

# VEHICULAR POLLUTION CONTROL IN INDIA TECHNICAL & NON-TECHNICAL MEASURE POLICY



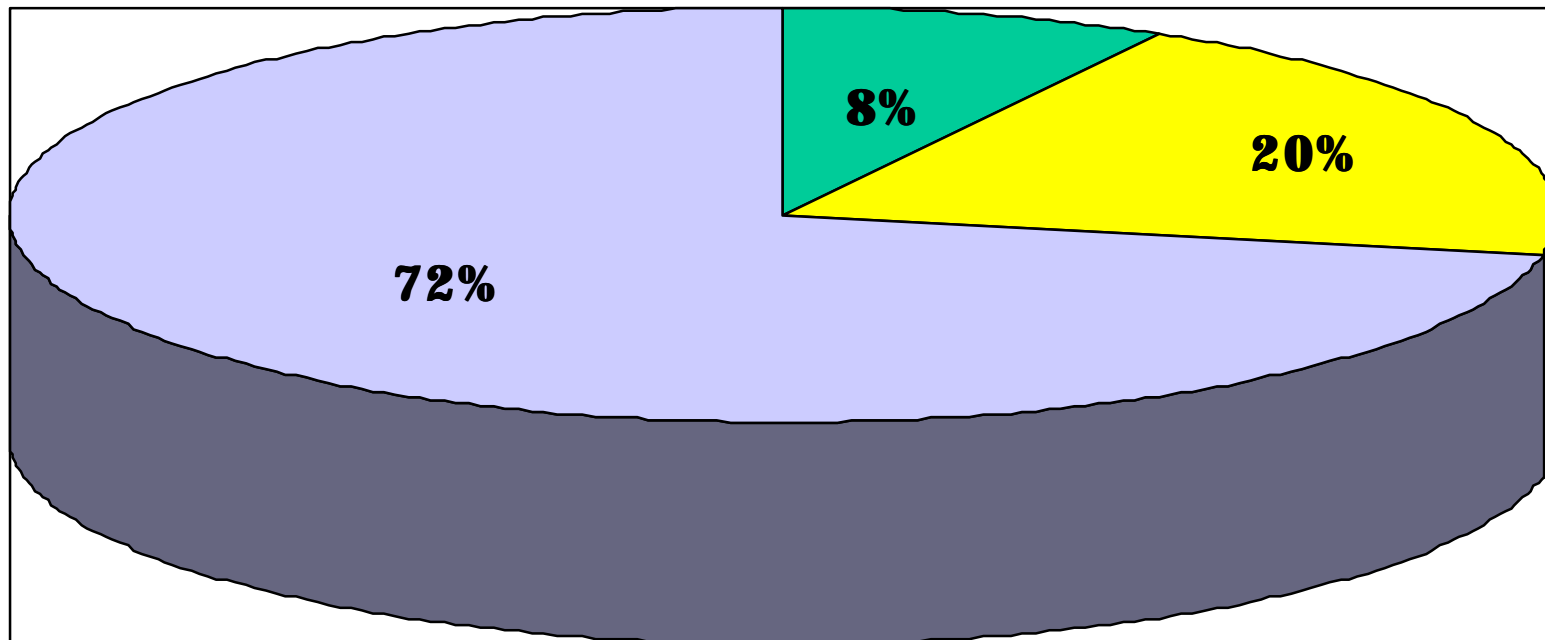
Dr. B. Sengupta  
Member Secretary  
Central Pollution Control Board  
Ministry of Environment & Forests  
Government of India, New Delhi

Paper Presented at Regional Workshop on Transport Sector  
Inspection & Maintenance Policy in Asia Organized by  
ESCAP/UN(DESA) in Bangkok during 10-12 Dec'2001

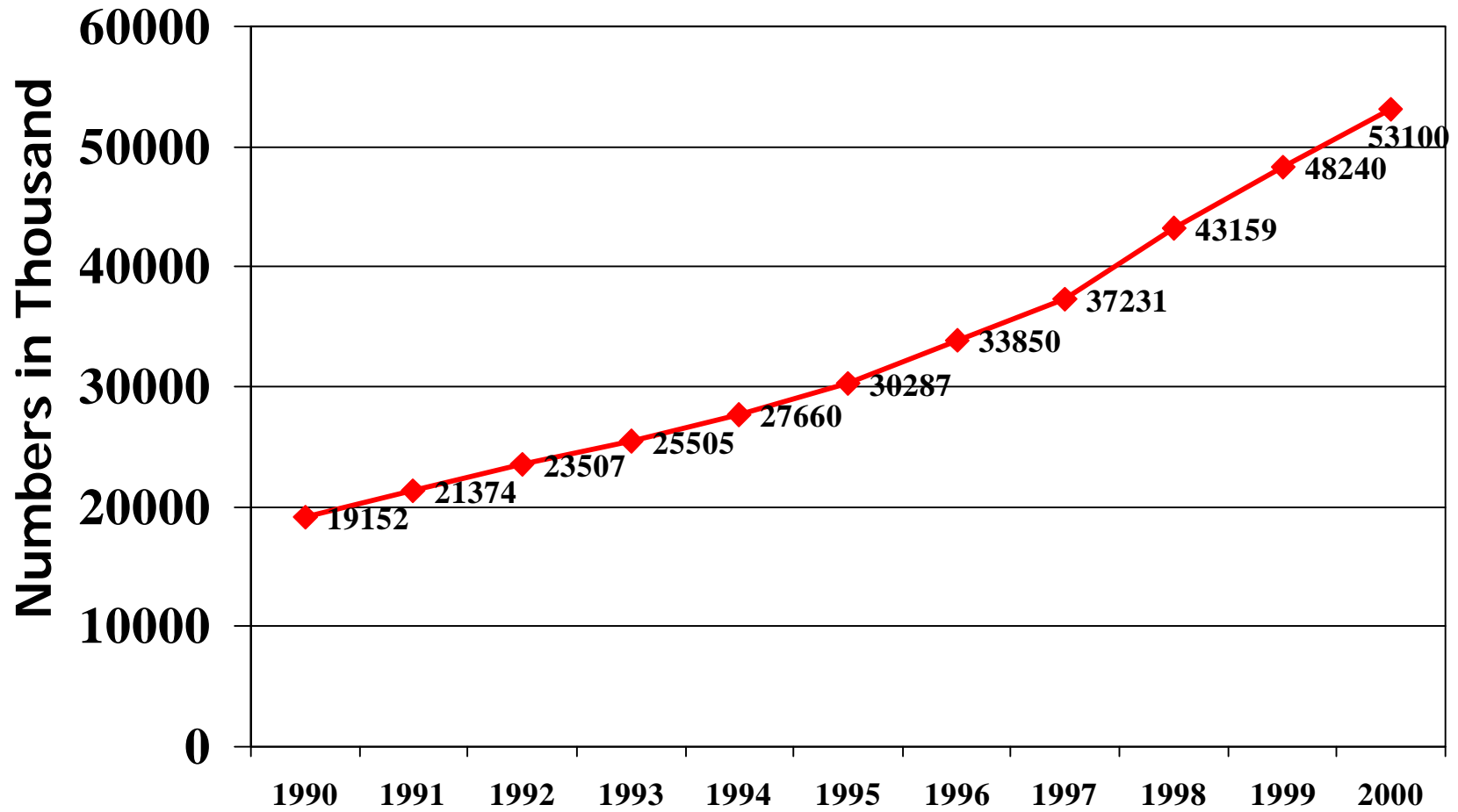
# VEHICULAR POLLUTION PROBLEMS IN INDIA

- **High vehicle density in Indian urban centers**
- **Older vehicles predominant in vehicle vintage**
- **Inadequate inspection & maintenance facilities**
- **Predominance of two stroke two wheelers**
- **Adulteration of fuel & fuel products**
- **Improper traffic management system & road conditions**
- **High levels of pollution at traffic intersections**
- **Absence of effective mass rapid transport system & intra-city railway networks**
- **High population exodus to the urban centers.**

