Review of Public Transit Services in the State Capital Bhopal

Ajay Pratap Singh, Dr. Varun Singh, Dr. A.K. Sharma, Dr. A.Sharma

***Abstract*— From the ancient time, Public Transit provides a basic mobility service to the persons without access to personal vehicle. Now-a-day Public Transit is an integrated part of human life. From traditional means of palanquins to modern means of Public Transit, the face of Indian Public Transit system has progressed at a rapid pace since the inception of economic liberalization of the 1990s. India's public transit system which is rising by almost 10% a year are among the most heavily used in the world but the access to these modes of transit has not been uniform and are still riddled with problems due to poor or outdated infrastructure and lack of investment. Just like India, growth of Public Transit System in Bhopal city is also very rapid. Bhopal's public transit system is a combination of low floor buses, mini-buses, autos and the odd structured tempos that are playing as major contributor of pollution for this growing city. Under the scheme of JNNURM, low floor buses are operated by Bhopal City Link Limited with the help of Municipal Cooperation, which are under GPS navigation. In addition, around 600 mini buses are run by private operators. Metro or Radio Taxis and auto rickshaws are another major means of transit. 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 having a "Bus Rapid Transit System". This paper will throw the light on existing condition of Public Transit Systems in Bhopal, issues of these system and measures to improve this system.**

***Index Terms*— Public Transit, Bus Rapid Transit System, GPS Navigation**

I. OBJECTIVE OF THE STUDY

The present study focuses on following research objectives: -
1) To study about the facilities provided or likely to be provided by the Public Transit System of Bhopal City
2) To study the attitude of passengers towards the city bus service in Bhopal.
3) To study the problems faced by passengers/ commuters while travelling in city buses.

II. METHODOLOGY INVOLVED

To achieve the above mentioned objectives, primary data has been collected with the help of questionnaire prepared by the researcher. Collection of secondary data from the various departments is also important in this work. The independent variable used in this study is overall satisfaction with Public Transit service. Dependent variables is specific service quality attributes which consist of public bus transit departure frequency, travel time, punctuality, price, information, cleanliness, staff behavior, bus comfort, seat availability, bus stop security, safe from accident, on board security, bus stop condition etc.

Manuscript received September 14, 2014.

Ajay Pratap Singh, Ph.D.Research Scholar, Dept. of Civil Engineering, MANIT, Bhopal,India
Dr. Varun Singh, Assistant Professor, Dept. of Civil Engineering, MNNIT, Allahabad,India
Dr. A.K. Sharma, Professor, Dept. of Civil Engineering, MANIT, Bhopal,India
Dr. A.Sharma, Professor, Dept. of Architecture, MANIT, Bhopal,India

III. DESIGN OF RESEARCH WORK

- Research approach : Survey method
- Research instrument : Questionnaire
- Data collection method : Primary Sources & Secondary Sources
- Sampling method : Convenience sampling
- Sampling unit : Passengers / commuters
- Sample size : 1300
- Sample area : Bhopal city

IV. INTRODUCTION

A. *About the Bhopal*

Bhopal is having a fascinating amalgamation of scenic beauty, old historic flavor and modern urban planning. "City of Lakes" is another name of this beautiful city. Today Bhopal has blossomed into a city, which in spite of being modern, upholds the patrician mark of its bygone rulers. With time, the city has emerged as a multifunctional regional hub of socio-political and economic activities. Bhopal city can be divided into two parts - the old city and newly developed area with administrative, institutional, industrial, commercial and residential activities.
Bhopal district has a population of 2,368,145 persons over 2,772 sq. km, as per provisional population totals of Census of India, 2011. The average density of the population is 854 persons per sq. km. The district has a literacy rate of 82.3%.

