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A Rational Approach for Improving Travel Impacts of Public Transport System in Indian Cities

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Abstract

Public Transport system encounters typical challenges in planning, maintaining and operating their services in Indian cities. A critical review of literature indicated that most of the researchers have its own particular approach to improve travel impacts of city public transport system. However, the improvement of travel impacts of public transport system does not necessarily reflect the city perspective and not considered appropritely in the literature. Therefore, this study identifies some strategies for improving city coverage, city mobility and public transport share due to improvement of public transport system in Indian cities. Some of the strategies identified in this study for improving city coverage of public transport system are improve the connectivity of route , realignment of route, integrate the public transit system and introduction of new alternative public transport system . Some of the strategies identified for improving city mobility are exclusive lanes for public transport, rationalization of routes to avoid overlapping, better traffic management of public transport, better traffic management of public transport system. Some of the strategies identified for improving public transport share are improve performance of public transport system, rationalisation of route, reduce the cost per km. It is expected that this study will be useful to improve the travel impact of existing public transport system in Indian cities and will also be useful to make appropriate decisions before implementation of new services, and performance improvement of existing city public transport system.

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Keywords:Public transport system; Strategies, City Coverage, city mobility, public tansport share

1. Introduction

Public transport system is one of the key component to improve social as well as economy welfare of a city in developing countries including India. From the antiquated time, public transport system gives an essential portability administration to the people requiring little to no effort and without access to private vehicles. At present, city bus

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service is the most important mode of public transport system in Indian cities. A range of city bus services like BRT, low floor buses, and mini buses are available for different city sizes. Hence, a scientific analysis is required to select the most appropriate city bus service for a given city size. However providing equitable and efficient city bus services is a challenging task in the developing countries due to high population density, low income, spatially separated land uses and ever increasing demand with the limited resource available. Further, the existing city bus services in developing countries are not well planned, results in increasing problems of congestion, traffic accidents, air pollution, noise pollution and energy consumption.

The rapid urbanization, coupled with increasing activities and opportunities in Indian cities, resulting in terrific increase in demand of motorized transport vehicles. Hence, recently different kinds of intermediate public transport system like Bus rapid transit system (BRTS), Light rail transit system (LRT), Mass rapid transit system (MRT), Mini bus, Metro and other many sorts of city transport systems are working in different Indian cities. Therefore, many researchers focused on improving travel impacts of public transport system to improve environment in Indian cities by shifting mobility from private mode of transport towards more efficient environmental friendly and safe travel modes. However, improvement of travel impacts of public transport system is a difficult task which is affected by various factors such as social, economic, environmental, travel pattern and political factors. Thus, it is necessary to improve the travel impact of alternate public transport system on Indian city to know how well it is providing transport system to the public in the area provided and provides beneficial information based on which important operating decisions can be taken for implementing new public transport system in Indian cities. It is also observed that the huge amount of money is required for application of this public transport system in Indian cities. Therefore, there is an urgent need to develop strategies for improving travel impacts of alternate public transport system for improved management and better application of existing infrastructures. Consequently, City perspective play a vital role in determining whether a public transport system is used, and which reflects mobility, city coverage, public transport shares, city safety, air pollution, noise pollution, property value as well as employment generation. The city perspective includes impact on the entire area and population of the provided region in a city including passengers or users. This aspect includes promoting an economically and socially feasible environment, quality of life, and energy conservation in entire city area. Hence, the significant explanation to improve travel impacts of the alternate public transport system on Indian cities is to control traffic congestion, city environment, city economy and justify the adjustments in the system before its application. Thus, simple and scientific strategies are required for improving impacts of alternate public transport system on Indian cities so that to select the most appropriate public transport system for a given city size.

This paper consists of four sections of which this is the first. This part i.e. Introduction focuses on the basic issues like need of the study, objective, scope of the study and report organization. The second section presents briefly an overview of literature on rational approach for improving travel impacts of alternate public transport system in Indian cities. The third section represents strategies identified for improving public transport system in an urban area. The last section presents the important conclusions & strategies based on this study.

2. Literature Review

The performance improvement of public transport system is an important measure in determining the level of success of the national transportation policies and to know the impact of a policy as well as the operation of transportation services effectively and efficiently. Hence, a systematic literature review is an important and useful approach to identify and analyses all relevant research on performance improvement of public transport system in developing countries as well as developed countries. This section reviews the literature on performance improvement of alternate public transport systems in developing countries as well as developed countries.

Most of the researcher [Alonso et al., (2015), Ramani et al., (2013), Black et al., (2012), Litman(2009,2006)] considered economic, social and environmental related performance indicators for development of sustainable transport system which are reflected to city perspective. The researchers [Dodson et al., (2011), Kittelson et al., (2003)] discussed that public transport service benefits the whole community or a city when it can contribute to social cohesion, reduction of air pollution, provide mobility to people without access to private automobile, parking congestion mitigation, reduction of traffic congestion, and job accessibility and sustainable environmental outcomes.

To select which indicators were more appropriate to assess sustainability of alternate public transport systems from a city perspective, a literature review of several initiatives with similar scope was carried out.