# CONTRIBUTION OF VARIOUS SECTORS TO AMBIENT AIR QUALITY IN MAJOR CITIES

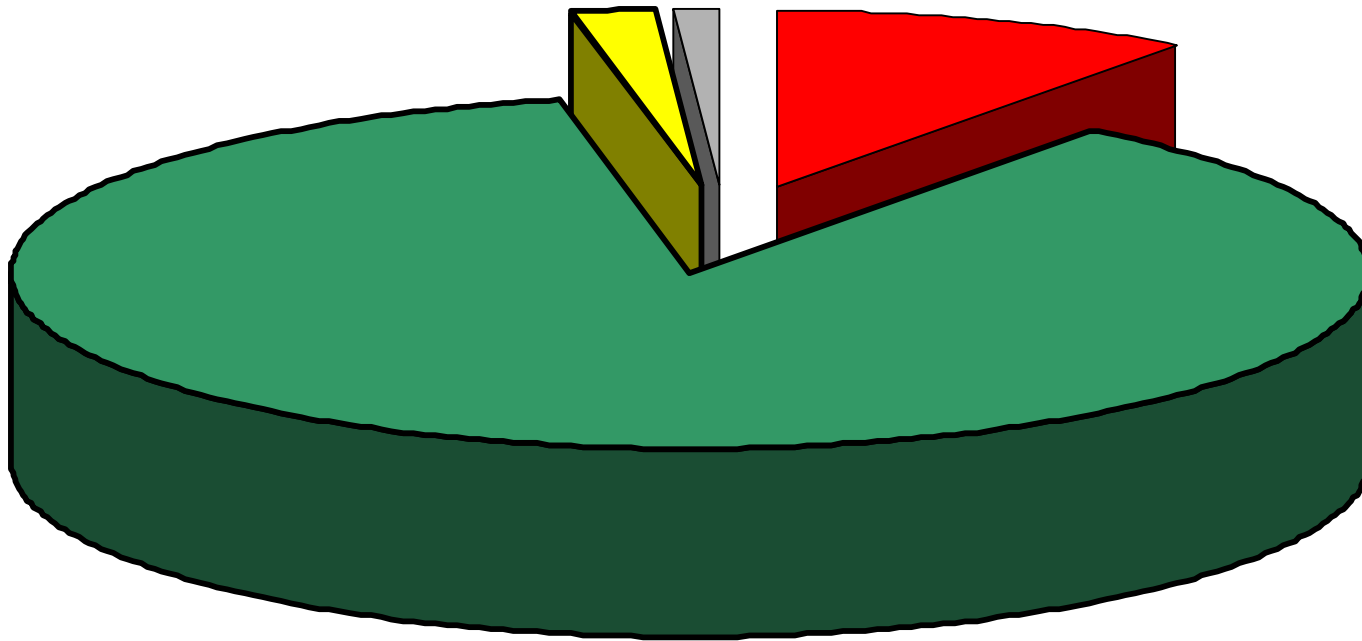


# GROWTH OF MOTOR VEHICLES IN INDIA

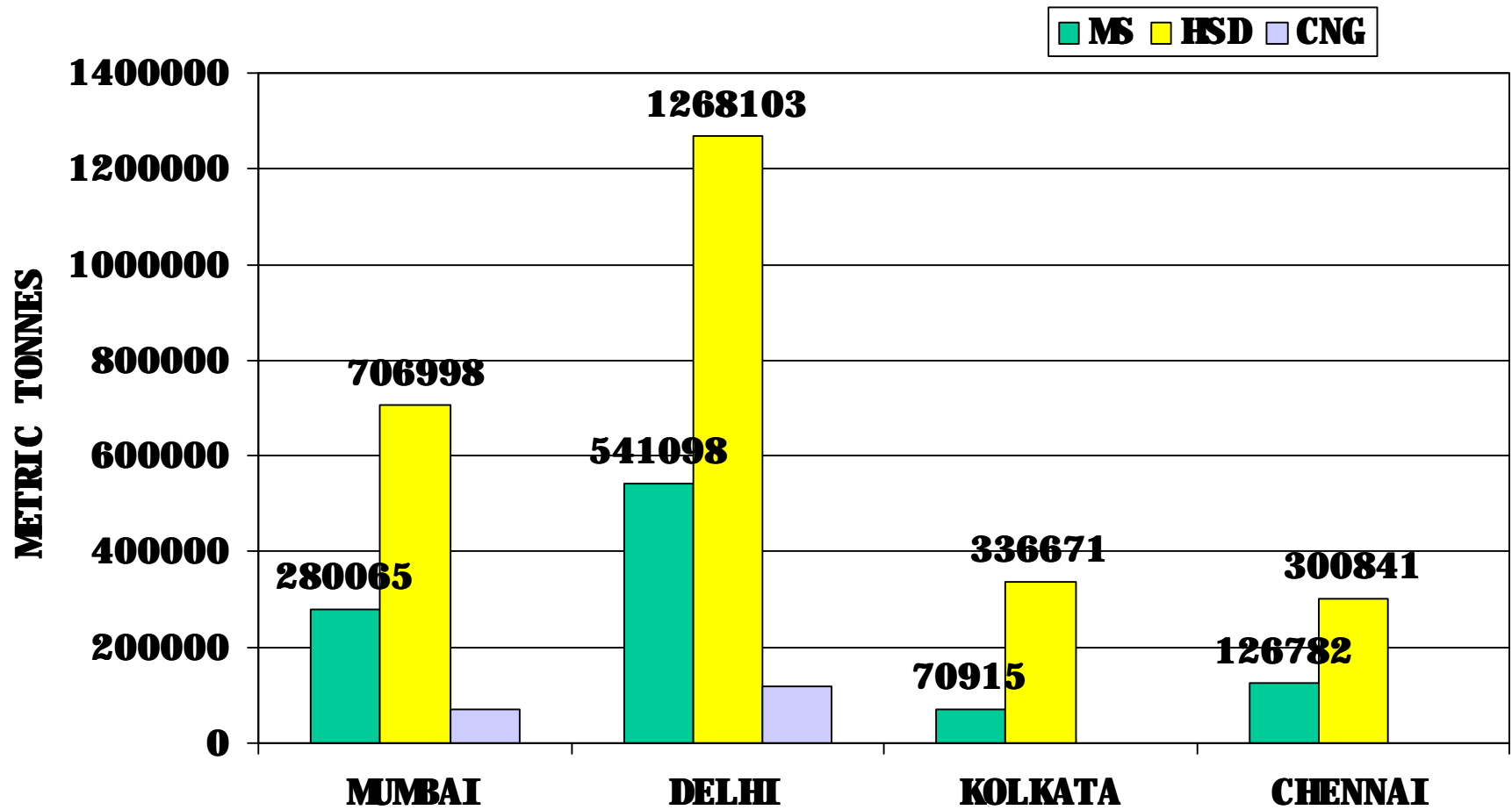


