis are put on the road by two companies named Trust Transport Services and Toma Construction and Company Ltd. Due to high fare, people could not enjoy its facility. ‘Uber’ and ‘Pathao’ (Ride Share Service) are recently introduced in the roads of Dhaka but it has high fare particularly for car rides and limited amount of people can take the facility. People of low and middle income are still dependent on CNG and bus due to comparatively low fare.

Source: The Financial Express

Figure 2.4-1 Percentage of market share for different private passenger motor vehicle services
Dhaka City is also facing various problems regarding its circular waterway service. The water bus project which was from Sadarghat to Ashulia is facing problems as no suitability study was done before launching this project. From public perspective, poor landing facilities, unable to maintain schedule and severe traffic jam faced to reach the terminals of Shadargat and Gabtoli are responsible for the failure of this as an effective alternative.

The Railway Sector of Bangladesh has a very limited amount of Private Investments and as a result this sector is not well privileged and well facilitated. In the railway transportation system, the main problem faced by the passengers is lack of train tickets and maintaining schedule.

2.5 Infrastructure and land use of Dhaka city

The core city area is dominated by 41.45% residential use. The railways and road connectivity are considered to be the most important features of a region, but it covers only 6.06% of the city area (RAJUK, 2015). In DMA area, currently most areas are of mixed use. Residential, business, market areas have deviated from their original area type which is a challenge for transportation planner. According to RSTP concept, a public-transport-oriented city cannot be realized solely by introducing mass transit as a mode of transportation; it must also be associated with effective integrated urban areas and a corresponding shift of lifestyle of the people. There are three principals provided by RSTP which can influence land use of DMA area in a great way. Those are:

- **Segregate interprovincial and urban transport**: Interprovincial transportation must be segregated from urban transportation to prevent heavy traffic from passing through the city. To do this adequate space between these two types of traffic needs to be provided using the peripheral urban area.

- **Establish clear ring and radial road systems**: Urban roads should follow the hierarchy of Primary, Secondary and tertiary roads so that primary roads can be comprised of clearly defined ring roads and radial roads.

- **Establish more effective mechanism for at-grade road development**: Detailed local plans along with urban development control measures must be followed to develop Tertiary and lower-level roads.
2.6 Intermodal transfer facilities of the city

All the bus stops are connected to different destinations via city bus, CNG or rickshaw which are readily available. Major railway terminals of Dhaka city are basically Kamlapur Station and Airport Station. Both stations have an adjacent parking area for rickshaw, CNG, private car and bikes. There are buses adjacent to the stations to provide facilities to middle and low-income passengers to reach their destination. In the airport area, there is a three storied parking facility for private cars. At outside there is also a parking area for CNG and other transports. Moreover, inter modal bus facility and train station is available right in the front gate of airport.

There are also some issues with the quality of some intermodal transport. Sometimes, passengers need to wait long to get bus or CNG to reach their destination and it’s very difficult to use bus during the peak hours due to overcrowded passengers. In few places some rickshaw and CNG stands are available, but in most of the cases there is none. So, they pick passengers by stopping right in the middle of the road which creates congestions and safety concerns.

In RSTP, based on the proposed BRT and MRT network, 21 transportation hubs or multimodal stations throughout DMA area has been suggested (Figure 2.6-1). These facilities will include drop-off and pick-up points for rickshaws, taxis, cars, motorcycles, circular waterway, as well as parking and bus interchanges with primary and feeder bus systems.
The existing urban transportation policies may have various reflections of previous initiatives which were being taken by agencies related to transport sector. Some Initiatives are discussed below:
2.7.1 Initiatives

In the past, urban transport received little attention, as investment went more in infrastructure development for inter-urban linkages and for opening up links to rural growth centers. The 4th Five Year Plan of Bangladesh (1990-95) indicated urban transport problems and stated to be tackled, particularly in the metropolitan areas. Government, therefore, undertook a study the ‘Greater Dhaka Metropolitan Area Integrated Transport Study (DITS)’ (1992-94), funded by UNDP. In line with the findings of the study, World Bank formulated a project – “Dhaka Urban Transport Project”. In the short-term basis this project addressed: urgent policy issues, infrastructure bottlenecks and traffic management constraints, and in the longer term this project focused on planning, institutional and policy action. Based on another recommendation of the World Bank for strengthening coordination mechanism, Greater Dhaka Transport Planning and Coordination Board (GDTPCB) was established. The Board has recently been renamed as Dhaka Transport Coordination Board (DTCA). While efforts are underway to improve urban transport situation in Dhaka, similar initiatives need to be taken to address urban transport problems in other cities. (Mahmud, Rahman, & Rabbi).

2.7.2 Existing policies

The vision of RSTP, 2015 is basically “Green Dhaka with Blue River and Green Urban” for Dhaka. To accomplish this vision, six strategies has been suggested to be followed. Among those the first strategy is to “Develop public-transportation-oriented urban areas to ensure people’s mobility and to promote an environment-friendly society”. RSTP defined overall urban transport goal as the following: “Ensure mobility and accessibility to urban services that are vital for the people and the society, by providing a transport system characterized by safety, amenity, and equity and sustained by an efficient public transport system”. On the basis of this goal, eight specific objectives are provided and to fulfill those, policies are suggested. The strategies are:

1. Promotion of Social Understanding about Urban Transport Problems and Issues
2. Effective Management of Urban Growth and Development
3. Promotion and Development of Attractive Public Transport
4. Efficient Traffic Control and Management
5. Effective Transport Demand Management (TDM)
6. Comprehensive Development of Transport Space and Environment
7. Enhancement of Traffic Safety
8. Strengthening of Transport Sector Administrative and Management Capacities

2.8 Ongoing transport projects

Several mega projects are going on in the Dhaka city. The projects focused on the improvement of public transportation system of the city. Few of them are described below:

Dhaka elevated expressway is a mega project executed by Bangladesh Bridge Authority. According to RSTP 2015, the four lane Elevated Expressway will commence at Shahjalal International Airport and run alongside New Airport Road which will connect Dhaka Chittagong Highway. The purpose of the Expressway is to increase traffic capacity within and around the city by improving connectivity between northern part of Dhaka City with the Central, South and South-Eastern part. Land acquisition of this 20 km elevated expressway project has been almost completed and overall progress of this project is 7%.

Source: DTCA annual report

Figure 2.8-1 Existing and proposed transportations projects for Dhaka city
Greater Dhaka Sustainable Urban Transport Project [BRT Gazipur-Airport] is another mega project approved by the government to implement 20 km long BRT route, starting from Hazrat Shahjalal International Airport to Gazipur. Once BRT project is in operation, it will carry 20 thousand passenger/hour/direction and travelling time will be half of the present (Bangladesh Bridge Authority, 2018). Construction work of this project is going on.

Dhaka Metro Rail project also known as MRT LINE-6, is the first metro rail project in the country. It will run all the way from Uttara to Motijheel, covering the distance of 18.9 kilometers, with 16 stations along the way. In 2021, an estimated 5 lakh people will commute by MRT Line-6 every day. The construction of this project is also going on.