Agarwal et al., (2015) determined eighteen performance indicators for evaluation of impact of public transport system in a city. These are mobility, service availability, traffic safety, transit use, infrastructure facility, service reliability, service coverage, crime rate, vehicle security, service equity, community cohesion, energy consumption, property value, employment generation, city air quality, city noise quality, city water quality, and support to local industries. Further, these eighteen performance indicators are classified into four major categories i.e. impact on transport system effectiveness, impact on social development, impact on environmental quality, and impact on economic development. Gandhi S. et al. [12] evaluated that the impact of change in alteration of BRTS service using Bead tool. Ramani et al., (2009) determined and discussed total of thirteen performance indicators to cover the five specific goals. The goals are reducing congestion, enhance safety, expand economic, opportunity, increase the value of transportation assets and improve air quality. They found that out of thirteen performance indicators two are related to reducing congestion, two to enhance safety, two to expand economic, four to increase the value of transportation assets and three to improve air quality. These thirteen performance indicators are travel time index, buffer index, annual severe crashes per mile, percentage lane-miles under traffic monitoring/surveillance, land-use balance truck throughput efficiency, average pavement condition score, capacity addition within available right of way, cost recovery from alternative sources, proportion of non-single- occupant travel, daily NOx, CO, and VOC emissions per mile of roadway, daily CO2 emissions per mile of roadway, and attainment of ambient air quality standards.Iseki et al., (2007) identified numerous criteria, which are grouped into six categories i.e. community image and pride, joint development and partnerships, safety and security, environmental impacts, neighbouring economy / local employment, and physical and social impacts on neighbouring land uses.Litmanet al., (2006)determinedtwenty-four performance indicators for evaluation and implementation of sustainable transportation. Significant issues include analysis, evaluation, and transportation impacts. Sustainable development includes economic and social welfare, equity, human health and ecological integrity. A narrow definition of sustainable transport tends to favour individual technological solutions, while a broader definition tends to favour more integrated solutions, including improved travel choices, economic incentives, institutional reforms, land use changes as well as technological innovation.Sheth et al., (2003) took four performance indicatorsfor evaluation of urban transport system in Blacksburg. These are number of accidents, air quality, noise pollution and resources degraded.

A critical review of the literature indicated that there are various deficiencies in the present state of the art of improving impacts of alternate public transport system on Indian cities. Most of the researchers have its own particular approach to improve travel impacts of city public transport system. However, the improvement of impacts by the researchers does not necessarily reflect the city perspective and cannot be considered sufficient. A literature review indicated that most of the research studies focused on evaluating the performance of public transport services, but limited studies are available on improving impacts of alternate public transport system on Indian cities and justify the alteration in system before its application. Therefore, it may be difficult to take decision for before application of new system, alteration of system, and reduction & expansion of transport systems in a city. It is indicated that the single measure is inappropriate for all situations therefore; multiple performance indicators are needed to improve impacts of alternate public transport service on Indian cities. However, most of the performance indicators which might be significant in the developed countries might be irrelevant for the developing countries. Hence, need to develop a balanced assessment methodology and strategy which can identify performance indicators from Indian context and fulfils all the requirements for improving impacts of public transport system on Indian cities. A review of the literature indicated various assessment methodologies which can used to evaluate the performance of public transport services from various perspectives. However, these methodologies may not be favourable due to absence of data base or incomplete data base or data is available but not in a comprehensive way. Thus, retrieval of that data is very difficult to analyse. There is an urgent need to develop a strategy which can improve impact of alternate public transport system on Indian cities and can also be executed with minimal data which are easily available.

3. Strategies for improving travel impacts of public transport system

The development of feasible public transport system largely depends upon city perspective which is concerned with the traffic flow pattern, social development, economic development and reduction in environmental pollution in the city. However, many performance indicators are presented in the literature so that identification of appropriate indicators for improving the impacts of alternate public transport system is a challenging task. Further, most of the studies may not be sufficient for improving the impacts of alternate public transport system from city point of view due to insignificant data. Thus, it is necessary to evaluate the impacts of alternate public transport systems on a city and provide valuable information based on which important operating decisions can be taken for implementing the alternate public transport system in Indian cities. City travel impact shows the impact on travel patterns within the city. City travel pattern is affected by efficient management of traffic, availability of public transport, connectivity of routes, making people use the public transport facilities etc.. Thus, three indicators i.e city coverage, city mobility and public transport share are identified in this study to evaluate the travel impact of public transport system. Some of the strategies identified for improvement in city travel pattern are summarized in Table 1.