# FUEL SHARE IN INDIA

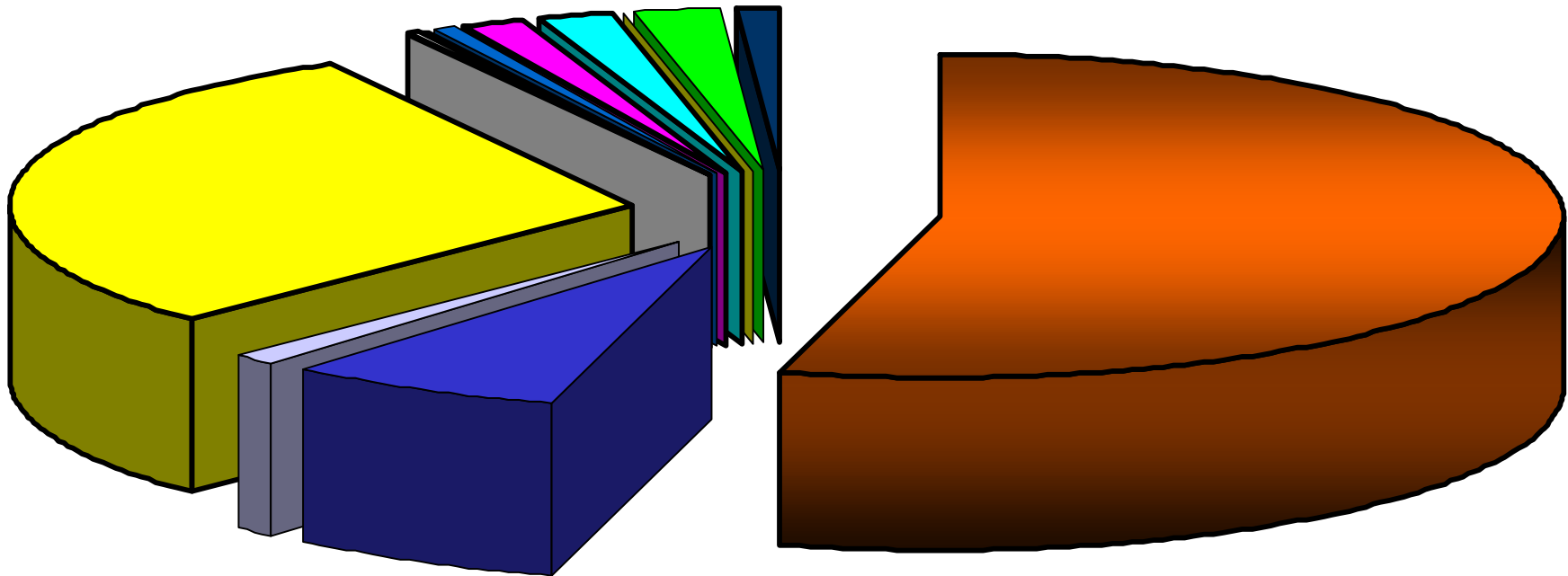
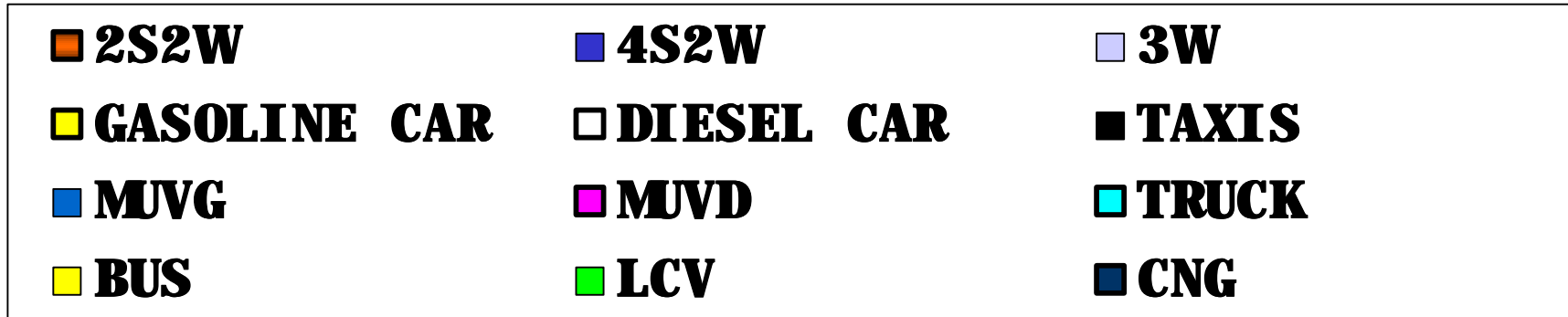
■ **GASOLINE** ■ **DIESEL** ■ **CNG** ■ **LPG/ELEC**



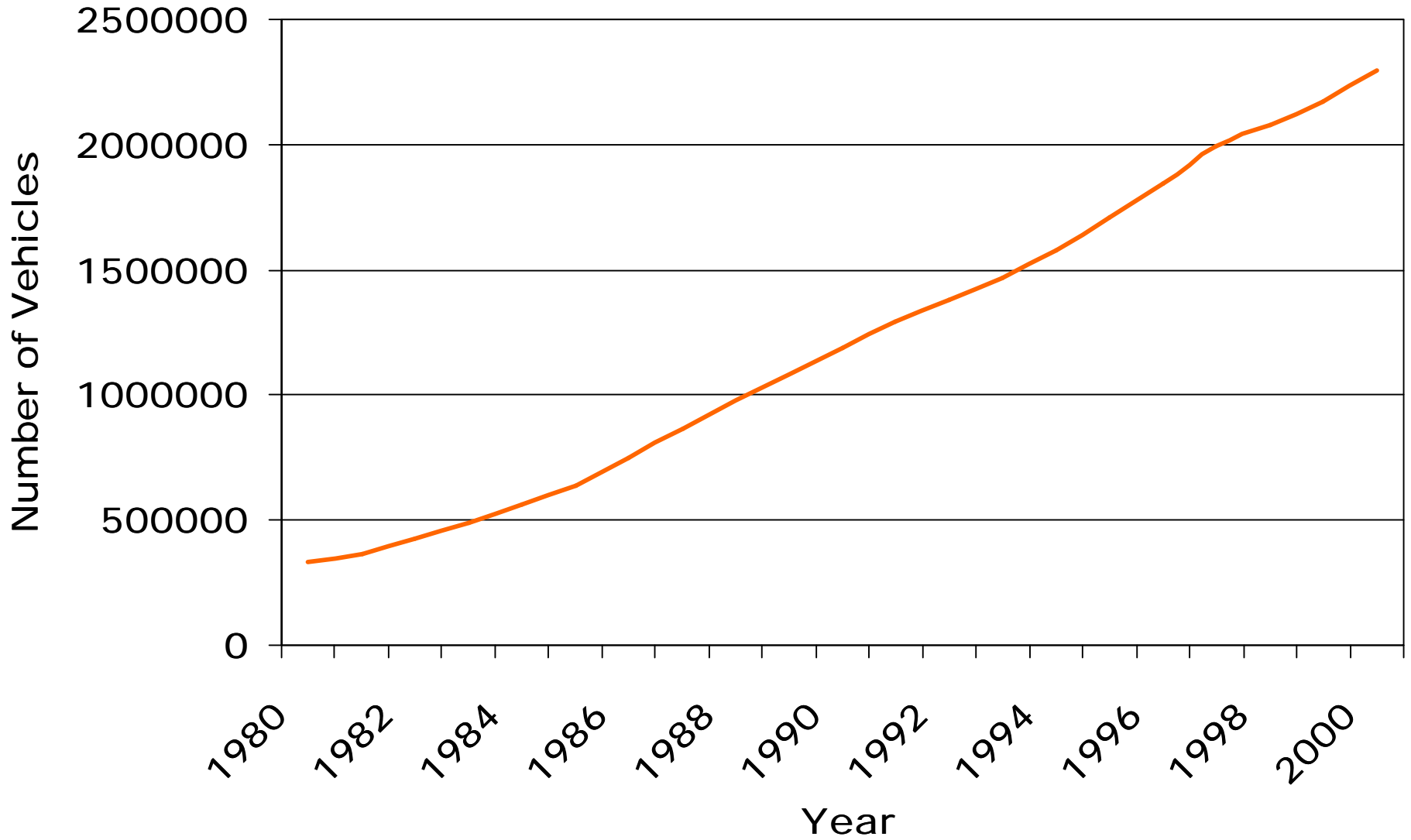
# FUEL CONSUMPTION IN METRO CITIES(1999-2000)