Moreover, BRTC is adding new buses to its fleet. Due to shortage of buses, BRTC could not meet the demand of people so the service is being hampered. To solve these issues, buses along with some double-decker are going to be added in BRTC fleet. Again, to solve congestion issue and reduce the number of Road Accidents DTCA will introduce Intelligent Traffic System (ITS) in the city. Under the intelligent traffic system (ITS), closed circuit cameras (CC cameras) or vehicle detectors (car detecting equipment) will calculate and monitor the number of cars on the road. The device will keep records of the number of vehicles passing through a lane at a certain time.

Along with these Mega projects many projects to educate people like Car Free Day celebration started in Dhaka from 2016 through government and non-government initiatives and it was first celebrated at national level. Road Transport and Bridges Minister Obaidul Quader announced publicly that, Manik Mia Avenue in Dhaka will be car free during morning time of first Friday of every month.
Government is also funding many projects to improve pedestrian facilities. DNCC had done the work of road improvement, storm drainage and construction of roadside drains and footpaths in the Gulshan, Banani and Baridhara areas. They had installed the country's first pedestrian escalator as part of a footbridge to encourage people to use overpass and prevent unsafe road crossing. It was established under CASE project in mid of 2009 and located at the intersection of Banani Road Number 11 and Airport Road.

Source: Work for a Better Bangladesh Trust

Figure 2.8-3 Car free day celebration 2017

Figure 2.8-4 Electric pedestrian escalator in Banani, Dhaka
Ride sharing service has become a popular phenomenon in Dhaka city. Uber started it all after launching their operation at 2016 and the popularity of this tech company saw rapid rise when it branched out to Dhaka. This paved the way for other companies to follow the trend. Around same time, “Pathao”, another bike and car sharing app started and got huge popularity. Currently there are many ride sharing services like Shohoz, Obhai, MUV Asia etc.
CHAPTER 3: DATA COLLECTION APPROACH FOR SUTI

3.1 Introduction

Data collection for different indicators to develop SUTI comprises of field data collection, data collection from appropriate authority and reviewing different relevant sources. Four consultation meetings were organized during data collection and analysis:

a. First consultation meeting:

First consultation meeting was held under the chairmanship of Executive Director of DTCA on 04th May 2018. Mr. Noor-E-Alam, Superintending Engineer of Roads and Highway Department, presented the concept of SUTI and proposed to assess the current state of transport system in Dhaka City through Sustainable Urban Transport Index (SUTI). He also proposes to organize a capacity building workshop on SUTI. Executive Director of DTCA opted that a capacity building workshop can be organized with UNESCAP. After the meeting he officially wrote to UNESCAP to assist DTCA to organize the workshop.

b. Second consultation meeting:

The second stakeholder meeting was chaired by Rakibur Rahman, Additional Secretary and Executive Director, DTCA on 6th June 2018. In this meeting representatives from BUET, Dhaka BRT, BRTA, DTCA, ARI, RAJUK, DMRTDP, GDSUTP, non-government organization were present. Mr. Madan B. Regmi, Economic affairs officer of UNESCAP attended the meeting. Mr. Regmi presented on various aspects of SUTI. He also shared some other cities experience where SUTI was implemented.

c. Third consultation meeting on 10th June 2018 at Ministry of Road Transport and Highways

Third consultation meeting was held at Ministry of Road Transport and Bridges under the chairmanship of honorable secretary Mr Nazrul Islam, Road transport and Highways division. Mr. Noor-E-Alam, Superintending Engineer of Roads and Highway Department, presented the concept of SUTI and details aspect of capacity building workshop on SUTI. After detail discussion it was decided that the workshop will be jointly organized by DTCA, RHD, BRTA and UNESCAP and subject to the approval of the honorable minister the workshop can be
organize during the month of September. It was also decided that Mr. Noor-E-Alam from RHD and Mr. Anisur Rahman, from DTCA would work as the focal point for the workshop.

d. Forth consultation meeting:

The last consultation meeting was held on 4th September 2018 to discuss the findings of the study with three experts. 2 professors from BUET and 1 from DTCA. Detail data collection approach, analysis and results were presented. Based on the feedback the draft report was modified.

After all consultation meetings the final report of SUTI was prepared for Dhaka.

3.2 Data collection approach for different indicators

As suggested by UNESCAP, SUTI has ten indicators as showed in Table 3.1.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes</td>
</tr>
<tr>
<td>2</td>
<td>Modal share of active and public transport in commuting</td>
</tr>
<tr>
<td>3</td>
<td>Convenient access to public transport service</td>
</tr>
<tr>
<td>4</td>
<td>Public transport quality and reliability</td>
</tr>
<tr>
<td>5</td>
<td>Traffic fatalities per 100,000 inhabitants</td>
</tr>
<tr>
<td>6</td>
<td>Affordability – travel costs as part of income</td>
</tr>
<tr>
<td>7</td>
<td>Operational costs of the public transport system</td>
</tr>
<tr>
<td>8</td>
<td>Investment in public transportation systems</td>
</tr>
<tr>
<td>9</td>
<td>Air quality (PM10)</td>
</tr>
<tr>
<td>10</td>
<td>Greenhouse gas emissions (CO2eq tons/year)</td>
</tr>
</tbody>
</table>

Overall data collection procedure along with sources for different indicators are described below:

Indicator 1

Indicator 1 was analyzed based on most recent transport plans which covers public transport, intermodal facilities and infrastructure for active modes. Revised Strategic Transport Plan (RSTP) Report, 2015 was used as the main secondary data source for evaluating this indicator. RSTP has been endorsed by the Government on 2015. Moreover, National integrated multimodal transport policy (NIMTP) 2013 along with two international conference reports on “Evaluation of Level of Service for Pedestrian Movement in Dhaka city” and “Assessment of
Pedestrian Perception towards Pedestrian Crossing Facilities in Dhaka Metropolitan City: A Study Based on Observation and Survey” were reviewed to add some more relevant information.

**Indicator 2**

Data required for indicator 2 were based on data of RSTP report, 2015 and Dhaka Urban Transport Network Development Study (DHUTS) report, 2009. Daily Vehicular Traffic Volume and Average Vehicle Occupancy data covering DMA area were provided in RSTP and DHUTS report. From those data, modal share percentage of active and public transport mode was calculated.

**Indicator 3**

For the calculation of indicator 3, Geographic Information (GIS) data of RSTP Report, 2015 were used provided by Dhaka Transport Corporation Authority (DTCA). Population density map of DMA area, Bus route map along with bus stoppage points were analyzed to calculate the percentage of people having convenient accessibility to public transports.

**Indicator 4**

To calculate this indicator field survey was conducted at bus stops and on-boards, along 5 busy corridors inside the DMA. 5 corridors are, Azimpur-Mirpur1; Gulisthan-Mohakhali-Gazipur; Gulisthan-Mohammadpur; Azimpur-Mirpur10; Jatrabari-Progoti Shoroni-Abdullahpur. Passengers who use public transports in their day to day life were asked questions about the reliability and quality of public transports.