Table 1. Strategies Identified for Improvement of Travel Impact of Public Transport System in Indian cities

S.No.	Indiactors for Travel impact in Cities	Strategies Identified for Improvement
1	City Coverage	ICC1: Improve the connectivity of public transport route
		ICC2: Realignment of routes
		ICC3: Integrate various public transit modes
		ICC4 : Introduction of new alternative public transport mode
2.	City Mobility	ICM1: Exclusive lanes for public transport
		ICM2: Rationalization of routes to avoid overlapping
		ICM3: Better traffic management on city road network
3.	Public Transport Share	ITS1: Improve performance of public transport system
		ITS2: Rationalisation of routes for improve ridership
		ITS3: Reduce the cost /km of trip

3.1 Strategies for improvement in city coverage

Some of the strategies identified for improvement in city coverage are summarized in Table 2 as follows:

Table 2: Strategies Identified for Improvement in City Coverage in Indian cities

S.No	Strategies Id	Strategies	Applications
1	ICC 1	Improve the connectivity of public transport route	Increase the connectivity of routs by connecting missing links and areas in a way such that maximum area is covered by public transport system
2	ICC 2	Realignment of route	Realignment of routes must be done in a way such that maximum no. of key amenities of the city like industries, hospitals, institutes, etc. gets connected. It must also cover low income house hold area or slum area.
3	ICC 3	Integrate various public transit modes	Connecting the public transport system with other modes like intermediate public transport system, non-motorized transport system will increase the city coverage area as these transport systems will be available in areas where public transport system is not reachable.
4	ICC 4	Introduction of new alternative public transport system	By introducing new public transport systems like metros, BRTS, city buses, etc. We can improve city coverage as these new public transport systems will cover those routes which were not covered by old transport system

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3.2 Strategies for improvement in city mobility

Some of the strategies identified for improvement in city mobility are summarized in Table 3 as follows:

Table 3: Details of Strategies Identified for Improvement in City Mobility in Indian cities

S.No	Strategies Id	Strategies	Applications
1	ICM 1	Exclusive lanes for public transport	Exclusive lanes, specific corridors for public transport are the efficient way of improving city mobility
2	ICM 2	Rationalization of routes to avoid overlapping	Public transport routes can be rationalized by connecting important locations of route and eliminating the overlapping sections which consumes more time. .
3	ICM 3	Better traffic management on city road network	Better traffic management improves city mobility. Traffic management can be done by use of modern technology like- **Intelligent Transport system:** Real time traffic information will be shared by traffic department, Transport Authorities, so that in situation of congestion or road accidents, collaboration is smoother. **Vehicle Positioning System (VPS):** It provides the drivers with advance knowledge of the roads with traffic jams and severe congestion, which prompts them to take alternate routes. VPS also lets travelers know the timing of next available bus

3.3 Strategies for improvement in public transport share

Some of the strategies identified for improvement in public transport share are summarized in Table 4 as follows:

Table 4: Details of Strategies Identified for Improvement in Public Transport Share in Indian cities

S.No	Strategies Id	Strategies	Applications
1	ITS 1	Improve performance of public transport system	By improving the performance of public transport system public transport share can be improved. If the people using the public transport finds it affordable, accessible and usable then automatically the share will increase, this can be done byproviding safe and comfortable journey, minimum travel time, on time performance of public transport system, etc.
2	ITS 2	Rationalisation of routes for improve ridership	Trip length can be rationalized by connecting important locations of route and eliminating the sections which consumes more time and hence enhance the public transport share
3	ITS 3	Reduce the cost /km of trip	Reduction in the cost per km of the trip will attract more passenger and hence enhance the public transport share Travel cost is one of the basic reasons for passengers to adopt public transport. As middle-income groups cannot afford higher travel cost of private modes they opt public modes, hence travel cost should be minimum as it has a direct impact on monthly budgets of daily commuters. Travel cost can be reduced by increase Total Passenger Kilometres Travel per Litres of Fuel, by increase Seating Capacity of Vehicles, by use of Low Cost Fuel, etc.

4 Conclusions

The main objective of this study is to identify some strategies for improving travel impacts of public transport system on Indian cities. Some of the important conclusions drawn from this study may be summarised as follows:

- In most of the developing countries including India the public transport systems has various problems such as slow service, inefficient route , poor connectivity of public transport routes, inappropriate public transit mode, overlapping of routes, less ridership and high travel cost of existing public transport system etc. Further, the improvement of travel impacts of public transport system does not necessarily reflect the city perspective and not considered appropritely in the literature. Therefore, there is an urgent need to develop some strategies for improving impacts of public transport system on Indian cities.
- City travel pattern is affected by efficient management of traffic, availability of public transport, connectivity of routes, making people use the public transport facilities etc.. Thus, three indicators i.e city coverage, city mobility and public transport share are identified in this study to evaluate the travel impact of public transport system.
- Some of the strategies identified in this study for improving city coverage of public transport system are improve the connectivity of route , realignment of route, integrate the public transit system and introduction of new alternative public transport system.
- Some of the strategies identified for improving city mobility are exclusive lanes for public transport, rationalization of routes to avoid overlapping, better traffic management of public transport, better traffic management of public transport system.. Congestion problems will overcome by these strategies.
- Some of the strategies identified for improving public transport share are improve performance of public transport system, rationalisation of route, reduce the cost per km.

It is expected that this study will be useful to improve the travel impact of existing public transport system in Indian cities and will also be useful to make appropriate decisions before implementation of new services, and performance improvement of existing city public transport system.

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