# SHARE OF ON-ROAD VEHICLES IN DELHI



# EXPONENTIAL GROWTH OF TWO WHEELERS IN DELHI



**% EMISSION LOAD CONTRIBUTION FROM DIFFERENT  
VEHICLES IN YEAR 2000 IN DELHI**

<b>Types Load Th.t</b>	<b>CO (292.6)</b>	<b>HC (112.6)</b>	<b>NOX (63)</b>	<b>PM (14.4)</b>	<b>BENZENE (3.0)</b>	<b>BUTADINE (0.36)</b>	<b>O3 POTENCIAL (402)</b>
<b>BUS</b>	<b>1</b>	<b>1</b>	<b>23</b>	<b>15</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>1</b>
<b>LCV</b>	<b>7</b>	<b>1</b>	<b>10</b>	<b>14</b>	<b>1</b>	<b>3</b>	<b>1</b>
<b>MUVG</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>&lt;1</b>	<b>1</b>	<b>2</b>	<b>&lt;1</b>
<b>MUVD</b>	<b>3</b>	<b>&lt;1</b>	<b>6</b>	<b>13</b>	<b>1</b>	<b>3</b>	<b>&lt;1</b>
<b>PCG</b>	<b>36</b>	<b>17</b>	<b>35</b>	<b>6</b>	<b>41</b>	<b>49</b>	<b>16</b>
<b>PCD</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>1</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>&lt;1</b>
<b>TAXIS</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>1</b>	<b>1</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>&lt;1</b>
<b>TRUCKS</b>	<b>4</b>	<b>2</b>	<b>22</b>	<b>21</b>	<b>&lt;1</b>	<b>1</b>	<b>2</b>
<b>3W</b>	<b>8</b>	<b>13</b>	<b>&lt;1</b>	<b>4</b>	<b>18</b>	<b>7</b>	<b>13</b>
<b>4S/2W</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>
<b>2S/2W</b>	<b>38</b>	<b>63</b>	<b>1</b>	<b>24</b>	<b>36</b>	<b>32</b>	<b>65</b>

# TECHNICAL MEASURES

VEHICLE TECHNOLOGY

FUEL QUALITY

AFTER COMBUSTION TECHNOLOGY

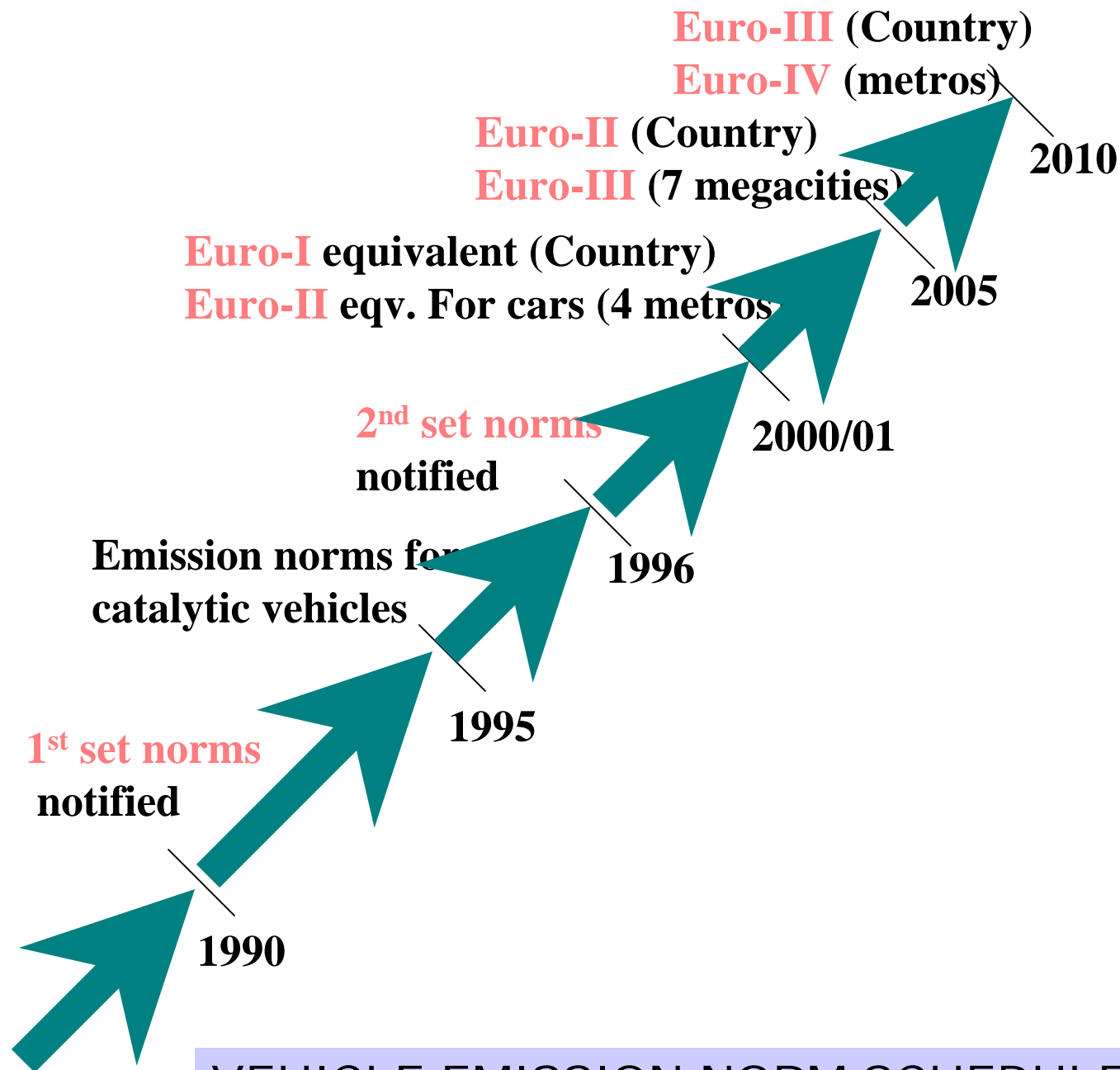
ALTERNATIVE FUEL

ZERO EMISSION VEHICLES (ZEVs)

