

# Leakage of Transit Ridership in BCLL Bus Service over Private Bus Service Provider in Bhopal

Vijay Singh Solanki, Siddhartha Rokade, Anuj Jaiswal

*Abstract-Leakage in the primary public transport system comparing other secondary private transport is major problem in Bhopal as other Indian cities. There are numbers of corridors on which both BCLL buses (government undertaking) and private buses are running, but major problem is leakage in transit ridership mean in these corridor the ridership in private buses are more compared to the BCLL buses although the better facilities are provided in BCLL buses. This becomes the major cause that affects the revenue of BCLL buses which are government undertaking. For increasing the revenue of BCLL buses, there is a need to shift the bus users from private bus service to BCLL bus services. For this study, we select the corridor from HEG Mandideep to Bharat Takies known as Trunk Route no.2 (TR-2) for identifying the reasons for leakage in transit ridership. In this study we have selected three parameters of travel behavior as they directly affected the demand generation in our context. The selected parameters are travel cost, travel time and service qualities as mentioned in the study. Six major bus stops in the corridor are selected and conduct the opinion survey along these stops mainly to understand the reasons for not using BCLL for that trip and the priority under which a commuter can have the mode choice.*

**Key Words-** Leakage in Transit Ridership, BCLL, Public Transport System.

## I. INTRODUCTION

Providing adequate and efficient public transportation system is the challenge that encountered in almost all cities in the world. Cities will always have a new problem, which arise due to the transportation system. In general, large cities in developing countries are highly dependent to the road transport. Increasing population and the use of motor vehicles has caused social and economic problems for cities that are dependent on road transport. Similarly, other problems will occur such as increased travel time, accidents etc resulting from the chronic road congestion (Jaiswal et al, 2012). Yet the time has not come that the public transport system would be able to provide a quality level of service to attract a large number of private users to switch to public transport, which aim at increasing public transport usage should uphold its image, but simultaneously, the public transport system needs to become more competitive and attractive. It requires an improvement in service quality, which can be achieved by a clear understanding of travel behavior and passengers' needs and expectations. Thus, it becomes necessary to evaluate the level of service (LOS) to identify the probable strengths and weaknesses of public transport systems (Shimazaki et al 1994).

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This will provide an indication for public transport management so that it can be enhanced to satisfy the passengers and increase the market share as a whole. However, developing appropriate and valid measures of the service quality of a transport system is a complex task, since it deals with human behavior and attitude. Hence, it is important to measure what types of quality of services are expected by the passengers. If it can be known, then the LOS can be improved accordingly. Bhopal is the capital and the second largest city in the state of Madhya Pradesh. The city is located on hilly terrain within the Malwa Plateau. National Highway-12 passes through the city (Beowra – Jabalpur), links to Bhopal to many large cities in the north – west and the south – east. Bhopal is facing the increased population pressure on resources and infrastructural systems as happening in other major cities in India. Bhopal has a decent public transportation system comprising of buses, minibuses, three wheeled autos and the odd looking tempos that are a major pollution concern for this growing city. Recently, under the scheme of JNNURM, Bhopal City Link Limited operates larger buses, which are under GPS navigation and smaller Metro Buses (Jaiswal et al, 2012). The major problem on this route is less passengers demanding of BCLL bus services and the demand is high in other private modes plying on the road, hence the are user required to switch over to BCLL as the system is efficient and already Installed (Damor et al, 2014). There are number of corridors in which both BCLL buses and private buses are running, but major problem is leakage in transit ridership of BCLL bus service. Comparing both the systems, private buses is working effectively that reduce the transit demand estimation in BCLL. There is a need to do the study by comparing the travel time, travel cost and service quality parameters of both the system for identifying the reasons for not using BCLL bus services (Muthukannan et al 2008).

## II. EXISTING PUBLIC TRANSPORT SYSTEM OF BHOPAL CITY

Bhopal has its own city bus service: Bhopal City Link Limited, which operates larger buses, which are under GPS navigation and smaller Metro Buses. In addition, around 600 mini buses are run by private operators. Metro or Radio Taxis and auto-rickshaws are another major means of transport. In some parts in the old as well as new city, the new Tata Magic Vans are running successfully and have replaced the older and bigger diesel rickshaws — known as "Bhat". Bhopal is also implementing a "Bus Rapid Transit System", projected to become functional from the year 2013 (figure1). Bhopal is planned on a ring radial pattern with a hierarchical road network.

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The total road length in Bhopal is about 1500 km. The total road length increased from about 531 km in 1981 to about 800 km 1990-91 at the rate of 2.28 % per annum (Jaiswal et al, 2012).



