Measuring the Last Leg of Mass Rapid Transit System

1. Background

India is witnessing a phenomenal growth rate in its population, economy, and the level of urbanization. According to the Census 2011, out of the total population of 1210.19 million in India, about 377.11 million lives in urban areas accounting for 31.16% of total population. This means that the current urban population in India is greater than its total population in 1951 and it is expected to add more number of people to cities in the coming years. Most of the urban cities act as engines of economic growth of the country. With 31% of the total population, the urban cities contributes nearly 62-63% of India’s Gross Domestic Product. The rapid urbanization and the economic growth has influenced phenomenal change in the transport sector. The total number of registered motor vehicles in India reported as 210.02 million in 2015. The private vehicles like two wheelers and cars, jeeps, taxis are the predominant used vehicle with mode share of 72.4 % and 13.5%. The statistics indicates that the share of public transport is shaded down to 1%. The most alarming figures is on NMT mode share (non-motorized transport), which includes walking and cycling. The growing demand for mobility and the increasing rate of motorization are severely affecting the quality life of people lives in urban areas. The country needs to shape for an effective and sustainable transport system solutions for its sustainable economic growth.

India has geared up with its sustainable transport strategies and is making brisk progress. Indian cities are choosing mass transit preferences like Bus Rapid Transit System (BRTS), Metro and NMT choices of segregated pedestrian sidewalks and bicycle tracks as their sustainable solution to meet the urban transport demand. Many of the Indian cities operates BRTS and metro services with good ridership data and address the mobility demand.

Though the country has implemented many public transit services, the productivity of the same is dubious. The success of any public transport depends on its service, accessibility, routes and schedules, convenience, comfort, safety and many more. Among these, the “accessibility” plays a predominant role. The concept of accessibility can generally be defined as the ease with which inhabitants can reach their destination in their overall journey which includes the first and the last mile connectivity. First mile refers to the initial leg of delivering connectivity from origin to transit system (access/ First Mile) and last mile refers the access from transit system to destination (egress/ Last Mile). The origin may be home-end or non-home end of a trip and similarly the destination may be home-end or a non-home end of the trip. The ridership of any public transport is the upshot of how well they are integrated with other transport modes to ensure an easy accessibility to users.

The country is focusing more on building high-class public transit network in various states and is paying limited attention to matters on accessibility and related connectivity issues. The present study is solely addressing this problem. The study focuses on first and last mile connectivity for Bengaluru metro rail and is trying to bring out the present modal share of metro connectivity.
2. Scope and Objective

The present work focuses on Bengaluru metro transit services in terms of its connectivity and related issues. Bengaluru metro operates on two lines, purple and green covering a network of 42 stations. The travel pattern of metro users and the accessibility of metro stations and related transport modes are the major attention of the study. The other objectives are as follows:

1. To study the adjacent land use and built up environment characteristics of Metro stations
2. To understand the travel pattern and identify the first and last mile connectivity of metro users
3. To quantify the present modal share for metro accessibility and compare the various transport modes based on travel time and cost incurred.
4. To evaluate the available transport facilities and their integrations to metro transit stations.

Methodology/Survey Design

The objective of the present study is to assess the accessibility of metro stations. The study intends to collect data on the following aspects – Metro stations and the built up environment characteristics, physical integration with other transport facilities, commuters travel profile and accessibility pattern and their opinions. Primary surveys to be conducted to collect the data. The details are presented in Figure 1.
First part of the survey is concerns with an assessment of physical infrastructure of station with surrounding land use pattern and major attraction centres. This gives an idea of how far the different midpoints are located. In addition built environment mapping is done for 1 km radius around stations, covering land use and major building attractions. The second part of the surveys concerns with an assessment how well the other transport infrastructure like pedestrian sidewalks, cycle tracks, bus bays, auto stands etc. around these stations are integrated. A self-audit for 1 km of all major streets adjoining and leading to/from the stations is carried out. The third part of the surveys is transit commuter surveys. Surveys were conducted on weekdays as the focus of the study is primarily on regular type of trips. Information was collected on first/last mile and main haul trip characteristics, user’s travel profile (O-D data, travel mode, travel time and total travel cost) and the stated preference rating of first/last mile choices. Transit commuter surveys included direct questionnaire interview and were conducted at entry/exit points of station during four hours in the morning and four hours in the evening.

3. **Expected Outcomes**

The project is intended to study the accessibility of Bengaluru metro and related accessibility. The present modal share and the integration with other transport facilities are other major focus of the study. The few expected outcome of the project are:

- adjacent land use and built up environment characteristics of Metro stations
- the present modal share for metro accessibility and the first and last mile connectivity of metro users
- Transport facilities available and the integration to metro transit stations.

4. **Application**

This study will quantify the present accessibility and connectivity to metro stations. This helps the planners and officials to understand the present modal shares used and the related issues faced by the commuters. This will also enable them for a better planning and the need of further integration with other transport facilities.

5. **Surveys to be carried out:**

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<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Method</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Reconnaissance survey (Metro station – Land use and built up environment characteristics)</td>
<td>Visual observation and map based marking using Arc-GIS</td>
</tr>
<tr>
<td>2</td>
<td>Road Safety Audit – Transit facilities and its integration to metro stations</td>
<td>Questionnaire Method. Questionnaires are attached in the next section. 10% of facility users are considered as sample size.</td>
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<td>3</td>
<td>Public Opinion Survey on</td>
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APPENDIX: QUESTIONNAIRE SURVEY

BENGALURU METRO – FIRST MILE AND LAST MILE CONNECTIVITY

Sample ID:  | Location:  | Time:  | Interviewed by:  
---|---|---|---

A. GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Gender</th>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
<th>(e)</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>&lt;20</td>
<td>21-30</td>
<td>31-40</td>
<td>41-50</td>
<td>&gt;50 years</td>
</tr>
<tr>
<td>Occupation</td>
<td>(a) Student</td>
<td>(b) Professional</td>
<td>(c) Business</td>
<td>(d) Home Maker</td>
<td>(e) Unskilled</td>
</tr>
</tbody>
</table>

B. METRO USAGE INFORMATION

Q. Are you a regular metro commuter  
(a) Yes  (b) No  

Q. Frequency of metro usage in a week  
(a) Every day  (b) 1-2 days  (c) 3-4 days  (d) 5-6 days  (e) Weekends only  

Q. Purpose of metro usage  
(a) School/College  (b) Work/Business  (c) Hospital  (d) Shopping/Recreational  (e) others

C. METRO CONNECTIVITY INFORMATION

Q. How do you access the Metro station  
Origin: …………………………………  Metro Station  
Destination: …………………………..  Metro Station

Mode of Travel:
- Origin to Metro station:  
- Metro station to destination:  
- In case of private vehicles, are you using parking facilities at metro:  
- Are you aware/using any metro e-bikes facilities:

Travel Time:
- Origin to Metro station:  
- Metro station to destination:

Cost of Travel:  
Origin to Metro station:  
Metro fare:  
Metro station to destination:

D. IMPROVING THE CONNECTIVITY

Q. Are you able to access metro stations with ease and convenience  
(a) Yes  (b) No  

If sufficient infrastructures are provided, would you change to sustainable modes like, walk and cycling?  
(b) Yes  (b) No