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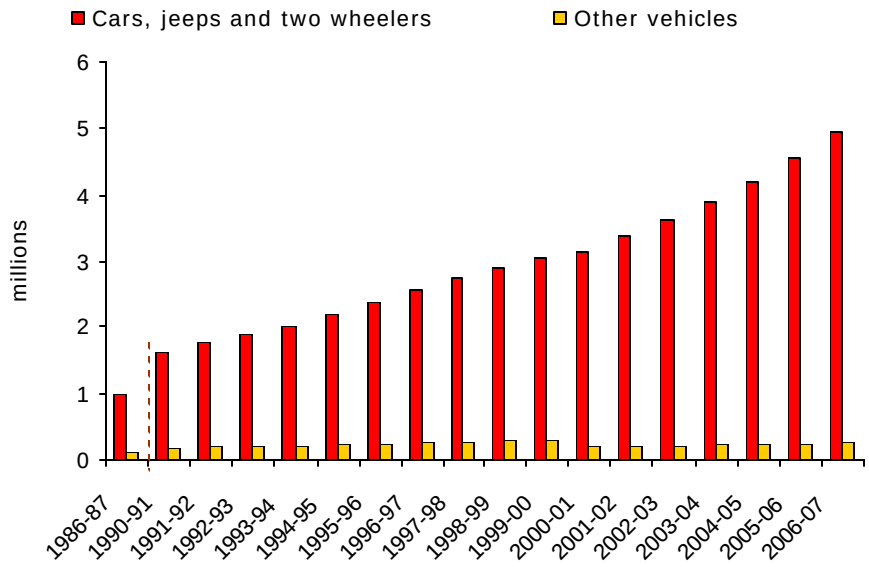
Congestion in Delhi: Scary future of our cities

Immediate sign of the mobility crisis in our cities is paralyzing congestion, -- crawling traffic and high pollution levels. Mounting global evidence shows that this imposes high costs on urban communities. This can be around 2 - 3 per cent of the GDP. In many cities congestion occurs during the longer portion of the day, more and more roads are falling into its deadly grip, and delays now affect more travelers and goods then ever before.

Explosive increase in personal vehicles – cars and two-wheelers, are responsible for choking congestion. The speed of this increase is scary. Since 1991 the vehicle growth rate is averaging 200,000 vehicles per year. In contrast to the national trend, cars are increasing at a faster rate than two-wheelers. Cars have grown at 10 per cent annually since 1995 as opposed to 7 per cent for two-wheelers. On the whole the growth rate in the personal vehicles sector is the highest. This is worsening the air quality, increasing energy use, and the city is actually grinding to a stop due to congestion. Direct exposure to traffic fumes is amongst the deadliest of the health threats.

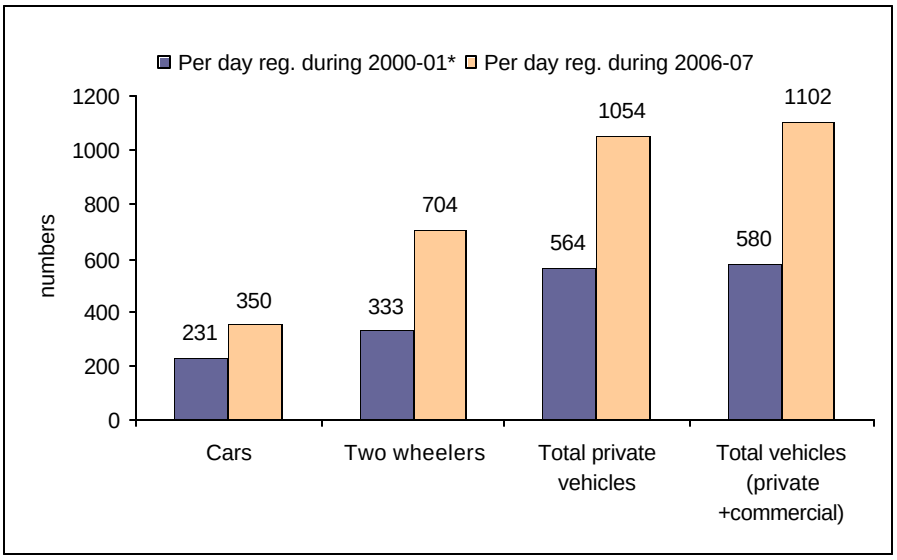
Graph 1: Galloping numbers



Source: Economic Survey of Delhi, 2007

Daily registration of vehicles is galloping at an alarming pace. In 2000-01 Delhi registered only 564 private vehicles (both cars and two-wheelers) a day. This has jumped to 1054 personal vehicles per day in 2006-07 – close to two-fold increase. If commercial vehicles are also added then Delhi registers more than 1100 vehicles a day. (Graph 2: Trend in per day vehicle registration (2001-02 – 2006-7)