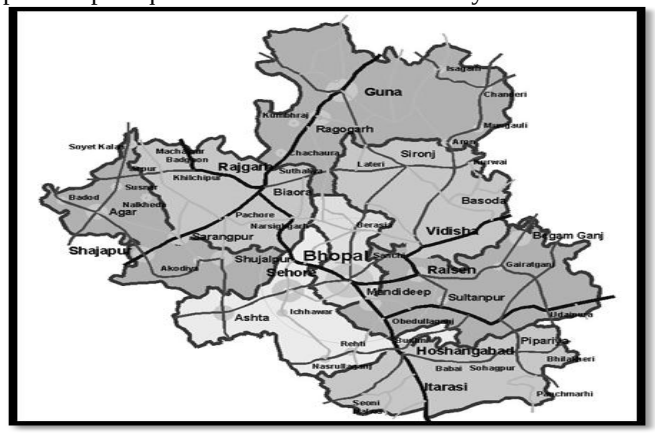


Figure 1: Showing Bhopal and its surrounding district Source-CDP

Bus services are playing the dominant role in providing public transit facilities in the city. If only considered the mechanized transits of the city, the busses run the highest passenger-km per day. Although the bus provides highest passenger-km travel, the modal share of bus in terms of person-trips is comparatively low; hence there is a considerable scope of improvement of modal share of bus by improving bus service in Bhopal city. However, the number of passengers in public transit has been increasing continuously during the last 20 years.

B. Major Activity Centres

The major locations of work centers in Bhopal include Maharana Pratap Nagar, State Capital Complex on Arera Hills, Commissioner and District Administration centre and main business centers in the Old City Area, the public sector units i.e., BHEL and Railways. The trade and commerce establishments are located in New market, Bittan Market, M.P. Nagar Zone 1 and 2, Old City and Bairagarh.

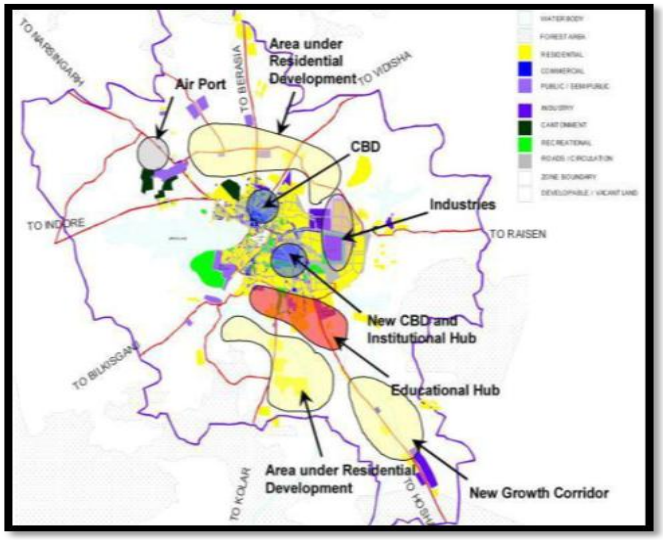
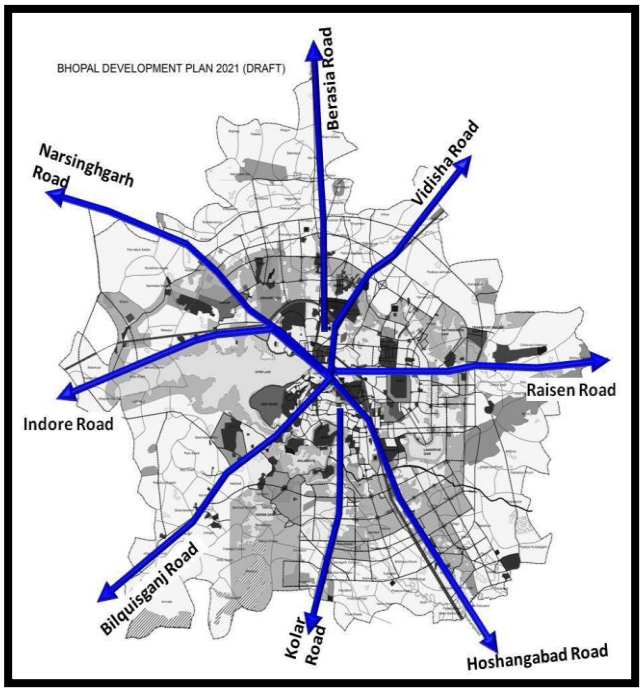


Figure 2: Showing Major Activity centre & CBD Area in Bhopal Source-City Development Plan of Bhopal