**Figure1: Bus Routes Operated In Bhopal**

Bhopal has a decent public transportation system comprising of buses, minibuses, three wheeled autos and the odd looking tempos that are a major pollution concern for this growing city. Recently, under the scheme of JNNURM, a private firm has plied a number of full-sized buses called Star-bus and Red buses in the city street for public usage which are quite safe and fun to travel in. These have started to gain popularity and are increasing in number.

### BCLL Buses: An Overview

The Bus system in Bhopal operates on Public private partnership model. The concept was based on Setting up of a SPV as a public limited company, which clearly demarcated the role of the market and the Government. Accordingly “Bhopal city link limited” (BCLL) was set up with the

Bhopal Municipal Corporation (BMC) and Bhopal Development Authority (BDA) as stakeholders. The management of the company was entrusted to the Board of Directors headed by the Collector. BCLL started its operation during October 2006, but the full fleet of 39 buses came into operation in Jan 2007 only with full operations starting from March 2007 onwards (BMC 2009). The average scheduled vehicle utilization is 223 km while the actual achievement is only 198km per day. The cancellation of kilometers accounts for about 11% and this is a measure of poor operational efficiency of the system. The average revenue per km is estimated at Rs.18.68 of which Rs. 16.00 is from the fare box collection and the balance (14.35%) is indirect revenue from advertisement, monthly pass etc.

**Table 1: Existing Public Transport Modes in Bhopal**

S.No.	Mode	Operator	Remark
1	Regular Buses	BCLL/PPP	39 buses operate with an estimated ridership of about 25000 passengers per day
2	Mini Bus	Private	450 minibuses (June 2011) with an estimated ridership of 200,000 passengers per days
3	Tempo	Private	300 tempo(June 2011) with an estimated ridership of 100,000 passengers per day
4	Auto rickshaw	Private	3000 auto rickshaws with an estimated ridership of 25,000 passengers per day

Source: CDP Bhopal, 2009

**III. STUDY AREA**

Capital of Madhya Pradesh with city Population 18.43 Lac (Census 2011) having Municipal area of 285 sq.km and Planning area of 603 Sq Km. National Highway No. 12 - 86 & State Highway No 18 -23 Passes through city. The city is also well connected to other Major cities by means of Air & Rail. Around 500 Intercity Buses, 150 Trains & 14 Daily flights cater to the daily transport needs of the city.

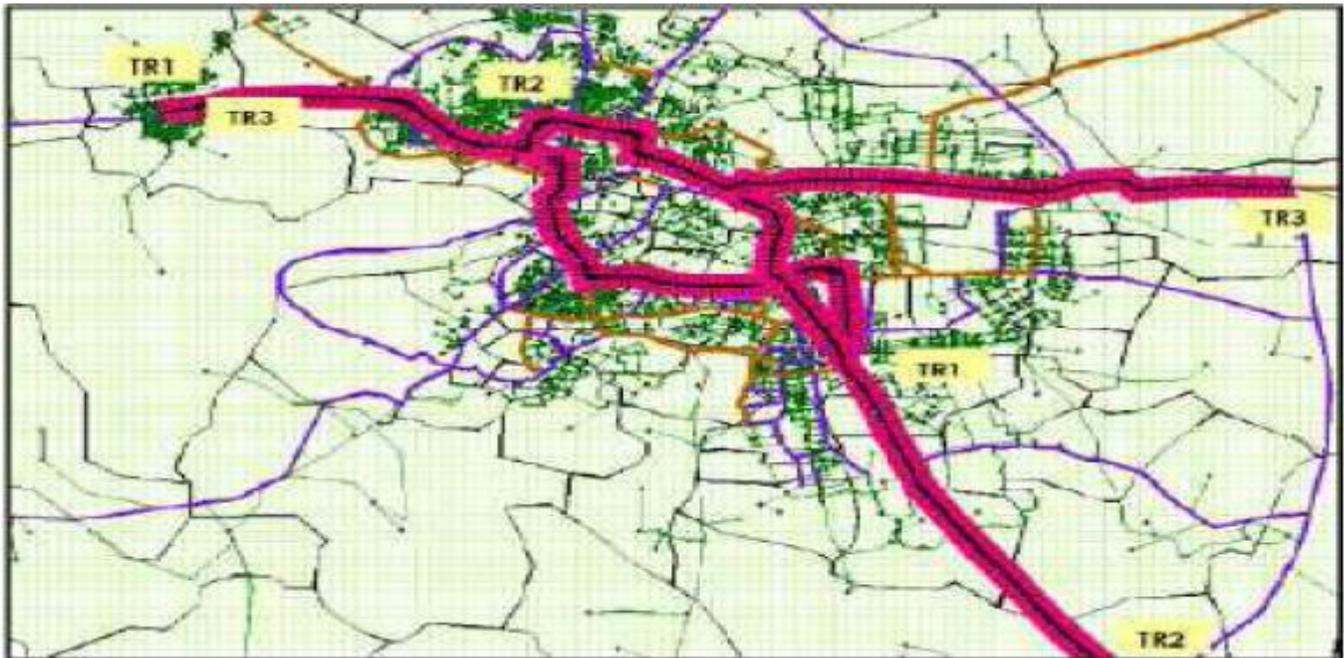
- i. Trunk Corridors (BRT Routes)
- ii. Standard Routes (BCLL Bus Routes)
- iii. Complementary Routes (for Mini Buses)
- iv. IPT Feeder Service (Tata Magic Routes)