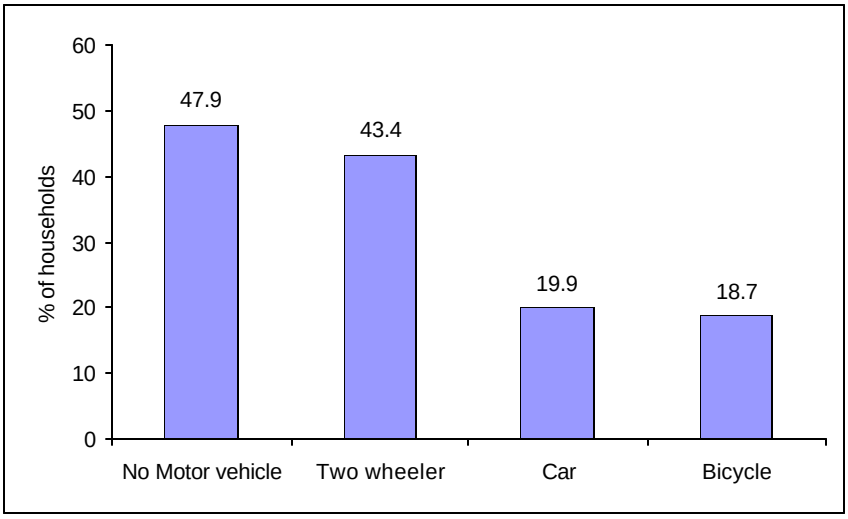
Graph 2: Trend in per day vehicle registration (2001-02 – 2006-7)



Source: Computed from vehicle registration data published in the Economic Survey of Delhi, 2007

Roads overcrowded even when more than half of population does not own motorized transport: In this populous city of 15 million, vehicles are overcrowding city roads even when more than half of our population does not own motorized vehicles. Just about 20 per cent of households in Delhi own cars. Only if two-wheelers are included then about 43 per cent of the households own motorized vehicles.

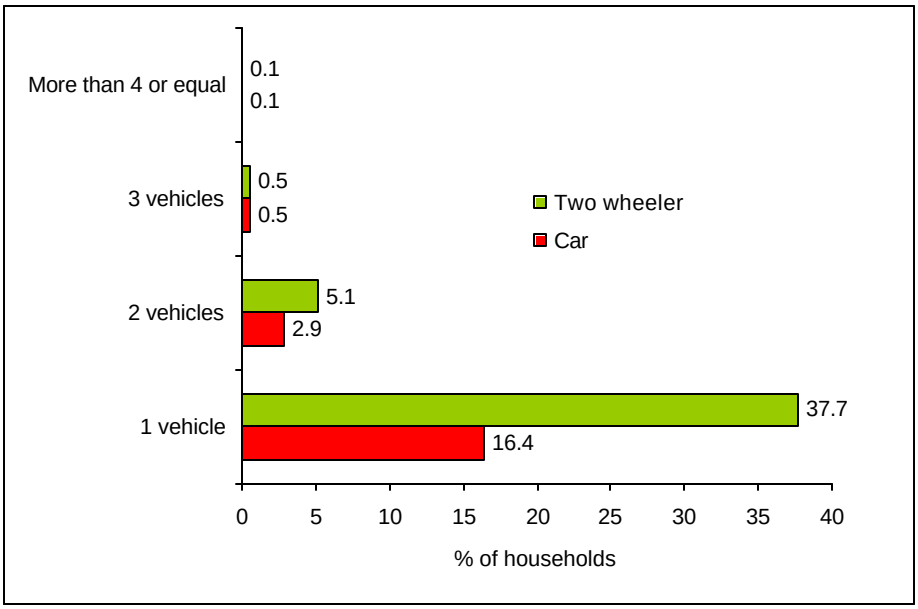
Graph 3: Private vehicle ownership increasing
Nearly half of Delhi's household surveyed owns a personal motorized vehicle



Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, et al , September

Multiple ownership increasing: Evidence shows that amongst the vehicle owning households more households are buying more than one vehicle. Multiple ownership of vehicle is also growing slowly.

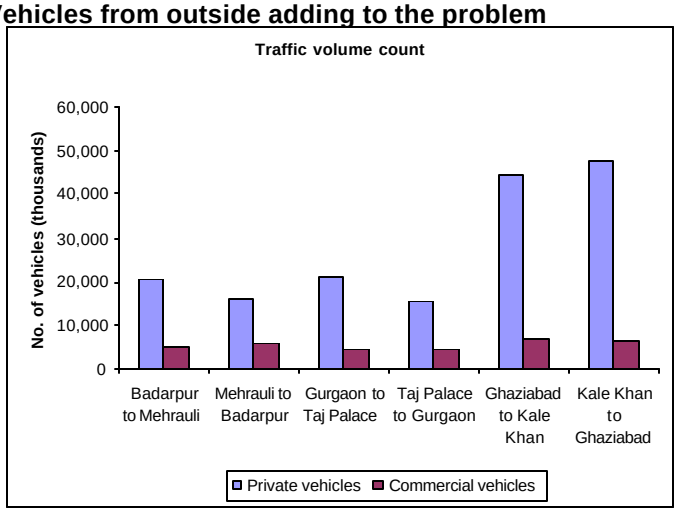
Graph 4: Private vehicle ownership is multiplying



Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, et al , September

Inter-city traffic - explosive: Not only the vehicle numbers increasing in the city daily influx of vehicles from outside the city are further inflating the bulge. Key arteries like the Nizamuddin bridge takes the brunt of the incoming traffic from outside, nearly 80 per cent of the traffic in the morning peak hour is from outside the city. In the evening peak hour, 75 per cent of vehicles in ITO are from outside. This greatly burdens Delhi's road and pollution load (see Graph 5: Vehicles from outside adding to the problem).

Graph 5: Vehicles from outside adding to the problem



On the key arteries that connect the satellite towns around Delhi in the National Capital Region of Delhi traffic volume has increased phenomenally. On key link roads like Loni and Rajokari borders the growth rate is nearly 30 per cent (see table 1: Growth of traffic on roads connecting NCR towns).