MASS TRANSIT SYSTEM

URBAN ROAD & FLYOVER PROJECTS

I&M / PUC PROGRAMME



**VEHICLE EMISSION NORM SCHEDULE IN INDIA**

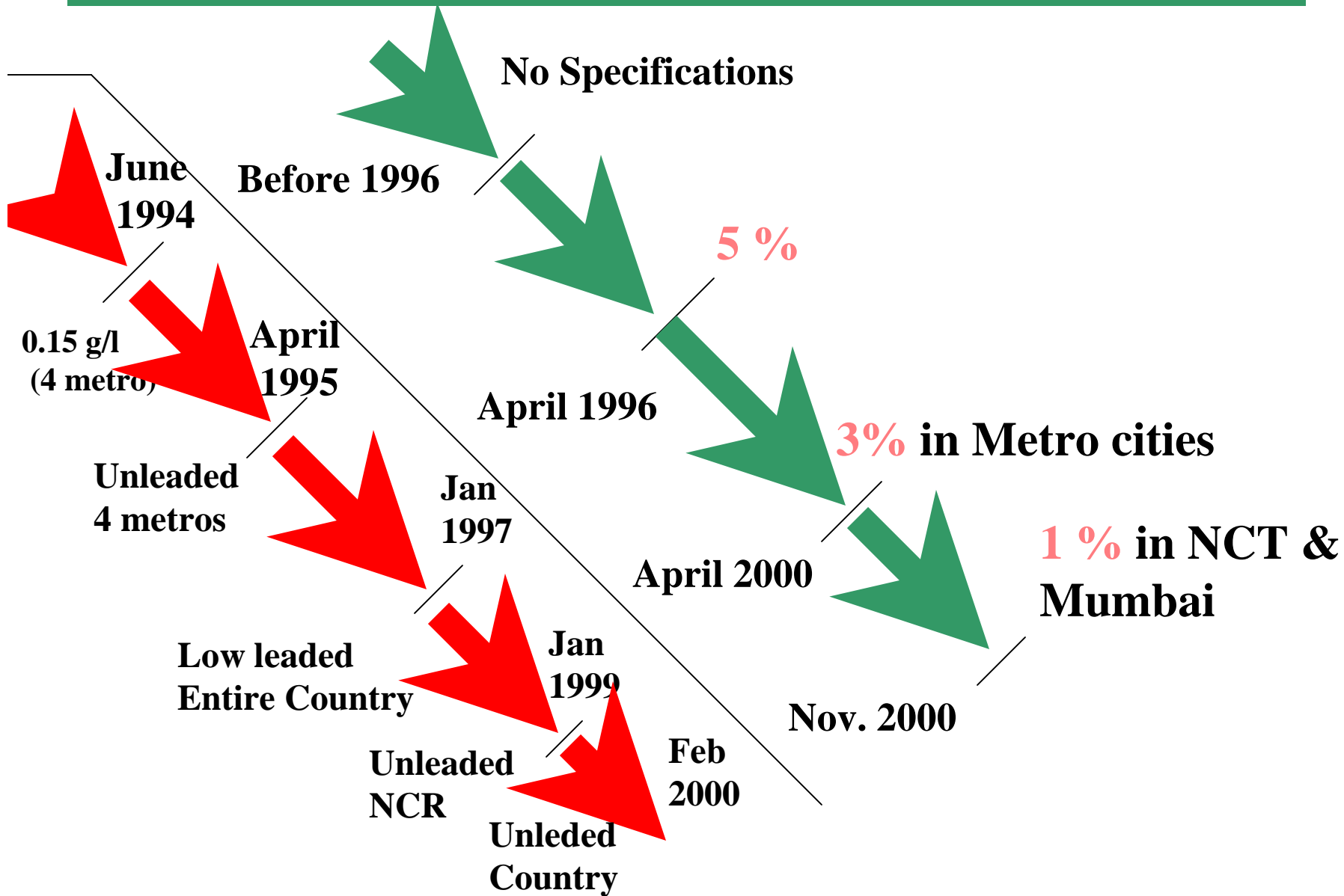
# GASOLINE SPECIFICATIONS & SCHEDULE

PARAMETER	SPECIFICATIONS			
YEARS →	1996	2000	2005	2010
<b>RVP at 38deg.c,kpa</b>	<b>35-70</b>	-	<b>35-60</b>	<b>60</b>
<b>BENZENE %by Vol.,Max</b>	<b>5.0</b>	<b>5.0</b> <b>3.0 (metros)</b>	<b>3.0 (all)</b> <b>1.0 (metro)</b>	<b>1.0</b>
<b>Lead G/m3, Max</b>	<b>0.15%</b> (low pb) <b>0.013%</b> (unleaded)	<b>0.013</b>	<b>0.013</b>	<b>0.005</b>
<b>Sulphur %by Mass,max</b>	<b>0.10</b> (unleaded) <b>0.20</b> (leaded)	<b>0.10</b>	<b>0.05</b>	<b>0.015</b>
<b>Aromatics % v/v., Max</b>	-	-	<b>45</b>	<b>42</b>
<b>Oxygen %by Vol.,max</b>	-	-	<b>2.0</b>	<b>2.7</b>

# DIESEL SPECIFICATIONS & SCHEDULE

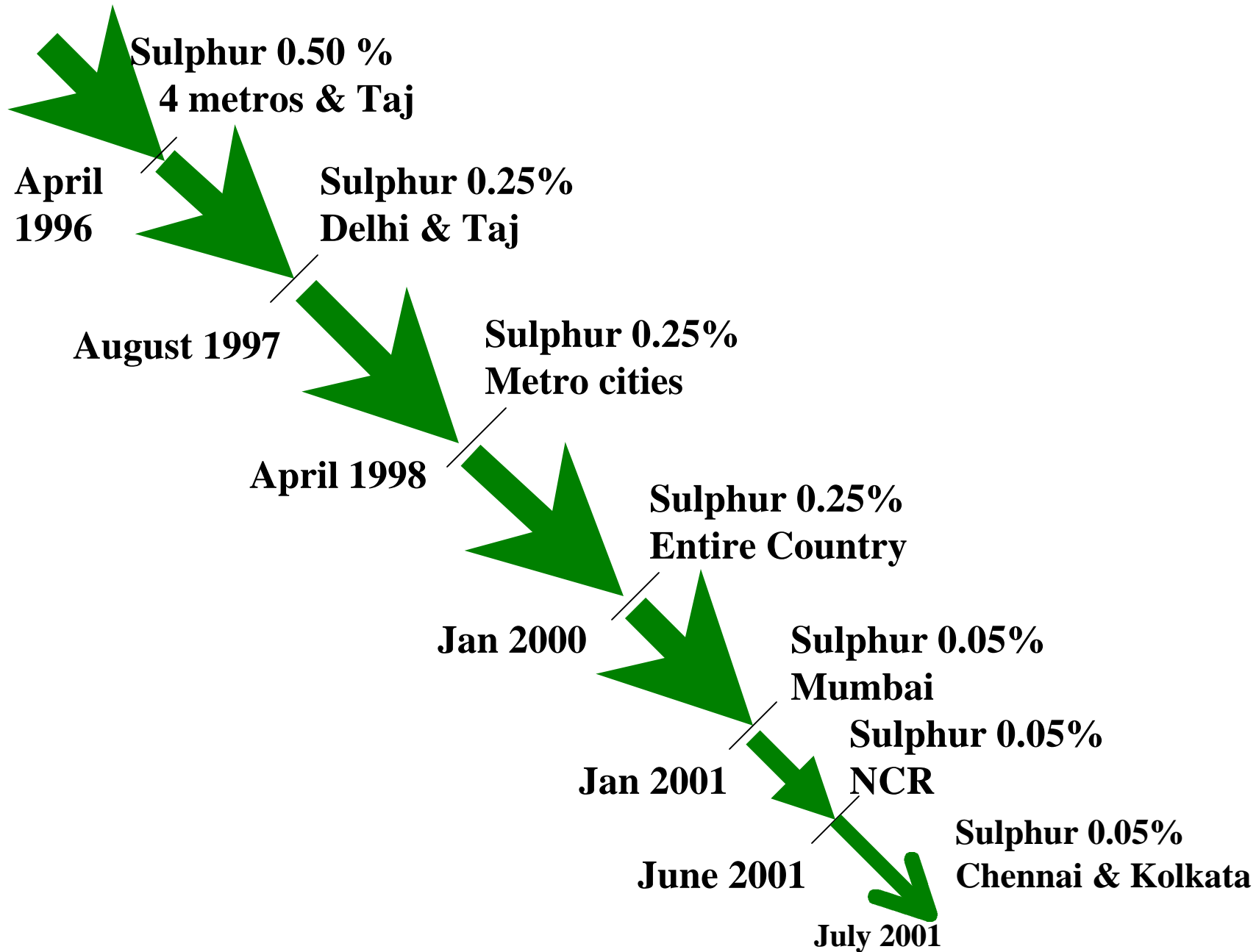
<b>PARAMETER</b>	<b>SPECIFICATIONS</b>			
<b>YEAR</b>	<b>1996</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
<b>Cetane No, Min</b>	<b>45</b>	<b>48</b>	<b>48</b>	<b>51</b>
<b>Sulphur % W/w, Max</b>	<b>0.50</b>	<b>0.25</b> <b>0.05</b> <b>(METRO)</b>	<b>0.05</b>	<b>0.035</b>
<b>Distillation T95</b>	<b>-</b>	<b>370</b>	<b>370</b>	<b>360</b>
<b>Polyaromatic</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>11</b>