**Figure 3: Four Levels of Public Transportation System Envisaged in Bhopal**

Trunk Routes connecting major activity centers by the Bus Rapid Transit System. It is a Farthest Activity centre should be accessible within 45 min. of journey time, Fleet comprising AC buses in addition to non AC Buses to attract

Private vehicle users and is a staggered stopping pattern. We have taken the corridor HEG Mandideep to Bharat Talkies i.e. Trunk Route 2 shown in figure 4 for the study.



**Figure 4: Trunk Routes (Selected Corridor TR2)**

Standard routes connect the major origin destination pairs of the city. Standard Routes are replacement of Mini bus routes. These are rationalized BCLL Bus Routes Non AC Buses and few AC buses Route length will be within 25 km and average turnaround time 1.5 to 2 hrs sharing few links with Trunk routes (BMC Bhopal 2009).

Mini Buses are complementary to Trunk and standard routes. Routes covering less dense Public transit demand

corridors. These will be collecting traffic from neighborhoods, Route length will be within 15km and average turnaround time 1.0 to 1.5 hrs. Tata Magic Routes are feeder service to all above mentioned PT systems, mainly catering intra-zonal trips, Maximum route length 6 km, having flexible schedule. Total number of routes and their length are mentioned in table: 2.

Table 2: Description of Routes (Length Wise)

Sl. No.	Description of routes	Number of Routes	Route length (in KM)
1.	Trunk Routes	3	67.64
2.	Standard Routes	8	123.60
3.	Complimentary /IPT Routes	20	250.24

Source: CDP Bhopal, 2009

IV. IDENTIFICATION OF PARAMETERS

On the basis of previous studies, it can be summarized that the public transport demand may depend on various factors, ranging from travel behavior parameters (travel cost, travel time, trip length, accessibility, comfort level, frequency, convenience etc), to land use, density, PCTR, etc (Shimazaki, T. et al,1994). Although for the purpose & context of our study which was on the city of Bhopal, we selected only those parameters of travel behavior as they directly affected the demand generation in our context. Thus, the selected parameters were travel cost, travel time and service quality as mentioned. These parameters were selected on the basis of a detailed stated preference survey conducted for understanding the travel behavior for Bhopal city.

**A. Study of Travel Cost:** It represents the willingness of the potential user to pay for the journey as compared to what he will pay for the private mode. As such, this is general perception that if the travel cost will increase in any of the mode, the demand for that mode of transport will decrease.

**B. Study of Travel Time:** Travel time is an important factor in the mode choice analysis. It includes access time, waiting time, and journey time. Many of the factors that affect perceived travel time and unit travel time costs have significant implications for transit project evaluation. More accurate analysis tends to increase the relative value of transit improvements over a period of time. It basically means total journey time spent in a mode of transport as compared to the time incurred in the private mode. A reduction in travel time not only adds to the value of the preferred mode, but can also be evaluated in monetary terms in the form of Time-Cost analysis; as very often, the saved time on a preferred mode of transport can result in more productive gain for the user of that transport, making the mode more preferred over others. Also, travel time can be of very important step while determining the traffic management schemes for synchronizing the existing infrastructure with the proposed one for making the public transportation system most efficient within the optimized use of energy & infrastructure.

**C. Study of Service Qualities:** The Service quality defines comfort level, convenience and accessibility. Here we have discussed all component of service quality in brief.

**Comfort Level:** Comfort level emphasizes on the extent of inside and outside comfort associated with the public transport system. The inside comfort mean Bus condition, comfortable sitting, Less crowded, air conditioning etc. the outside comfort mean information regarding arrival of bus, designing of waiting areas at bus stops, cleanness, attractive, well-lit, accessibility to bus stops and parking facilities, interchanges etc. Such service quality factors can be very important but are s to quantify. It is quite difficult to monetize these attributes and results may vary depending on how questions are phrased and who is surveyed. For this study we have grouped all the comfort services in five categories for conducting stated preference survey ranging scale of 1 to 5. Comfort level 5 mean optimum level of comfort can be provided by service provider and comfort level 1 is the minimum requirement from the user perspective.

