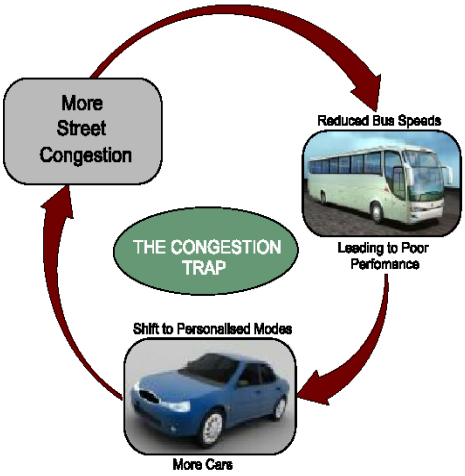
Executive Summary

The Urban Transport Environment in India

Although circumstances differ across cities in India, certain basic trends which determine transport demand (such as substantial increase in urban population, household incomes, and industrial and commercial activities) are the same. These changes have exacerbated the demand for transport – a demand that most Indian cities have been unable to meet. The main reason for this is the prevailing imbalance in modal split besides inadequate transport infrastructure and its sub-optimal use.



Public transport systems have not been able to keep pace with the rapid and substantial increases in demand over the past few decades. Bus services in particular have deteriorated and their relative output has been further reduced as passengers have turned to personalised modes and intermediate public transport (such as three-wheelers and taxis), adding to traffic congestion which has had its impact on bus operations.

The worrying factor is car ownership in India is still significantly lower than what is in a developed city. The Indian economic boom has in its wake provided a great opportunity for an urban dweller to acquire personalized modes which he has taken to with glee given that the public transport system in every city without an exception has fallen short of meeting the increasing demand and expectation level. The urban road chaos is increasing day by day with ever increasing car ownership. Infrastructure shortages are increasingly showing their ugly arm with traffic snarls and grid locks.

Unless problems are remedied, poor mobility can become a major dampener to economic growth and also cause quality of life to deteriorate. If we let things lie as they are,the future of the urban area in India looks bleak. Streets could well

become parking lots. The dent this may have on the econimics of India is unthinkable. The National Urban Transport Policy (April 2006) has been set out to tackle urban mobility issues to ensure a safe and sustainable urban mobility in the coming decades.

Need for the Present Study

A similar transport study, " Traffic and Transportation Policies and Strategies in Urban Areas in India" was conducted in 1994 to establish the urban transport scenario and forecast the anticipated issues that would most likely crop up in the future. Further to this, a National Urban Transport Policy was approved in 2006 to help in addressing the unprecedented increase in transport problems that the major cities in the country are facing. The present study is aimed at updating the transportation information and projections made from the previous study in order to review the National Urban Transport Policy in light of the new and comprehensive data that this study is likely to provide.

Objectives of the Study

The objective of the study is to:

- Establish a comprehensive baseline of the traffic and transport scenario in urban areas in India, separately for all million plus cities and for a second level of cities with a population range of 0.5 to one million (including all the State Capitals that are not covered under the one million plus category of cities).
- Validate and refine the projections made in the previous study of similar nature, the report of which was submitted in 1998, under the title "Traffic and Transportation Policies and Strategies in Urban Areas in India".
- Establish an independent and reliable basis for the formulation of future polices and programs for the management of urban transport in India.

- Form a reliable database for future research and academic work in the area of urban transport.

Study Approach

The study approach may be summarised as follows. The first step has been to short list the cities that qualify for this study purpose and to obtain a sample that is truly representative of these cities. The following factors were considered in the selection process.

- Size of city
- Shape of city
- Availability of Public Transport
- Economic Activity level of the city
- Congestion
- Geographical locations

There are 87 cities that qualify for the present study (all State capital cities and with population above 0.5 million). Thirty representative cities have been selected for detailed study.

