An Accessibility Analysis of Proposed Stations of MRT Line-1, Line-5 and Line-6 in Dhaka, Bangladesh

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INTRODUCTION

- Important Agenda of urban transportation planning: maximizing accessibility and reducing social inequity.
- Accessibility refers to people's ability to reach goods, services and activities. It considers the factors which affect the capability to access opportunities, location of the opportunities, patterns of land use, the quality and affordability of transport options and people's ability to use those transport options (Levinson, 1992).
- Equity is referred to as the appropriate and fair distribution of impacts (benefits and costs) among all (Litman, 2017).
- Six Mass Rapid Transit (MRT) lines have been proposed in the Revised Strategic Transport Plan (RSTP, 2015) for solving the transport problems in Bangladesh.
- This study will identify the areas or wards of Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC) of good and poor accessibility to the proposed MRT stations of three MRT lines – 1, 5 and 6.

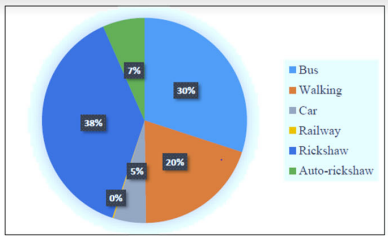

Figure 1: Modal share of available transport mode in Dhaka

Source: RAJUK, 2016

OBJECTIVES OF THE STUDY

- To evaluate the accessibility to MRT stations of the DNCC and DSCC wards.
- To assess the equity status of accessibility to MRT stations according to population density, trip demand and number of population served by public bus.

STUDY AREA

- Wards of the two City Corporations in the mega city Dhaka which are Dhaka South City Corporation (DSCC) and Dhaka North City Corporation (DNCC) were considered the study area of this research.

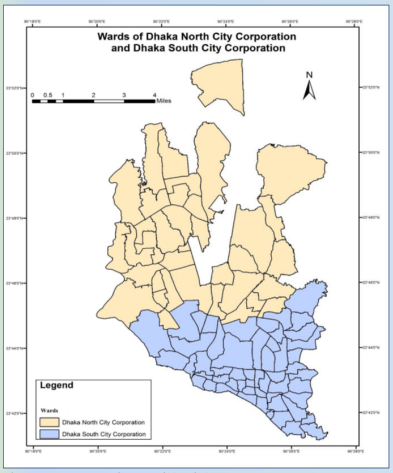

Figure 2: DNCC and DSCC boundary

Source: DTCA, 2016

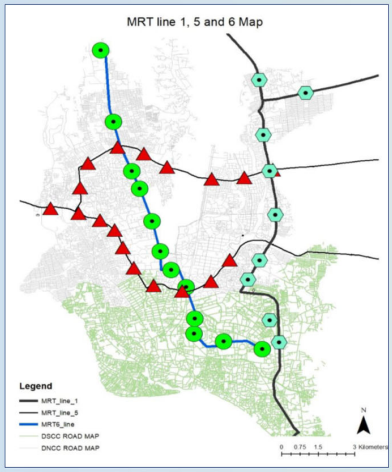

Figure 3: MRT stations in DNCC and DSCC area

Source: Author, 2021

METHODOLOGY

Measuring Accessibility Index

Accessibility Index generated based on 3 parameters:

1. Access Road density = $\sum \frac{\text{Total Access Road length within MRT coverage area}}{\text{Coverage area for each MRT stop}}$
2. Number Population Served = ∑(Population Density of respective ward * Area of buffer for each MRT stop)
3. Ratio of Coverage area and ward area = $\sum \frac{\text{Coverage Area for each MRT stop}}{\text{Ward Area}}$

800-meter MRT Coverage area was identified by generating service area buffer using Network Analyst Tool of Arc Map and thus Access road inside the coverage area was identified as well

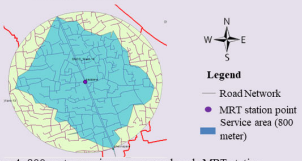

Figure 4: 800-meter service area around each MRT station

Composite Accessibility Indices

- Generated from the 3 parameters with weight using Composite Index Method
- Weight of the parameters was determined based on expert opinion (35 transport experts of Bangladesh) using Fuzzy AHP method
- Weights: 1. Access Road Density = 27%
  2. Number of Population Served = 55%
  3. Ratio of Coverage area and ward area = 18%
- Wards have been sorted into three classes (under-served, moderately served, and highly served) using a natural break optimization method based on the accessibility indices