C. Linkages & Connectivity

Bhopal is having an important location on the national railway network, Airways linking with various cities of the country as well as regional and district centres in the state. The city is connected by regular flights to major cities of the country such as Mumbai, Delhi and Ahmadabad, Raipur. The rail connectivity is also good, being strategically located on the track between Delhi and Nagpur, as well as Bangalore, Lucknow, Jhansi, Raipur and Trivandrum etc. National Highway (NH) 12 connects Bhopal with Jabalpur in the east and Jaipur in the west while NH 86 links Bhopal to Sagar in the east and Dewas in the west. NH-12 and NH-86 (Raisen Road) bypass the urban core of Bhopal, but passes through the planning area. Other important roads connecting the city to the surrounding towns are shown below in Figure. SH-17 (Sehore Bypass Road) connects Indore, SH-23 (Berasia Road) links Berasia while Vidisha Road connects Sanchi and Vidisha to Bhopal. Hoshangabad Road leads to Mandideep Industrial Area. Some important bus terminals in Bhopal are Nadra Bus Stand, Jawahar Chowk Bus Stand, Interstate Bus Terminal (ISBT) near Habibganj, Halalpura and Putlighar,

Figure 3: Showing linkage & Connectivity of Bhopal



D. Vehicular Growth in Bhopal City

The Bhopal District has experienced tremendous growth in vehicular traffic over the last decade, as shown in Figure below. The average rate of growth since 2002 is about 10% per annum. The total vehicular population registered in 2011 was about 7.9 lakhs, of which 80% were two wheelers, as shown in Figure. The majority of the vehicles registered with RTO, Bhopal District is located in the urban core. This is a major area of concern.

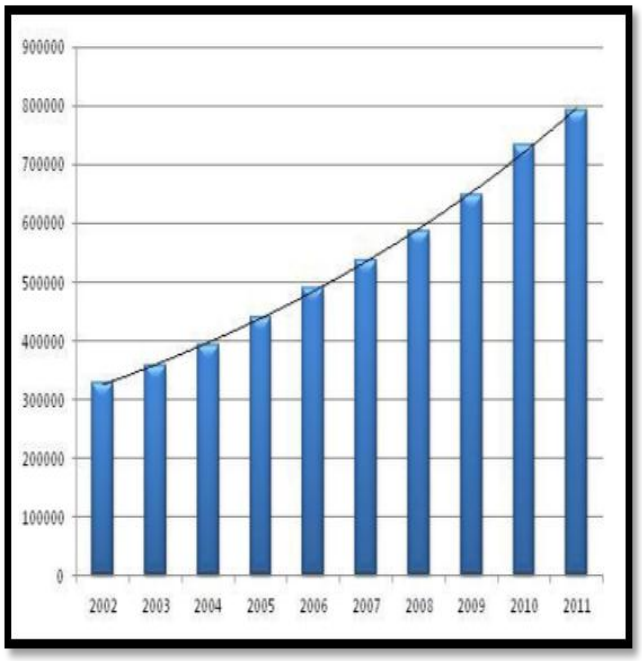


Figure 4: Showing Vehicular Growth Source-CDP

majority of the vehicles registered with RTO, Bhopal District is located in the urban core. This is a major area of concern. Tremendous growth of motorized vehicles has been witnessed in Bhopal, especially two wheelers. Recent data collected from Regional Transport Office (RTO) shows that 57,552 vehicles were registered in 2011, of which 42,087 were two wheelers.

V. FACTORS AFFECTING TRANSIT RIDERSHIP

There are lots of factors which affect the ridership in the public transit system. Some of the major factors that are affecting the ridership in public transit are given in the table 1

TABLE I: SHOWING THE FACTORS AFFECTING TRANSIT RIDERSHIP

Convenience	Increase transit service coverage and frequency.
Information	Provide information on where, when and how to use transit.
Price	Keep fares low and offer targeted discounts, such as commuter passes
Speed	Provide express commuter services and transit priority measures
Accessibility	Develop more accessible land use patterns and more diverse transit systems
Integration	Provide park & ride facilities, transit service to major transitation terminals
Comfort	Provide adequate service so transit vehicles are not crowded
Security	Insure that transit vehicles, facilities and service areas are considered secure
Prestige-	Treat transit riders with respect, and promote transit as a desirable travel option.

Source-(Kittleson & Associates)

The distribution of sample for subject study can be seen in below Table 2 depicting demographic variables as well as percentage distribution of the respondents.