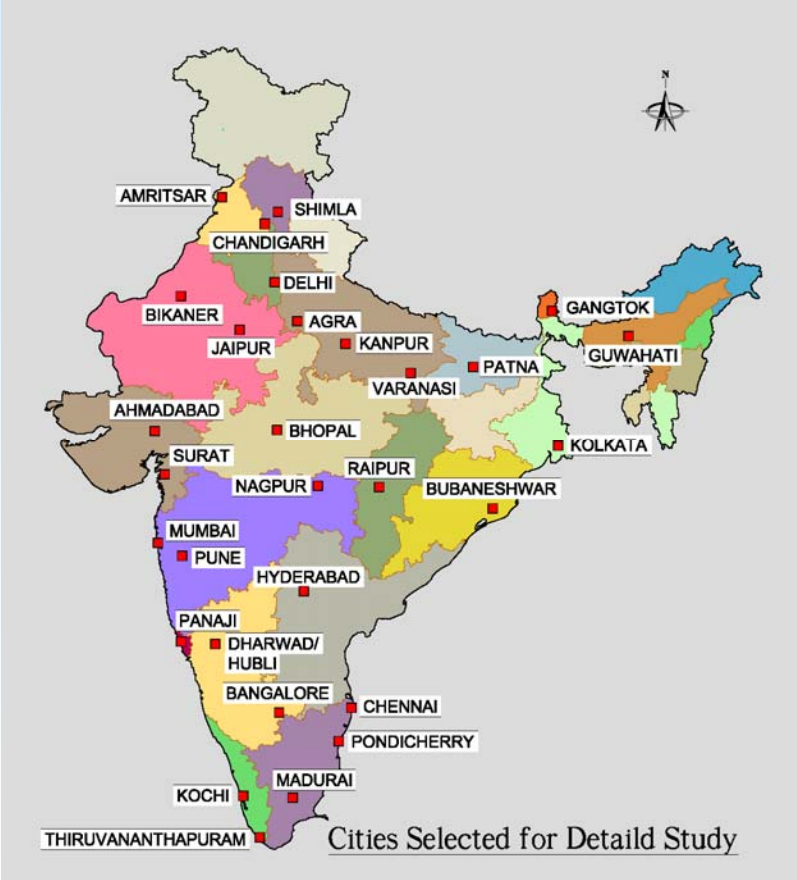
The second step has been a data collection through primary and secondary surveys for the 30 sample cities to understand the existing urban transport scenario. A Limited House hold interview survey, Cordon survey, Terminal Survey, Speed studies, Parking studies, etc, was some of the primary data that was collected.

The third step has been the development of strategic transport models for the selected 30 cities in order to establish the future urban transport scenerio. This model has been developed using state - of - the art softwares TRANSCAD/ CUBE.

The above three steps provide the data for evolving policies and strategies. In order to compare transportation parameters across cities, indices have been developed/ evolved as part of this study. The present travel characteristics have been compared with the RITES projections made in the earlier

study to refine the predictions for the future. Based on transport goals in the future, the study attempts to estimate transport needs including a broad estimate of costs and phasing. An estimate of what component of these can be privatized is also made.

Selection of Study Cities: Out of the 87 cities that qualified for the study, 30 cities were selected as study cities, based on certain criteria such as size and shape, geological location, mportance, etc. The selected cities are presented in the Figure given below.



Study Findings:

The share of personalized modes especially of two wheelers have gone up leaps and bounds clocking 12% per annum in the past two decades, while public transport has generally dwindled. Some public transport services have been even pushed out of business. Consequently street congestion has

dramatically increased and overall speeds on major corridors have dropped.

Operating bus services in congested streets have become increasinghly difficult in congested networks with turn around times increasing by the day. Fleet sizes in nearly all public undertakings have declined rather than grow to meet the demand .

Another important observation is the decline of NMT especially cycling. Congestion, increase in trip lengths due to urban sprawl, increase in purchase power of people and totally inadequate facilities for cycling have all contributed to reducing cycling to less than 11% of the mode share which is down from nearly 30% in 1994. And for pedestrians our city roads have simply forgotten they exist. The percentage of roads with pedestrian footpaths runs to hardly 30% in most cities.

Mode Share/Composition: The present day mode share for the 6 city categories is given in the table given below. When this is compared with the 1994 values one can see a significant change in the public transport share.

Mode Share (%)-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**

The decline in the share of public transport over the past 14 years is given in the table presented below.

Public Transport share Comparison with 1994 Study

City Category	City Population Range in lakhs	WSA, 2007 (%)	RITES, 1994 (%)
1	< 5.0	0.0 -15.6	14.9-22.7
2	5.0 -10.0	0.0 - 22.5	22.7-29.1
3	10.0 -20.0	0.0 - 50.8	28.1-35.6
4	20.0 – 40.0	0.2 - 22.2	35.6-45.8
5	40.0 - 80.0	11.2 – 32.1	45.8-59.7
6	Above 80.0	35.2 - 54.0	59.7-78.7

Note: Present study included 30 cities, while RITES study had only 21 cities and a number of cities selected in the present study have no public transport facility. In the present study, a high percentage of PT share (50.8%) is observed in category- 3, as Kochi falls in this category, which is supplied with very good public transport).

