Management of Urban Transport

Training Module

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Foreword

Cities play a vital role in economic development and prosperity. Development of cities largely depends upon their physical, social and institutional infrastructure. Urban transport is of paramount importance for development of the cities. However, urban centres lack adequate infrastructure for urban transport though the travel demand is gradually increasing. In order to improve the urban infrastructure and services delivery, JNNURM has been launched by the Government of India during 2005. City Bus Transport Services are being promoted through introducing the guidelines for the purchase of new buses under the Mission. Government of India is also providing financial support under the Mission for improving the urban infrastructure to increase the efficiency of urban transportation. However, effective urban transport system is required for improving the productive efficiency of transport operators with emphasis on public transport management.

The training module on Management of Urban Transport has been prepared by my colleague Dr. A.K. Singh. I hope that the module will help in understanding of the various dimensions and aspects of urban transport management and it will also help in evolving action plan for improving the efficiency of the system.

Prof. Nishith Rai
Director

Preface

Urban centres are viewed as engines of growth and thus, the urban transport is called the wheel of that engine. Sustainable development of the cities largely depends upon infrastructure while urban transportation is the single most important component in urban development. The travel demand in urban areas is gradually increasing however; most of the Indian cities do not have adequate infrastructure and efficient transport system. Most of the Indian cities have failed to address the transportation problems due to resource crunch and inappropriate institutional capacity. The public transport systems in many cities have not been able to keep pace with the rapid and substantial increase in travel demand. This has created enormous problems to the commuters and particularly poor. Though, JNNURM has attempted to improve the urban infrastructure and the institutional capacity for urban transportation however; Indian cities require a transportation system which is integrated across all modes of public transport. The system also requires productive efficiency with multi-pronged approaches and strategies for managing urban transportation.

The present module is an attempt to review the status of urban transportation in India. It has also examined the problems and challenges of urban transport management and presented a package of policy measures for improving the efficiency and effectiveness of the system. I hope that the module will be helpful in understanding the various dimensions of urban transportation and will be helpful to the policy makers for evolving action plan for urban transport management.

Dr. A.K. Singh

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Management of Urban Transport in India

[1]Dr. A.K. Singh

Introduction:

Cities play a vital role in promoting economic growth and prosperity. They constitute more than 65 per cent in Gross Domestic Product of India. Development of cities largely depends upon their physical, social and institutional infrastructure. The cities are called engines of growth and therefore, urban transport is the wheel of growth and development. The travel and transport demand is increasing with the change of time in urban centres due to urbanization and growing economic activities. However, public transport system has not been able to keep pace with the rapid and substantial increase in demand over the past years. The poor mobility in urban centres may hamper the economic growth and also deteriorate the quality of life. National Urban Transport Policy, 2006 has been set out to tackle urban mobility issues and take India into the coming decades' ensuring a safe and sustainable urban mobility.

Urban Transport Scenario:

India's urban population is growing at an average rate of around three per cent per annum. It has almost doubled during the period between 1981 and 2001 from 160 million to 285 million and is estimated to be around 540 million by the year 2021. In terms of percentage of total population the urban population has gone up from 17 per cent in 1951 to about 29 per cent in 2001 and is expected to increase up to 37 per cent by the year 2021. Consequently the number and size of cities have also increased considerably. The number of metropolitan cities having million plus population has increased from 23 in 1991 to 35 in 2001; the pattern of

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urbanization has great variations across states and regions. It ranges from around 8 per cent for Himachal Pradesh to around 35 per cent for Maharashtra. The very process of urbanization has often been looked as something undesirable, while the objection used to be on social and moral grounds earlier, the criticism lately is more on economic grounds such as provision of requisite infrastructure and civic amenities at rapid escalating per capita cost. Despite all the objections, the rate of urbanization has not even retarded, nor to speak of it being halted.

Many cities in India have grown at an unprecedented rate in recent years and this growth is expected to continue in the foreseeable future. City efficiency largely depends upon the effectiveness of its transport system i.e. efficacy with which people and goods are moved throughout the city. Poor transport system stifles economic growth and development and the net effect may be a loss of competitiveness in both domestic as well as international market.

The increase in travel demand has resulted in rapid growth in the number of motor vehicles in the cities. In the six major metropolitan cities of India viz., Bangalore, Kolkata, Chennai, Delhi, Hyderabad and Mumbai, growth in motor vehicles has outpaced population growth. On an average, while the population in India's six major metropolitan cities increased by 1.89 times during 1981 to 2001, the number of vehicles registered went up by 7.75 times during the same period. Thus, the growth of motor vehicles was almost 4 times faster than the growth of population. Cities without good mass transit systems, like Delhi, Chennai, Hyderabad and Bangalore showed a higher growth rate in vehicle population as compared to those with mass transit systems.

During 2001, 55 million vehicles were running on the Indian roads. The annual growth rate of vehicle population in India has been about 10 per cent during the decade of 1991 to 2001. During 2000, more than 6.3 million vehicles were running in mega cities, which constitute more than 13 per cent of all motor vehicles. About 1/3rd of all vehicles are running in

metropolitan cities alone. The annual growth rate of vehicle population in some of the cities shows higher rate than the national average (Table 1).

Table: 1
Growth of Vehicle Population

('000')

City Name	1995	1996	1997	1998	1999	2000	Annual Growth Rate (1995-2000) (%)
Ahmedabad	510	572	631	686	739	799	9
Bangalore	796	900	972	1130	1332	1550	14
Chennai	768	812	890	975	1056	1150	8
Delhi	2432	2630	2848	3033	3277	3423	7
Hyderabad	557	764	769	887	951	991	12
Jaipur	368	405	449	492	542	598	10
Kolkata	561	588	588	664	702	799	7
Mumbai	667	724	797	860	911	970	8
Nagpur	198	213	239	270	298	331	11
Pune	358	412	468	527	568	593	11

Source: Ministry of Road Transport and Highways.

It is estimated that by the year 2015, the vehicle population of the country will be 121.3 million. It is likely to increase by three times in 2035. The highest growth is projected in case of two wheelers and cars (Table 2).

Table: 2
Forecast of Vehicle Populations in India

(In Million)

Population	2005	2008	2015	2025	2035
2-W	35.8	46.1	87.7	174.1	236.4
3-W	2.3	3.0	5.3	8.8	13.1
HCV	2.4	2.9	4.6	9.1	16.2
LCV	2.4	3.2	5.7	12.5	26.9
Car, SUV	6.2	8.8	18.0	41.6	80.1
Grand Total	**49.1**	**63.9**	**121.3**	**246.1**	**372.7**

Source: Ministry of Urban Development, Government of India.

Public Transport:

Public transport systems in Indian cities have not been able to keep pace with the rapid and substantial increase in demand over the past few decades. The level of urban travel demand in India is increasing substantially over the years. Three factors contribute to this. The first is the increase in population. The urbanization process has indicated that the population size of an urban area doubles in about two decades. The second factor is the mobility rate, that is, average trips per person per day. Mobility rate in urban India is continuously increasing over the years. For example, in Delhi, average number of trips per person per day has increased from 0.49 during 1969 to 1.10 during 2001. The trip rate for Mumbai, Kolkata, Chennai, Hyderabad, Bangalore, Ahmadabad, and Pune are 1.26, 1.26, 1.22, 1.05, 1.20, 1.57, and 1.48 respectively. The third factor contributing to travel demand is the increase in trip length due to increase in the physical expansion of the city. To make the situation worse, most of the major roads and junctions in Indian cities are heavily encroached by parked vehicles, roadside hawkers, and pavement dwellers. Qualitatively, the available transport services are overcrowded, unreliable, and involve long waiting periods. The problem is further worsened by the less allotment of space in the cities of India no matter it's a metropolitan or a small city as compared to other cities worldwide.

Over the long term, however, the demand for public transport services has increased considerably, mainly due to the burgeoning growth of India's cities, both in population and land area. That has increased both in the number and length of public transport trips. The best example for public transport in India is for suburban rail services, because they are publicly owned, centrally administered, and operated throughout the country by Indian Railways. Buses account for a smaller and smaller percentage of total motorized vehicles on India's roads—only 1.1 per cent in 2002. Buses carry over 90 per cent of public transport in Indian cities. Indeed, most Indian cities have no rail transport at all and rely instead on a

combination of buses, minivans, auto rickshaws, cycle rickshaws, and taxis. Even in most of the largest cities, rail transport carries less than a third of public transport passengers.

