



## INFORMAL PUBLIC TRANSPORT SYSTEM IN A FAST GROWING SUBURB OF DELHI: CHARACTERISTICS, ISSUES AND POLICY IMPLICATIONS

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Public transport supply in Indian cities is characterized by multiplicity of modes ranging from two seated manually driven cycle rickshaws to fifty seated buses compatible with local conditions and demand patterns available for use. The level of intermixing of the two types of systems in a city is determined by the prevailing city's socio economic fabric, travel patterns and road network.

Gurgaon is a fast emerging suburb of Delhi, the national capital of India. The city offers world class business opportunities particularly for IT industries and related industries. This paper is based on an empirical study carried out in Gurgaon to study the public transport scenario with particular emphasis on auto rickshaws. The paper highlights various issues related to the operation, spatial inequities, quality of service; institutional arrangements etc. of auto rickshaws operation and suggest policy measures to improve the role played by auto rickshaws in city's public transport system

Les transports en commun dans les villes indiennes est caractérisé par la multiplicité de modes étendant de rickshaws de cycle à l'autobus. Le niveau de mélange est déterminé par le socio économique tissu de la ville, les modèles de voyage et le réseau de route.

Gurgaon est une banlieue rapidement émergente de Delhi, la capitale nationale d'Inde. Elle offre des occasions d'affaires de niveau international notamment pour les industries de informatique. Ce papier est fondé ici pour étudier le scénario de transports en commun avec l'accent particulier sur rickshaws d'auto. Le papier souligne des problèmes apparentés à l'opération, les injustices spatiales, la qualité de service ; les arrangements institutionnels etc. et suggère les mesures pour aient amélioré le rôle joué par rickshaws d'auto.

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## 1. Introduction

The prevailing urbanisation trends in India are putting the essential services and infrastructure in the larger (especially, million plus or metropolitan) cities under severe strain. With improving socio-economic levels and liberalised economic policy leading to considerable increase in motor vehicle production coupled with inadequate mass transport system in cities, the motor vehicles ownership in India has been going up at a fast pace. In 2002 nearly 59 million vehicles were plying on Indian roads. The annual growth rate of motorized vehicles during last decade has been around 10%. During year 2000 more than 6.2 million vehicles were plying in mega cities which accounted for 12.7 % share of country's vehicle population. Two wheelers in most of the cities account for 60-80% of the total number of motor vehicles. The bus supply in cities vary from a low of 0.12 buses/1000 population in size I cities to 0.46 in size VI cities reflecting inequities in public supply provisions.(RITES,1995)

Public transport supply in Indian cities is characterized by multiplicity of modes ranging from two seated manually driven cycle rickshaws to fifty seated buses compatible with local conditions and demand patterns available for use. The level of intermixing of the two types of systems in a city is determined by the prevailing city's socio economic fabric, travel patterns and road network. The widely varying socio- economic characteristics and development profiles of different sized cities in India typified by their different rates of modernization and urbanization levels exert a strong influence upon the use and choice of urban transport in these cities. In the absence of adequate and efficient public transport system, a major part of the transport demand is met by personalised motor vehicle modes, IPT modes and bicycle. Cities with poor public transport systems have higher availability of IPT and private modes. City size and its economic base is observed to have an appreciable impact upon the supply levels, spatial coverage, content and composition of para transit operations in Indian cities. Large metropolitan cities having organised public transport system exhibit wide coverage of auto oriented modes while medium and smaller sized cities exhibit a wide range of manually operated para transit modes. Auto rickshaws supply in particular in Indian cities indicate that major metro cities exhibit a higher share of auto rickshaws ranging between 7 – 13 auto rickshaws per 1000 population compared to smaller cities supply ranging between 0.3 to 2 auto rickshaws per 1000 population(Wilbur Smith, 2007)..

The present paper is based on an empirical study carried out in Gurgaon, a fast growing suburb of Delhi, to study the public transport scenario with particular emphasis on the role and operation of auto rickshaws in meeting city's mobility requirements.