Trip Rate: The trip rate in almost all city categories have increased as expected. The increase of trip rate from 1994 to 2007 is presented below.

Comparison of PCTR by city category- 2007 & 1994

City Category	Population Range in lakhs	WSA, 2007	RITES, 1994
1	< 5.0	0.76	0.77-0.89
2	5.0 -10.0	0.81 - 1.02	0.57-1.00
3	10.0 -20.0	0.98 - 1.25	0.89-1.10
4	20.0 – 40.0	1.20 - 1.29	1.10-1.20
5	40.0 - 80.0	1.3 - 1.50	1.20-1.35
6	Above 80.0	1.41 - 1.67	1.25-1.40

Trip Length: With the increase in the sprawl of the city, average trip lenghts would naturally increase. The average trip length for travel in each of the city categories is presented below.

Trip length (in KMs) by city category

City Category	Population	Average Trip Length (Km)
Category-1 a	<5 lakhs with plain terrain	2.4
Category-1b	<5 lakhs with hilly terrain	2.5
Category-2	5-10 lakhs	3.5
Category-3	10-20 lakhs	4.7
Category-4	20-40 lakhs	5.7
Category-5	40-80 lakhs	7.2
Category-6	> 80 lakhs	10.4
National		**7.7**

Journey Speeds: Our journey speed surveys were focused only on the main roads of a city. The average speeds in our city roads is presented in Table 5.6.

Forecast Scenario

Transport models developed have been used to forecast traffic. Some of the salients of the do-nothing run is presented below.

Estimated trips in the future: The daily trips in the 87 urban centres are anticipated to double from 2286 lakhs to 4819 lakhs during the next 24 years . Details are presented below.

Category-wise projected daily trips of 87 Cities (including NMT)

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**

Per Capita Trip Rate: The city category-wise average per capita trip rate estimated for all modes including NMT is presented below.

Projected Per capita Trip Rate (all modes)

City Category	Population	2007	2011	2021	2031
Category-1 a	<5 lakhs with plain terrain	0.8	0.8	0.9	1.0
Category-1 b	<5 lakhs with hilly terrain	0.8	0.9	1.0	1.1
Category-2	5-10 lakhs	1.0	1.0	1.1	1.2
Category-3	10-20 lakhs	1.1	1.2	1.3	1.4
Category-4	20-40 lakhs	1.3	1.3	1.4	1.6
Category-5	40-80 lakhs	1.4	1.5	1.6	1.8
Category-6	> 80 lakhs	1.5	1.6	1.8	2.0

Mode Share: The future mode share including NMT is presented in the table given below. A significant decrease in public transport and a very high increase in private mode share for all city categories is predicted.

Estimated Mode Share for the selected Cities for future (%)

City Category	Population	2007			2011			2021			2031		
		PT	PV+ IPT	NMT	PT	PV+ IPT	NMT	PT	PV+ IPT	NMT	PT	PV+ IPT	NMT
Category-1 a	<5 lakhs with plain terrain	5	57	38	4	59	36	3	66	31	2	72	26
Category-1b	<5 lakhs with hilly terrain	8	34	58	7	37	56	5	47	48	3	57	40
Category-2	5-10 lakhs	9	39	53	8	42	50	6	51	43	5	58	36
Category-3	10-20 lakhs	13	43	44	12	46	43	10	52	38	9	57	34
Category-4	20-40 lakhs	10	47	43	9	49	42	8	51	41	8	52	40
Category-5	40-80 lakhs	22	42	36	21	45	35	15	51	34	12	54	34
Category-6	> 80 lakhs	46	24	30	42	28	30	31	40	29	26	46	28

Note: PT- Public Transport, PV- Personal vehicles, IPT- Auto rickshaw, NMT- Non motorised transport including walk and cycles

Speeds: Expected avegrage journey speeds on major corridors in future for various city categories are presented below. With higher share of cars on the roads, severe traffic congestion will be the order of the day.

Anticipated Average Journey Speed (KMPH) on major corridors by City Category

Sl. No	City Category	Population	2007	2011	2021	2031
1	Category-1	<5 lakhs	26	22	15	8
2	Category-2	5-10 lakhs	22	18	13	9
3	Category-3	10-20 lakhs	18	13	10	7
4	Category-4	20-40 lakhs	22	18	12	9
5	Category-5	40-80 lakhs	19	15	10	7
6	Category-6	> 80 lakhs	17	12	9	6

Note: Speeds in KMPH

Transport Indices

Several indices have been developed for each selected city to evaluate the performance of the transportation system reflecting different perspectives. They are:

- **Accessibility Index (Public Transport and Service)**: **Public Transport Accessibility Index** is formulated as the inverse of the average distance (in km) to the nearest bus stop/railway station (suburban/metro). **Service accessibility index** is computed as the percentage of work trips accessible within 15 minute time and 30 minute time for each city.