**Indicator 5**

Bangladesh Police has the official responsibility to collect accident data. The concerned Police Stations fill-up ‘Accident Reporting Form’ (ARF) for each accident. Again, newspaper reports also consider as source of accident data. Bangladesh University of Engineering and Technology has a renowned institute solely working with the accidents named “Accident Research Institute (ARI)”. ARI received accident data mainly from Bangladesh police. For SUTI study, crash data for the year 2013-2017 were collected from ARI. Population related data was collected from the publications of Bangladesh Bureau of Statistics (BBS).
Indicator 6

During the field survey for indicator 4, data was also collected for indicator 6. Daily travel expense along with their monthly income data was collected which was then used to calculate affordability.

Indicator 7

The data for this indicator was collected from the final report of “Dhaka Bus Network and Regulatory Reform Indicator”, 2012. The revenues and operational costs of Bus and mini buses were provided there, and result is calculated.

Indicator 8

Both the data of investments on public transport and on active transport over the last five-year and total transport investments by the city government, central government and development partner over the same period (including, roads, signals, infrastructure, public transport facilities, facilities for pedestrians and cyclists, etc.) were collected from annul Reports of DNCC and DSCC (2014-2017) and other related secondary source.

Indicator 9

There are three Continuous Air Monitoring stations (CAMS) installed under Clean Air and Sustainable Environment (CASE) Project within Dhaka City. These CAMS are continuously collecting PM2.5 and PM10 data. From monthly published reports of 2017 PM 10 values are taken from three CAMS of Dhaka.

Indicator 10

From Bangladesh Petroleum Corporation (BPC) fuel consumption (diesel and petrol) and as per the guideline provided by ESCAP CO2 emitted from fuel burning is calculated using standard CO2 emission factor. Population related data was collected from the publications of Bangladesh Bureau of Statistics (BBS).
CHAPTER 4: ANALYSIS OF DATA

4.1 Indicator 1: Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes

Transport complexity is one of the major issues now in Dhaka City. Due to huge population pressure this issue is hard to solve and day by day this problem is becoming more acute. To mitigate this problem, the procedure has to be systematic, sustainable and realistic. Visions, goals and policies need to be set in such a way that integrates the existing situation with the future solutions. Government of Bangladesh implemented many large projects to lessen transport complexities, but due to lack of sustainability measures, many projects failed to work properly. In 2015, Bangladesh Government accompanied by JICA has provided a report on Revised Strategic Transport Plans (RSTP) which analysed previous transport policies and identified some lacking. The newly proposed transport plans along with their opportunities were stated in that report too. This chapter will focus on the data analysis, scoring procedure and other discussions regarding SUTI indicator 1.

4.1.1 Data analysis

There are 4 aspects in Indicator 1, i.e. Walking, Cycling, Intermodal Transfer Facilities and Public Transports. To analyse these 4 aspects, three factors are taken to consideration which are: Stating clear goals and visions for each aspect, designating infrastructure, facilities and measures for each aspect in the plan and allocating funding, specifying budgets, and securing finance for the facilities.

Among these aspects public transport system is highly prioritised in RSTP report. The overall urban transport goal stated in the report can be detailed as: mobility and accessibility will be ensured for people with their safety, amenity and equity and a public transport-based city will be created through 60% public transport-based mode share. So, there is quantitative vision regarding public transportation system. Objectives like promotion of public transport use and expansion of services, providing an affordable public transport system and so on are enlisted to fulfil this goal. Moreover, 5 MRT and 2 BRT lines were proposed. One MRT and one BRT corridor will be in operation by 2020. Moreover, railway and waterway were also encouraged as public transport mode. Adequate funding was proposed to develop public transportation system within Dhaka city.
The objectives of Urban Transport Plans stated in RSTP, 2015 are highly concentrated on promoting integrated urban and transport development, particularly Transit Oriented Development (TOD). TOD highly focuses on walking facilities and parking requirements of the city. To encourage walking as a sustainable mode of transport, Bangladesh Government has declared some areas as ‘motorized free zones’ for specific times or days. Moreover, car free day celebration takes places in Dhaka city since 2004 and recently one road is declared as car free during the first Friday of every month. These initiatives not only encourage walking but also help to create sustainable environment. According to DHUTS report, 4 locations of existing pedestrian underpasses in Dhaka are: Gulistan intersection, Gabtoli Bus terminal, Sayedabad (Dhalpur) and Karwan Bazar. Moreover, there is already 87 constructed foot over bridges in Dhaka city (Daily Sun, 2017) to ease the pedestrian crossing at intersections.

There is no clear strategy to provide bicycle routes. Some policies (policy 70 & 71) were proposed where Bicycle is recognized as a mode of transport and separate lanes and crossings is proposed within the city in order to make bicycle journeys safe. It is also proposed that to make bicycle affordable to the poorer sections of society. Government should support local manufacture. Recently huge interest has been observed among young generations to use bicycle and many students and employees are using it for daily commute. But no realistic funding is secured.

Based on the proposed mass transit network, 21 transportation hubs or multimodal stations were identified throughout Dhaka and its suburbs as indicated in Figure 2.6. The primary existing multimodal transportation interchanges include Dhaka International Airport, Kamalapur Station, Mohakhali bus Terminal, Jatra Bari Bus Terminal, Gabtoli Bus Terminal, Gabtoli Circular Waterway Station, and Shdarghat Boat Terminal. In addition, there are other locations where interchange facilities between transportation modes can be developed within RAJUK area.

Under the vision of ensuring ‘Efficient Traffic Control and Management’, objective of establishing parking policy and controls is also enlisted. This objective can pursue intermodal transfer facility in a great extent. Moreover, in various important terminals and nodes intermodal transfer facilities are observed which helps the mobilization of public.
4.1.2 Scoring procedure

After identifying the different plans (from related documents), it was reviewed by a panel of experts who revised and scored the aspects under the provided guidelines by UN ESCAP. In the following table, the marking on these 4 aspects along with a brief explanation is provided:

Table 4-1 Scoring analysis for indicator 1

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Explanation</th>
<th>Score</th>
</tr>
</thead>
</table>
| Walking Networks         | -For DMA area there are qualitative goals like: Pedestrian First policy regarding walking  
                          -Some designation in major areas (example: Banani, Gulshan, Uttara etc) are observed. Pedestrian overpasses and underpasses are built at some major junctions to ease crossing of pedestrians.  
                          -Budget regarding the improvement of walking facilities are increasing day by day.                                                                                          | 2     |
| Cycling Networks         | -There is no clear vision or goals regarding cycling facility in DMA area  
                          -Very few designations seen in plans as a support to other facilities  
                          -There is no specific budget or funding plan                                                                                                                                       | 1     |
| Intermodal Transfer Facilities | -Qualitative goals are proposed for ensuring mobility and interchange facility  
                          -Intermodal facilities exists at major bus, rail and launch terminals  
                          -21 multimodal hub is planned along MRT and BRT route.  
                          -Some funding is proposed for developing new bus terminals in RSTP                                                                                                               | 2     |
| Public Transport         | -Ambitious goals are set. DMA area will increase the modal share of public transport to 60%.  
                          -To fulfill these goals, strategic projects 5 MRT line, 2 BRT line and elevated express ways are planned to improve the transport system of Dhaka City. Moreover, One MRT and one BRT corridor will be in operation by 2020.  
                          -Major funds are secured.                                                                                                                                                           | 3     |
Sustainable Urban Transportation Index (SUTI) for Dhaka, Bangladesh