## 2. Profile of Case Suburb - Gurgaon

Gurgaon is a city in the Indian state of Haryana and is situated in National Capital region of Delhi, the capital of India. It is just 10 kms away from Indira Gandhi International Airport, Delhi. The city, also called the Millennium city, is spread over an area of 127 sq km and has a population of 2.48 million as per 2001 census. It is situated along one of the major National Highways (NH-8) connecting Delhi with Jaipur, one of the major tourist destinations of India.

The city had a substantial increase in population growth since 1991. The private sector participation in city's development coincided with the change in economic policies of Government of India in 1990's leading to a trend in globalization which led to the influx of multinational companies and increase in residential, commercial and industrial developments in the city. The effect of these developments started showing its effect on the population growth in the city. During 1991-2001 the population growth jumped to 104.93 %. The present growth trends are expected to continue in future as well as evident from the prevailing trends wherein its population is estimated to have been increased to 0.8 millions in 2007 registering growth of 222.61%.

## 3. Public Transport System in Gurgaon

The auto rickshaw oriented public transport supply in Gurgaon comprises of 35 buses and 5500 autos rickshaws operating in the city providing intra city services in residential complexes. The city has only two bus routes which connect new Gurgaon with old Gurgaon. The services provided by Para transit mode auto rickshaws are the life line of the city's transport system. It not only caters to line haul trips but also acts as feeder mode to trips coming in or going out of Gurgaon. The manually cycle rickshaws provide connector (feeder) services to supplement the auto rickshaw services over shorter distances of travel.

Like any other small size Indian city, the evolution of public transportation system in the city started with para transit modes, namely auto rickshaws and cycle rickshaws to meet its transport demand. When the city was small, the employment opportunities were not much and villagers in search of employment came into business of auto rickshaw operation. The District authorities, in order to give employment opportunity to each of the villages, identified the influence area of each village along the major roads and allotted permits to the operators accordingly. The operational control for plying of auto rickshaws in the earmarked area was given to the Association of the auto operators. In spite of city becoming a modern and contemporary entity this operational arrangement is still prevalent and the auto operation has further extended to new Gurgaon.



## 4. Field Studies

An empirical study was conducted to study the public transport scenario of the city with particular emphasis on the auto oriented Para transit systems in the form of auto rickshaws. The study included following field surveys:

- **Bus Stop Survey:** This survey was carried out at 36 bus stop locations. Personal, trip information along with house hold level information (such as income, vehicle ownership, expenditure on transport etc) was obtained from bus as well as auto passengers. The survey was carried out during peak hours.
- **Passenger Boarding/ Alighting Survey:** The survey was carried out on - board the bus recording boarding and alighting passengers at various bus stops en- route. The survey was carried out both in peak and one off peak trips.
- **Auto Rickshaw Operator Survey:** Auto rickshaw operators were surveyed to obtain the operational characteristics of the auto operation
- **Users Attitudinal Response Survey:** As part of this survey opinion of the bus and auto passengers was obtained about the existing public transport services. The preferences of the users on various aspects of public transport services were also obtained during the survey.

In addition to above field data, information on auto rickshaw operation was obtained from Regional Transport Authority (RTA) and Transport Department.

## 5. Public Transport Route Network and Supply Characteristics

### 5.1 Bus System

There are only two intra city bus routes. These routes originate from Old Gurgaon city centre (Fountain Chowk). Both the routes connect old Gurgaon with new Gurgaon. As most of the job opportunities are in new Gurgaon, there is heavy movement of passengers, particularly for those employees who are residents of Old Gurgaon, between two parts of the city. The routes are operated by mini buses with smaller capacities and owing to excess demand most of the time these buses are over crowded. Table1 summarises the details of bus operation.

**Table 1: Details of Bus Operation in Gurgaon**

Route	Buses	Route Length (km)	Frequency (Min.)	Trips/Day	Km/Day	Daily Passengers / Bus
Bus Stand- Sec 55-56	31	16	7	8	128	1000
Bus Stand- Nathupur	4	10	15	8	80	800

The buses operating within the city are mini buses owned by the private operators and the route has been decided by the RTA and permit allotted to them for



operation. The timely operation of the route by different buses is controlled by the operator association only.