- **Congestion Index**: is defined as

  Mobility Index = 1- (A/M), where

  A- Average journey speed observed on major corridors of the city during peak hours and

  M- Desirable Average journey speed on major road networks of a city during peak hour, which is assumed as 30 KMPH.

- **Walkability Index:** is calculated as [(W1 x Availability of footpath)+ (w2 x Pedestrian Facility rating)]

  Where, w1 and w2: Parametric weights (assumed 50% for both)

  Availability of footpath: Footpath length / Length of major roads in the city and

  Pedestrian Facility Rating: Score estimated based on opinion on available pedestrian facility

- **City bus supply index:** is formulated as**, Index** = City Bus fleet (public + private agency operations) for 1, 00,000 population)

- **Safety Index**: is defined as

Safety Index = 1/ Accident Fatality Index

Accident Fatality Index is defined as the number of road accident deaths per lakh of population.

- **Para Transit Index** is estimated as:

  Para Transit Index = Number of para transit vehicles for 10,000 population

- **Slow Moving Vehicles Index**: The index is computed as:

  Slow Moving Vehicle Index = [(W1 x Availability of cycle tracks)+ (w2 x SMV share in trips)]

  Where,

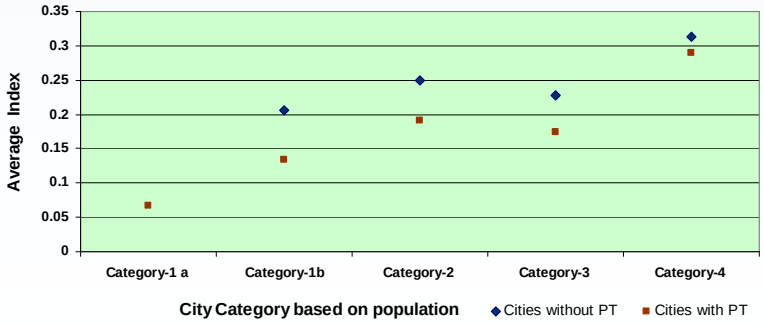
  w1 and w2: Parametric weights (assumed 50% for both)

- **On- street Parking Interference Index**:

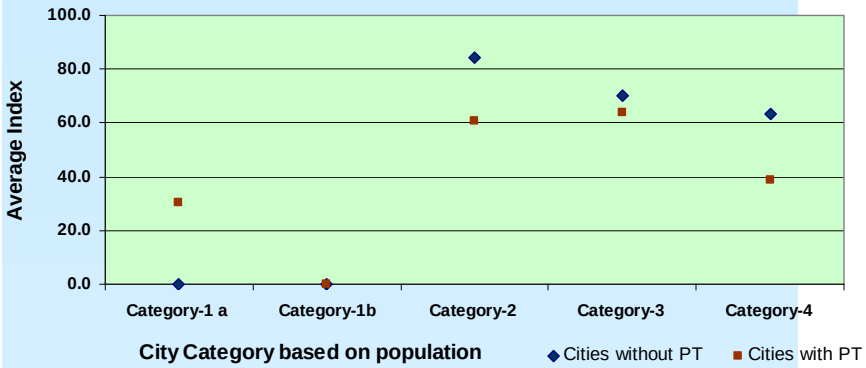
  Parking Interference Index = 1/ (w1 x % of major road length used for on-street parking + w2 x on-street parking demand on major roads)

  Where, w1 & w2 are the weightages, assumed 50% for both parameters

The index values computed for the selected 30 cities are presented in the table given below. Impact of availability of public transport on various indices are presented in the two Figures presented below.