The only exception is Mumbai, which has India's most extensive suburban rail network, carrying over 5 million passengers a day—58 per cent of total public transport passengers in the region and 80 per cent of total passenger kms. Almost 80 per cent of all trips in Kolkata are by some form of public transport, compared to about 60 per cent in Mumbai, and 42 per cent in both Chennai and Delhi. Differences in land use and roadway supply explain some of the variation. Delhi and Chennai are lower-density, more polycentric, and more spread out than Mumbai and Kolkata. Delhi also has a particularly extensive roadway network, while the supply of roadways in other large Indian cities is much more limited. For example, 21 per cent of Delhi's total land area is devoted to roads, compared to only 11 per cent in Mumbai and 5 per cent in Kolkata. Mumbai and Kolkata also have more restricted space, since both are situated on peninsulas that channel travel and land use development in only a few directions. Such focused travel corridors especially encourage suburban rail use, as in Mumbai. Delhi has no such geographic restrictions and sprawls out in all directions. Thus, Delhi currently relies primarily on auto rickshaws, motorcycles, taxis, and private cars to serve the multi-destination, less-focused travel patterns of its residents.

According to Motor Transport Statistics, the annual rate of growth of motor vehicles in India is around 10 percent during last decade. In 1991 there were 21.7 million vehicles. After 10 years in 2001, this number increased by nearly three times to 55 million. The basic problem is not the number of vehicles in the country but their over concentration in a few selected cities, particularly in metropolitan ones. India, where more than 15 per cent of the world's human population lives, constitutes just 5 per cent of the world's motor vehicle population. As far as cars are concerned, its share is even less than 1 per cent.

Private and public transport vehicles in selected metropolitan cities are shown in Table 3. Out of total vehicles, the share of two wheelers, cars, and taxies account for much higher proportion while the number of buses and other vehicles account for less share in all vehicles.

Table: 3
Vehicles in Selected Cities in India
(As on March 31, 2000)

Metropolitan Cities	Two Wheelers	Cars (including jeeps)	Taxies (including auto-rickshaws)	Buses	Others	Total
Ahmedabad	6167318	1041179	43865	14993	19316	799091
Bangalore	1164204	238374	77375	6380	63362	1549695
Chennai	648118	207860	45016	4409	44223	1149626
Delhi	2184581	869820	104747	37733	226593	3423474
Hyderabad	757684	99314	48898	2539	42189	950624
Jaipur	444889	76133	12513	14362	49760	597657
Kanpur	273208	323212	5252	882	23556	626110
Kolkata	298959	2385560	41946	8586	75995	664046
Lucknow	344268	53069	15454	2816	26779	442386
Mumbai	407306	325473	156261	15414	65226	969680
Nagpur	272734	27573	10666	2788	17478	331239
Patna	184585	40357	16302	3785	30989	276018
Pune	443266	62885	44590	7827	34046	592614

Source: Ministry of Road Transport & Highways, Government of India, New Delhi.

There has been the declining reliance on public transport vehicles, with a corresponding rise in the dependence on personal motor vehicles. The share of public transport vehicles in the total vehicle fleet in India has been declining whereas the share of buses in the total motor vehicle fleet was 11 per cent in 1951, it came down to only 1.1 per cent in 2001 (Table 4).

Table: 4
Share of Buses in Total Motor Vehicles in India

Year	Total Registered Vehicles ('000)	Registered Buses ('000)	Share of Buses to Total (per cent)
1951	306	34	11
1961	665	57	9
1971	1865	94	5
1981	5391	162	3
1991	21,374	331	2
1996	33,786	449	1.3
1997	37,332	484	1.2
1998	41,368	538	1.3
1999	44,875	540	1.2
2000	48,857	562	1.1
2001	54,991	634	1.1

Source: Ministry of Shipping, Road Transport & Highways, Government of India.

Growth of State Transport Undertaking Bus Fleet is shown in Table 5. In order to promote public transport system in urban centres, many cities have launched city bus service. However, a number of growing cities have not launched city bus service for public. There has been almost decline in the number of State Transport Undertaking bus fleet in India except in case of Bangalore and Pune during 2002-2007. Although, there is emphasis on improving public transport system especially modern city bus service on public private partnership model in the cities. The cities like Bhopal, Indore, Surat, Jaipur, Jodhpur, Nagpur, Ajmer, Jalandhar, Ludhiana and Amritsar have also launched city bus service on PPP model.

Table: 5
Growth of STU Bus Fleet

City	STU	Year								
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Growth**
Mumbai	BEST	3269	3155	3075	3075	3074	3069	3075	3081	-0.8 %
Delhi	DTC	4916	4330	4466	2496	2905	3010	3143	2814	-7.7 %

Chennai	CHI-I	2353	2314	2211	2270	2251	2187	2176	2087	-1.7 %
Kolkata	CSTC	814	821	856	800	769	707	659	635	-3.5 %
Ahmedabad	AMTS	752	729	630	410	382	371	545	727	-0.5 %
Pune	PMT	657	664	647	662	697	764	784	752	1.9 %
Chandigarh	DCHNTU	393	395	404	-	-	-	405	404	0.4 %
Bangalore	BMTC	2110	2250	2446	2656	3062	3533	3802	3967	9.4 %

Source: Various STUs

Auto-rickshaws both diesel and CNG based are the preferred mode of public transport in most of the cities in India. However, there is always inadequacy of such vehicles as per the increasing travel and transport demand. The number of auto-rickshaws in selected cities is shown in Table 6.

Table: 6

Number of Auto Rickshaws in Selected Cities

Sl. No	City	Number of IPT vehicles (2005)	No. of IPT Vehicles/ Lakh Population
1	Gangtok	Nil	0
2	Panaji	293	302
3	Shimla	Nil	0
4	Pondicherry	2017	397
5	Bikaner	4125	645
6	Raipur	7478	1040
7	Bhubaneswar	3421	405
8	Chandigarh	7256	751
9	Hubli-Dharwad	8407	868
10	Guwahati	5567	525
11	Amritsar	9903	913
12	Thiruananthpuram	7152	637
13	Madurai	6361	537
14	Agra	4884	357
15	Bhopal	11620	797
16	Kochi	12742	701
17	Patna	16302	888
18	Varanasi	12221	645
19	Nagpur	10666	505
20	Jaipur	12513	467
21	Kanpur	5252	193
22	Surat	19512	631
23	Pune	44590	1062
24	Ahmedabad	43865	739
25	Hyderabad	48898	766

26	Chennai	45016	642
27	Bangalore	77375	897
28	Delhi	104747	756
29	Kolkata	41946	285
30	Mumbai	156261	883

Source: Vehicle Registration Data from Various RTOs, 2005

Improved traffic management is crucially needed in all Indian cities to alleviate the current traffic chaos. India's largest cities have been benefited recently from modest improvements in traffic management through the introduction of more advanced technology and effective enforcement of traffic regulations. In sharp contrast, most medium-size and small Indian cities lack even basic provisions such as stop signs, traffic signals, lane striping, and other regulatory and directional signage. Those basic provisions must be accompanied by strict enforcement of traffic regulations, especially those relating to safety. Clearly, better driver training, traffic signage, uniform regulations, and strict enforcement are needed.

Travel Demand:

Daily trips in the 87 urban centres are anticipated to double from 2286 lakhs to 4819 lakhs during the next 24 years (Table 7). The increase in daily trips is likely to increase more in larger cities as compared to smaller cities.

