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# Evaluation of Feeder System between BRTS and Proposed Metro Station of Ahmedabad

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**Abstract:** *Infrastructural gap between increasing traffic and existing feeder system leads to unsustainable condition, which prevents the smooth flow of traffic and healthy environmental conditions in urban areas of country. Concept of sustainability thus arises from the need of a transportation system which would efficiently cater to the needs and travel demands of citizens of metropolitans. This phenomenon, warrants for a critical study on integration of linking infrastructure between the terminals of Bus Rapid Transit System (BRTS) and proposed Metro station, as to ensure mobility and smooth transportation of regular commuters as key components of urban life of Ahmedabad. This research paper gives brief information and data about the current situation of Feeder System of selected study area.*

**Keywords:** *Feeder System, Mobility, Integration, linking infrastructure, BRTS, Metro station*

## I. INTRODUCTION

Mobility and transportation services play a vital role in civic life. People desire mobility both for its own sake and it enables them to overcome distances between the places to satisfy their needs. In an urban sector, an efficient transportation system is the basic component for the social, economic development of the areas. Effective public transport services are prerequisite for any transit within the city. However, due to lack of efficient public transportation system, cities are not catering the demand and as a result there is a strong need arise for para transit system. Feeder system is one of the para transit system (link) which cater the supply to the trunk lines. This system is more popular in many European countries which improves the overall performance of the public transportation of the city. However, this link is lacking in several developing countries like India.

In the current days, when para transit attracts significant trips globally, why they are lacking in many Indian cities and hence the present study shows a major concern on this. The implementation of para transit in the form of feeder system or link between public transportations and its acceptability depends on the perception and attitude of folks. This study reveals folk's perceptions of feeder and public transport systems for the Ahmedabad city, heritage city of the Gujarat, India. The development of transport infrastructure in urban areas in Ahmedabad has tended to ignore the feasible connectivity medium between major modes of transports.

Janmarg BRTS (Bus Rapid Transit System) is one of the most popular mode of transport in Ahmedabad for daily commuters. Annual ridership demands of BRTS are around 39 million according to official of BRT data. Along with that planning of Metro in the city is under process and implementation of the same at its pick.

Primary analysis revealed that the linkage infrastructure of various public transport systems (such as BRTS, Metro, local transit etc.) is deficit, in turn traveller forced to use auto rickshaw or shuttles. This may be results many traffic issues like congestion, delay, accident, and safety due to excess loading of rickshaw and driver's behaviour towards road sense.

Over the years, due to rapid urbanization has led to spill-over of population outside the Ahmedabad city limits. This has resulted in large demand arise for public and feeder system which are putting tremendous pressure on the infrastructure facilities. However, owing to continued development without commensurate infrastructure integrations, leads to greater problems in future. In addition, the safety and security of the pedestrian is equally important but not satisfied as the large numbers have overwhelmed the existing footpaths and most of the pedestrians find their way into the vehicle carriageway which poses a danger to them. There is great discomfort and inconvenience to the users in the absence of these facilities. The pedestrians are also facing the problem of poor linkages of footpaths to various parts of BRTS corridor, and suffer from congestion issues; especially during the peak hours. Viewing to the existing situation, there is an urgent need to evaluate the current transport systems comprising feeder, BRTS and proposed Metro system of Ahmedabad city. Along with that the studies also investigate the challenges and implications of integrating NMT with other modes of transport.