### 5.2 Auto rickshaws

Auto rickshaws operate throughout the city within eight kms of radius of old Gurgaon city centre (Fountain Chowk). It operates on major corridors of the city as well as in the interior areas. The major auto rickshaw terminal is also at Fountain Chowk from where all major corridors of auto rickshaw operation radiate and connect Gurgaon with Delhi and other neighboring areas. The operational routes are very short with some routes are as short as three km. The present route network and the operational arrangements are such that it forces commuters to make at least one interchange to reach their destination resulting in an increased cost of travel.

As the auto rickshaw supply levels are fairly high keeping in view the demand, there is very well organized self regulated arrangement in place which controls its operation in the city. Auto rickshaw operation is owned and operated by the residents of villages falling in the influence area of corridors. No operator is allowed to operate on routes other than specified routes. To control the operation of so many autos rickshaws they are allowed to operate on major corridors on alternate days and on off days they operate in the interior areas of the city. On the major corridors the auto rickshaws operate by turn through a number system from their identified stands.

On an average the vehicle utilization levels of auto rickshaws observed from the surveys is around 100 kms in a day with the average route length being 7 kms. A flat fare of Rs 5 is charged for an auto rickshaw trip and the fare/km works out to be 70 paise per km. An auto rickshaw operator on average makes a saving of Rs 100-150 /day (Table 2).

**Table 2: Cost of Operation for Auto rickshaw**

Expenditure(Rs/day)	Item
200	Diesel
200	Driver/Owner
100-150	Saving

The permitted capacity of an auto is eight passengers but actually it carries up to 16 passengers including one driver. To carry passengers in excess of its designed capacity, the auto rickshaw operators have made additional temporary sitting arrangements within it. On an average an auto rickshaw carries between 100-150 passengers per day in about 8 to 10 trips. The easy availability of autos and flexible stoppage en route makes them very popular among its users, particularly low income users who are captive to these modes.



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### 5.3 Accessibility levels

Accessibility analysis has been carried out for the public transport modes to identify their accessibility levels and spatial inequities in their supply. The accessibility measures for bus and auto rickshaw were given by the index

$$AI = \sum_i \sqrt{N_{ij}} / \sqrt{A_j}$$

where AI= Accessibility index by bus or auto rickshaw

$N_{ij}$ = Off-peak frequency on route ' i ' and passing through

Zone 'j'

$A_j$ = Area of zone 'j'

The analysis was carried out for each of the 20 traffic zones and the city as a whole. Overall while the accessibility index of auto rickshaw was much higher at 2.22 compared to 0.66 of bus indicating a higher level of accessibility by auto rickshaw. In case of bus only eight out of twenty internal zones are served by bus .Figure 1 shows the variation of accessibility levels by auto rickshaw at zonal level. It is observed from the accessibility index of those zones is high which are auto stand.