Impact of Availability of Public Transport on Congestion Index



Impact of Availability of Public Transport on Para transit Index

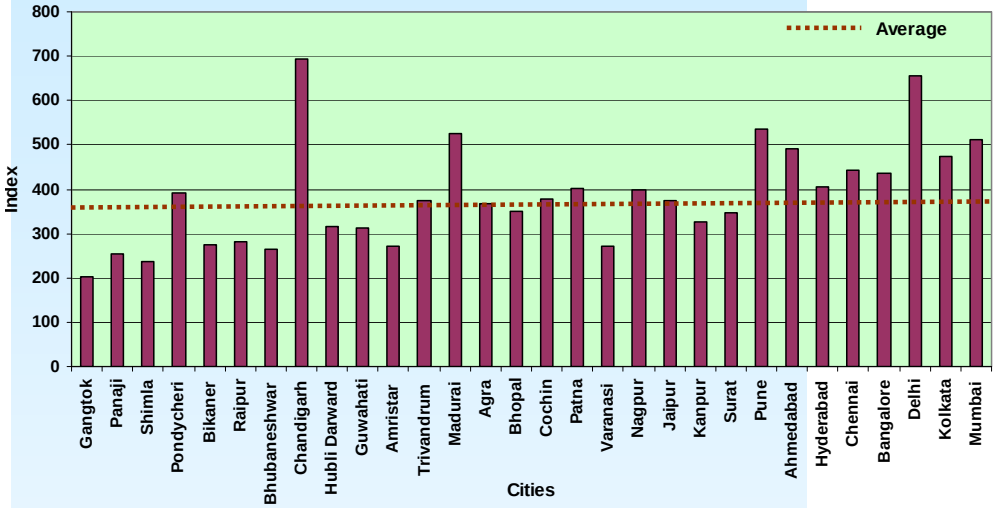
Transport Performance Index : A Transport Performance Index has been derived for each city based on the indices computed, which has been considered as an overall measure of the efficiency of the transportation system of the 30 study cities. The indices and the corresponding weightage adopted in the calculation of transport performance index are as follows.

- Public transport Accessibillity index (weightage -1)
- Service Accessibility Index (% of Work trips accessible in 15 minutes time) -(weightage -1)
- Congestion Index (weightage -2)
- Walkability Index (weightage -2)
- City Bus Transport Supply index (weightage -2)
- Safety Index (weightage -1.5)
- Slow Moving Vehicle Index (weightage -2)
- On- street Parking Interference Index (weightage -1)

Indices computed for the selected 30 cities

Sl. No.	City Name	Public Transport Accessibility Index	Service Accessibility Index (% of Work trips accessible in 15 minutes time)	Congestion Index	Walkability Index	City Bus Transport Supply index	Safety Index	Para Transit Index	Slow Moving Vehicle Index	On- street Parking Interference Index
1	Gangtok	0.00	94.12	0.21	0.30	0.00	0.04	0.00	0.00	0.59
2	Panaji	0.88	73.47	0.07	0.32	7.64	0.02	30.20	0.02	0.47
3	Shimla	0.70	76.84	0.13	0.22	8.66	0.06	0.00	0.00	0.54
4	Pondicherry	2.12	85.68	0.20	0.37	8.62	0.04	39.70	0.07	1.80
5	Bikaner	0.00	77.00	0.20	0.43	0.00	0.04	64.50	0.08	0.75
6	Raipur	0.00	93.27	0.30	0.41	0.00	0.02	104.00	0.10	0.67
7	Bhubaneswar	1.27	31.72	0.33	0.28	2.93	0.05	40.50	0.10	1.14
8	Chandigarh	1.64	83.13	0.00	0.91	17.54	0.08	75.10	0.08	0.66
9	Hubli Dharward	0.97	43.68	0.23	0.39	15.15	0.04	86.85	0.09	0.63
10	Guwahati	1.22	56.00	0.33	0.39	5.55	0.03	52.50	0.09	1.37
11	Amritsar	0.00	68.85	0.20	0.31	0.00	0.06	91.30	0.09	1.24
12	Trivandrum	1.71	54.00	0.23	0.34	20.03	0.06	63.70	0.09	0.74
13	Madurai	2.13	69.50	0.10	0.40	42.77	0.11	53.70	0.08	0.69
14	Agra	0.00	57.30	0.07	0.38	0.00	0.14	35.70	0.10	2.42
15	Bhopal	0.95	45.00	0.20	0.47	12.82	0.08	79.70	0.08	1.09
16	Kochi	1.47	57.30	0.17	0.57	16.07	0.09	70.10	0.03	1.00
17	Patna	0.00	48.00	0.23	0.65	0.00	0.19	88.80	0.14	1.21
18	Varanasi	0.00	46.00	0.41	0.33	0.00	0.16	64.49	0.08	0.98
19	Nagpur	1.06	34.45	0.30	0.66	10.21	0.10	50.50	0.11	1.13
20	Jaipur	1.38	51.00	0.30	0.64	11.11	0.06	46.70	0.05	1.33
21	Kanpur	0.71	42.86	0.33	0.59	5.64	0.05	19.30	0.09	1.14
22	Surat	0.00	53.95	0.31	0.62	2.87	0.15	63.15	0.07	1.31
23	Pune	3.15	54.35	0.20	0.81	16.43	0.22	106.20	0.04	0.98
24	Ahmedabad	2.49	21.54	0.30	0.85	12.99	0.14	73.90	0.06	2.03
25	Hyderabad	1.62	6.08	0.37	0.68	31.88	0.06	76.60	0.03	1.24
26	Chennai	1.38	12.00	0.37	0.77	33.39	0.07	64.18	0.04	1.26
27	Bangalore	1.01	13.00	0.40	0.63	39.22	0.11	89.70	0.02	1.28
28	Delhi	1.09	16.36	0.47	0.87	43.86	0.32	75.60	0.04	2.82
29	Kolkata	1.12	14.00	0.40	0.81	26.20	0.08	28.50	0.03	3.00
30	Mumbai	1.34	17.00	0.47	0.85	16.66	0.25	88.30	0.03	2.80