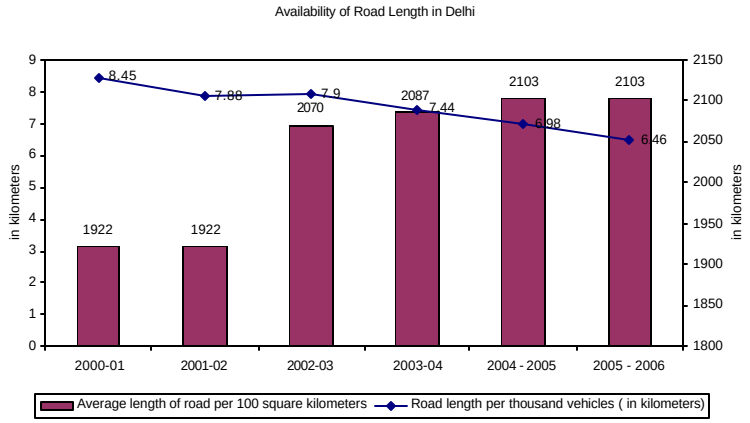
Table 1: Growth of traffic on roads connecting NCR towns

		DAILY VEHICLES		
		2001	2007	ANNUAL GROWTH (%)
1	Nh-8 Near Rajokari Border	42881	196514	28.89
2	Mehrauli Gurgaon Road Near Aya Nagar	34344	91520	17.75
3	Mathura Road (Near Badarpur Border) And Surajkund Road	49923	98802	12.05
4	Road No. 13 A Kalindi Kunj Road	52760	61437	2.57
5	Nh-24 Near Gazipur Border	29142	75532	17.21
6	Loni Border (Saharanpur Pur)	16832	78080	29.15
7	Nh-1 Singhu Border	34999	53947	7.48
8	Auchandi Bawana Road (Near Auchandi Border)	5690	9072	8.09
9	Rohtak Road	23259	43714	11.09
10	Dhansa Border	2244	4056	10.37
11	Wazirabad Bridge	44414	67602	7.25
12	Yamuna Bridge Isbt	60709	154913	16.9
13	Old Yamuna Bridge	86848	85243	-0.31
14	Ito Bridge	115768	84025	-5.2
15	Nizamuddin Bridge	119407	157187	4.69
16	Ashram Bridge	54408	93819	9.51
17	Azadpur Rob	79667	86689	1.42
18	Dnd Flyway (Ntpc Ltd)	17161	97096	33.49

Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, et al , September

There is barely any space left for more cars: Delhi is one of the most privileged cities to have maximum land area under roads – as much as 21 per cent. Even then the city is gridlocked. The road network in Delhi has increased 3.7 times between 1971-72 and 2005-06 (from 8,380 km to 31,183 km), but during the same period the number of vehicles has increased 21 times. There have been several spurts in road expansion over the last few decades, but further scope of expansion is very limited now. This is evident in the fact that the rate of increase in road length has come down successively through the stages. During the decade (1970 to 1980) road network had expanded by as much as 71 percent. During the decade, 1980 – 1990, it further expanded by 51 per cent. But in the subsequent decade of 1990-2000 the growth was a lot slower at 32 per cent. And during the five years (2000-2005) in the current decade, the growth has been down to mere 9 per cent (Graph 18: Constrained growth). Clearly, there is barely any space left to build more roads in Delhi.

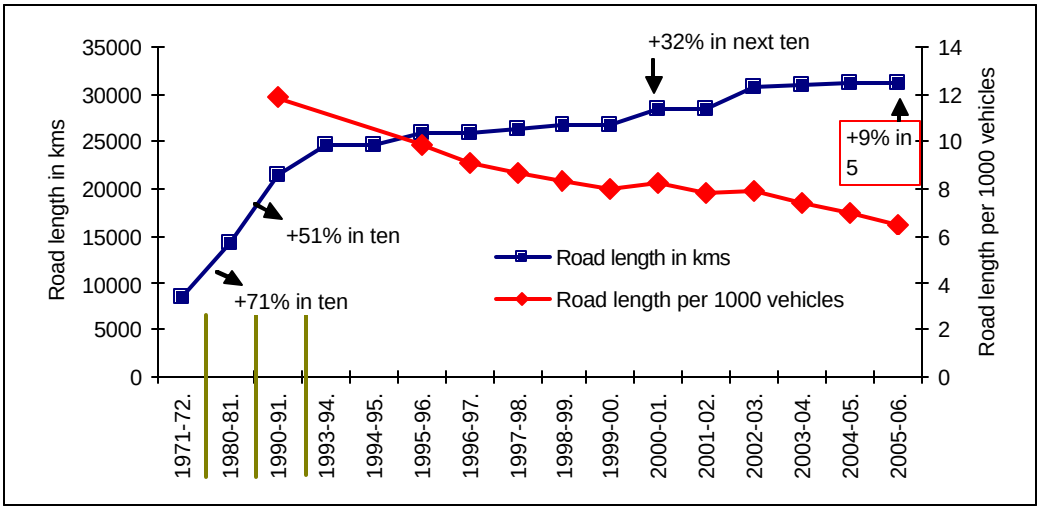
Graph 8: Constrained growth
Expansion in road network slows down



Road availability per vehicle is coming down consistently. The 'road length per 1,000 vehicles' has reduced by nearly half between 1990-91 and 2005-06 from road length of 12 km per 1000 vehicle to 6 km per 1000 vehicles. (See Graph 19: Roads hitting dead end). Result: Congestion nightmare.