## II. LITERATURE REVIEW

Various studies have been carried out for evaluating performance public transport system. For instance, Wu et al. (2019) proposed framework extended the existing social network analysis theory and identified five indicators to assess and optimize the network design. To validate the proposed method, nine typical cases in Shanghai were examined. The results based on the proposed analysis framework suggested that more edges between access points (bus stops within the willable area of a metro station entrance) and other nodes can improve the accessibility of the study area and create a well-integrated system. Saghapoura et al. (2018) analysed that the accessibility measures recognized as valuable input for decision support tools for land-use and transport planning. Despite the relatively, large number of available measures outlined in the literature, they are not widely used in planning practice, particularly in non-motorized transport modelling. The concept of availability of activities within acceptable walking/cycling travel distances may potentially affect the travel behaviour of pedestrians and cyclists, as distance has always been a significant barrier for travellers using active transport. Three non-motorized accessibility measures were used in cluster analyses for classifying levels of access. Subsequently, three separate negative binomial regression (NBR) models were applied to examine the impact of access versus land-use measures in the models. Salleh et al. (2014) defined strategies for influencing of shifting from motorised to non-motorised modes of transport in the framework of a sustainable urban transport. Many policy measures were introduced to reduce last-mile connectivity problems along with other road side parameters such as widening the roads, limiting speed, upgrading the motorcycle lanes and upgrading public transport, but there are no measures and encouragement for the provision of non-motorised modes of transport (cycling and walking) were reported in available literature. These modes of transport are seldom acknowledged by planners and policymakers. The present study is suggested the need of improvement intraditional practices towards urban sectors with the central view of public opinion and available public transportation modes.

## III. STUDY AREA

In order to fulfil the objectives, a particular roadway stretch- Shivranjani cross road to Jivraj cross road of Ahmedabad city, Gujarat was selected for the present study. The stretch carries four-lane divided road extending over a length of 2.02 km and provided with service road on either side. The development along the road includes commercial, residential and mixed land use generating traffic of varying intensity and composition. This stretch provides the intercity route for anuran trips. Mainly local as well as public transport vehicles are sharing the carriageway as shown in Figure 1.

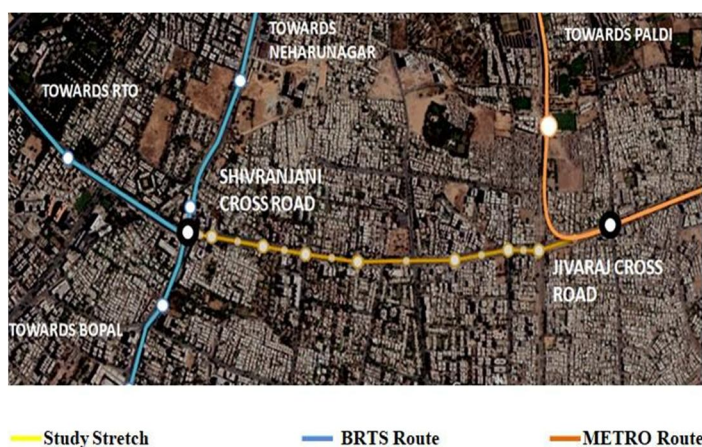


Fig. 1 Study stretch

From the Figure 1, it shows that the study stretch bridges two main parts of Ahmedabad city. Based on pilot study, it revealed that the study stretch carries large amount of intercity traffic

## IV. PRESENT FEEDER SYSTEM AT STUDY LOCATION

From the primary survey, it was observed that the Shivranjani cross road having heavy traffic and passenger movement throughout the day, and sometimes it becomes tedious movement to pass cross road because of very heavy traffic during pick hours. BRTS stand of Shivranjani cross road is a transition stand for every passenger those are coming from Western part of Ahmedabad (Bopal) and wish to move towards the Eastern part (RTO) or vice-a-versa. Hence, it becomes more important to provide well integrated feeder system for ease of people.

A critical observation at the study stretch highlights the problem of improper feeder system, which may adversely affect the usability of stretch. Moreover, Metro station at Jivraj will be working by year 2020 which also arise a demand to the stretch. Well designed and integrated feeder medium will help to provide smooth, timely and economic connectivity between two major stations. Private rickshaw is the dominant mode of paratransit available on this route having special characteristics (small in dimensions, flexible mobility and easy pick and drops). This turns out to be very important and most preferable mode against lake of other optional feeder system. There are several AMTS (Ahmadabad Municipal Transport System) bus stops present at the corridor but no buses are available to this connectivity. Due to the integration issue between this links, private rickshaws takes part in integration. However, due to huge demand and limited available in numbers, the link becomes over crowded during pick hours which have a serious concern of safety. Furthermore, dominance of private rickshaw driver over consumers is another point to be considered, while studying the whole scenario.