Table 4-2 Final result for indicator 1

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum score value to enter in data sheet for indicator 1</td>
<td>8</td>
<td>2015</td>
<td>Score is based on ‘Revised Strategic Transport Plans (RSTP), 2015’ for Dhaka city. Scoring conducted by 4-person team.</td>
</tr>
</tbody>
</table>

4.1.3 Conclusion

Sum of the scores value to enter in the final data sheet is 8. This score is based on RSTP report, 2015 and scoring is conducted by a panel of 4 experts. The measures needed to improve the situation are:

- Dedicated bicycle networks along major roads should be constructed and adequate budget needs to be secured for this sector.
- Continuous footpaths in the DMA should be planned with ramps for special need people.
- Overpass or underpass should be provided at the busy intersections for crossing
- Intermodal facilities should be developed at all existing and future transit nodes.
- Immediate implementation of Bus sector reform project.

4.2 Indicator 2: Modal share of active and public transport in commuting

Being an emerging megacity of a developing country like Bangladesh, Dhaka is focusing to improve its transportation system. Various projects are in implementation phase to make the road transport system efficient and faster, but the projects and policies tend to neglect the sustainable issue, and this degrade the conditions for walking and cycling. Dhaka is moving towards a public transport-based city. But assessing the existing condition of Dhaka, it can be understood that the overall aspects of efficient public transport system is not in good condition. SUTI, Indicator 2 is defined by the percentage of modal share of public and active (bicycle and walking) transports. This section covers the data analysis, interpretation and measures to improve the public and active transport mode share.
4.2.1 Data analysis

The survey data of RSTP Report, 2015 has been used to calculate this indicator. The data of all motorized and non-motorized modes of Dhaka city was provided there, except the data of walking. Later the walking data is collected from DHUTS report, 2009 as it was compatible with the other data. After the data collection, using statistical total number of trips was calculated for each mode of transport through multiplying Daily Vehicular Traffic Volume with Average Vehicle Occupancy.

After this calculation, all the modes were categorized into three sections, as defined in the SUTI guideline by UN ESCAP. All kind of buses, auto tempo, CNG, Laguna and Rickshaw were in Public transport category. Walking and cycling were considered as active transport. Private cars, motorcycles, taxi and Mini Vans were categorized as individual motorized transport. Then the percentage of modal share was calculated from the grand total of all three categories.

Table 4-3 Modal share of active and public transport

<table>
<thead>
<tr>
<th>Mode</th>
<th>Trip Numbers</th>
<th>Individual percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>1353760</td>
<td>56.19</td>
</tr>
<tr>
<td>Auto Tempo/ Laguna</td>
<td>96289</td>
<td>3.997</td>
</tr>
<tr>
<td>CNG/ Auto</td>
<td>206251</td>
<td>8.561</td>
</tr>
<tr>
<td>Rickshaw (Non-Motorized)</td>
<td>35429</td>
<td>1.471</td>
</tr>
<tr>
<td><strong>Public Transport</strong></td>
<td><strong>1691729</strong></td>
<td><strong>70.22</strong></td>
</tr>
<tr>
<td>Taxi</td>
<td>1330</td>
<td>0.055</td>
</tr>
<tr>
<td>car</td>
<td>87150</td>
<td>3.617</td>
</tr>
<tr>
<td>Motor cycles</td>
<td>29529</td>
<td>1.226</td>
</tr>
<tr>
<td>Trucks and Mini Van</td>
<td>192650</td>
<td>7.997</td>
</tr>
<tr>
<td><strong>Individual Motorized Transport</strong></td>
<td><strong>310658</strong></td>
<td><strong>12.89</strong></td>
</tr>
<tr>
<td>Bicycle</td>
<td>5186</td>
<td>0.215</td>
</tr>
<tr>
<td>Walking</td>
<td>401585</td>
<td>16.67</td>
</tr>
<tr>
<td><strong>Active Transport</strong></td>
<td><strong>406771</strong></td>
<td><strong>16.88</strong></td>
</tr>
<tr>
<td>Grand Total</td>
<td>2409158</td>
<td>-</td>
</tr>
<tr>
<td>Public and Active</td>
<td>2098500</td>
<td>-</td>
</tr>
</tbody>
</table>
### Modal Share of Active and Public Transport

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modal share of active and public transport trips in commuting (%)</td>
<td>87.11</td>
<td>2015</td>
<td>Data is based on an update of travel survey 2015</td>
</tr>
</tbody>
</table>

Table 4-4 Final result for indicator 2

By observing the table, it can be stated that people of Dhaka are quite depended on the public transports and due to cheapest fare level people use buses at very high rate. Moreover, due to absence of proper cycling facility, the number of bi-cycle trips is the lowest. Almost 16% people prefer walking and most of them choose it due to financial constraints.

#### 4.2.2 Conclusion

Dhaka is an exception to all other cities as huge amount of people are very much depended on public transports though condition of public transport is not comfortable. To improvise the situation following measures can be taken:

- Quality and reliable Bus service should be introduced to keep this high share. Convenient and efficient public transport system should be provided, and they should be properly and timely maintained. This can ensure less greenhouse gas emission along with establishing a sustainable urban transport system.
- Once MRT and BRT will be in operation public transport share may increase due to more reliable service.

#### 4.3 Indicator 3: Convenient access to public transport service

Accessibility measures integration between land use and transport. Population and other socio-economic features change with the change of land use. Transport terminals and stoppages should be provided by complementing that land use and purpose. Trips are being generated for various purpose like work, education, recreation, business, shopping etc. Being the capital of Bangladesh, Dhaka has a huge amount of educational institutions, working companies,
industries and business sectors and this significant concentration generates huge number of trips. Moreover, the average trip length for the people of DMA is 5.3km/trip and it is expected to be increased at 6.7km/trip by 2035 (JICA & DTCA, 2015). Along with all, a population density of 56,120 persons/km² creates a huge pressure on the existing bus stops and terminals. So, to support this huge population density and trip demand, proper accessibility of public transport is a crucial need for Dhaka City. SUTI, Indicator 3 is defined by the rate of population within 500-meter radius of bus stoppage with 20 minutes frequency of buses. This indicator will reflect the percentage of people having proper accessibility of public transports in Dhaka city.

4.3.1 Data analysis

Geographic Information (GIS Data) of Dhaka City was taken from RSTP data source. The Data included bus route, bus stoppage and population density of DMA area for the year 2011. The updated bus routes and stoppages were being analysed but due to unavailability of recent population data in authorized GIS format, previously created data of 2011 was used. Almost all the bus stops of Dhaka have a frequency of 2 or 3 buses within every 15 minutes.