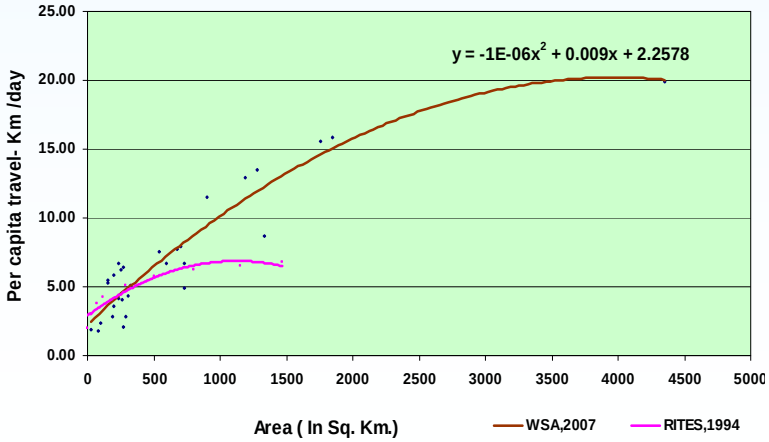
Initially all the transportation indices were converted to a scale of 100. The values corresponding to various indices for a city after multiplying with corresponding weightage are summed up to obtain the index for that city. *(Note: The inverse of congestion index is taken in the calculation of the transport performance index).* The transport performance index computed for each city is presented below.



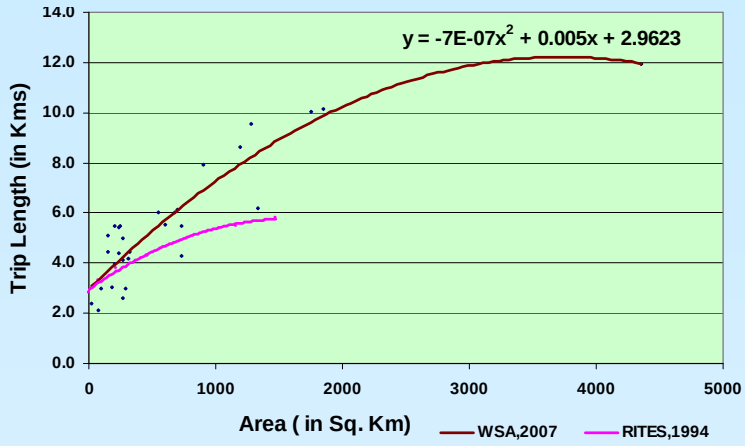
Transport Performance Index

Trends and Relationships

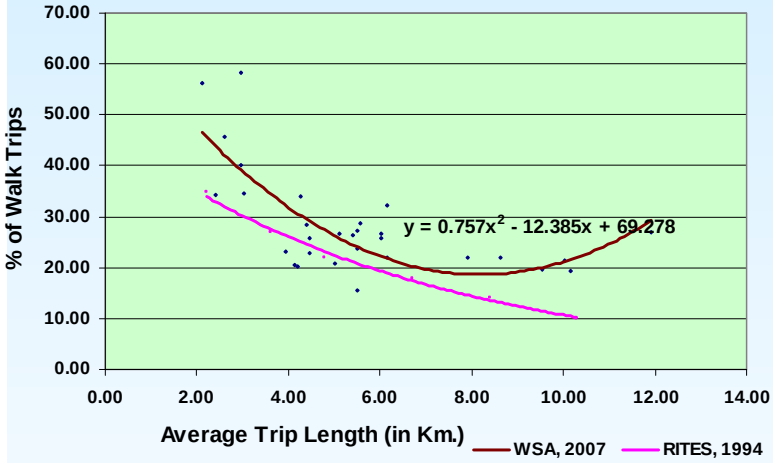
Various relationships between traffic characteristics such as per capita travel demand, trip length etc are compared with the city parameters and a comparison is made with RITES observations for similar relationships. These are presented below.