### V. DATA COLLECTION AND ANALYSIS

For the present study the data collection was divided into two parts-primary data collection and secondary data collection. A primary survey was carried out to get the information of the site and commuters perception towards public transportation and available feeder system. Based on the secondary data (BRTS and Metro) proposal has been made to improve the existing system.

#### A. Primary Data

Survey was designed in such a way that data collection must be carried out in easiest way. The data was collected in the month of September- October 2019. Survey was carried out along the study stretch. Commuter’s data was collected manually in the printed format which was designed based on expert advice. Total 229 regular commuters data (based on random sampling) were collected and considered for analysis. It is quite difficult to collect the socio-economic data direct from housing to get detailed perception and accurate data. Inventory survey of the area was carried out to understand the physical dimensions of the study stretch. For screening of the interviewed person following criteria have been follow as –

- 1) Be 18 years old or older
- 2) Be a resident of Ahmedabad
- 3) Have to travel between terminal points of stretch.

#### B. Purpose of Trip

Feeder system is an important part for daily commuters on regular bases. Commuters usepublic transport for different purposes and thus well integrated transport system is must to satisfy purpose of trip. Figure 2 highlights the data related to purpose of trip starting from Shivranajani cross road to Jivraj cross road and vice-a-versa.

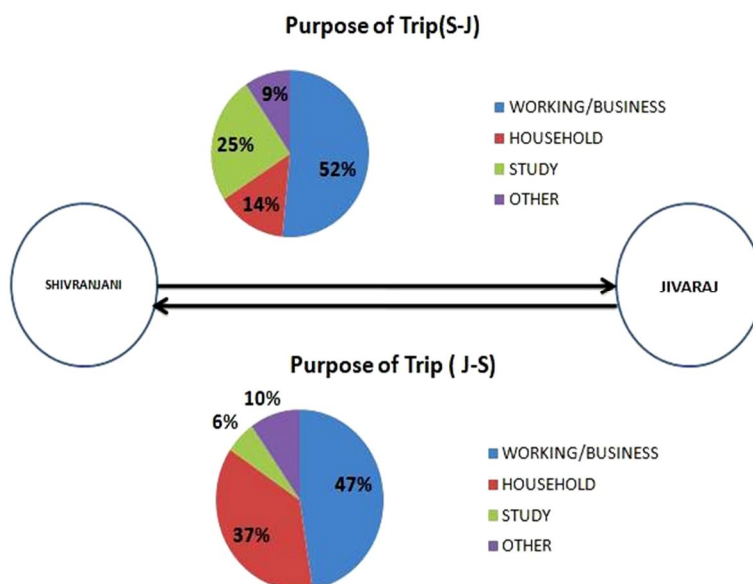


Fig. 2 Distribution of different purpose of trips at study stretch

Figure 2 clearly show the data related to trip purpose distribution. It represents distribution of trip for Shivranjani cross road to Jivraj cross road, clearly states that working trips are highest among all different type of trips. Shivaranjani cross road is the main terminal station of BRTS route, which is surrounded by corporate and business building and the station is also the transfer point for all BRTS stations of different part of the city.

Figure 2 also revealed that the household trip for Jivraj cross road to Shivranjani cross road is also significant as 37% . And this is due to Jivraj cross road is surrounded by housing societies and residential buildings.

### C. Commuter Movement

Hourly data collection about the trip is helpful to get the particular amount of trip for that particular hour. Analysis of this data provides 'Peak hour', with in which the movement of commuters is to be highest. This data is very helpful in the design stage of feeder system. Designers have the clear idea about the peak hour and have information about the maximum number of trips or movement for which they have to design the feeder system.