Graph 9: Roads hitting dead end

Roads expansion no longer keeps pace with rising demand of space for more vehicles



Source: Based on data provided in the Delhi Economic Surveys, Delhi Planning Department

Travel speed plummets: Peak hour traffic has slowed considerably in Delhi. On an average, it is estimated that to provide a congestion free drive traffic speed should be close to 40 km per hour. But studies carried out by different agencies in Delhi show that peak hour speed has dwindled quite drastically. Central Road Research Institute (CRRI) study of 2006 shows that during the morning and evening peak hours 55-60 per cent of the major arterial roads have travel speeds less than 30 kmph. Even during off-peak hours 40-45 per cent of major arterials have travel speeds less than 30 kmph. About 20 per cent or more of the arterial road network are highly congested with travel speeds falling below 20 kmph throughout the day. (See Table: Table 2: Speeds on Major Arterial Roads in Delhi) There is very little change in speeds during peak and off peak periods and the network is operating at its capacity. Any disturbance in traffic flows creates long queues and delays to traffic.

A subsequent survey carried out by RITES in 2008 shows that the peak hour speed of 22 km per hour is more widespread and even off-peak journey speed is about 26 kmph. This despite Delhi having about 46 flyover, 33 ROBs, 17 RUBs and 7 river bridges and has nearly 20 per cent of land under roads. The RITES survey also shows that now over 70 per cent of road length has peak hour traffic speed less than 30 km per hour. The traffic signals accounts for 63 per cent of delays and traffic congestion is another reason.

Table 2: Speeds on Major Arterial Roads in Delhi

(in percentage)

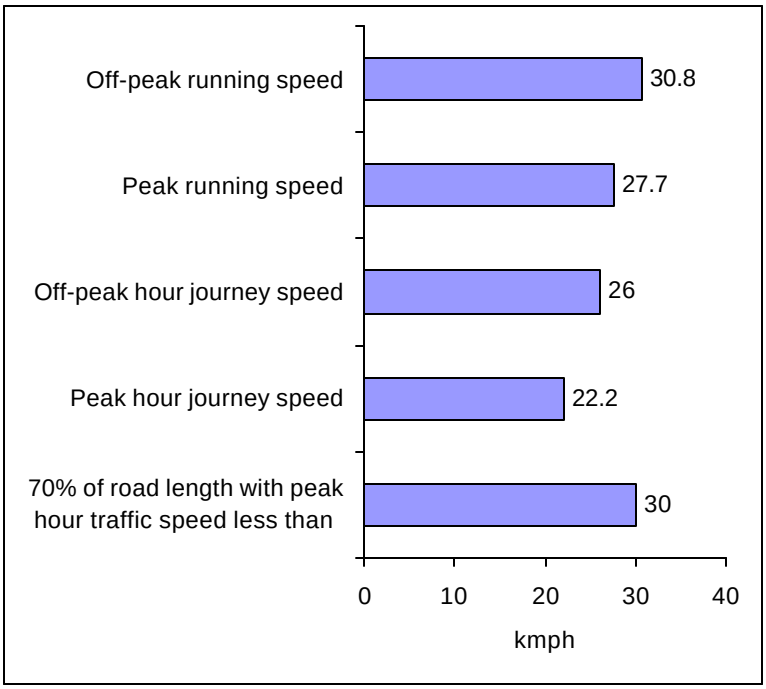
During the morning and evening peak hours 55-60 per cent of the major arterial roads have travel speeds less than 30 kmph

KM/Hour	**Morning peak**		**Evening peak**		**Off peak**	
	Direction 1	Direction 2	Direction 1	Direction 2	Direction 1	Direction 2
< 50	4.87	3.76	1.8	4.15	5.42	6.68
45-50	4.42	3.01	1.44	6.06	4.93	3.02
40-45	11.05	7.26	5.54	8.47	8.02	13.61
35-40	18.63	13.67	15.78	11.08	19.09	14.99
30-35	17.62	13.31	18.99	1.07	19.73	18.23
25-30	1.93	20.37	15.52	17.15	12.91	12.68
20-25	18.54	17.4	13.9	15.62	10.67	11.91
>20	13.94	21.21	27.03	19.4	19.23	18.89