The GIS data was processed in Arc map GIS 10.3. The number of total bus stops were 237 and these were buffered for 500m radius. Then the buffer bus stoppage data clipped population density of Dhaka City. After that, through field geometry the buffered area was calculated. Later through multiplication of population density and buffered area the number of people having proper accessibility to public transport was calculated. The result represents that more than 56 percent people are having the accessibility of public transports.

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population of Core Dhaka 2011</td>
<td>8092761.0</td>
</tr>
<tr>
<td>Population with Accessibility to public transport</td>
<td>4575455.3</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td><strong>56.5%</strong></td>
</tr>
</tbody>
</table>
Figure 4.3-1 Public transport accessibility map of Dhaka

Table 4-6 Final data for indicator 3

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenient access to public transport service</td>
<td>56.5</td>
<td>2011</td>
<td>The data is based on the DMA 2011 census for population in areas within 500 m of main nodes, and the 2011 schedule of public buses.</td>
</tr>
</tbody>
</table>

4.3.2 Conclusion

Though more than 50 percent people are having the proper accessibility of public transport, huge lack of well-defined bus stoppage exists in the roads of Dhaka city. As a result, drivers randomly pick passengers from various places. This creates congestion on the roads as well as raise the risk of accidents. Measures need to be taken to improvise the situation:

- Transit oriented development (TOD) shall be introduced. This will increase the accessibility of people.
- Well defined bus stops should be provided into places where trip generation rate is high.
• To improve “Last mile connectivity” access roads need to be constructed and cheap transport options should be provided.
• Adequate east – west connecting routes need to be developed.

4.4 Indicator 4: Public transport quality and reliability

Reliability and quality are two very important factors for daily commuters. A reliable public transport service is one that adheres to schedule, whose vehicles run on-time along with proper information of routes, fare level and frequency of buses. On the other hand, quality can be ensured through providing comfort and cleanliness, behaviour of service operators and safety. SUTI Indicator 4 focuses on reliability and quality factors through analysing 8 aspects, i.e. frequency of buses, punctuality, comfort and cleanliness, safety of vehicles, convenient of bus stops, information availability, personal courtesy and fare level. Percentage of peoples’ satisfaction over these aspects would provide an over view of reliability and quality of public transports in Dhaka City.

4.4.1 Data analysis

The data for this indicator was collected through field survey. The survey was conducted at bus stops and on board. People who use public transports on daily basis were asked to answer the questions regarding the factors. 280 passengers were interviewed about the 8 aspects of this indicator and 100 of them were women.

After the data collection, all the data were being statistically analysed. The total number of responses in each individual factor was calculated. Then weighted average of all the aspects along with the percentage of satisfaction was calculated.
By analysing the results, it can be observed that more than 50 percent people are satisfied with the fare level and also the satisfaction score of personal courtesy level is satisfactory. But people are highly dis-satisfied with the safety issues. During, boarding and alighting from buses the drivers and helpers do not provide proper attention to passenger’s safety. In fact, the chasing and racing tendency of drivers is also observed in highly busy roads. Punctuality got very poor satisfaction level as due to frequent stops at sudden boarding/alighting of passengers and due to congestion maintaining schedule is difficult. Though enough buses from different companies are available on the road, still there is a huge lack of well-defined bus stoppage.

Table 4-8 Final result of indicator 4

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transport quality and reliability</td>
<td>37.90</td>
<td>2018</td>
<td>Based on satisfaction survey on 5 main bus lines.</td>
</tr>
</tbody>
</table>
4.4.2 Conclusion

From the above result it is well understood that the reliability and quality level in Dhaka city is very low. Various measures can be taken to improve the situation:

- At grade boarding and alighting and provision for special need people at stations and inside buses should be provided.
- Old malfunctioned buses should be gradually phase out from the city.
- Traffic management system needs to be improved
- Regular training program for drivers.

4.5 Indicator 5: Traffic fatalities per 100,000 inhabitants

Road accidents costing Bangladesh in the order of US $800 million (nearly 2% of GDP) each year (Hoque & Alam, 2002). Therefore, making roads safer is one of the prime importance. As set in the SUTI guideline this indicator depends on the number of fatalities to population of Dhaka city.

4.5.1 Data processing

Crash data was collected from Accident Research Institute (ARI) established at Bangladesh University of Engineering and Technology (BUET), Dhaka. The following table represents the fatality data in Dhaka:

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Accidents</th>
<th>No. of Fatality</th>
<th>No. of Severe Injury</th>
<th>No. of Simple Injury</th>
<th>Total No. of Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>341</td>
<td>273</td>
<td>95</td>
<td>36</td>
<td>404</td>
</tr>
<tr>
<td>2014</td>
<td>264</td>
<td>264</td>
<td>109</td>
<td>55</td>
<td>428</td>
</tr>
<tr>
<td>2015</td>
<td>391</td>
<td>301</td>
<td>167</td>
<td>73</td>
<td>541</td>
</tr>
<tr>
<td>2016</td>
<td>326</td>
<td>247</td>
<td>103</td>
<td>51</td>
<td>401</td>
</tr>
<tr>
<td>2017</td>
<td>267</td>
<td>280</td>
<td></td>
<td></td>
<td>359</td>
</tr>
</tbody>
</table>

*Source: Accident Research Institute (ARI), BUET (2018)*
The collected data were processed for deriving the SUTI indicator value. Firstly, the fatality data were separated for calculation (figure 5.2). Other casualty data were ignored as directed in the “SUTI data collection guidelines”.

Table 4-10 Year wise value for traffic fatalities in DMA

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Fatality</th>
<th>Population</th>
<th>TF Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>282</td>
<td>14,171,567</td>
<td>1.99</td>
</tr>
<tr>
<td>2012</td>
<td>292</td>
<td>14,620,806</td>
<td>2.00</td>
</tr>
<tr>
<td>2013</td>
<td>273</td>
<td>15,084,285</td>
<td>1.81</td>
</tr>
<tr>
<td>2014</td>
<td>264</td>
<td>15,562,457</td>
<td>1.70</td>
</tr>
<tr>
<td>2015</td>
<td>301</td>
<td>16,055,787</td>
<td>1.87</td>
</tr>
<tr>
<td>2016</td>
<td>247</td>
<td>16,564,755</td>
<td>1.49</td>
</tr>
<tr>
<td>2017</td>
<td>280</td>
<td>17,089,858</td>
<td>1.64</td>
</tr>
</tbody>
</table>

Secondly, the population census data of 2001 and 2011 were used to derive the growth rate. The derived growth rate was used to project the population for 2017 (Annex 1). Finally, both the population and fatality data were used to calculate the indicator value using the following formula:

Figure 4.5-1 Total number of fatalities in recent years within Dhaka Metropolitan Area
**Fatality Rate**, \( FR_i = \frac{F_i \times 100,000}{I_i} \)

Where,
- \( FR_i \) is the fatality rate per 100,000 inhabitants in year \( i \)
- \( F_i \) is the number of total fatalities (for all modes) in year \( i \)
- \( I_i \) is the number of total inhabitants in year \( i \)