Table: 7

Category-wise Projected Daily Trips of Selected Cities

City Category	Population	Passenger trips/day (in Lakhs)			
		2007	2011	2021	2031
Category-1 a	<5 lakhs with plain terrain	8.5	10.0	13.4	17.2
Category-1b	<5 lakhs with hilly terrain	7.5	8.8	12.0	15.6
Category-2	5-10 lakhs	263.1	308.3	423.0	558.3
Category-3	10-20 lakhs	427.7	498.2	675.6	871.9
Category-4	20-40 lakhs	183.6	210.4	309.6	433.5
Category-5	40-80 lakhs	403.6	469.8	675.2	868.0

Category-6	> 80 lakhs	992.1	1124.9	1552.4	2054.7
Total		**2286.0**	**2630.4**	**3661.2**	**4819.2**

Source: Ministry of Urban Development, 2009

RITES (1998) has estimated that although the population in class-I cities and above is estimated to grow 2.5 times during 1991-2021, corresponding inter-city travel demand would grow by 3.5 times during the same period. Intra-city travel demand in 1994 was 759 million persons per day. It is expected to grow up to 2511.23 million persons km. per day by 2021 (Table 8). Interestingly, projected share of daily trips by different vehicular modes suggest that largest share of trips would be by public transport followed by cycling.

Table: 8

Projected Travel Demand for Different Categories of Cities

Class of city	Population (Million)	1994	2001	2021	Growth (1994-2021)
A	0.1 - 0.25	103.9	149.43	453.25	4.36
B	0.25 – 0.5	75.89	90.43	309.57	4.08
C	0.5 – 1.0	109.20	148.66	227.23	2.08
D	1.0 – 2.0	94.41	132.07	347.08	3.68
E	2.0 – 5.0	92.08	97.22	270.30	2.94
F	> 5.0	284.34	420.99	903.80	3.18
Total		**759.00**	**1038.8**	**2511.23**	**3.31**

Source: RITES (1998)

The mode share for the six city categories is given in Table 9. The share of public transport is reported to be significantly high in the larger cities however; walk is most preferred mode of travel in the smaller cities. Even the share of two-wheelers in small and medium towns is reported to be significantly high. Overall, the share of public transport accounts for slightly more than 1/4th while about 28 per cent city dwellers walk for travel. The share of two-wheelers including cycles is reported to be slightly more

than 1/4th. The share of cycles is found significantly high in medium sized cities and towns.

Table: 9
Mode of Urban Transport (Percentage)
(2007)

City Category	Population	Walk	Cycle	Two Wheeler	Public Transport	Car	IPT
Category-1 a	<5 lakhs with plain terrain	34	3	26	5	27	5
Category-1b	<5 lakhs with hilly terrain	57	1	6	8	28	0
Category-2	5-10 lakhs	32	20	24	9	12	3
Category-3	10-20 lakhs	24	19	24	13	12	8
Category-4	20-40 lakhs	25	18	29	10	12	6
Category-5	40-80 lakhs	25	11	26	21	10	7
Category-6	> 80 lakhs	22	8	9	44	10	7
National		**28**	**11**	**16**	**27**	**13**	**6**

Source: Ministry of Urban Development, 2008

A comparison of traffic composition in the selected cities is presented in Table 10. It can be observed that composition of traffic has significantly changed across all cities in between 1994 to 2007. It is clear from the table that on an average, the share of fast moving vehicles has increased from 70 to 88 per cent while the share of slow moving vehicles, basically cycles has decreased from 33 per cent to 12 per cent.

Table: 10
Traffic Composition of Vehicles within the Selected Cities

Sl. No	City*	Population (2007) (Lakhs)	Average Share of Fast Traffic (%)	Average Share of Slow Traffic (%)	Population (1994) (Lakhs)	Average Share of Fast Traffic (%)	Average Share of Slow Traffic (%)
1	Shimla	1.85	100	0	1.1	100	0
2	Guwahati	11.92	89	11	5.84	71	29
3	Varanasi	21.37	73	27	10.31	46	54
4	Bhopal	18.73	94	6	10.63	83	17
5	Nagpur	23.61	83	17	16.64	59	41

6	Kanpur	31.22	86	14	20.37	40	60
7	Pune	50.15	89	11 24.	94	79	21
8	Ahmedabad	68.20	92	8	33.12	71	29
9	Kolkata	162.47	88	12	110.22	84	16
	Average		**88**	**12**		**70**	**33**

Source: Ministry of Urban Development, 2008

Government of India had launched JNNURM in 2005 to provide financial assistance to cities for various urban development projects including urban transport. The mission is reform based and aims at strengthening of urban local bodies in selected cities of India. Under JNNURM, rail based metro, BRTS and other projects are being supported in the selected cities. As per information available, rail-based metro system has been developed in the cities of Delhi, Mumbai, Bangalore, Kolkata, Chennai and Hyderabad. Although Metro Rail is becoming the cost effective and most preferred mode of travel in the metropolitan cities and therefore, the new cities are coming forward with their proposals for financial assistance to strengthen their rail-based urban transport. (Table 11).

Table: 11

Urban Transport-Rail Based Metro

City	Length (Km.)	Cost (Rs. Crores)
Delhi	121.26	19251
Mumbai	62.89	18634
Bangalore	33.00	6395
Kolkata	13.77	5068
Chennai	50.00	9347
Hyderabad	66.39	8760

Source: Ministry of Urban Development, Government of India, 2009

Under JNNURM, the projects of road-based urban transport encompassing 329 kms., travel length with the investment of Rs. 2884 crores have been approved by the Ministry in the cities of Pune, Indore, Bhopal, Ahmedabad, Jaipur, Vijayawada, Vizag, Rajkot and Pimpri-Chinchwad (Table 12).

Table: 12
Urban Transport-Road Based BRTS

City	Distance (Km.)	Investment (Rs. Crores)
Pune	101.70	807.13
Indore	11.45	98.45
Bhopal	21.71	237.76
Ahmedabad	58.00	493.32
Jaipur	26.10	219.19
Vijaywada	15.50	152.64
Vizag	42.80	452.93
Rajkot	29.00	110.00
Pimpri Chinchwad	23.00	312.14

Source: Ministry of Urban Development, Government of India, 2009

Under JnNURM, low floor buses have been launched in the Mission cities. These luxurious buses provide clean and safe mode of urban transport for the public in the cities. Even in the state of Uttar Pradesh, 1310 buses have been purchased in selected 7 cities however; only a few are reported to be operational. The low floor buses are being run on public private partnership mode in several cities whereas; in many states, these buses are being managed by State Transport Department or State Transport Undertakings (Table 13).

Table: 13
Status of JnNURM Buses in U.P.

City	Total Buses	Operation of Buses
Lucknow	300	66
Kanpur	300	86
Agra	200	70
Allahabad	150	20
Varanasi	150	42
Meerut	150	34
Mathura	060	37
Total	**1310**	**355**

Source: Rashtriya Sahara, 22nd January, 2010

Under JnNURM, other projects such as widening of roads, construction of flyovers, pedestrianization, and traffic improvement have been supported by the Ministry in selected cities. The cost of such projects is reported to be Rs. 1935 crores. As per information available from the Ministry of Urban Development, Government of India, 40 projects of transport sector with the cost of Rs. 5576.85 crores have been sanctioned to the Mission cities. However, the sanctioned projects in the transport sector account a meager share (Table 14).

Table: 14
Other Transport Projects Under JnNURM

	No. of Project	Total Cost (Rs. Crores)
Roads	12	1161
Flyovers	14	284
ROBs/ RUBs	18	374
Pedestrianisation	2	94
Traffic Improvement	--	23
Total	**--**	**1935**

Source: Ministry of Urban Development, Government of India, 2009

In the coming years, large increases in funding will be required for the enormous investments needed to improve Indian transport systems. Given the many social, environmental, and economic problems caused by private motor vehicles, it would make sense to place most of the financial burden of new transport expenditures on motorists and not on public transport riders, cyclists, and pedestrians. Not only do motorists cause most of India's transport problems, but they are generally much more comfortable than users of public and non-motorized transport modes. Increases in petrol and diesel taxes, vehicle registration and import taxes, and driver licensing fees, and the assessment of higher and more widespread roadway tolls would generate much needed additional revenue for transport investments.

Inadequate Public Transport:

Vast improvements are needed in India's public transport systems, but the necessary funding is not available. Most buses and trains in small and medium size Indian cities are old and poorly designed, inadequately maintained, dangerously overcrowded, undependable, and slow. Public transport systems in India are generally inefficient, due to outdated technology, incompetent management, corruption, overstaffing, and low worker productivity. They require increasingly large subsidies, in spite of extremely high passenger volumes. Expanding and improving public transport systems would seem to be the ideal approach to dealing with the extraordinary high volumes of passenger traffic in densely populated cities. Public transport might also be expected to serve the travel needs of the poor.