Note: Study by CRRI, 2006

Source: ILFS Ecosmart, City Development Plan: Delhi

Graph 10: Slowing speed

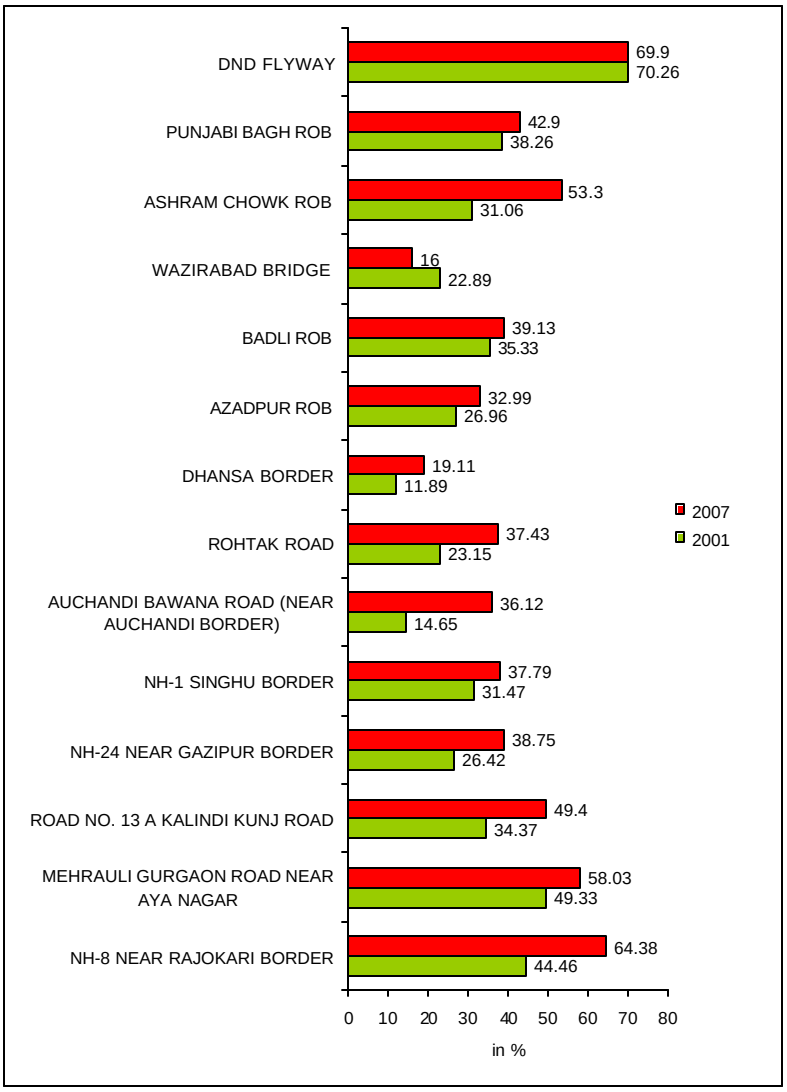


Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, et al , September

Its all because of cars: Cars have certainly become more visible as they have begun to dominate the traffic on Delhi's roads. An older assessment of the on-road composition of vehicles in the inner, middle and outer areas of CRRI shows that between 1991 and 2004 while the proportion of two wheelers has remained more or less the same, the proportion of cars has increased throughout Delhi. At the same time the share of intermediate public transport modes like auto rickshaws and taxis has gone down. The share of cars has increased tremendously in all arterial roads in all three zones — inner, middle and outer, the highest increase is observed in the middle area followed by inner area and outer area. Share of buses, autos and taxis have gone down in most arterial roads

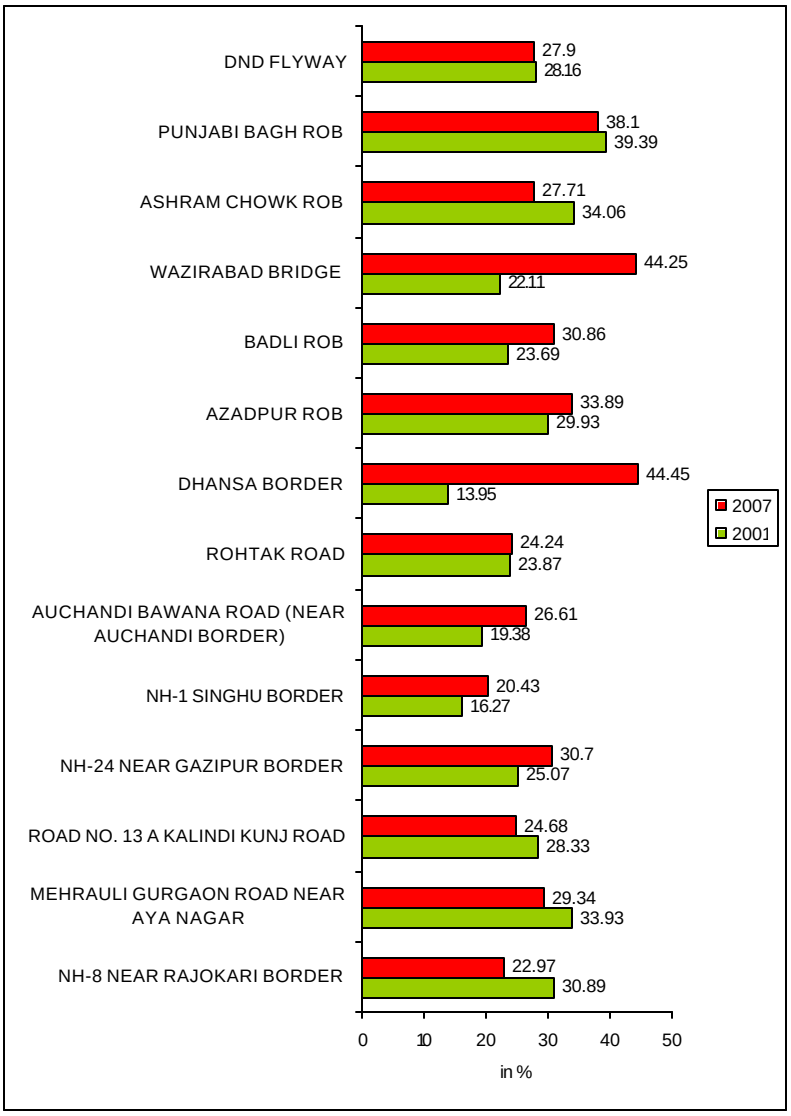
The 2008 RITES survey also confirms that the trend has continued. . For instance, at NH-8 near the Rajokari Border the car traffic was 44.46 per cent of the total traffic in 2001, which has increased to 64.38 per cent in 2007. At the same place the two-wheeler traffic was 30.89 per cent in 2001, which has fallen to 22.97 in 2007. Together the private vehicles constitute nearly 87 per cent of the traffic. Overall traffic has increased by 28 per cent. Similarly, private vehicles near Mehrauli Gurgaon Road near Aya Nagar constitute 87.37 per cent of the traffic -- 58.03 per cent are cars and 29.34 per cent are two wheelers. In Kalindi Kunj two wheeler's share has reduced from 28.33 per cent to 24.68 per cent. At Ashram Chowk rail over bridge while the cars has increased to 53.3 per cent, the two wheeler share has fallen from 34.06 per cent to 24.71 per cent in 2007.