TABLE II: SHOWING THE FACTORS DEMOGRAPHIC VARIABLE

Demographic Variable	**Percentage Distribution**	
Gender	**Male%**	**Female%**
Absolute No	**900**	**900**
Age Below 20	60%	40%
Age Between 20-30	55%	45%
Age Between 30-35	50%	50%
Age Between 35-45	65%	35%
Age Between 45-55	50%	50%
Age Above 55	65%	35%

VI. EXISTING BUS SERVICE IN BHOPAL CITY

Low Floor Bus services are available on 11 (eleven) routes only, operated through a total of 189 The routes are classified as Trunk (TR) and Secondary (SR) routes.
TR-1: Aakriti Eco City- Chirayu Hospital
TR-2: HEG Mandideep- Bus Station
TR-3: Ayodhya Nagar- Nariyel Kheda
TR-4: HEG Mandideep- Bairagarh Chichli
SR-1: Nehru Nagar- Lalghati
SR-2: Nehru Nagar- Katara Hills
SR-3: Alpana Tiraha- Gandhi Nagar
SR-4: Karond Chouraha- Baira Garh
SR-5: Chirayu Hospital – Handicapped College
SR-6: Rajiv Gandhi College- Oriental College
SR-8: Coach Factory- Bairagh Chichli

TABLE III: SHOWING THE EXISTING ROUTES OF LOW FLOOR BUSES

Route	**Route length**	**No. of buses**	**Frequency**
TR-1	25.27	23	10 Minutes
TR-2	23.32	20	8 Minutes
TR-3	23.7	13	16 Minutes
TR-4	25.1	12	12 Minutes
SR -1	17.3	13	12 Minutes
SR-2	20.5	13	16 Minutes
SR-3	24.9	14	12 Minutes
SR-4	25.6	24	8 Minutes
SR-5	29	21	12 Minutes
SR-6	24	15	15 Minutes
SR-8	22	21	10 Minutes
TOTAL		**189**	

Source: Bhopal City Link Limited

VII. OVERALL PUBLIC TRANSIT COVERAGE OF BHOPAL CITY

Bhopal's Public Transit Network is basically covered by Low Floor Buses, Mini-Buses, Autos and Magic. Figure 5 is showing the whole public transit coverage of Bhopal city by different-different transit system.

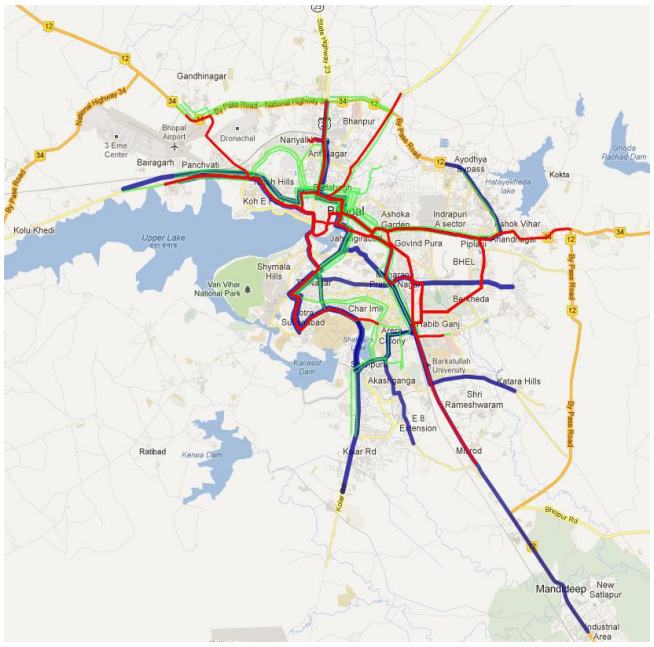


Figure 5: Showing the existing Public Transit Network of Bhopal Source: CMP

VIII. REASON FOR NOT USING PUBLIC TRANSIT

There are various issue and reasons for not using the public transit. Following are the important reasons for not using Public Transit System in Bhopal City

- Encroachment at Bus stops
- Bunching of Buses at Bus Stops
- Irrational location of Bus Stop
- Bus Stops without any display facility

- Bus Stops without any Passenger information System facility
- Poor physical condition of Buses
- Internal Aesthetic and sitting arrangement in Minibus
- No Proper light arrangement at bus-stops during night

Some other reasons also represented in figure 6 for not using public transit system in Bhopal city.