**Study of Convenience:** Similarly the convenience emphasized on the attributes like the frequency, reliable & punctuality, service information’s, feeder services and safety. Thus, the steps which determine the good convenience of a public transport system can be like:

1. For reducing waiting time increase frequency with provision
2. Ensuring the reliability and punctuality for the journey
3. Service schedules and information regarding arrival and departure of buses
4. Feeder services for interchanges with parking facility
5. Safety and comfort

**Accessibility:** It is concern of approach and availability of public transport facilities. The demand of public transport is highly depend on the distance for the availability of bus transit facilities, this is general perception that if the public transport is available up to 500 meters which is comfortable distance for walking the bus ridership will be high if the distance is more than 500 meters then the demand for public transport will decrease.



All of these parameter we select most effective Parameters selected i.e. travel cost, travel time and service quality.

V. REVEALED PREFERENCE SURVEY

Study of preference shows that the public transport demand responses most sensitive on travel time, accessibility and convenience. Consequently, it can be elaborated the effort on reducing travel time and more convenience with proper access to attract more public transport ridership (Muthukannan et al, 2008). In Bhopal there are a number of corridors having leakage in transit ridership, for this study we select the corridor from HEG Mandideep to Bharat Takies known as Trunk Route i.e. TR 2. In which both government bus, i.e. BCLL and private bus service running parallel. We have selected the six major bus stops in this corridor and conducted a revealed preference opinion survey along these selected stops among bus passengers along the BCLL Corridor mainly to understand (i) the reasons for not using BCLL for that trip and (ii) the priority under which a commuter can switch over to BCLL from Private Bus. The results of opinion survey are given in Figures-5 and 6. Figure-5 shows that the priority of commuters is Travel Cost 31%, followed by Travel Time 23%, followed by Frequency 25%, followed by Service Quality 21%. Figure-6 shows that the reasons for not using BCLL are due to mainly (i) Difference in Fare 42%, (ii) Less Frequency 24%, (iii) Difference in Travel Time including Waiting Time (18%), (iv) Poor Service Quality 16%.



Figure 5: Priority Criteria for Mode Choice (Based on Selected Parameters)

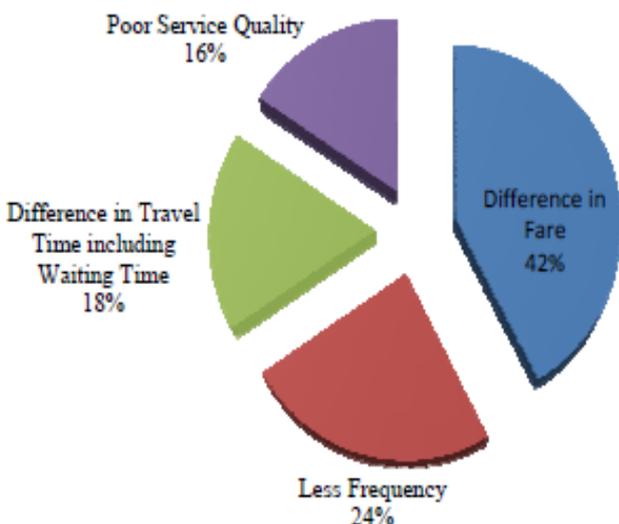


Figure 6: Reasons for Not Using BCLL Bus Service

The analysis of opinion survey demonstrates that about 50% of people are not using the BCLL because of high fare and more travel time due to less frequency. The short trip makers will be attracted in the BCLL bus if travel cost is reduced. On the other hand the cost of travel is very high in BCLL since the minimum ticket is Rs. 9. The short trip makers will prefer private buses since it is relatively cheaper i.e. minimum Rs. 5. If we reduce the cost of ticket for BCLL it will certainly have a great impact on BCLL patronage. The other problem facing the BCLL system is low Frequency (30%) of bus compare to private busses. If we increase frequency of buses on this corridor, the patronage can be further increased effectively.

VII. FINDINGS

1. At present BCLL bus service systems is utilized only 40 % for its initial capacity and 50% for its reduced capacity. This shows the system is underutilized and need attention.
2. The reason for not using the BCLL is due to difference in fare (42%), less frequency(24%),difference in travel time including waiting time (18%), poor service quality (16%).
3. If we reduce the cost of trip by 30% we can increase the ridership by 25% in BCLL bus services.
4. If we reduce waiting time and increase frequency, more ridership can be achieved.
5. If we can improve the service quality and facility like information about the schedule of the bus, using intelligent transport, comfortable buses, staff behavior, etc. we can increase the transit ridership in BCLL buses and stop the leakages.

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