Graph 11: Car traffic has increased significantly



Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, et al , September

Graph 12: Two wheeler's share in traffic has also increased

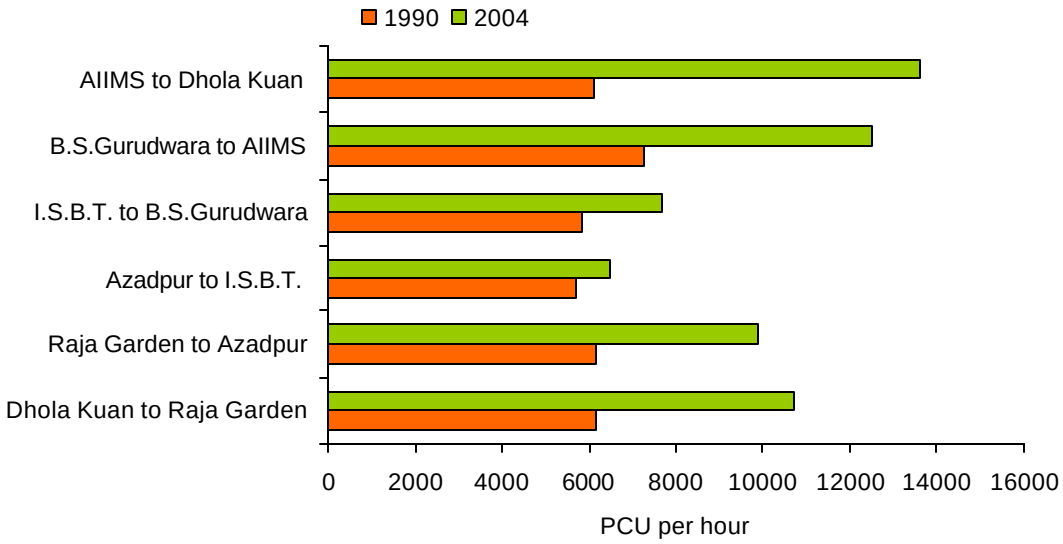


Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, MVA Asia Ltd, TERI, September

Explosive numbers have exhausted roads' capacity: Roads are designed to carry an estimated volume of traffic. But traffic has overwhelmed the designed capacity of many roads leading to long delays especially during the peak hours. Of the 170 traffic locations surveyed by RITES in 2008 shows that in 44 per cent of locations traffic volume is already exceeding the designed capacity, about 19 per cent locations are on the verge of exceeding it.

Assessments carried out in the Ring Road and on some prominent roads in the Central areas show that the road is already over stretched. City development plan reports total length of Ring road as 48 km that has 6 carriageways. These were designed to carry about 75,000 vehicles a day. But already the road carries 1,60,000 passenger vehicles per day (pcu) and it is expected to carry about reach 4,00,000 by 2011. It is anticipated that Ring road will require anywhere between 18 to 24 lanes. But where is the space? Situation is equally bad on roads connecting Delhi with the surrounding towns especially Gurgaon, Faridabad, Noida, Loni and Gaziabad. This is most starkly evident in the NH8 (Delhi-Gurgaon) which is designed for a peak traffic volume of 160,000 vehicles by 2015. But there are already 130,000 vehicles fighting for space on that road today.

Graph 13: Traffic volume exceeds the designed capacity of the capital's key arterial roads.



Source: IL&FS 2004 as quoted in CDP Delhi

In 2008 RITES has surveyed 89 key arteries and 61 mid block locations. Most of these locations are severely congested as these have traffic volume more than the designed capacity. According to transport planners wherever the value of road traffic volume to the capacity ratio falls in between 0.8 to 1 than it is termed as to be close of congested condition and when it value exceeds '1' it is termed as completely congested condition (See table: congested roads)

Table: high traffic load leading to severe congestion

Selected locations	Total vehicles per day	Volume to capacity ratio More than 1 indicates exceedance of designed capacity
Road And Rail Bridge (Near Yamuna Bazar)	85,243	3.59
Patel Road (Near Shadipur Rob)	1,45,975	2.72
Ito (Near Ito Bridge)	1,48,638	2.09
Nizamuddin Bridge	1,57,187	2.08
Tilak Marg (Near Tilak Bridge Rub)	1,30,856	2.01
Ring Road Near Naraina Rob	1,44,939	1.9
Gazipur Road (Near Vivek Vihar Railway Station Rob)	80,913	1.87
Lala Hardev Sahai Road Near Delhi It Park	1,54,913	1.83
Outer Ring Road (Near Peera Garhi Rob)	1,24,132	1.81
Road Number 40 Near Zakhira Rub	99,721	1.49
Noida Link Road (Near Ganesh Nagar Rob)	74,705	1.49

Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, MVA Asia Ltd, TERI, September

Costs of congestion: Congestion entails enormous costs on the economy. Idling and frequently accelerating and decelerating vehicles waste a lot of energy, cause increased emissions of toxic pollutants, lead to high personal exposure to pollutants, and loss of productivity due to lost time, among others. This eats away the GDP silently. The cost of congestion in OECD countries is nearly 3 per cent of GDP. Cost of congestion in Korea is 4.4 per cent of its GDP and 6 per cent of GDP in Thailand. In India these costs have not been adequately assessed. Preliminary estimates carried out by the Pune based CIRT show congestion costs in India can be as high as Rs 3000 to 4000 crore per year.