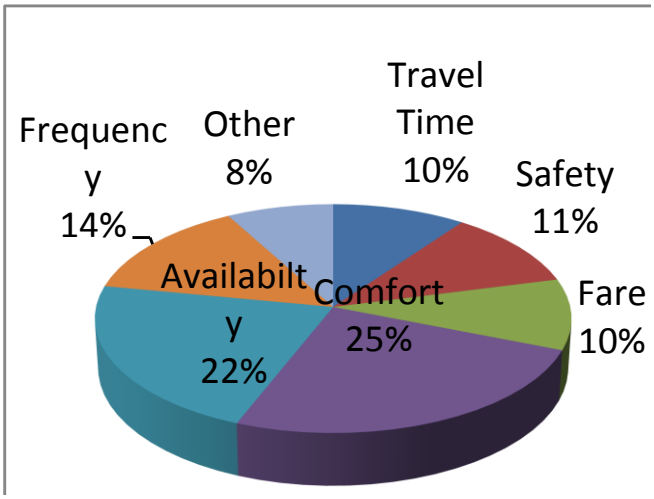


Figure 6: Showing reasons for not using public transit system Source

The following table show the factors which affect the passenger's choice of a particular public transit (or intermediate public) mode. It can be noted that 81% of commuters choose buses because of the cheap fare structure. 87% commuters find the buses safe while 82% find them comfortable. 80% of the passengers are quite satisfied with the bus services available.

88% of the commuters by autos have complained about their low availability although it is a safe and comfortable mode with good coverage.

Table IV: Showing factors that affects the passenger's Choice

	Auto	Tata Magic	Bus Mini Bus	Low Floor Bus
Cheap fare	6%	84%	86%	76%
Costly	35%	15%	13%	25%
Non Availability	88%	16%	19%	15%
Safe	67%	65%	83%	90%
Good Area Coverage	57%	56%	73%	83%
Good Crew Behaviour	52%	72%	54%	86%
Bad Crew Behaviour	66%	45%	51%	38%
Unsafe	29%	27%	17%	9%
Easy Availability	45%	63%	79%	77%
Not Comfortable	23%	27%	33%	5%
Comfortable	58%	84%	76%	88%
Poor Area Coverage	2%	15%	17%	11%
No effective Control	0%	0%	0%	0%
Others	63%	79%	71%	66%

IX. ADVANTAGES OF USING PUBLIC TRANSIT SYSTEM IN BHOPAL CITY

- **Ensures Safety**- Public transit can be one of the safest modes of travel in the Bhopal. In fact, riding a transit bus is 91 times safer than car travel. Transit vehicle operators are highly trained to anticipate and avoid problems. Most transit vehicles are larger, newer and more substantial than autos or vans.
- **Saves Money**- Studies have shown that public transit can save up to 2 to 3 times the money spent over private vehicles.
- **Eases Traffic Congestion**- Nearly half of all residents of the city believe traffic is a serious problem where they live, specially the people living in the space constrained Old City area. Most (about 57 percent) do not feel their commute will improve over the next three years, and nearly a quarter expect to spend more time commuting. Public transportation can help much to alleviate city's crowded network of roads by providing transportation choices.
- **Improves Air Quality**- Public transit system helps to promote cleaner air by reducing automobile use, which can exacerbate smog and public health problems. For each kilometer travelled, fewer pollutants are emitted by transit vehicles than by a single-passenger automobile. (Buses emit 80 percent less carbon monoxide than a car.) Each year, public transportation use avoids the emission of more than 126 million pounds of hydrocarbons, a primary cause of smog, and 156 million pounds of nitrogen oxides, which can cause respiratory disease.
- **Reduces Energy Consumption**- Public transit system can significantly reduce dependency on petrol, reducing auto fuel consumption by 1.5 billion gallons annually.
- **Fosters More Livable Communities**- Public transit facilities and corridors are natural focal points for economic and social activities. These activities can help to create strong neighborhood centers that are more economically stable, safe and productive. Studies have shown that the ability to travel in an area conveniently, without a car, is an important component of a community's livability. Public transit system provides opportunity, access, choice and freedom, all of which contribute to an improved quality of life.