Improved public transport services are also necessary. Considerable progress has been made in this area, but much more improvement is needed. For example, suburban rail and metro systems are being expanded and better coordinated in India's largest cities. Most of the old, decrepit, and dangerous busfleet in India are in desperate need of

replacement by modern, safe vehicles. Thus, the main focus of public transport policy must be on improved bus transport, including more and better buses as well as some degree of traffic priority in mixed traffic to increase average bus speeds. In addition, much better coordination is needed between different bus routes as well as between bus and rail services. One recent development is the new high-capacity, express bus system now being proposed for Bangalore and possibly for Delhi as well.

Environmental Impact:

Noise, air, and water pollution are all serious problems in Indian cities, and transport sources contribute to all three kinds. Levels of air pollution concentrations are highest for suspended particulate matter (SPM) and respirable suspended particulate matter (RSPM), which exceed World Health Organization (WHO) air quality standards, as well as official Indian government standards, for all of the cities. Indeed, for India's three largest cities, SPM and RSPM levels are three to four times higher than the WHO's maximum acceptable levels, and among the highest in the world, indicating a very severe health hazard. While levels of CO, NOx, and SOx are generally considered moderate to low in most Indian cities, ozone levels have been increasing in virtually all Indian cities, causing a range of respiratory illnesses and irritation. One important source of air pollution remains the large and mostly old fleet of motorized two-wheelers (motorcycles and scooters) and three-wheelers (auto rickshaws) with highly inefficient, poorly maintained, very polluting 2-stroke engines. Since many auto rickshaw drivers illegally adulterate their gasoline fuel with up to 30 per cent kerosene and 10 per cent lubricating oil, the pollution they generate is yet further increased. Estimated vehicular emission load in selected metropolitan cities is shown in Table 15.

Table: 15
Estimated Vehicular Emission Load in Selected Metropolitan Cities in India

Name of the city	Vehicular Pollution Load (tones per day)					
	Particulates	Sulphur dioxide	Oxide of the Nitrogen	Hydrocarbons	Carbon monoxide	Total
Delhi	10.30	8.96	126.46	249.57	651.01	1046.30
Mumbai	5.59	4.03	70.82	108.21	469.92	659.57
Banglore	2.62	1.76	26.22	78.51	195.36	304.47
Kolkata	3.25	3.65	54.69	43.88	188.24	239.71
Ahmedabad	2.95	2.89	40.00	67.75	179.14	292.71
Pune	2.39	1.28	16.20	73.20	162.24	255.31
Chennai	2.34	2.02	28.21	50.46	143.22	226.25
Hyderbad	1.94	1.56	16.84	56.33	126.17	202.84
Jaipur	1.18	1.25	15.29	20.99	51.28	88.99
Kanpur	1.06	1.08	13.37	22.24	48.42	86.17
Lucknow	1.14	0.95	9.68	22.50	49.22	83.49
Nagpur	0.55	0.41	5.10	16.32	34.99	57.37
Grand Total	35.31	29.84	422.88	809.96	2299.21	3597.20

Source: Central Pollution Control Board, New Delhi, India, 1996

Most of the cities face high level of air pollution caused by motor vehicles. Suspended Particulate Matter levels in the six major metropolitan cities are shown in Table 16. There has been significant increase in the air pollution levels caused by motor vehicle in the most of metropolitan cities over the period of 1993 to 2003.

Table: 16
Air Pollution Levels in Selected Cities

City	SO_2 (mgm/cu.m)			NO_2 (mgm/cu.m)			SPM (mgm/cu.m)		
	1993	1998	2003	1993	1998	2003	1993	1998	2003
Delhi (Nizamuddin)	13.70	15.60	12.20	30.10	35.10	43.30	362	342	315
Mumbai (Bandra)	49.50	15.90	7.70	32.30	14.70	18.70	475	211	219
Kolkata (Lalbazar)	65.10	47.20	18.0	62.00	39.70	75.50	507	283	244
Chennai (Gen. Hospital)	10.30	10.30	6.60	27.10	15.40	7.50	73	131	149

Bangalore (Anand Rao Circle)	–	41.60	10.80	–	28.40	44.90	–	239	198
Hyderabad (Abids)	7.30	7.60	9.70	11.00	22.10	19.50	156	152	139
National Ambient Air Quality Standard (Residential areas: annual average)		60			60			140	

Source: http://www.cpcb.nic.in

Given the sharply rising level of motorization in India, it becomes increasingly important to improve motor vehicle technology and fuels in order to increase energy efficiency and safety while decreasing noise and air pollution. Already, the Indian government has introduced a series of regulations that limit pollution from private cars, buses, and trucks. So far, the most successful measure was the complete phasing out of lead in fuels. The allowable levels of sulfur and benzene in fuels were also reduced. Of course, less-polluting fuels must be accompanied by less-polluting vehicle technology.

Thus, between 1991 and 2000, national regulations for new vehicle emissions reduced allowable levels of carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx). Further improvements are likely by Implementation of Bharat Stage-III emission norms for cars across India from April 2010, while rules in 11 major cities - Delhi/NCR, Mumbai,Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad, Pune, Surat, Kanpur and Agra will be made even tougher. Cars running in those 11 cities have to comply more stricter Euro IV emission norms from 2010. Bharat Stage-IV norms, the Indian version of Euro-IV norms, would be extended to 11 major cities from April 2010. The Department of Road Transport and Highways is in the process of notifying the rules very soon. Government also plans to introduce Bharat Stage III (Euro 3) emission standards before 2010 for two and three wheeler.

Roadway Congestion:

Traffic congestion is probably the most visible, most pervasive, and most immediate transport problem plaguing India's cities on a daily basis. It affects all modes of transportation and all socio-economic groups. Most estimates and impressions suggest rapidly worsening congestion. For example, average roadway speeds for motor vehicles in Mumbai fell by half from 1962 to 1993, from 38 km/h to only 15–20 km/h. In Delhi, the average vehicular speed fell from 20–27 km/h in 1997 to only 15 km/h in 2002. Moreover, the periods of peak congestion in Delhi now last 5 hours from 8:30 to 10:30 in the morning and from 4:30 to 7:30 in the evening. In Chennai, average speed is 13 km/h, and in Kolkata it ranges from 10 to 15 km/h overall but falls to only 7 km/h in the center.

Congestion within vehicles unquestionably impairs safety, with some passengers falling off overcrowded vehicles, since many are forced to ride on the roofs or hang onto the sides of vehicles that often have no shutters for the doors and windows. The overcrowding of pedestrians, cyclists, and street vendors on the shoulders of roads also creates safety problems, since they often spill over onto the roadway itself. Uncontrolled on-street parking further exacerbates congestion and safety problems by narrowing the available right of way for moving traffic. Perhaps the most obvious cause of congestion is the rapid increase in travel demand, especially of motorized travel, compared to the very slow growth in transport infrastructure. Slow non-motorized modes such as bicycles, hand-pulled and cycle-drawn rickshaws, pedestrians, and animal-drawn carts obviously slow down faster motorized modes such as cars, trucks, buses, and auto rickshaws.

Given the many new roadway projects in recent years—and massive expansions likely in coming years—it will be essential to design new roads to accommodate the needs of buses, cyclists, and pedestrians. Unfortunately, most recent roadway projects have ignored the needs of non-motorists and focused instead on serving the sharp growth in private

car ownership and use. Wherever feasible, new roadways should provide bus lanes to speed up public transport as well as cycle paths and walkways to improve safety for non-motorists. The 50 per cent Central Government funding of cycle and pedestrian paths proposed by the National Urban Transport Policy could help fund those parts of the new roadway facilities. Moreover, the Central and state governments should specifically require that any new roadways accommodate non-motorists either on the same or parallel facilities.

Traffic Injuries and Fatalities:

A large number of deaths in developing world are due to road accidents. Apart from humanitarian aspect of the problem, road accidents cost countries of developing world at least one percentage of their GNP each year. The proportion of commercial and public service vehicles involved in road accidents are often much greater. Pedestrians and cyclist are often the most vulnerable. During the year 2002, nearly 85,000 people died due to road accidents in India. Fatality risk (defined as, road accidental deaths per million population) in India is increasing over the years, from 64 in 1990 to 80 in 2002. During the same period, road accidental deaths have increased at a rate of 3.8 percent per annum while the population of the country has increased by only 1.8 percent per annum. Although fatality rate (defined as, number of fatalities per 10,000 vehicles) in India is declining over the years, it is still quite high in comparison to developed world.