High fuel wastage: It is known that idling and vehicles caught in congestion consume more fuel. This is also due to loss in fuel economy as lots of kinetic energy is lost in breaking and idle running of the engine, which could be used in running the wheels. There are very few studies carried out in Delhi to assess the wastage of fuel due to congestion.

The CRRI Study on Losses of Petroleum Products at Traffic Intersections due to idling of vehicles at Delhi was sponsored by PCRA to estimate the total fuel loss per day due to idling of vehicles at traffic intersections in Delhi and to recommend remedial measures for conserving fuel at intersections. Its assessment involved 466 signalized traffic intersections. These intersections were classified into three categories based on the traffic volume and as per this classification there were 183 high volume Intersections, 250 medium volume Intersections and 33 low volume Intersections.

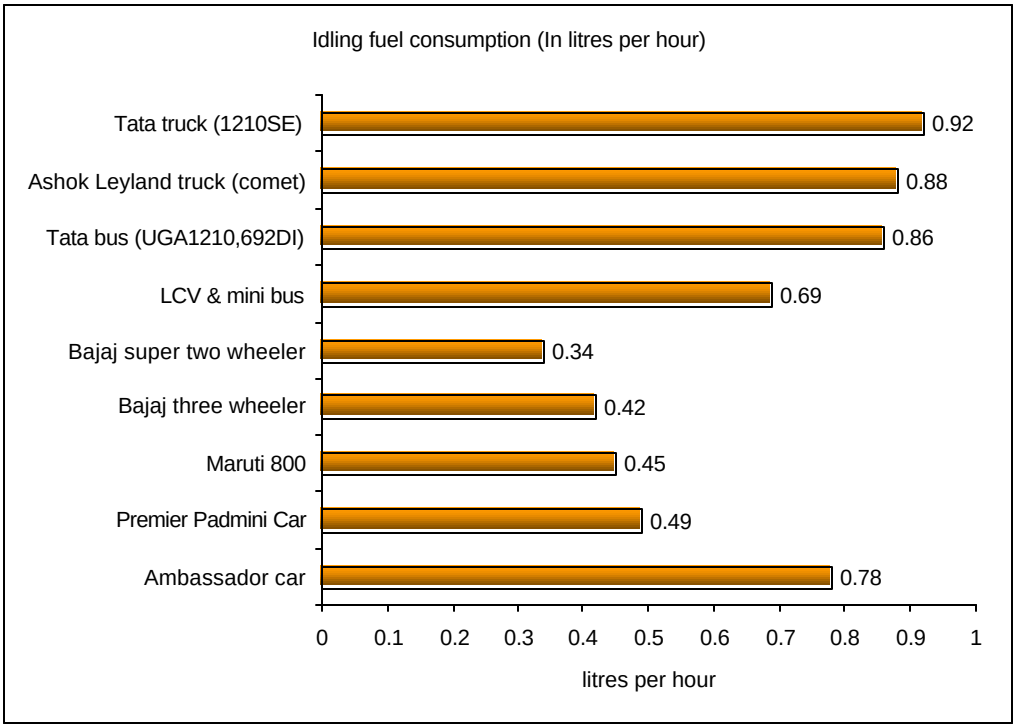
With over 466 signalized intersections, 3,21,432 litres of Petrol and 1,01,312 litres of Diesel are being burnt every day due to the idling of vehicles, estimated the study. Converting these figures into monetary terms the total losses, at the 1996 prevailing price of fuel, works out to be Rs. 82.00 lakhs per day for Delhi. Annually it is estimated to be in the tune of Rs 245.00 crores per annum. This reveals that per hour half to nearly one litre of fuel is lost by most of the vehicles, in fact larger the vehicle more the loss while idling.

More recent estimation released in 2006 for Delhi carried out by CRRI for 600 signalized traffic intersections shows an annual loss of fuel due to idling of vehicles results in Rs 994.46 crore. Out of the total fuel wasted in the intersections, 41 per cent is CNG, 45 per cent is petrol and 14 per cent is diesel.

Amongst the intersection the fuel loss in Moolchand was worth Rs 35.8 million and in Khanpur intersection was worth Rs 10 million. This reveals that per hour half to nearly one litre of fuel is lost by most of the vehicles, in fact larger the vehicle more the loss while idling.

Graph 14: Dead mileage

The idling fuel consumption is drain to economy as India imports nearly 70 per cent of crude oil, which is unproductively wasted



Source: Anon 1996, Loss of petroleum products due to idling of vehicles at road intersections in Delhi, Final report, Central Road Research Institute, New Delhi

A fuel-efficient car can become a guzzler when caught in congestion. According to studies, the fuel consumption or CO2 emissions in gm per km can increase up to 3 to 4 times compared to the car running at around 55 to 65 km per hour.