.

X. SUGGESTIONS FOR THE IMPROVEMENT OF PUBLIC TRANSIT SERVICES FROM THE PASSENGERS

Suggestions have been collected from passengers to improve the services in order to meet the travel demand. The need to augment the fleet and coverage of services across all modes has been stressed upon. The various suggestions received from commuters have been compiled in Table VI

Table VI: Showing the suggestions for improvements in Services

Suggestions	Auto	Magic	Mini-Bus	Low Floor Buses
Rationalization in Fare Structure	87%	33%	15%	22%
Improvement in Punctuality	05%	34%	48%	25%
High Coverage Area	25%	31%	47%	73%
Frequency Enhancement	13%	45%	72%	77%
Improvement in Vehicles condition	69%	86%	84%	89%

Improvement in internal Aesthetics	35%	47%	75%	45%
Improvement in convenience	51%	56%	69%	65%
Improvement in Crew Behaviour	59%	65%	55%	76%
Fleet Size Improvement	32%	55%	73%	75%
Others	0%	1%	0%	2%

Source: Primary survey conducted by Researcher

XI. HOW TO IMPROVE THE PUBLIC TRANSIT SHARE

Here, some strategies for targeting the desired public transit share among the total generated trips

- Organized Public Transit System: A planned public transit system in terms of routing, scheduling and ticketing system would help in attracting more passengers.
- Optimization and Strengthening of Transit Services: To provide quick, convenient and economic service, measures like reserved bus lanes, priorities at intersection and good terminal facilities to improve turn round time should be undertaken.
- Subsidized Public Transit: This is an important factor which is affecting in the ridership of the Public Transit system. That's why the fare structures in the public transit should be targeted to be affordable to a larger percentage of population specially, the lower income group.
- Accessibility to the System: More accessible system should be designed by expanding its influence area, reducing the walking time and with the help of proper information system (**PIS**).
- Disincentives for Private Mode Users: Higher taxation on personalized mode, high parking charges and other such ways should be introduced to discourage the use of private mode of transit.
- Area Specific Public Transit Services: Public Transit services targeting people from particular origin or destination can also help in increasing the share of public transit.
- Special Consideration: Consideration of various sections of society such as women, aged people, handicapped etc. while designing the public transit infrastructure can also immensely help to increase its share.
- Interchange facilities: Provide major interchanges for transit services in those cities where metro trains like Delhi, with proper parking space and informative services. Apart from these, there are many other possible ways to improve the transit service quality, including reduced crowding, increased service frequency, nicer waiting areas and better user information.

  Some more measures to improve the comfort ability & the convenience factor are as follows:
- By improving vehicle design, comfort and cleanliness.
- By increasing frequency to reduce wait times and vehicle crowding.
- By improving boarding/alighting ease and speed, with pre-paid fare collection, wider doors and more convenient loading areas.
- By increasing fare options, discounts and passes purchased through work, school and communities, and for shoppers (similar to merchant-paid parking).
- By improving user information, customer service, and marketing programs.
- By modal integration, with transit service coordinated with walking and cycling facilities, taxi services, intercity bus, and delivery services (to facilitate shopping by transit).
- By improving safety and security for transit users and pedestrians.

XII. CONCLUSION AND POLICY IMPLICATIONS

Cities play a vital role in promoting economic growth and prosperity. The development of cities largely depends upon their physical, social, and institutional infrastructure. Transit systems are among the various factors affecting the quality of life and safe movement in a city. India is only 30% urbanized at present, however, is expected to double its urban population in the next twenty years. Since urban transit and urbanization are closely interlinked, therefore planning for urban transit starts at understanding the urbanization process which affects the quality of life and safety in city. On the basis of this study it is suggested to have the following measures.