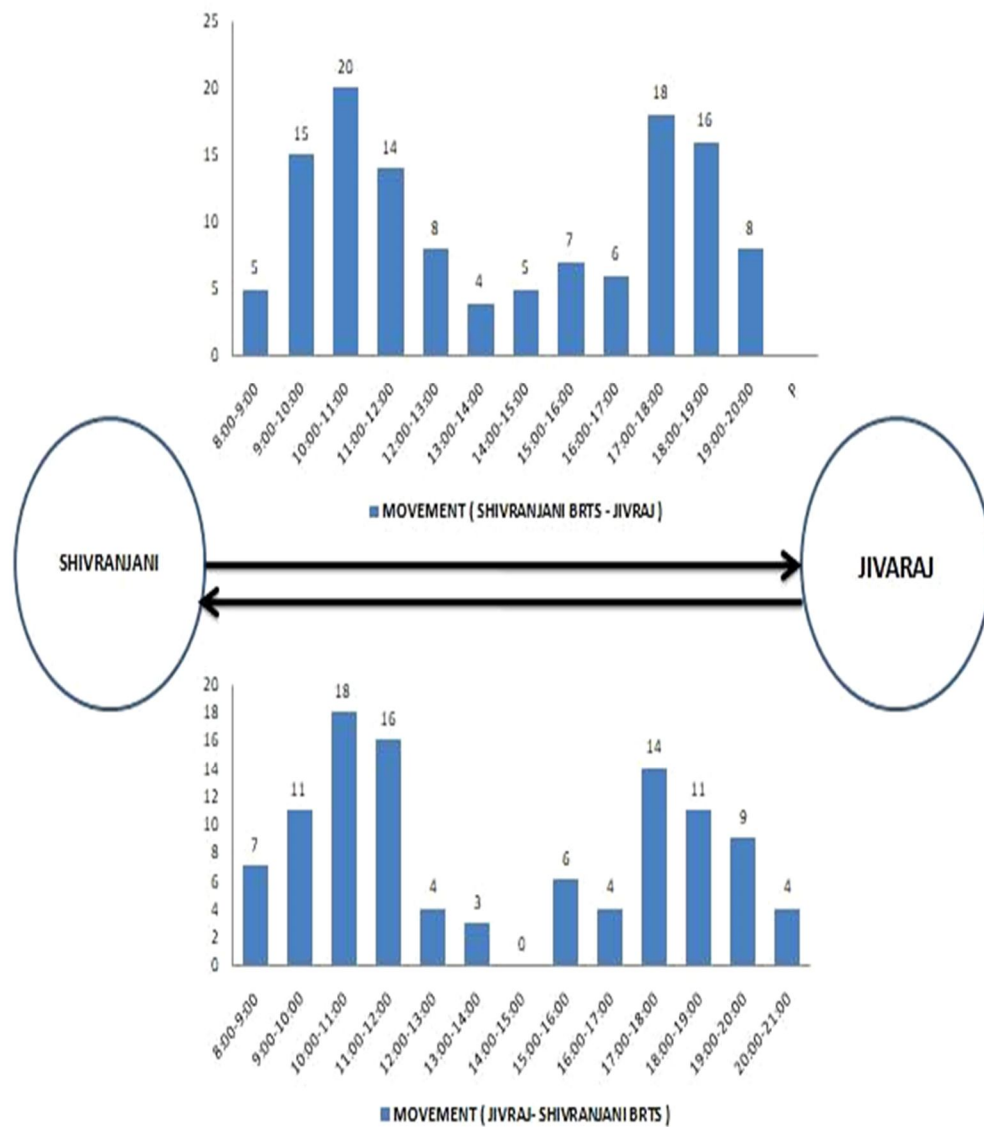


Fig. 3 Commuter movement

From the Figure 3, the highest commuter movement is in between morning and evening pick hours. As per previous section, most of the trips are of business or working type; thus it is obvious to have the highest movement during working hours. 20 commuters are highest number which is to be noted while planning new feeder medium.

**D. Preferred Mode of Feeder**

Public view is most important while implementing or planning new system. Any system must be designed to satisfy the commuters need. This part of analysis gives the brief idea about public preference towards feeder system on different time of the day.