Relationship Developed for Per capita travel- Km per day (PKM) Vs Area of city



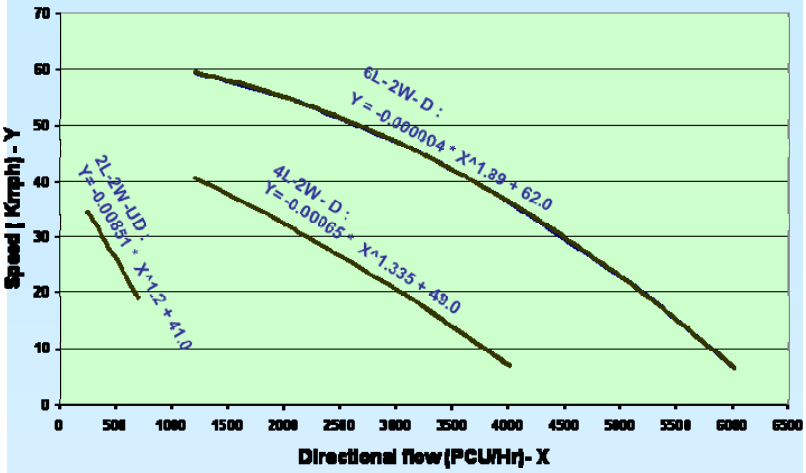
Relationship Developed for Average Trip Length Vs Area of city



Relationship Developed for Share of Walk Trips Vs Trip Length

Generic Relationships

Speed- flow curves on relationships between traffic flow and speed have been estabilised for different link types. These curves have been developed with data across cities and hence can be used for any urban area in India. The curves are presented below. These relationships are for running speed (not for journey time) and directional flow.



Speed- Flow Curves

Attempt has been made to develop a relation between various trip parameters and variables such as population, shape factor, slum population, available bus fleet, etc.

Eqn. (1): Trip length (Kms) = 0.0476* X1 + 4.7726* X2

Where,

X1- Population in lakhs and

X2- Shape factor of the city, which is calculated as the ratio of Minimum Spread of the city (in Kms) and Maximum Spread (in Kms)

Eqn. (2): PT Share (%) = 0.00949* X1 + 0.18218* X2

Where,

X1- Bus supply/ lakh Population and

X2- Slum population in % (a proxy variable for lower income households)

Eqn. (3): IPT Share (%) = 0.000088 * X1

Where,

X1- IPT vehicle population/ lakh Population

Eqn. (4): Walk Share (%) = -0.0025* X1 + 0.3961*

Where,

X1- Trip length (km) and

X2- Shape factor

Eqn. (5): Cycle Share (%) = 0.200* X1 + 0.150* X2,

Where,

X1- Slum population in % (a proxy variable for lower income households) and

X2- Shape factor

Urban transport Investment needs

An assessment of investment for urban transport sector of the country is made. The 87 cities identified in the study is classified into four categories for the investment requirements.

Transport infrastructure requirement for the next 20 years for each city categoty is derived separately. The objective of the interventions in small and medium cities is to enable smooth and safe traffic flow and prevent a decline in the use of non-motorised modes in the next 20 years. This could be possible by ensuring that travel by non- motorised modes to continue to be safe by proper NMT management, improvement/development of urban roads, various traffic management measures, implementation of bus transport along major corridors for cities without PT currently and augmentation of bus services for cities having PT in the next 20 years is essential. Larger cities would need largely the same interventions as small/medium cities with the diference that these cities have to plan for medium to high capacity mass transport systems and terminals.

Total Investment Requirement: The total urban transport investment requirements for the 87 cities is estimated as Rs. 4, 35, 380 Crores. The summary of the investment is given below.