- Due to more and more workforce coming to the urban area from remote places; it is advisable to have proportionally higher number of buses to make it convenient for the natives especially during peak hours to avoid overcrowding.
- There should be uniformity in the frequency of buses adherence to strict timings is required to maintain service quality.
- Proper maintenance of buses and bus stands are required to retain the existing passengers and attracting the new ones. It is very necessary for the survival of public sector transit in the times to come.
- Bus drivers should stop the bus close to the bus stop and not in the middle of the road causing hindrance to public.
- All buses can have light radio/ music system or provision for video to be played so that the passengers don't feel the stressed and they may enjoy their trip.
- Bus stop should be covered with roof to adjust the worst climatic conditions.
- Proper first aid facility should be provided in buses and at bus stops to meet any emergency.
- Conductor should carry more coins to avoid the delay in returning the balance amount of fare.
- There must be arrival and departure times at each bus stop.
- The conductor and driver must wear dresses having their names and employee number mentioned on it.
- There is a need to introduce special city bus to provide special service for female passenger.

Conclusively, we can deduce that majority of the respondents are not satisfied with the level of service of existing public transit system. Moreover it is also found that passengers / commuters are not aware of the mandatory services to be given by the city buses. The researcher has tried to touch upon the minimum expectations of the commuting class. The suggestions are made on the basis of the interactive discussions with commuters; which could be incorporated into policy decisions of management.

REFERENCES

[1] Tiwari, G., (2009), "Public Transport Research Challenges in India," *Department of Civil Engineering & Transportation Research and Injury Prevention Programme,* Institute of Technology, Delhi.

[2] Kittelson & Associates (2003), Transit Capacity and Quality of Service Manual, *Report 100, Transit Cooperative Research Program, Transportation Research Board*

[3] Marsden, G., (2009), "Good Practice in the Exploitation of Innovative Strategies in Sustainable Urban Transport: City Interview Synthesis," University of Leeds.

[4] Pucher, J., Korattyswaropam, N., et al., (2005),"Urban Transport Crisis in India," *Transport Policy 12, <www.elsevier.com/ locate/tranpol (online journal)>*.

[5] "Jawaharlal Nehru National Urban Renewal Mission Overview," *Ministry of Urban Development, Government of India.*

[6] Singh, K. S., (2005),"Review of Urban Transportation in India," Indian Institute of Technology," *Journal of Public Transportation, 8.1*, Indian Institute of Technology, Delhi.

[7] Holmgren, J (2007), "Meta-analysis of public transport demand," *Science Direct, Transport Research, part A 41, pp. 1021-41*

[8] Holmgren, J (2008), "Study in local public transport demand for Sweden," *Linköping Studies in Arts and Science No. 460,*

[9] *Pucher, J & Ittyerah, N (2004), "*The crises of public transport in India: Overwhelming needs but limited resources," *Journal of Public Transportation, vol. 7, no. 4, pp 1-20*

[10] Wilbur Smith Associates (2008), "Study on traffic and Transportation Policies and Strategies in Urban Areas in India final report," *Ministry of Urban Development*, India.

[11] Sreedharan, E., (2003), "Need for Urban Mass Transport System for Our Cities," Press *Information Bureau, Government of India*, New Delhi, India.

[12] Singh, A.P., (2012), "A review on urban public transport system of Bhopal City," *International Journal of Advanced Engineering Technology* E-ISSN 0976-3945, IJAET/Vol.III/ Issue II/April-June, 2012/163-167

[13] Singh, A.P., (2010), "Some Strategies for the Development of Environment Friendly, Safe and Efficient Public Transport System of Bhopal City," M.Tech. Thesis submitted to Maulana Azad National Institute of Technology, MANIT Bhopal, India.

[14] Litman, T., (2010), "Evaluating Public Transit Benefits and Costs: best practices Guide book," *Victoria Transport Policy Institute*.

[15] Balcombe, R and Paulley, N (2004), "Demand of Public Transport: A Practical Guide," *TRL Report 2004, TRL Limited,* Great Britain

[16] Colin, A.H.,(1976), "Evaluation of Public Transport Services: The Level-of-Service Concept," , TRR, 606, TRB,

[17] Murugesan. R., and Moorthy N.V. Rama, (1998), "Level of Public Transport Service Evaluation - A Fuzzy Set Approach," *Journal of Advanced Transportation*, Vol.32, No.2.

[18] Debasish Ray & Sarkar Ashoke Kumar,(1994)," Evaluation of Service Levels of Different Categories of Buses in Two routes of Calcutta," *Highway Res. Bulletin,* No.51, IRC, New Delhi,

[19] <http://jnnurm.nic.in>