# GASOLINE BENZENE REDUCTION PROGRAMME IN INDIA



# GASOLINE LEAD PHASE-OUT PROGRAMME IN INDIA

# DIESEL SULPHUR REDUCTION PROGRAMME IN INDIA



# INSPECTION & CERTIFICATION SYSTEM

- **Fitness certification is a statutory requirement for commercial vehicles and public transport vehicles. Periodicity for certification is once in a Year.**
- **For non-commercial passenger cars, fitness certification is required for renewal of registration, only after 15 years from the date of first registration. In case of two wheelers no such requirement exists.**
- **Pollution Under Control (PUC) certificates are required to be obtained every three months for all categories of vehicles. In case of petrol vehicles idling CO measurements are taken and in case of diesel vehicles, free acceleration smoke is measured.**
- **RTOs, filling stations & service stations are authorized to issue PUC certificates. There are more than 400 PUC centers in Delhi.**
- **The agency for issue of Fitness Certificate is the Transport Department.**
- **A fee of Rs.150 per vehicle for heavy commercial vehicles and Rs.50 for medium & light commercial vehicles is levied for obtaining PUC certificates.**

## Current & Proposed Emission Standards for in-use Vehicles

Vehicles	Category	Current Standard		Proposed Standard	
		CO (%)	HC (ppm)	CO (%)	HC (ppm)
<b>Gasoline 2/3 Wheelers</b>	<b>2-stroke</b>	<b>4.5</b>	<b>-</b>	<b>3.5</b>	<b>9000</b>
	<b>4-stroke</b>	<b>4.5</b>	<b>-</b>	<b>3.5</b>	<b>9000</b>
<b>Gasoline 4-wheelers</b>	<b>Without close loop Cat. Con.</b>	<b>3.0</b>	<b>-</b>	<b>3.0</b>	<b>To be proposed</b>
	<b>With close loop Cat. Con.</b>	<b>-</b>	<b>-</b>	<b>0.5</b>	<b>200</b>
<b>Diesel Vehicles other than agricultural tractors</b>	<b>Full load</b>	<b>75 HSU (Smoke Density)</b>		<b>Not Proposed</b>	
	<b>Free acceleration</b>	<b>65 HSU</b>		<b>Not Proposed</b>	
<b>Diesel Agri Tractors</b>	<b>80% load</b>	<b>75 HSU</b>		<b>Not Proposed</b>	
<b>LPG/CNG</b>	<b>2/3 Wheeler</b>	<b>-</b>		<b>4.5</b>	<b>-</b>
	<b>4-Wheeler</b>	<b>-</b>		<b>3.0</b>	<b>-</b>

# VEHICLE CHECK SHEET FOR FITNESS CERTIFICATE

S	Item	Check
1	Tyres	Cut, deformation, threadease were
2	Steering	Gear backlash, kingpin, stub axle, steering freeplay
3	Engine	Noise level 85 dB
4	Suspension	Leafspring position, clamping, shock absorber, bushes,shackle, centre bolt
5	Horn	Electrical, bulb, pressure horn
6	Brake	Total brake effort > 45%, stopping distance at 30 kmph < 13 mtrs, parking brake, brake oil leakage
7	Lamps/signals	Headlamps, parking, turn signal, top lights, reflectors
8	Embossing of chassis	Chassis & engine no. identification plate, month & year of mfg.
9	Speedometer	Functioning, speed governors.
10	Painting	As per Act and rules
11	Wiper	Wiper fitment & functioning
12	Dimension	As per CMVR, DMV rules
13	Body	Seating, mudguard, emergency gate, window size, glasses, floor, etc.
14	Electrical	Insulations, switches, doom light, spark arrester
15	Finishing	Riveting, welding, bonnet, crankcase cover, etc.
16	Road Test	Clutch, transmission, axels & performance
17	Others	As per specifications.

## TECHNICAL MEASURE EVALUATION BY EMISSION

**Up gradation of fuel quality & tightening of vehicle emission norms resulted in decreasing trends of pollution in major cities of India.**

**Inspection & Maintenance has definite utility on emission performance.**

**Concentration of lead in traffic intersection shows good downward trends.**

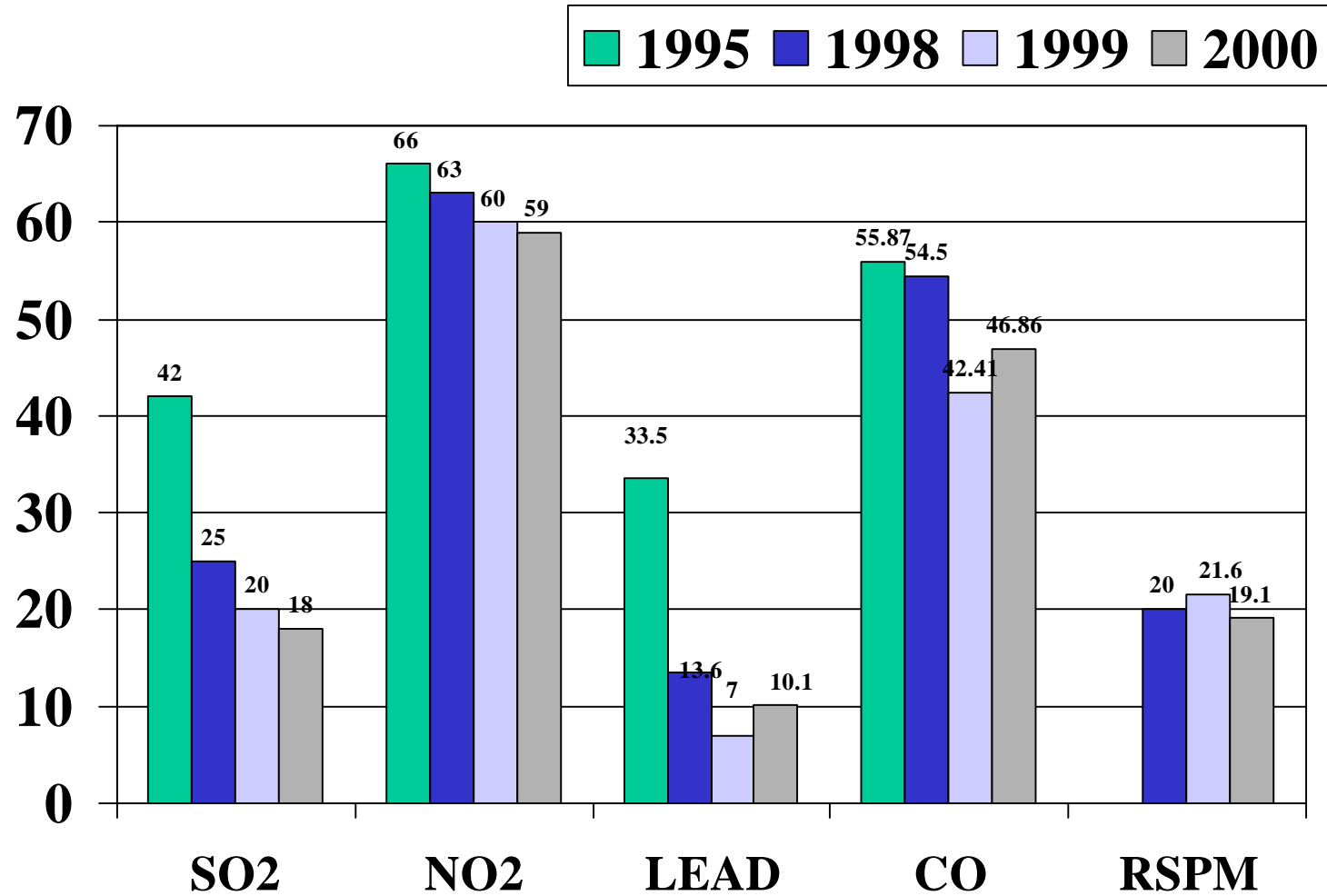
**SO<sub>2</sub> shows decreasing trends over the years.**