It is alarming to note that more than 38 people die per week due to road accidents in Delhi alone. Between the year 1990 and 2000, number of road accidental casualties has increased in almost all the metropolitan cities in India. Analysis shows that except Kolkata, Mumbai, and Nagpur all cities are showing very high growth rate in fatalities over the period. Accident severity index (defined as, number of fatalities per 100 accidents)

is also very high for all the cities other than Ahmedabad, Bangalore, Kolkata, and Mumbai.

Road traffic clashes and injuries are increasing in India due to increase in vehicle population and traffic density. Road accidents in India are shown in Table 17. There has been phenomena increase in the number of road accidents during 1997-2007. Similarly, there has been significant increase in the road accident injuries increased over the period. The burden of road traffic injuries in India is relatively high in its metropolitan cities. In 2007, fatality risk in 21 out of 35 metropolitan cities was higher than the all India average. On an average, the fatality risk in metropolitan cities is 11.7 fatalities per 1 lakh population, which is higher than the national average of 10.1 per 1 lakh population.

Table: 17
Road Accidents in India (1997-2007)

Year	No. of Road Accidents (in '000)	No. of Road Accidental Injuries (in '000')	No. of Road Accidental Deaths (in '000')	Accident Risk (No. of Accidents Per 1,00,000 People)	Accident Severity Index (No. of Fatalities Per 100Accidents)	Fatality Risk (No. of Fatalities Per 1,00,000 People)	Fatality Rate (No. of Fatalities Per 10,000 Vehicles)
1997	290.9	309.5	74.2	30.5	25.5	7.8	19.9
1998	300.0	320.5	76.7	30.9	25.6	7.9	18.5
1999	306.4	324.5	81.0	31.1	26.4	8.2	18.1
2000	308.3	340.2	80.0	30.8	25.9	8.0	16.4
2001	323.7	353.1	80.3	31.5	24.8	7.8	14.6
2002	329.4	382.9	81.9	31.4	24.9	7.8	13.9
2003	336.4	398.2	84.4	31.5	25.1	7.9	12.6
2004	361.3	413.9	91.4	33.3	25.3	8.4	12.6
2005	390.4	447.9	98.3	35.4	25.2	8.9	12.3
2006	394.4	452.9	105.7	35.2	26.8	9.4	12.0
2007	418.6	465.3	114.6	36.8	27.4	10.1	11.8

Source: Accidental Deaths and Suicides in India, 1997-2007, published by the National Crime Records Bureau, Ministry of Home Affairs, Government of India, New Delhi

There has been increasing trend in the road fatalities and accidents in metropolitan cities during 1990 to 2005. Maximum number of road

accidents are recorded in Mumbai followed by Delhi. During 2005, road accidents per 1 lakh population was reported high in the cities of Panji, Raipur, Bhuneshwar, Trivandrum, Bhopal, Kocchi, Pondicherry, Mumbai, and Jaipur (Table 18).

Table: 18

Road Accidental Casualties in Selected Metropolitan Cities in India

Metropolitan Cities	1990		1997		2005	
	Fatalities	Accidents	Fatalities	Accidents	Fatalities	Accidents
Ahmedabad	195	2873	239	3229	467	2460
Bangalore	562	7629	704	8722	833	7575
Chennai	507	5877	749	5171	1055	4499
Delhi	1670	7697	2342	10957	2023	9351
Hyderabad	276	1412	377	2108	1196	6149
Jaipur	235	1062	303	2022	495	2681
Kolkata	463	10911	471	10260	484	3751
Mumbai	400	25331	401	27421	787	21678
Nagpur	166	1139	387	1496	246	1628
Pune	275	1387	320	2687	216	1477

Source: Road Safety Cell, State Transport Authority, Cuttack, Orissa, India, March, 2003. Compendium on Road Accidents-2003

Traffic crashes in Indian cities pose a severe public health problem resulting each year in about 20000 deaths, 1.2 million serious injuries and 5.6 million minor injuries. The number of traffic fatalities has increased more than 5 times since 1971. Even the population growth in India is reported to be low than the road accident rate. Fatalities per million populations were reported to be 77.89 during 2001 while it was only 27.36 during 1971. However, fatalities per 1000 vehicles have come down from 8.04 in 1971 to 1.45 in 2001 (Table 19).

Table: 19

Number of Vehicles, Population and Road Facilities in India

Year	Vehicles (millions)	Population	Fatalities (1000s)	Fatalities per 1000 vehicles	Fatalities per million population
1971	1,865	548,159,652	15	8.04	27.30
1975	2,472	625,246,123	16.9	6.84	27.03
1981	5,391	683,329,097	28.4	5.27	41.56
1985	9,17	772,196,737	39.2	4.27	50.76
1991	21,374	843,930,861	56.6	2.65	67.07
1992	23,507	861,693,859	59.7	2.54	69.28
1993	25,505	879,279,448	60.6	2.38	68.92
1994	27,66	897,223,927	64	2.31	71.33
1995	30,295	915,534,620	70.7	2.33	77.22
1996	33,551	934,219,000	71.9	2.14	76.96
1997	37,231	949,200,000	75	2.01	79.01
1998	41,361	965,600,000	80	1.93	82.85
1999	44,857	1,000,848,550	82	1.82	82
2000	48,857	1,016,118,000	78.9	1.61	77.65
2001	54,991	1,027,015,247	80	1.45	77.89

Source: Ministry of Road Transport and Highway (2003)

In the state of Uttar Pradesh, 17879 road accidents were reported in 2004 in which 9463 persons were killed and 12456 persons were injured. It is expected that by the year end of 2011, there will be 19250 road accidents. The economic loss due to road accidents in the state of Uttar Pradesh was estimated Rs. 8939.5 million in 2004 which is likely to increase in the coming years (Table 20).

Table: 20

Road Accidents in Uttar Pradesh

Year	Registered Vehicles ('000')	Road Accidents	Persons Killed	No. of Injured	Economic Loss (Rs. Million)
1995	2544	--	--	--	--
1996	2977	16475	8111	--	8237.5
1997	3164	16648	8741	--	8324.0
1998	3775	17631	8201	--	8815.5

1999	4027	18116	9984	--	9058.0
2000	4627	16644	8187	12055	8322.0
2001	4921	20473	9654	13256	10236.5
2002	5171	20684	9726	13152	10342.0
2003	5928	14286	7845	9348	7143.0
2004*	6423*	17879	9463	12546	8939.5
2011	9079	19250	--	--	9625.0
2021	13213	20668	--	--	10334.0

Source: PWD, Uttar Pradesh Government, Lucknow

The share of road accidents in total accidental fatalities in Agra (82 per cent), Lucknow (78 per cent), Varanasi (53 per cent), Meerut (47 per cent) and Kanpur (42 per cent) is far higher than the all India average (33 per cent). Road accident fatality risk has been reported much higher in the cities of Agra, Meerut, Faridabad, Vijayawada, Jaipur, Lucknow, Vishakhapatnam, Kanpur and Coimbatoor. Fatality risk in U.P. metropolitan cities during 2007 was reported 23.1 which is much higher than the national average of 10.6 (Table 21).

Table: 21

Fatality Risk in UP's Metropolitan Cities in 2007

	Population (In Million)	**Number of Fatalities**	**Fatality Risk (No. of Fatalities Per 1,00,000People)**
Agra	1.32	510	38.6
Allahabad	1.05	104	9.9
Kanpur	2.69	545	20.2
Lucknow	2.27	517	22.8
Meerut	1.17	354	30.3
Varanasi	1.21	218	18.0
Metropolitan Cities of U.P.	9.71	2247	23.1
Metropolitan Cities of India	107.88	12664	23.1
Metropolitan Cities of Rest of India	98.17	10417	10.6
Uttar Pradesh	188.54	12555	6.7
India	**1136.55**	**114590**	**10.1**

Source: Accidental Deaths and Suicides in India, 2007, published by the National Crime Records Bureau of Home Affairs, Government of India, New Delhi.