**Calculation detail for Year 2017:**
No. of fatalities, \( F_{2017} = 280 \)
Total Inhabitants, \( I_{2017} = 17,089,858 \) (Projected)

Traffic Fatalities per 100,000 Inhabitants, \( TF_{2017} = \frac{F_{2017} \times 100,000}{I_{2017}} \)

\[ = \frac{280}{(17089858/100000)} = 1.64 \]

The traffic fatalities per 100,000 inhabitants of Dhaka city was found 1.64 which has been summarized in Table 5.8.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic fatalities per 100,000 inhabitants</td>
<td>1.64</td>
<td>2017</td>
<td>The average value from 2011 to 2017 was 1.79</td>
</tr>
</tbody>
</table>

(Source: Authors calculation)

**4.5.2 Conclusion**

Results found for this indicator indicated a fair good situation for Dhaka. As the population is huge and the reported number is not that high the overall situation looks good. The fatality data is taken from police reported data. Data collection for fatality is based on fatality happened during the event of any accident. In Bangladesh the post-accident fatality is not reported as the event of accident and there are evidences of un-reported fatality also. In Dhaka most of the fatalities occurs with pedestrian. So, adopting the following may improve the situation of safety more:

- Improving Pedestrian crossing facilities at intersection.
- Adequate Training for driver for safe driving.
- More awareness program should be initiated.
- Improve traffic arrangement system (ITS, modern signaling etc.)
4.6 Indicator 6: Affordability – travel costs as part of income

Measuring affordability of transport system of individuals or households is very much important to formulate any strategic transport policy. In developing countries, it is very much important to monitor and understand public transport expenditure pattern because it helps to develop comfortable travel strategies for low income and mobility constrained people. Dhaka is a city where people of various income range resides and according to RSTP Report, a wide variety of people from middle income and lower income group is more depended on public transportation system than the upper class. And more or 14% who use public transports, are below the poverty line (about 10,000 Bangladeshi Taka a month for four family members (JICA & DTCA, 2015). SUTI Indicator 6 is defined by the percentage of monthly income of the lower income group spent in travelling.

4.6.1 Data analysis

The survey basically focused on middle lower income and lower income class who use public transports in regular basis. Considering all other aspects, bus and mini bus are the cheapest public transport mode of Dhaka city. The following table can provide the overview of the bus fare level in Dhaka City which they should maintain:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Minimum Fare Level (BDT)</th>
<th>Fare/ Kilometer (BDT/KM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>7</td>
<td>1.60</td>
</tr>
<tr>
<td>Mini Bus</td>
<td>5</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Source: RSTP Report, 2015

A statistical analysis took place after the field data collection for this indicator. During field survey some passenger complaint about the fluctuation of fare. They mentioned that sometimes the conductor asked for higher fare then the published fare. The collected data were based on daily number of trips, cost of per trip and monthly income. After multiplying the cost of per trip with the daily number of trips, cost per day was found. This cost was multiplied with the number of working days of Bangladesh. The result represents monthly cost of travel. Then the percentage calculation of monthly expenditure on travel was derived.
Table 4-13 Data for average wage and transport cost

<table>
<thead>
<tr>
<th>Factors</th>
<th>Quantity (BDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Wage of People (According to Survey Result)</td>
<td>17,375.18</td>
</tr>
<tr>
<td>Average Transport Cost</td>
<td>2,752.20</td>
</tr>
</tbody>
</table>

The result represents the average wage level for lower income group is 17,375 BDT where the expenditure for travelling is 2,752 BDT (only who travels in Buses and Mini Buses). Almost 16 percent of the income is expended on day to day travel and this represents a huge pressure on the lower income group.

Table 4-14 Final result of indicator 6

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability – travel costs as part of budget</td>
<td>15.88</td>
<td>2018</td>
<td>The result is based on a 2018 filed survey of income levels for the population</td>
</tr>
</tbody>
</table>

4.6.2 Conclusion

To improvise the situations following strategies can be applied:

- A more convenient fare level can be proposed by the government through providing subsidies over the fuel sector.
- Special pass for student, senior citizen and special need people can be introduced. This will attract people more toward public transports rather than the private one. It may convert into a very fruitful step to fulfill the RSTP vision of making Dhaka a public transport-oriented city.
- Strong monitoring is required whether the operators are following the fare fixed by the government.

4.7 Indicator 7: Operational costs of the public transport system

Operating costs in transportation sector basically includes three major sections which are running cost (Fuel cost, wage of driver and support staff), maintenance cost and fixed cost (rent of garage, insurance, road permit and so on). To cover these costs transport companies basically
depends on revenues collected through fares or other ways like advertisements. Revenues received by the sale of tickets, passes, and concession to the passengers (i.e. the payment received from passengers for the journey performed). This indicator is defined by the percentage of operational cost recovered by fares and usually termed as fare box ration. This section will focus on the data analysis and other discussion related to this indicator.

4.7.1 Data analysis

Initially field survey was conducted by following the questionaries’ received from UNESCAP. But most of the operator found reluctant to disclose their business secret. Then after consultation with UNESCAP expert, data from Dhaka Bus Network and Regulatory Reform Implementation Report, 2012 was used. Operational cost is calculated through multiplying standard operating cost with the defined route round trip length, trips per day, Daily Run and Round-Trip Time. The revenue data was given, and percentage of recovery rate was calculated through total operating and revenue cost.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Amount (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Revenues</td>
<td>646811</td>
</tr>
<tr>
<td>Operating Cost</td>
<td>871350</td>
</tr>
</tbody>
</table>

This indicator is a critical economic variable as it represents the financial stability of the operator. Though Dhaka city has a huge population which depends upon public transportation services, but the recovery rate is almost 74 percent which clearly indicates government subsidies is needed.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Cost of the public transport system</td>
<td>74.23</td>
<td>2018</td>
<td>The data are from 131 routes where public bus services are available</td>
</tr>
</tbody>
</table>

Dhaka Public Transport companies generally do not have other sources of recovery like advertisement, retail services or others. Moreover, according to findings of Dhaka Bus Network and Regulatory Reform Implementation Report, the following factors also emphasize on unsustainable financial operation
• The commercial speed of 9 km/h is very low when compared to optimal international standards between 25-30 km/h.

• Low commercial speed is negatively affecting the number of passengers that can board the buses during the day, which in turn translates into reduced revenues.

• Low commercial speed also impacts negatively the profit levels of operators as it keeps variable costs relatively high. In simpler words, the fleet is burning fuel while in congested streets instead of plying the roads and moving passengers.

• Current official rate levels do not seem to cover the needs of the operators to sustain an efficient operation of buses.

4.7.2 Conclusion

The following measures can be taken to improve the situation:

• Fragment bus services need to be regulated through bus route restructure.

• Current official rate levels do not seem to cover operational cost, so fare level needs to amend. Maintenance cost need to be managed more efficiently.