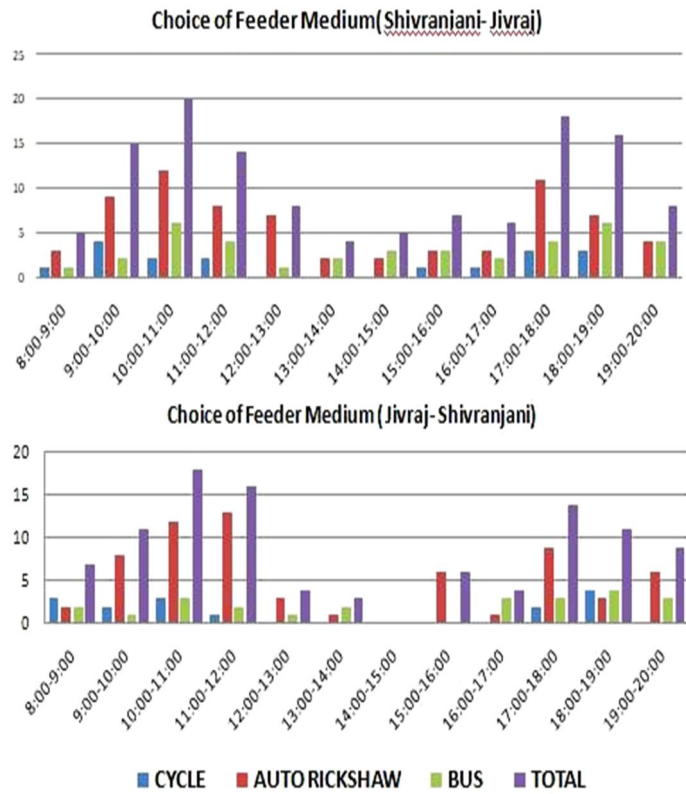


Fig. 4 Preferred feeder medium

Based on the analysis, auto rickshaw came out as most preferred medium of feeder. Regular commuters are more confirmable in auto-rickshaws as this turn out to be most quite and economical medium with specific characteristics like small in dimensions, door to door connectivity and higher mobility. Some of the commuters are willing to use cycle as feeder but the current infrastructure is not suitable to support safe and comfortable movement of cycles due to limited road infrastructure at this route.

**E. Secondary Data**

During the analysis following documents, reports and articles were referred, related to BRTS and METRO project of Ahmedabad. These secondary data supports the base concept of hypothesis and gives a brief insight of technical data of transport system. CEPT (2013) studied the Bus Rapid Transit System (BRTS) and provided a central solution to fulfil the needs of equity and sustainability. The BRTS is conceived as an integrated system, which includes affordable transport along with infrastructure for pedestrians and cyclists and changes in land use planning, housing policy, road design approach, road space use, pricing of parking and public transport. Learning from different approaches to BRTS in different countries carried forward to policy dialogues has resulted in its acceptance as the main public transport mode in many countries, including in India through the JnNURM. The study analysed the urban poor’s travel pattern in the city and assessed whether the BRTS addresses their accessibility needs. The study contextualised Ahmedabad BRTS within the overall public transport paradigm in urban India. Authors also highlighted the key concepts on sustainability, accessibility, and travel behaviour of the urban poor and their transport expenditures in Indian cities along with the methodological framework adopted.

Transport Performance Index values for Ahmedabad for variables such as public transport, congestion, walk ability, safety, parking and city bus transport supply.

With a view to provide convenience to its commuters by ensuring last mile connectivity from the metro stations, the first E-Rickshaw service was formally flagged-off from the Delhi Metro Headquarters at Metro Bhavan (Reference) The first fleet with atotal 5 E-rickshaws inaugurated and make it operated from Vaishali Metro station. The specially designed E-rickshaws with

covered cabin and full front windscreen is proposed which provides the last mile connectivity within an area of 3 to 4 km around Metro stations. The system is also enabled with CCTV and GPS availability. The facility of E-rickshaws at the stations in Gurugram and Faridabad will also get operational very shortly by third party operator. Looking to the response and successful implementation of the E-Rickshaw services in the NCR region, it is recommended to implement similar format in the other parts of the city subject to the feasibility.

## VI. CONCLUSION

Based on the detailed study and response of the local folks, it states that current feeder system do not satisfy needs of regular commuters. The overcrowded rickshaws are turning out to be unsafe medium of transport and need to replace with well designed feeder system. The reviews from commuters turn out to be most important while deciding future medium of feeder. According to all the analysis and data gathering, Electric rickshaws will be the most suitable medium of feeder between BRTS and Metro, Ahmadabad.

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