Involvement of bicycles and pedestrians in road accidents for some of the selected cities for the year 2005 is shown in Table 22. Pedestrian related accidents are higher compared to bicycles related accidents across all cities. Pedestrian involvement on road accidents range average 20 per cent while bicycles are involved in 5 per cent of the road accidents (Table 22).

Table: 22

Share of Bicycles and Pedestrians in Road Accidents (2005)

Sl. No	Name of the city	Bicycle (per cent) Accidents	Pedestrian (per cent) Accidents
1	Agra	4	6
2	Bhopal	2	4
3	Kochi	11	14
4	Nagpur	14	25
5	Jaipur	2	7
6	Kanpur	10	7
7	Surat	4	43
8	Pune	3	13
9	Bangalore	5	44
10	Ahmedabad	10	0
11	Chennai	2	5
12	Hyderabad	5	19
13	Kolkata	5	64
14	Delhi	6	24
15	Mumbai	3	35

Source: Ministry of Urban Development, Govt. of India

One of the most crucial needs is the provision of improved rights of way for pedestrians and cyclists. Throughout the world, these non-motorized travelers are among the most vulnerable roadway users. Thus, Western European cities generally provide them with a wide range of separate facilities such as wide sidewalks (pavements), crosswalks, cycle

paths, ped/bike traffic signals, intersection modifications (bulb-outs, raised surface, special lighting), car-free zones, and traffic-calmed neighborhoods. By comparison, Indian government officials and planners have largely ignored non-motorists— although they account for about half of all trips made—and thus expose them to intolerably high levels of traffic danger. It is very rare indeed to find any special provisions for pedestrians and Cyclists. While narrow roads, densely built central cities, and lack of funding obviously hinder the allocation of scarce roadway space to cyclists and pedestrians, the real problem is government priorities that favor motorized traffic. Since the powerful elite are more likely to drive private cars, they have strongly favored highway projects over improvements for pedestrians and cyclists. Policy makers rarely consider the needs of the non-motorized urban poor.

Causes of Road Accidents:

Road accidents are caused by several factors, viz., human, automobile, geographical, Infrastructure, information and legal. It is generally acknowledged that human error is an underlined cause of almost all accidents. It is involved over 90 per cent of road accidents while a small proportion of accidents may be directly attributed vehicle defects or faults in road design or maintenance.

The vehicle factors responsible for road accidents include worn tyres, poor breaks and non-functional light, overloading of public service vehicles and tracks, use of unsuitable vehicles like picups for transport of passengers and poor praiseworthiness design.

Road factors responsible for road accidents are related with high or no speed limits and poor visual guidance, poorly controlled intersections and uncontrolled access, narrow roads, poor alignment standards and poor maintenance of pavements and shoulders and steep ditches and hard objects near the road.

Traffic and environmental factors include mix of motorized and non-motorized vehicles, pedestrians, poor traffic management and enforcement of traffic codes, darkness and inclement weather conditions and inadequate emergency medical services.

Economic pressure factors have also become more important following the liberalization of road transport services, as intense competition for passengers have resulted more speeding and reckless driving of the public service vehicles. Moreover, with the globalization and economic liberalization, there is increasing trend of automobiles having speedy pickups with high speed suitability of vehicles, though conditions of roads do not support it. Thus, there will be increasing demand for financial resources for catering to the imperatives of road safety measures.

Road Safety Measures:

Road safety measures in India vary from state to state and within the state from district to district and within a district from one department to another department. The states like Karnataka, Kerala, Tamil Nadu have performed well in road safety measures while states like Delhi, Tamil Nadu, Rajasthan and Haryana mobilized substantial amount of resources for road safety measures.

Road safety being a multi-sectoral activity, its functional responsibility lies with many key sectors associated with the road safety, structural conditions of roads and their maintenance, emergency medical care and rehabilitation, justice, finance, information, education and training, law enforcement and traffic regulations. In the State of Uttar Pradesh, there are six departments/agencies which have identified as the agencies delivering road safety related sub tasks. These are PWD, Home (Traffic), Transport, Urban Development, Medical and Public Health & Education.

PWD is responsible for formulation of road network projects, construction, maintenance, physical marking of extent of encroachment of road space, etc. Home (Traffic) Department is entrusted with the task of

enforcement of intra city, intercity, inter-district, inter-state traffic on roads and highways; checking of vehicles and drivers for compliance of Motor Vehicle Acts, & Rules; road safety regulations; rescue, first aid and transport of accident victims to emergency and trauma care facility; filing of FIR, accident investigation and pursuing prostitution in road accident cases.

Transport Department is responsible for registration of different types of vehicles, licensing of different categories of drivers, collection of road tax and fee, passengers of goods transport, issuing of permits for special purpose and specific destinations commercial vehicles; checking of compliance of rules and regulations on Motor Vehicle Act and road worthiness of vehicles; planning and operation of road transport system; road safety education.

Urban Development is supposed to prevent and remove encroachment; planning of construction of new roads and maintenance of roads within their respective areas of jurisdictions; provisions and maintenance of parking, pavement and pedestrians space; planning, installation and maintenance of traffic signaling, infrastructure and traffic regulation, etc. Medical & Health Department is entrusted with post-accident emergency and trauma care of the accident victims. Education Department is supposed to provide road safety education to school and college going students.

Measures related to road safety in the state are mainly concern with education, awareness creation of road users and installing road safety signs on sensitive places. There is lack of coordination among the different organizations, departments and officials. There is also lack of mechanism for creating data base related to road accidents, deaths and persons injured. The task of road safety measures among the different stakeholders is highly fragmented with responsibilities defused amongst constituting sub-sectors viz., ambulances, pre-hospital care, transport authority, driver and vehicle licensing, enforcement of traffic laws and regulations,

compliance of Motor Vehicle Acts, etc. Post-accident critical cares of accident victims are highly inadequate in the state. The budgetary provision for road safety financing is grossly inadequate and therefore, resource mobilization for financing of road safety measures is imperative.

Under the Constitution of India, responsibility for urban development rests with the State government. Therefore, the responsibility of urban transport is also lies with state government. Yet, the Central Government plays an important role in many respects. The main legislation that regulates road transport, namely, Motor Vehicles Act is administered by the Central Government. Production and quality specification of petroleum fuels rests with central government agencies. Indian Railways works under Central Government. The automobile industry is regulated by the Central Government which lays down motor vehicle specifications. Finally, the Central government alone has the financial muscle to support investment in mass transit infrastructure. The budget requirement for urban transport during 11th Five Year Plan is shown in Table 23.

Table: 23

Urban Transport Requirement of Funds According to Eleventh Five Year Plan

Details	**Rs in Crores**
Capacity Building	100
0.1 - 0.5 Million cities	3,700
0.5 - 1 Million cities	4,000
1 - 4 Million cities	11,600
4 Million plus cities	6,000
MRT for Mega-cities	32,000
Total	**57,400**

Source: 11th Five Year Plan, Government of India

There is no clear allocation of the subject of urban transport to a particular department with the state. While in some states, the transport department undertakes urban transport planning, in others; it is done by the department responsible for urban development or municipal

administration. The entire gamut of activities require to manage and regulate the city transport system can be divided into three levels. First, the strategic and policy functions that will have to be perform directly by a government department. These are followed by regulatory and short term planning functions, which can be discharged by a government department or by a especially constituted by public agency. Finally, the actual operation of transport services which can be undertaken by public agency or even private agency (Table 24).

Table: 24

Responsibilities of the Government and Public Agency

Level 1	Strategic and Policy functions	• Strategic planning • Policy formulation • Capital financing
Level 2	Regulation of commercial issues Health and Safety regulation	• Fixation of fares/tariffs • Monitoring quality of service • Setting standards • Ensuring adherence to safety standards • Ensuring adherence to environmental standards
	Procurement and provisioning of public transport	• Network and route design • Identification of demand • Franchising/route allocation • Planning and provisioning of services • Contract monitoring
Level 3	Supply of common infrastructure and other services	• Inter-modal coordination • Passenger information systems • Data collection and management • Dispute resolution • Management of common infrastructure • Public relations • Security services • Management of common ticketing facilities • Management of revenue sharing arrangement between operators
	Operation of services	• Operation of publicly run bus services • Operation of privately run bus services • Operation of the Rail based systems

Source: India Infrastructure Report, 2006

Regulatory and management responsibility is spread over a multiplicity of agencies that not only span several ministries but also multiple jurisdictions. Unlike inter-city transport, intra-city transport requires several functions to be performed in a well-coordinated manner. Unfortunately these are performed by multiple agencies, some working under Central Government and other under the state government with responsibilities impacting urban transport (Table 25).