Equity Analysis

- Equity was studied applying Lorenz curve and Gini Co-efficient value, across

I. Accessibility index vs. Population density of the ward
II. Accessibility index vs. Trip Demand
III. Accessibility index vs. Number of population served by public bus

ACKNOWLEDGEMENT

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FINDINGS

✓ Accessibility Results

DNCC (Dhaka North City Corporation) has better accessibility than the DSCC (Dhaka South City Corporation)

Table 1: Classification of Wards Based on their Accessibility Indices

Class	Accessibility Index	Wards of DNCC	Wards of DSCC	Frequency
Under Served	0.43-0.72	2, 7, 8, 15	4, 9, 13, 18, 27, 39	10
Moderately Served	0.72-0.87	9, 11, 20, 24, 27, 29, 30	1, 5, 7, 8, 12, 19, 20, 28	15
Highly Served	0.87-1.06	3, 4, 6, 10, 12, 13, 14, 16, 17, 18 ,19, 21, 22, 23, 26, 28, 32, 35, 36	6, 11, 15, 16, 17, 21	25

✓ Equity Results

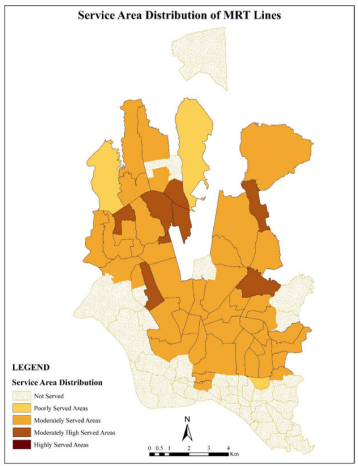


Figure 5: Distribution of Service Area across wards Served with Different Accessibility Indices

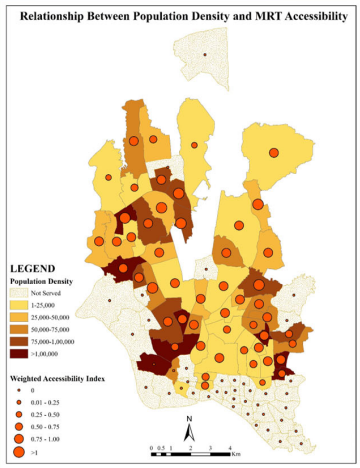
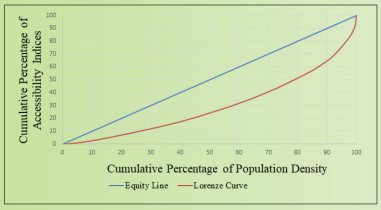


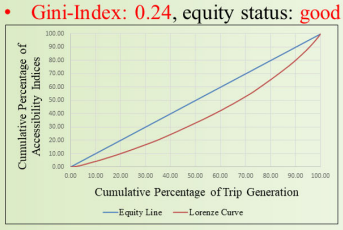
Figure 6: Relationship between Population Density and Weighted Accessibility Index (AI)

Source: Author, 2023

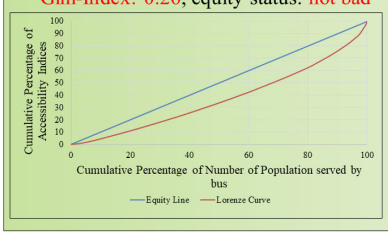
1. With Population Density
   - Gini-Index: 0.41, equity status: poor



2. With Trip Demand
   - Gini-Index: 0.24, equity status: good



3. With population served by bus
   - Gini-Index: 0.26, equity status: not bad



Conclusion

- Location of the stations of some areas needs to be modified
- Equity status is poor regarding population density, but good regarding trip demand
- MRT cannot meet the 100% demand of public bus, however it can minimize the pressure of public bus a lot

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