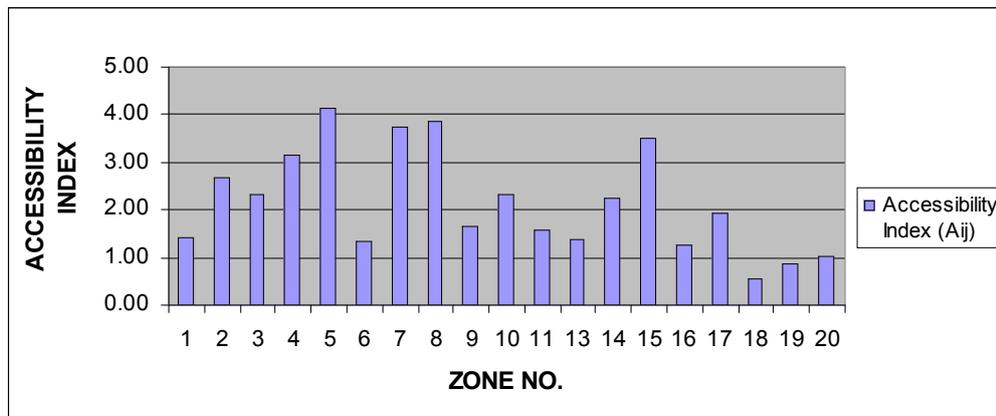


Figure 1 : Zonal Accessibility levels of Auto Rickshaw

## 6. Public Transport User and Trip Characteristics

### 6.1 User Personal Characteristics

The distribution of public transport users as shown in Table 3 indicates that nearly 90 % of the auto rickshaw users have monthly household income less than of Rs. 20000 while it is 80% in case of bus users. However it is significant to note



that 50% of the auto rickshaw users have household income below Rs. 10,000 per month indicating a general low income profile of the users of such systems.

**Table 3: Distribution of Users by Income (%)**

House Hold Monthly Income	Over All	Bus User	Auto User
<10000	40.58	29.82	50.62
10,000-20,000	45.65	50.88	39.51
20,000-40,000	10.87	17.54	7.41
>40,000	2.90	1.75	2.47
<b>TOTAL</b>	100.00	100.00	100.00

Table 4 shows the pattern of monthly expenditure on transport of the public transport users. It is observed that while the overall expenditure on transport varies from 10.7% to 18.7% from higher to lower income groups the corresponding expenditure on public transport varies from 5% to 13%, clearly exhibiting a strong dependence of lower income population, on the public transport system for their mobility. Overall on average 10.14% of the monthly household income is spent on public transport by the residents of the city.

**Table 4: Expenditure on Transport as % of Monthly Income**

House Hold Monthly Income (Rs.)	Monthly Expenditure On Public Transport (Rs.)	Monthly Expenditure On Private Modes (Rs.)	Expenditure On Public Transport (As % Of Income)	Expenditure On Transport (As % Of Income)
<10000	1072	500	13%	18.72%
10,000-20,000	1676	1000	11%	17.84%
20,000-40,000	1500	1700	5%	10.67%

## 6.2 Trip Characteristics of Auto Users

There is a clear functional hierarchy of public transport modes in terms of their operation as observed from Table 5. While buses predominantly are used for line haul trips (50%), the auto rickshaws are largely used for access and dispersal trips with an average trip length of around 5 km.

It is observed from the Table that 59% of the trips by auto rickshaws involved access and dispersal movement compared to 33% for line haul travel. However the average trip lengths are fairly stable between 5 km and 6.3 km for access/dispersal and line haul movement respectively. The cycle rickshaws which account for a share of 25% and 18% in the access/dispersal trips and line haul



trips respectively, are used both for short distance line haul travel as well as access/dispersal movements with a stable trip length of about 2.1 to 2.2 km.

**Table 5: Trip Characteristics of Auto Rickshaw Users**

Mode	Line Haul Trip			Access/Dispersal Trip		
	%	Cost/Trip (Rs)	Average trip length (km)	%	Cost/Trip (Rs)	Average trip length (km)
Auto	33	5.6	6.3	59	5.7	5.0
Bus*	49	9.0	9.0	16	7.5	6.5
Cy. Rick.	18	15.0	2.1	25	12.0	2.2

\* both inter city & intra city bus trips

The inequities in public transport provisions also have an adverse impact on the expenditure on public transport systems in the city. While areas which are served by public transport on average have an expenditure of 8% of monthly income those un served by public transport have expenditure on transport as high as 13%.

### 6.3 Attitudinal Characteristics

All the bus and auto users were asked to rank different attributes like comfort, convenience, easy availability, cost, pollution, etc. according to their preference for a new bus system. Users gave topmost priority to easy availability i.e. good frequency of buses followed by comfort level. The cost factor was given the third priority which shows that availability and comfort level is poor in the existing situation. Least priority was given to travel time and environment. The attitudinal survey also revealed that auto rickshaw and bus users prefer a new comfortable bus system in the city. It was found that 30 % of users ranked easy availability as the most important attribute of the new system while 19% consider safety and comfort each as the most important attribute. Cost of travel is important concern of the public transport users and 28% of the users ranked cost of travel as next important attribute of the new bus system.