Table: 25

Agencies Responsible for Different Aspects of Urban Transport

Central government		State government	
Agency	**Responsibility**	**Agency**	**Responsibility**
Ministry of Railways	Technical planning of urban rail transit systems	Department of Transport	Licences and controls all road vehicles, inspection of vehicles, fixing motor vehicle tax rates
Ministry of Surface Transport	Administer the Motor Vehicles Act and notify vehicle specifications as well as emission norms	Public Works Department	Construction and repair of major roads
Ministry of Urban Development	Overall responsibility for urban transport policy and planning	Local municipality	Management of smaller roads and traffic lights, licensing and control of non-motorized vehicles, clearing of encroachments, provision of water, sewerage and drainage services
Ministry of Environment and Forests	Recommend emission norms for motor vehicles and administer the Environment Protection Act	Police	Enforcement of traffic laws and prosecuting violators
Ministry of Finance	Responsible for fiscal policies	Department of Environment	Monitoring air quality
Ministry of Industries	Responsible for the Industrial Policy	Land Revenue administration	Allocation of land and land acquisition
Ministry of Petroleum	Controls all the oil refining companies	State Transport Undertaking	Operation of bus services
Planning Commission	Provision of funds for capital investments	Development Authority	Land use planning and regulating the growth of a city

Source: Agarwal (2002)

Most Indian cities have failed to address transportation problems effectively, mainly because they are not equipped with the appropriate

institutional capacity and required financial resources. This is because functional responsibilities for urban transport are fragmented among central, state, and local level governments where no one entity is in charge of overall coordination. Management of urban areas is primarily a responsibility of the state governments in India. However, several key agencies play an important role in urban transport planning work under the central government, with no accountability to the state or local government. Central government is directly involved in the provision of suburban rail service through Indian Railways in four megacities.

The Indian Ministry of Road Transport & Highways is responsible for national highways, including the stretches within urban areas, and local governments have no role in the operation and management of these stretches though they are heavily used for urban transport. State governments independently control local land-use policies, motor vehicle and sales tax rates, bus transport systems, and policies for private sector participation. Most of the local governments at the municipal level rely heavily on capital grants from the states for almost all infrastructure projects.

Although Urban Local Bodies (ULBs) have been empowered by the Constitution (74th Amendment) Act of 1992 to assume responsibilities for development of urban transport, most of them do not have adequate power to raise financial resources. Their revenue comprises mainly intergovernmental transfer from the state, property tax revenues, and octroi. The first two are the major sources of revenue for most ULBs. However, octroi is a major source of revenue for some of the ULBs in the state of Gujarat, Maharashtra, Punjab, and Manipur. ULB revenues are barely sufficient for salaries and current expenditures, and most capital investments are funded through borrowing, often from the state Urban Infrastructure Development Corporations (UIDCs). Revenues from user charges imposed on publicly provided infrastructure services are minimal.

Need For National Policy:

India has however attempted twice to evolve a transport policy. The first in 1966 when the dreams of independence were still alive and the second in 1980 under the shadow of zooming oil price. The silver lining however was the establishment of State Transport Undertakings (STU) which in 1960s and 1970s did an enormous service in linking up towns and villages across the country particularly in the western and southern part. Whatever the influence the public had was not so much for improving the quality of transport but in reducing the fares which further added to inadequacy and inefficiency.

The political and bureaucratic setup was done little to introduce professionalism without which the planning and regulatory measures can only be inadequate, inefficient and at the most half baked. The new trends/ developments in recent days are the new commercial development in the distant suburbs.

Although the responsibility for management of urban areas including urban transport rests with the State governments, a Central policy for managing urban transport is considered necessary for the following reasons:

- Several key agencies that would play an important role in urban transport planning work under the Central government, with no accountability to the State government.
- Several Acts and Rules, which have important implications in dealing with urban transport issues, are administered by the Central Government.
- A need exists to guide State level action plans within an overall framework.
- The launching of the JNNURM has provided a timely platform for providing significant financial support from the Central Government for investments in urban transport infrastructure. As such, this offers

an opportunity for a meaningful national policy that would guide Central financial assistance towards improving urban mobility.

- A need exists to build capacity for urban transport planning as also develop it as a professional practice.
- A need exists to take up coordinated capacity building, research and information dissemination to raise the overall level of awareness and skills.

Urban Transport Policy, 2006:

The objective of this policy is to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities. This is sought to be achieved by:

- Incorporating urban transportation as an important parameter at the urban planning stage rather than being a consequential requirement.
- Encouraging integrated land use and transport planning in all cities so that travel distances are minimized and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved.
- Improving access of business to markets and the various factors of production.
- Bringing about a more equitable allocation of road space with people, rather than vehicles, as its main focus.
- Encourage greater use of public transport and non-motorized modes by offering Central financial assistance for this purpose.
- Enabling the establishment of quality focused multi-modal public transport systems that are well integrated, providing seamless travel across modes.

- Establishing effective regulatory and enforcement mechanisms that allow a level playing field for all operators of transport services and enhanced safety for the transport system users.
- Establishing institutional mechanisms for enhanced coordination in the planning and management of transport systems.
- Introducing Intelligent Transport Systems for traffic management.
- Addressing concerns of road safety and trauma response.
- Reducing pollution levels through changes in traveling practices, better enforcement, stricter norms, technological improvements, etc.
- Building capacity (institutional and manpower) to plan for sustainable urban transport and establishing knowledge management system that would service the needs of all urban transport professionals, such as planners, researchers, teachers, students, etc.
- Promoting the use of cleaner technologies.
- Raising finances, through innovative mechanisms that tap land as a resource, for investments in urban transport infrastructure.
- Associating the private sector in activities where their strengths can be beneficially tapped.
- Taking up pilot projects that demonstrate the potential of possible best practices in sustainable urban transport.

The objectives of this policy would be achieved through a multi-pronged approach that would revolve around the measures given below:

- Integrating land use and transport planning
- Equitable allocation of road space
- Priority for using public transport system
- Improving quality and suitable pricing of public transport
- Use of improved technologies for public transport
- Use of integrated public transport systems
- Priority to non-motorized transport systems
- Adequate parking for motorized and non-motorized vehicles

- Addressing legal and administrative issues
- Capacity building of institutions and personal
- Use of cleaner technologies
- Innovative financing mechanisms and promotion of public private partnership mode

Service Level Benchmarking:

The challenges of the urban sector in India are growing rapidly, and government agencies at various levels are taking steps to address the gaps in service delivery. One of the important steps towards this is introduction of appropriate systems for information management, performance monitoring, and benchmarking. Benchmarking is now well recognized as an important mechanism for introducing accountability in service delivery. It can help Urban Local Bodies (ULBs) and utilities in identifying performance gaps and effecting improvements through the sharing of information and best practices, ultimately resulting in better services to people. It provides (1) Common minimum framework for monitoring and reporting on service level benchmarks. (2) Guidelines on how to operationalize this framework in a phased manner.

Ministry of Urban Development is intended to address institutional and operational aspects for ensuring long term sustainability of the benchmarking activity. Accordingly all JNNURM mission cities are advised to undertake the process of service level benchmarking. In addition, the initiative will facilitate development of Performance Improvement Plans using information generated by the benchmarking exercise. It will address both, performance monitoring for internal decision making and reporting to higher levels of government and external stakeholders.

System for measuring performance of urban transport activities and taking further action on them has not been institutionalized in urban agencies. It is therefore important that the basic minimum standard set of performance benchmarks are commonly understood and used by all

stakeholders. Depending on the specific needs of a city, performance parameters can be defined and used to improve the quality of urban transport.