4.8 Indicator 8: Investment in public transportation systems

Investments in transportation sector plays an important role to enhance the mobility of the city dweller. Being the capital city of Bangladesh, Dhaka faced huge migration pressure ever year and thus requires more investment in transport sector. The 8th indicator of SUTI is basically defined by the percentage of total transport investment to investment on public and active transport. This section will focus on the data Analysis and other discussion related to indicator 8.

4.8.1 Data analysis

The indicator is basically derived from two basic data sets which are:

• Investments in Public and active Transport Systems and Facilities (last 5 years)

• Investments on Total Transport Sector (including all the aspects both private and public)
Sustainable Urban Transportation Index (SUTI) for Dhaka, Bangladesh

Table 4-17 Total data of overall transport and public transport facilities

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transport facilities</td>
<td>103369.87</td>
<td>176772.33</td>
<td>60542.11</td>
<td>338801</td>
<td>421913.51</td>
<td>220,279.76</td>
</tr>
<tr>
<td>Total Transport facilities</td>
<td>119724.91</td>
<td>193506.05</td>
<td>72960.36</td>
<td>360019.22</td>
<td>443219.48</td>
<td>237,886.00</td>
</tr>
</tbody>
</table>

The result derived from these two data sets is 92.60%.

The total amount of all kind of registered vehicle for Dhaka city is 51974 (BRTA, 2018) and among them the number of buses and minibuses are respectively 12055 and 673. These buses and minibuses are contributing as public transport from 2013-2018. No new bus depots, terminals or stops are developed during the last five years. No workshops regarding improvising services, capacity or awareness building took place in the last five years. According to the officials of Dhaka North City Corporation (DNCC) 20-25% of the transport sector related budget is invested into improving pedestrian facility whereas no budget is secured for bi-cycle lane.

Table 4-18 Final result of investment

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment in public transportation systems</td>
<td>92.6</td>
<td>(2013-2017)</td>
<td>Based on Annual Reports of the Respective Years of Dhaka North and South City Corporation</td>
</tr>
</tbody>
</table>

4.8.2 Conclusion

Due to recent huge investment in some mega project i.e. MRT line 6, BRT line 3 and some ongoing PPP projects, the ratio is high considering the real scenario. However, as per the advice of UNESCAP expert the maximum value (50%) is considered.

- Investment for walking and bicycle lane should be increased.
- More investments in bus sector (buying new buses, building depots and terminals according to necessity) can increase the facilities for people.
4.9 Indicator 9: Air quality (PM10)

Air pollution is one of the major problems of Dhaka city. Different pollutants are responsible for the air quality degradation of Dhaka. Particulate matter is one of them. According to Environment Protection Agency of USA, “Particulate Matter” refers to a mixture of solid particles and liquid droplets found in the air. “Particulate Matters” are so small that they can be inhaled and cause serious health problems. Particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into the lungs, and some may even get into the bloodstream. Brick kiln and Transport sector are the two major source of PM 10 pollution in Dhaka.

4.9.1 Continuous air monitoring stations (CAMS) in Bangladesh:

The ambient air quality monitoring network of Bangladesh consists of eleven fixed Continuous Air Monitoring Stations (CAMS).

![CAMS stations map](image)

Figure 4.9-1 CAMS stations all over the country

Among all the 11 CAMS, only three are in Dhaka metropolitan Area. Brief description of the monitoring stations located in Dhaka Metropolitan area and the list of measured parameters recorded at each station are provided in the following table.
Table 4-19 Month wise data of CAMS-1,2 and 3

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Parameter</th>
<th>PM 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CAMS-1</td>
</tr>
<tr>
<td>2017</td>
<td>January</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>February</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>March</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>April</td>
<td>Average</td>
<td>88.9</td>
</tr>
<tr>
<td></td>
<td>May</td>
<td>Average</td>
<td>74.5</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>Average</td>
<td>45.3</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>Average</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>September</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>October</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>December</td>
<td>Average</td>
<td>....</td>
</tr>
<tr>
<td></td>
<td>Yearly Average</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average of CAMS-2 and CAMS-3 | 137.34

Source: Monthly Reports CASE Project

4.9.2 Data processing:

The average PM 10 value of the year 2017 was calculated from the monthly values recorded in the CAMS-2 and CAMS-3. CAMS-3 could provide the data of each month of year 2017 whereas CAMS-2 had collected data of all the months except March and April. That was why average data of these 2 stations were used. Otherwise, the population weighted indicator value could be derived. The final indicator value for the year 2017 has been shown in Table 4-20.

Table 4-20 Findings regarding the 9th indicator of SUTI

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality (PM 10)</td>
<td>137.344</td>
<td>2017</td>
<td>Data of Continuous Air Monitoring Stations (CAMS) in Dhaka were used. Data of CAMS-2 and CAMS-3 stations were used for 2017.</td>
</tr>
</tbody>
</table>

4.9.3 Conclusion:

The indicator value is high compare to the standard set by the SUTI guideline. This implies that Dhaka may have to struggle a lot to reduce the value of PM 10 concentration and also
improve the existing pollution level. The measures which can improve the state are given below:

- Low sulfur diesel should be introduced
- Encourage the use to CNG and make proper rules for implementation.
- Regular maintenance of vehicle.

4.10 Indicator 10: Greenhouse gas emissions (CO2eq tons/year)

Greenhouse gas emissions has been a concern all over the world as it is responsible for global warming. CO2 shares a major portion of greenhouse gas and transport sector is highly responsible for the emission of CO2. In Dhaka city registered motor vehicles are 3419884 (Bangladesh Road Transport Authority, 2018). Fuel used for vehicles are diesel, petrol and CNG. SUTI indicator 10 is denotes greenhouse gas emissions in CO2eq tons/year which represents CO2 equivalent emissions from transport by urban residents per annum per capita.

4.10.1 Data analysis

In Bangladesh fossil fuel is mostly imported and Compressed Natural Gas (CNG) is extracted from mines. Different fuel types like High Speed Diesel (HSD), Superior Kerosene Oil (SKO), Motor Spirit (MS), High Octane Blended Component (HOBC), Jet Fuel and others are used. HSD is a Diesel type of fuel where MS and HOBC are Petrol type of fuel. For this indicator, yearly amount consumed of diesel and petrol were collected from Bangladesh Petroleum Corporation. Data was found for Dhaka division and it was estimated that more than 70% fuel consumed in the metropolitan area by motorized transport. Data calculation is shown in the table below.