## 7. Daily Travel Demand Served by Public Transport

The total daily intra city demand served by public transport modes is 0.25 million trips and including intercity trips the daily demand served by public transport modes is 0.42 million trips. (Table 6). The share of auto rickshaws in the total public transport demand is 92% while in the intra - city public transport travel demand its share is 85% respectively.

It was also observed that zonal accessibility levels of the two systems have a profound effect on the trip generation by public transport systems at the zonal level.



**Table 6: Estimated Daily Travel Demand Served by City Public Transport Modes**

<b>Mode</b>	<b>Total</b>	<b>Inter City Passenger Trips</b>	<b>Intra city Passenger Trips</b>
Auto	385,000	184,800	215,600
Bus	35,000	-	35,000
<b>Total</b>	<b>420,000</b>	<b>-</b>	<b>250,600</b>

## 8. Issues and Policy Implications

Though the auto rickshaws are meeting the majority of the public transport demand of the city there are certain issues pertaining to its operation which needs to be addressed. Some of the major issues are:

- i. At present the city public transport is in hands of private operators, namely auto operators and bus operators who operate buses on two routes. With no control from government coupled with profit making objective of private operators the condition of public transport is in chaotic condition.
- ii. The condition of travel in existing modes is very pathetic.
- iii. The auto route network is faulty as it is not based on travel demand. The routes are very short which makes changeovers inevitable. Some of the routes are as short as 3-4 km. and flat fare of Rs 5 makes it very high fare for short trips.
- iv. The expenditure on transport is high due to necessity of changeovers and poor accessibility levels.
- v. The operation of public transport is mostly limited on high demand corridors only as a result of which a large area remains unserved.
- vi. Overcrowding in the auto rickshaw makes it very unsafe for commuters to travel

The present state of operations and supply provisions of public transport in general and auto rickshaws in particular has policy implications for sustainable mobility. The spatial inequities in public transport provision discussed earlier has implications on increased use of personalized modes of travel resulting in increased fuel consumption, congestion and other externalities. The competition between auto rickshaws and buses on major corridors particularly in a privately operated environment, as per present practice, may effect the efficiency of both the systems in terms of rider ship, safety etc making them unsustainable over time.



Moreover metro network which is being extended from Delhi to Gurgaon would also demand an efficient access and dispersal system at the metro stations failing which the patronage on a capital intensive transport system like metro may not reach the expected figures to sustain it economically. Keeping in view all the above policy implications there is a need to scientifically plan for para transit modes such as auto rickshaws in an integrated framework which takes into account the desired accessibility levels, feeder system requirements and competing modes of transport - both line haul and feeder systems.

## 9. Summing Up

The auto rickshaws are playing an important role in the transport system of Gurgaon. But with the rapid growth of the city and limitations of auto rickshaws in terms of capacity, safety, etc. a more efficient transport system is required for the city. While it would be appropriate to increase the supply of conventional buses to provide a safe, efficient and equitable public transport system it is also imperative to improve the auto rickshaws operation in the city which can provide a very vital complementary and supplementary role to the main systems. Some of the suggested measures towards such an effort are:

- i. Auto rickshaw operation in the city should be reorganized and brought out from the present operational basis of corridor operation falling in village influence area.
- ii. Autos rickshaws should be brought under the Cooperative made by all its operators who will control its operation in the city under the administrative control of RTA Gurgaon.
- iii. Auto rickshaw route network needs to be rationalized by RTA based on existing and potential travel demand, accessibility levels, competing principal modes and its potential role as a feeder transport.
- iv. Over time the auto rickshaws operators may be provided incentives to replace their polluting, unsafe and low capacity autos rickshaws with standard /mini buses particularly on the major travel corridors.

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