The following areas need to be focused for the assessment of overall level of service:

- Quality and Financial sustainability of a Public transport
- Pedestrian / NMT safety and infrastructure facilities
- ITS facilities in a city
- Land use transport integration
- Parking system and Pollution levels in a city

To facilitate comparison between cities and changes in performance over time, it is important that the performance levels are monitored against set benchmarks. It is in this context, that the MoUD has initiated an exercise to define Service Level Benchmarks (SLBs).

Service level performance benchmarks have been identified for the following areas of intervention:

- Public Transport in a city
- Pedestrian Infrastructure facilities
- Non Motorized Transport facilities
- Usage of Integrated Transport System (ITS) facilities
- Travel speed along major corridors
- Road Safety
- Availability of Parking facilities
- Pollution levels
- Land Use Transport Integration
- Financial Sustainability of Public Transport

Role of Intelligent Transport Systems:

Road systems all over the world are getting more and more congested and unsafe. Traditional approach to increase the capacity of

roads by providing additional lanes cannot go on indefinitely. The only option is to maximize the use of existing available infrastructure and get optimum returns from new investments on highway building. Intelligent Transport Systems (ITS) provide opportunities to achieve such objects. In order to achieve better safety and decrease the number of accidents in injuries and fatalistic, new approaches to high way safety are required. ITS technologies can be applied to reduce traffic exposure, reducing the probability of crash occurrence, and minimizing the consequences of a crash.

Intelligent Transport System is a new traffic concept linking people, roads and vehicles in information oriented multimedia society. Smooth and comfortable driving using real time information about traffic and road conditions and availability of services are possible due to adaptation of intelligent transport system. Rapid progress in safety with the development of auto drive technology is possible by adopting the new information technology in transport sector. Dramatic improvement in transportation efficiency by providing information to commercial vehicles and introducing automatic control is possible with the adoption of intelligent transport system. It will also help in eliminating traffic congestion and reducing environmental load.

Problems:

- Growth of road infrastructure in the country has not kept pace with the revolution in automotive sector.
- Private vehicles ownership and use is growing rapidly in most cities across the country.
- There is decline in public transport vehicles usage and Vehicle ownership ratio in the cities is growing at an alarming rate manifestation in congestion, rising accidents and incidents of road range.
- Increasing dependence on personalized modes of transport could also be attributed to the inadequate level of investments in public transport.

- Share of mass transport varies from 10-80 per cent in metropolitan cities. Two wheelers accounted for 19 per cent of share in 1990-91 which increased to 35 per cent in 2000-01.
- Traffic congestion is growing continuously resulting in the operating speed reducing to around 10 km./hr in most of the cities/towns.
- The burden of road traffic injuries in India is relatively high in its metropolitan cities.
- Terminal facilities and model interchange facilities are high inadequate in most urban areas.
- Absence of adequate on street/off street space parking space results in vehicles spilling on to main carriage way increasing congestion.
- Automotive emissions of gases are responsible for about 70 per cent of air pollution.
- There is inadequate emphasis on land use planning for managing urban transport.
- There is lack of resources for financing road safety measures.

Transport systems in most of the Indian cities are under the pressure of economic growth on the one hand and under-investment on the other. Resolving this is therefore the highest priority of urban authorities. An integrated transport strategy, which should be socially, economically, and environmentally acceptable, has to be evolved and implemented.

Urban transport plans should especially emphasize public transport systems. As far as public transport systems in Indian cities are concerned, dedicated city bus services are known to operate in 17 cities only and the rail transit exists only in three cities (i.e., Mumbai, Chennai, and Kolkata) out of 35 cities with populations in excess of one million. Very few urban bus transport systems in India have been able to keep pace with the very rapid and substantial increases in travel demand of the past few years. Bus services have deteriorated over the years, and their efficiency and quality have further been reduced.

There is a need for a great variety of modes of public transport. Given the opportunity, people reveal widely divergent transport preferences, but in many places city authorities favor a basic standard of bus services provided by closely controlled large undertakings. This approach is often justified by certain misconceptions. First, it is said that there are great economies of scale in the size of the firms providing bus services. Second, it is often thought to be in egalitarian to provide special services such as premium or guaranteed seats or express buses in return for higher fares. In other words, variety is usually curbed.

Way Forward:

- Efficient and reliable urban transport systems are crucial for India to sustain a high growth rate and alleviate poverty. The urban transport problems in India are growing acute mainly because of rapid motorization. The major challenge for urban transport agencies in India is how to improve the current urban transport situation, or at least prevent it from deteriorating it further. In order to address these lacunae, it is imperative to develop medium term and long term strategies so as to bring in large scale reforms in this sector. There is imperative need to expand the transport infrastructure network.
- Traffic management is necessary to reduce congestion and pollution. In the densely populated cities, operation of tram may be more effective however; there should be ban of motorized vehicles on such roads during the peak hours in order to improve the efficiency of tram and also increasing its usage.
- It is the need of hour that judicious land use planning should be ensured and proper space for transport management in the cities and towns be allocated in the master plans. Public transport may be improved by promoting metro rails, inter-cities and other local trains

in the metropolitan cities. It will cater the emerging needs of commuters and the city dwellers.

- Similarly, public city bus service should be promoted on public private partnership mode however; emphasis should be given to low tariff bus services so that the poor and low income people may afford such services. Preferential treatment of buses and reservation of lanes for them is also called for.
- There should be more emphasis on promoting non-motorized vehicles particularly the usage of cycles through providing incentives by the municipalities and other para-statal agencies. The municipalities and development authorities need to allocate and develop proper land and space for parking and servicing of bicycles. The cycle owners should also be encouraged through providing them some monetary incentives or concessions in terms of free parking and servicing facilities at major points in the city.
- The shared taxi/car service may also be introduced in the cities. It will promote the usage of share taxi or car by the commuters and the city dwellers while they will be discouraged to use their own vehicle for the travel purposes due to lower tariff charges.
- Transport strategy should support the following points:
    - Improve the efficiency and effectiveness of city's transport systems;
    - Promote public transport system and reduce the need to travel by personalized modes;
    - Improve public transport systems and its efficiency;
    - Promote non-mechanized and non-motorized vehicles through creating separate way on roads to them; and also encouraging green modes;
    - Promote clean energy and technologies of transportation;

- Optimization of existing transport infrastructure and give precedence to low cost and affordable technology;
- Establish a unit of urban transport or Mass Rapid Transport System at the Department of Urban Development and its effective functioning;
- Promote the health of people by encouraging more walking and cycling, and also protected natural and built environment;
- Create Road Safety Fund for financing road safety measures.

- Integration of land use and transport planning is imperative. Integrated master plan needs to internalize the features of sustainable transport systems. In developing such plans, attention should also be paid to the future growth of the city and transport and travel demand. Equitable allocation of road space is imperative in order to reduce the encroachments and ensure road safety to non-motorized modes.
- Priority to the use of public transport is given. Proper pricing of public transport, appropriate technologies for public transport, financing of special purpose vehicles and discouraging ownership of personalized modes of travel may be ensured through Urban Transport Policy.
- Priority to non-motorized transport is imperative however, safety concerns of cyclists and pedestrians have to be addressed by encouraging the construction of segregated rights of way for bicycles and pedestrians. The government should give priority to the construction of cycle tracks and pedestrian path under JNNURM to enhance safety and thereby enhance use of non-motorized modes.
- Proper place for parking of motorized and non-motorized vehicles is needed in cities. The government would be required to around the building bye-laws so that adequate parking space is available in cities.

- Urban transport plans should emphasize on bus transport system. Introducing variety of bus transport services is essential while improving the efficiency of bus transport operation is called for.
- Restraining the use of polluting vehicles and fuels be ensured through use of market based instruments to promote cleaner technology and fuel.
- Tightening vehicle emissions standards and inspection and maintenance programmes may be useful in mitigation of vehicles pollution.
- Road infrastructure improvement measures like new road alignments, hierarchy of roads, provision of service roads, by passes, ring roads, bus ways, wide medians, inter section improvements, construction and repair of footpaths and roads, removal of encroachments etc. should be introduced in million plus cities.
- Car sharing may be encouraged through affinity groups, large employers, transit operators, neighbourhood groups, etc. It will reduce the costs of vehicle travel to the individual while it will also reduce traffic congestion and pollution.
- Urban institutions need strengthening. There is pressing need to empower the urban local bodies in raising resources for development projects, and coordinating activities of urban transport management.

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