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Liters Sold</th>
<th>CO2 Factor kg/l</th>
<th>Emissions tons/year</th>
<th>Population</th>
<th>Emission/capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline/Petrol</td>
<td>104771000</td>
<td>2.272</td>
<td>237987.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td>956214000</td>
<td>2.676</td>
<td>2558828.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2796815.99</td>
<td></td>
<td></td>
<td>17000000</td>
<td>0.16</td>
</tr>
</tbody>
</table>

There are some limitations regarding the calculation of greenhouse gas emission. For Dhaka, there has not been any work on CO2 emission from transport sector. So, overall fuel sell data
was used for Dhaka division and then it was estimated after talking to experts that around 70% of this sell has been used by motorized transport in Dhaka city. Again, many vehicles used in Dhaka are very old which may be responsible for more CO2 emission which was not accounted in this calculation. Result of this calculation is shown below in Table 4-22.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2 emissions for transport</td>
<td>0.16</td>
<td>2017</td>
<td>Based on estimate of total fuel use by motorized vehicles (car, bus, minibus, MC, light truck, heavy duty truck)) on DMA road network for 2017.</td>
</tr>
</tbody>
</table>

**4.10.2 Conclusion**

Though in terms of CO2 emission Dhaka is in better position. It can be further improved by the following measures:

- Old malfunctioned vehicles need to be gradually phased out
- Electric/ Hybrid vehicles should be promoted
- Use of CNG should be encouraged.
### 4.11 Combined final results

<table>
<thead>
<tr>
<th>No</th>
<th>Indicators</th>
<th>Units</th>
<th>Weights</th>
<th>Range</th>
<th>Normalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes</td>
<td>0 - 16 scale</td>
<td>0.1</td>
<td>0</td>
<td>50.00</td>
</tr>
<tr>
<td>2</td>
<td>Modal share of active and public transport in commuting</td>
<td>% of trips</td>
<td>0.1</td>
<td>10</td>
<td>96.39</td>
</tr>
<tr>
<td>3</td>
<td>Convenient access to public transport service</td>
<td>% of population</td>
<td>0.1</td>
<td>20</td>
<td>45.63</td>
</tr>
<tr>
<td>4</td>
<td>Public transport quality and reliability</td>
<td>% satisfied</td>
<td>0.1</td>
<td>30</td>
<td>12.15</td>
</tr>
<tr>
<td>5</td>
<td>Traffic fatalities per 100,000 inhabitants</td>
<td># fatalities</td>
<td>0.1</td>
<td>35</td>
<td>95.31</td>
</tr>
<tr>
<td>6</td>
<td>Affordability – travel costs as share of income</td>
<td>% of income</td>
<td>0.1</td>
<td>35</td>
<td>60.70</td>
</tr>
<tr>
<td>7</td>
<td>Operational costs of the public transport system</td>
<td>Cost recovery ratio</td>
<td>0.1</td>
<td>22</td>
<td>34.14</td>
</tr>
<tr>
<td>8</td>
<td>Investment in public transportation systems</td>
<td>% of total investment</td>
<td>0.1</td>
<td>0</td>
<td>100.00</td>
</tr>
<tr>
<td>9</td>
<td>Air quality (pm10)</td>
<td>μg/m3</td>
<td>0.1</td>
<td>150</td>
<td>9.04</td>
</tr>
<tr>
<td>10</td>
<td>Greenhouse gas emissions from transport</td>
<td>Tons/cap</td>
<td>0.1</td>
<td>2.75</td>
<td>94.18</td>
</tr>
<tr>
<td></td>
<td><strong>Geometric Mean of the Index</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>46.27</strong></td>
</tr>
</tbody>
</table>
**4.12 Spider diagram for Dhaka city**

- Extent to which transport plans cover public transport, intermodal facilities and...
- Modal share of active and public transport in commuting
- Convenient access to public transport service
- Public transport quality and reliability
- Investment in public transportation systems
- Air quality (pm10)
- Operational costs of the public transport system
- Traffic fatalities per 100,000 inhabitants
- Affordability – travel costs as part of income
- Greenhouse gas emissions from transport
CHAPTER 5: PERSPECTIVE ON SUTI EXERCISE

Indicators of SUTI has provided a quantitative analysis on the existing transport situation of Dhaka city. The overall index indicated a moderate situation (geometric mean 46.27). The basic findings of these indicators are given below;

5.1.1 Basic Findings

- The overall transportation system in Dhaka city was found in a moderate condition. Huge investment in public transportation system has been planned and many of the plans are on the working stage (Two mega projects like: MRT and BRT). On the other hand, public transport quality and reliability, affordability of the people, operational cost of public transportation system and air quality are comparatively in critical condition.

- Public transportation system is the most used mode in DMA area. Among all public transport modes, people prefer to use buses due to comparatively low fare level. The second most used travel mode particularly for low income group is walking due to financial constraints. As a result, Active and public transport mode is dominating in DMA area.

- Though People of Dhaka highly depends on Public Transportation services, they are dissatisfied with public transport quality, reliability and especially the safety issues.

- There is only 13.3% footpath compared to whole road network of DMA area. Developing pedestrian facility is on progress. Continuous footpaths, overpass and underpasses exist in various areas of Dhaka city.

- While DMA area completely lacks facility for bicyclists. No vision and budget were allocated to improve cycling facilities.

- More than 50 percent of the population has accessibility to public transports but due to high population pressure many of them cannot utilize this facility. Moreover, a weak east west connectivity of DMA area, make people suffer a lot.

- Number of fatalities in Dhaka city is relatively low because most of the fatalities take place in highway roads due to high speed of vehicles. But in urban area, due to congestion, the travel speed of vehicles decreased nearly into walking speed, so many times, the intensity of many accidents are minor.
• The operating cost of the public transport companies is not covered by fare revenues in many cases. Low commercial speed negatively affecting the revenue as it lowers the number of passengers. Moreover, these companies do not have other sources of recovery like advertisement, retail services or others.

• The concentration of PM 10 particles is very high in the air of Dhaka, and these particles is decreasing the air quality in a drastic way.

Data collection is always a big challenge like other mega cities. We faced several obstructions during data collection, for this reason some old study data is used. However, DTCA can take some initiative to collect data for refining the SUTI.

Along with Dhaka city participants from various cities like Surat, In Ho Chi Minh, Surabaya presented their index results and overall transport system in the Capacity Building Workshop of Dhaka, 2018. Some general measures taken by these cities can be implemented in Dhaka city for future improvements. Some of them are discussed below:

• Street priorities should be established. The first priority should be provided to the pedestrians, second priority should be given to bicyclists and thirdly the car riders.

• Taking Surat free ride example for BRT can be replicated for Upcoming MRT and BRT operation.

• More public awareness programs with meaningful agenda like: “No person should be killed on the road” needs to be taken. And long-term activities should be planned and implemented.

• SUTI indicator should be updated in every 2 year.
CHAPTER 6: KEY PERSONS AND EXPERTS

i. Dr. Shivananda Swamy,
Professor, CEPT University, Ahmedabad
Email: shivanand.swamy@gmail.com

ii. Dr. Hadiuzzaman
Associate Professor, Transportation Engineering Division,
Bangladesh University of Engineering and Technology (BUET)
Email: mhadiuzzaman@ce.buet.ac.bd

iii. Dr. Md. Musleh Uddin Hasan
Associate Professor, Department of Urban and regional Planning
Bangladesh University of Engineering and Technology (BUET)
Email: musleh_uddin@urp.buet.ac.bd

iv. Mr Anisur Rahman,
Traffic Engineer,
Dhaka Transport Coordination authority (DTCA)
Email: rahman2005@gmail.com
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