**Nox & PM still remain a problem though trends are decreasing.**

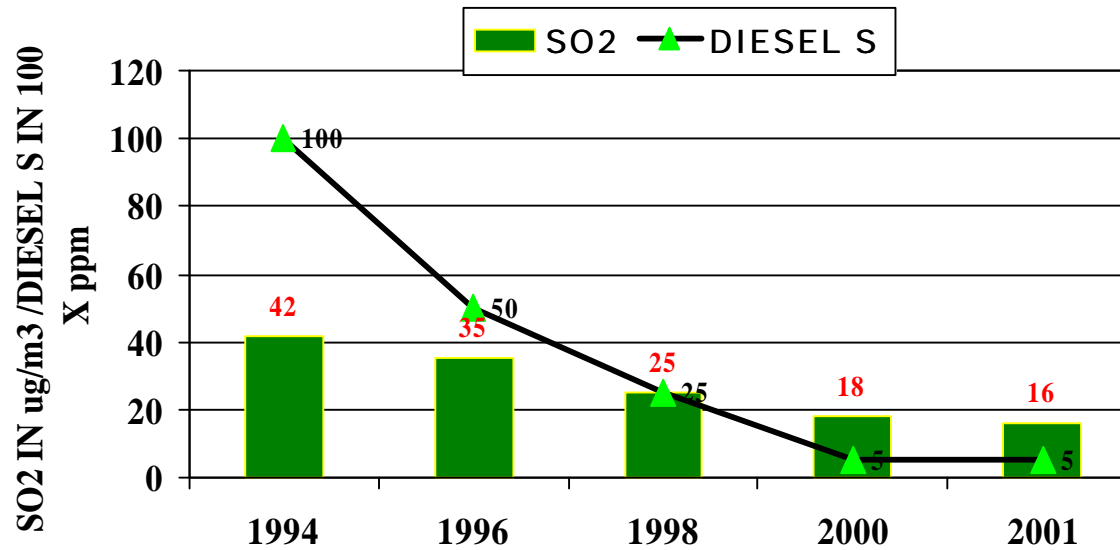
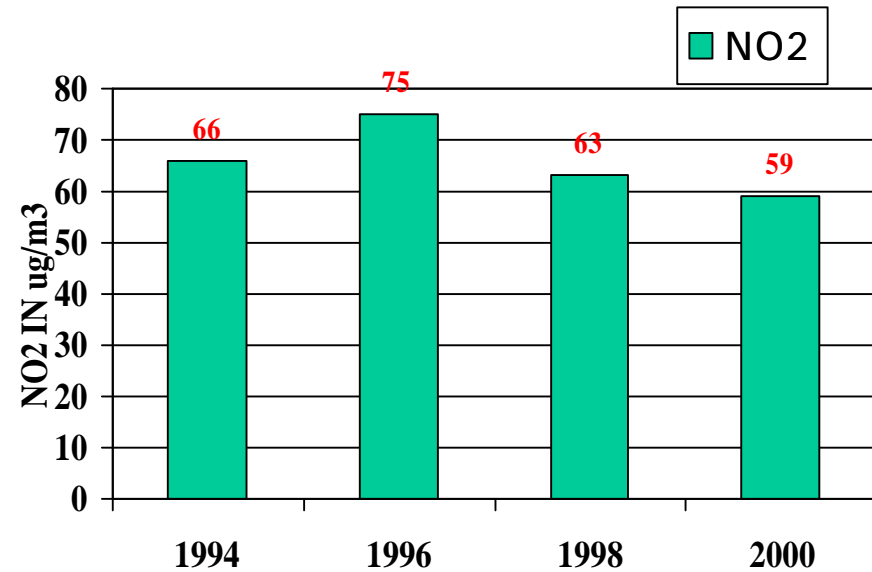
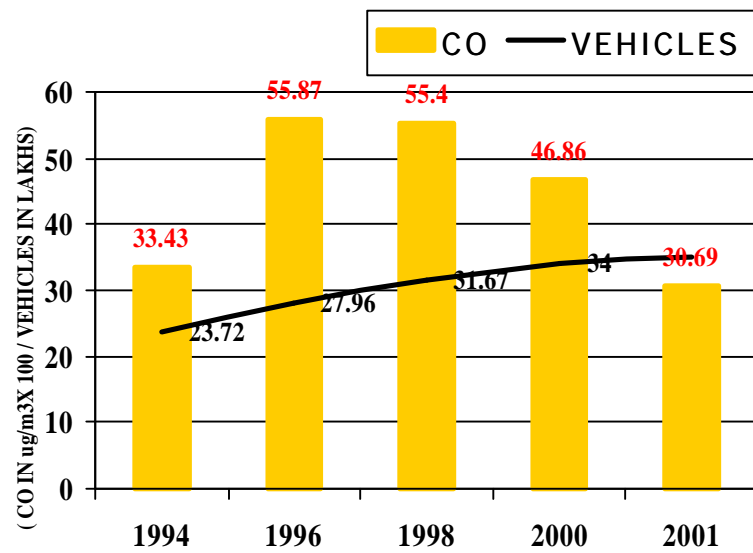
**Marginal decrease in RSPM observed at traffic intersections.**

# AMBIENT AIR QUALITY (TRAFFIC INTERSECTION) IN DELHI

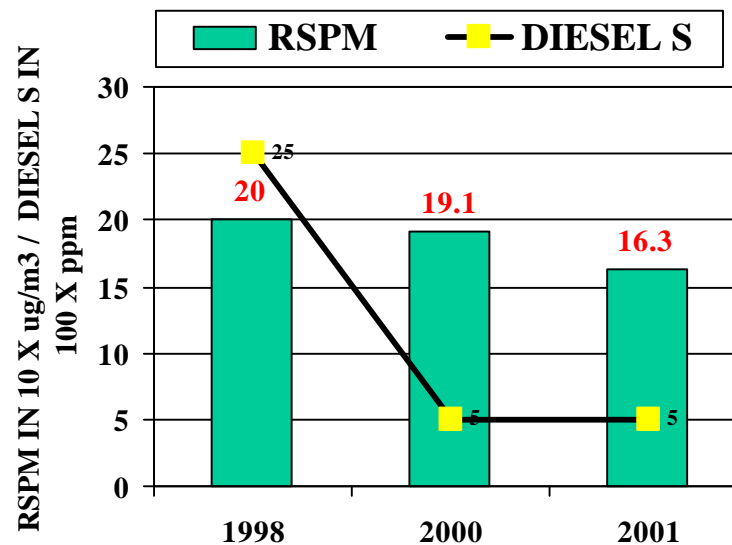
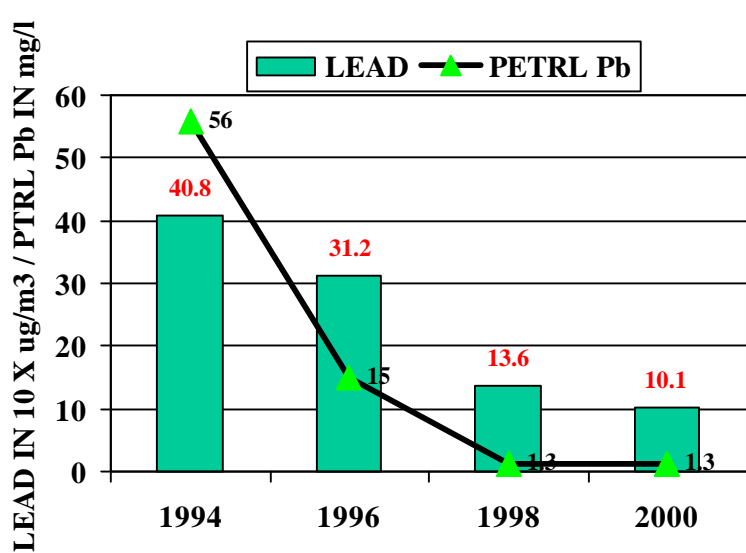
SO<sub>2</sub>/NO<sub>2</sub>-ug/m<sup>3</sup> RSPM-10 x ug/m<sup>3</sup>  
LEAD-10 x ng/m<sup>3</sup> CO-100 x ug/m<sup>3</sup>