Congestion aggravates pollution: Low average speeds due to traffic congestion increases the emissions due to the stop-and-go pattern of traffic flow in congested condition. The emissions of hydrocarbon and carbon monoxide emissions per vehicle-kilometer tend to increase at low average speeds in congested city driving, while emissions of nitrogen oxides increase at high speeds as on highways. However the CO2 emission is at both high at slow and high speed. International studies bear out this point (See Table: Emissions in different traffic types)

Table 3: Emissions in different traffic types

Automobile exhaust emissions as a function of driving conditions in France

	CO	HC	NOx	PM	CO2
Traffic type					
Congested urban	3.29	1.04	2.70	0.68	588
Free flowing urban	1.05	0.29	0.76	0.29	225
Highway	0.61	0.16	0.57	0.19	179

Motorway	0.61	0.09	0.56	0.25	166

Source: Asif Faiz et al, Air pollution from motor vehicles**, The World Bank, p79

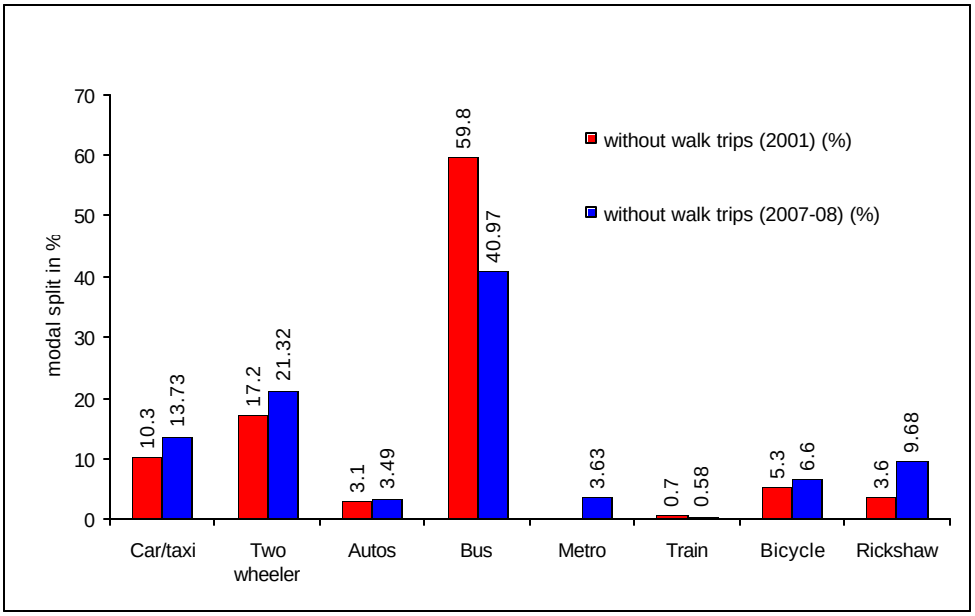
Studies show that vehicle fuel consumption increases approximately 30 per cent under heavy congestion. The Increased fuel consumption and air pollution costs represent about 17 per cent of the total external cost of congestion.

Loss of time: Congestion also leads to loss of one very significant aspect of human resource – productive time. Recently the Associated Chambers of Commerce and Industry (ASSOCHAM) of India, an apex body of the chambers of commerce conducted a survey in national capital region to assess the commuting time for working population and delays. The study found that as a result of traffic congestion and increasing jams during peak morning and evenings hours commuters in Delhi and NCR towns are loosing as much as 2 to 2.5 hours every day while to reach their destinations, i.e. from home to office and office to home. This translates into a total loss of nearly 420 million man-hours every month by about 70,00,000 working population of Delhi and NCR that are taking to public transport for commuting between home and their office destinations and vice-versa, according to the study.

This phenomenon was found particularly acute in the arterial roads connecting Delhi with the surrounding towns in the NCR. Maximum traffic load was observed on Delhi-Gurgaon, South, North and East Delhi, Noida and Ghaziabad roads. This congestion is largely caused by the personal transport. UP, Delhi and Haryana are not well linked with public transport systems.

Usage of public transport under pressure: It is worrying that public transport usage is declining in our cities. Even during the early part of this decade public transport buses met more than 60 per cent of the travel demand in Delhi. But Delhi is letting its bus transport decay as -car policies are taking over. This is starkly evident from the 2008 RITES survey. Between 2001 to 2007-08 in the modal split the Bus's share has fallen from 60 per cent to 41 percent and train's from 0.7 per cent to 0.58 per cent. The gainers are car/taxis and two-wheeler. Today all public transport trips (bus, train, auto, rickshaw, and metro) make up 58 per cent of all person trips and 54.55 per cent of passenger kms.

Graph 15: Buses marginalised



Source: Anon 2008, transport demand forecast study: study and development of an integrated cum multi modal public transport network for NCT of Delhi, RITES, MVA Asia Ltd, TERI, September

Reinvent mobility

Cars are overwhelming the urban space and road infrastructure. They have eroded public spaces and urban commons to meet the insatiable need for roads and parking. Cars are locking up enormous resources to provide mobility to a minority – bringing in their wake unacceptable social inequity and pollution. Public transport, pedestrians, and cyclists are the immediate victims of this car mania. This car dependency can be reversed with right policies. City governments can discourage car usage while improving access to more sustainable forms of transport.

- Build and expand public transport: The only way out of the congestion mayhem is to massively augment public transport so that the road space can be used more efficiently to carry more people and at greater speed.
- Integrate all modes of transport to maximize access to public transport systems and its usage.
- Integrate Delhi with the surrounding towns with public transport to reduce the pressure of the incoming traffic. Already a common agreement has been signed by the state governments of the neighbouring states to develop seamless public transport system and design common policy regime for them.
- Introduce uniform emissions standards across national Capital Region to bring the entire motorized fleet in the region at par.
- Implement parking policy to provide for controls over parking in the city which will discourage use of personal vehicles and provide incentives for shift.
- Correct distorted taxes related to transport to encourage public transport