Total Urban Transport Investment Requirements for the identified 87 cities

Category	Rs. in Crores
Cities in the population range of <5 lakhs	9,800
Cities in the population range of 5- 10 lakhs	70,700
Cities in the population range of 10- 40 lakhs	2,17,200
Cities in the population range of >40 lakhs	1,37,680
Total	**4,35,380**

Investment Phasing: The estimated investment of the urban transport sector is phased in four equal periods of five years. The phasing of the proposed investments is presented in the table given below.

Phasing of Urban Transport Investment

Category	Rs. in Crores	%
2008-2012	1,57,020	36
2013-2017	1,34,880	31
2018-2022	80,050	18
2023-2027	63,430	15
Total	**4,35,380**	**100**

Institutional Framework

The proposed heavy urban transport infrastructure investments needs proper guidance, planning, sustainability, adequate provisions for their maintenance and safeguard. Apart from the required fund, adequate expertise and proper institutional mechanism to implement the urban transport infrastructure is the basic requirement. The following suggestions are made for the proposed institutional framework:

- Priority for UMTA implementation
- Developemnt and management of Central Urban Transport Database
- Strengthening of Institutional setup
- Development of urban transport software library
- Clearing house for new technologies / major projects / projects involving different agencies in urban transportation:

Key Policy Suggestions

The central policy suggestions that have emerged from the present study are;

- **Focus transport Supply in the Mass transport domain:** There are a number of pointers in the data and analysis that we have carrried out that indicate that Mass Transport will be the only way forward. Be

it in the form of Buses, BRT's, Monorails, LRT or Metro Systems. A few transport indices such as Congestion Index and Safety Index have performed better in cities with Public Transport Services. It must be noted that many cities in India have no public transport. Before we embark on the implementation of larger mass transport systems, there must be an effort to first ensure that bus systems are in place and the city bus index stands satisfied.

- **Serious attention is to be given to NMT:** With the environment friendly NMT declining, our cities are losing sustainability and it is imperative that this trend is reversed. 40% of todays trips in cities are by NMT and 25% of all fatal accidents involve NMT. Yet we have not focused on the much needed infrastructure to aid these modes.

- **Set up a Dedicated Transport Fund:** This study has established that urban transport needs a huge investment. It would be important to consider a dedicated transport fund to be established to meet this demand**.**

- **Give a thrust to TSM/ITS:** The accident information collected at the city level clearly indicate very unsafe conditions in our cities. In almost all cities, traffic is mismanaged and road networks are being put to suboptimal use.

    - To optimise the present infrastructure, traffic system management to be given immediate priority as this yields very high benefits with relatively low costs and will improve safety.

    - Wherever possible efforts on Transport Demand Management have to be pursued to ensure that optimal use of infrastructure is made.

    - There is ample evidence in other parts of the world that ITS brings about significant improvement in network efficiency. ITS must

be seen as a way forward in improving traffic conditions in our cities.

- **Create a National level Database:** The virtual lack of a database on urban transport statistics has severely constrained the ability to formulate sound urban transport plans and reliably assess the impact of the different initiatives that have been taken. As a part of this study most of the data had to be recreated. It is essential to develop a Central Urban Transport Database. Necessity of creating a national level institute that would build up a database for use in planning, research, training, etc in the field of urban transport is brought out in the National Urban Transport Policy also.

- **The Institutional setup needs to be strengthened:** If the identified investment has to be utilised properly, a Transportation Authority needs to be set up at the city level and a Clearing house for new technologies / major projects needs to be in place at a central level.

- **Develop transportation plans in conjunction with the Land use Development Plans:**

    - A demonstration of the benefits of this has been carried out as part of this study which clearly shows the importance of Transit Oriented Development. We must post haste start the process of conducting land use plans along with transport plans. The terms of reference for both these components should be one.

    - The transportation scenario witnessed in urban areas is changing drastically. The differences between the 1994 study and this study suggests that if proper tracking of these changes have to be made to take suitable remedial action in time, it would be necessary to conduct updates once in 5 years atleast. It would be suitable to carry out Comprehensive Mobility plans at a city level

once in 5 years so that the data from these can be used to update the overall transport strategy also once in 5 years.

Way Forward

Tremendous amount of data has been collected which has to be continued to be put to good use. This data can be used for other transportation projects and research.

Transportation models calibrated under this study can be used for preparation of CMPs with little additional inputs which will then cut down duration of CMP preparation for the 30 selected cities.

Relationships developed for modeling including speed-flow curves, can be used to obtain strategic results for any city in India.

For the equitable allocation of funds, one could use the transportation indices effectively as they serve as comparative measures between cities. Also cities can be asked to improve a certain index before they can obtain or apply for a particular fund.