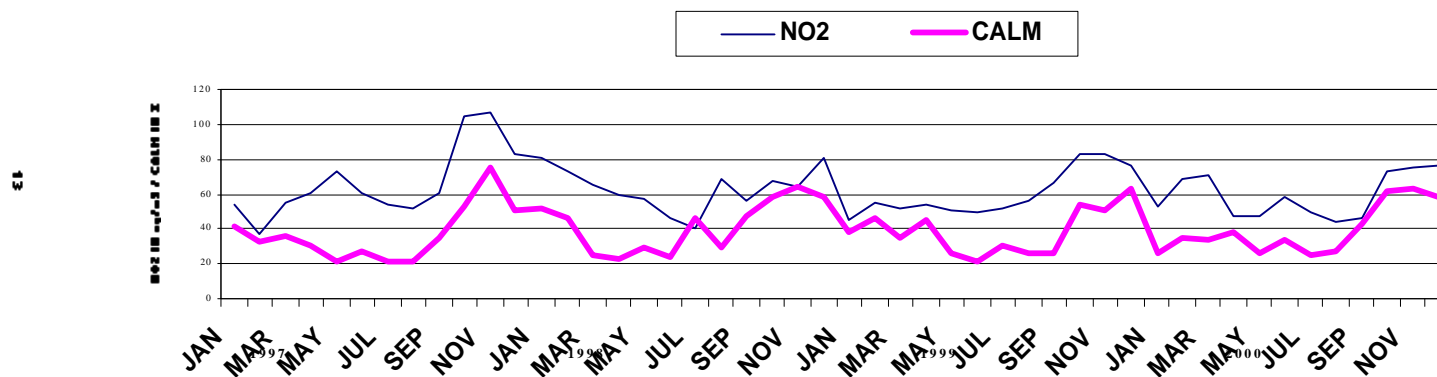
# AMBIENT POLLUTANT LEVELS IN TRAFFIC INTERSECTION IN DELHI



# AMBIENT POLLUTANT LEVELS IN TRAFFIC INTERSECTION IN DELHI



CORRELATION OF AMBIENT NO<sub>2</sub> LEVEL WITH CALM CONDITIONS OF WIND IN DELHI



PART-II

NON-TECHNICAL MEASURE POLICY

## NON-TECHNICAL MEASURES

EMISSION WARRANTY

SCRAPING OLD POLLUTING VEHICLES

TOLL TAX FOR COMMERCIAL VEHICLES

SUBSIDIES FOR CLEAN VEHICLES

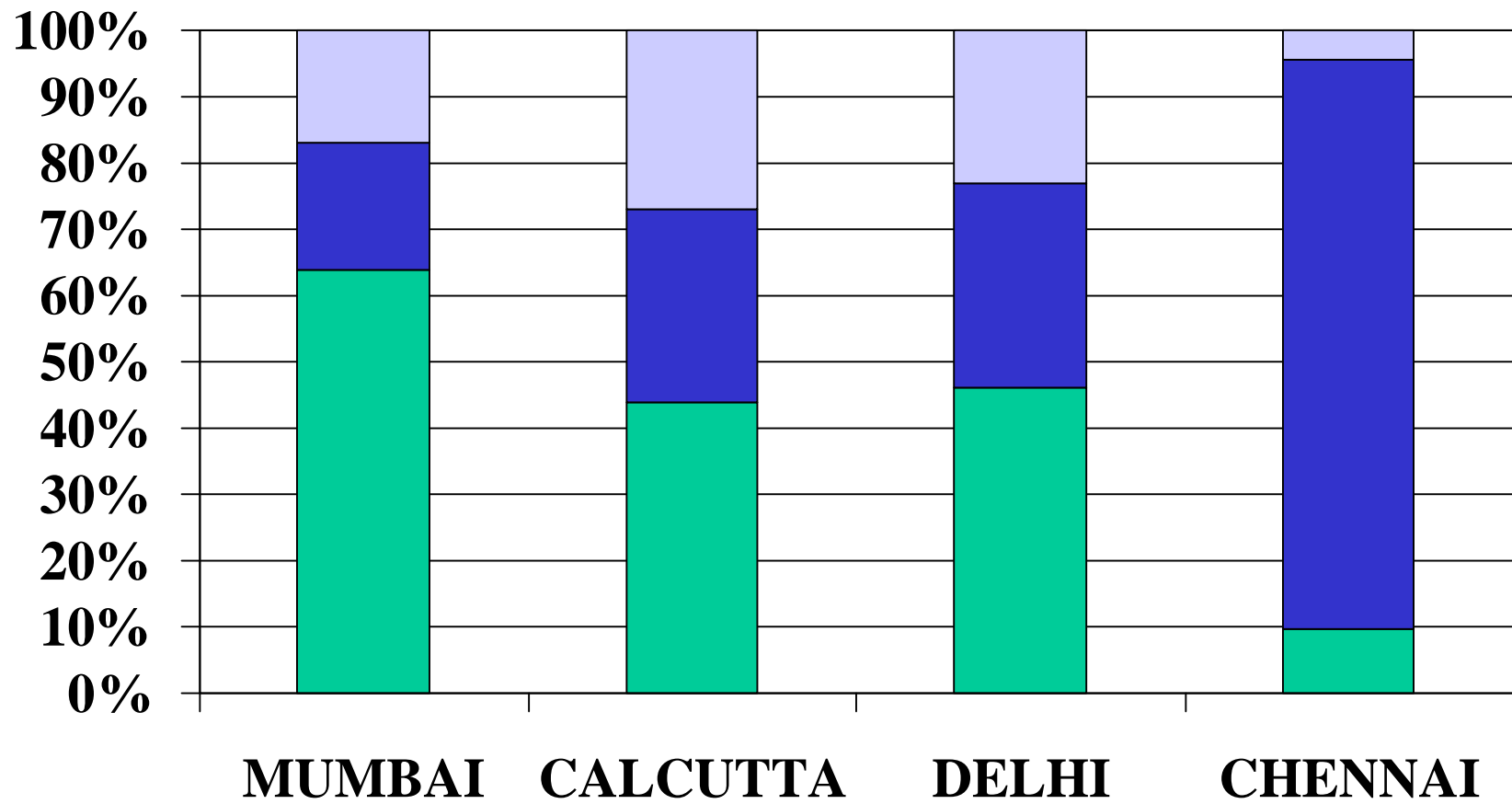
PARKING CHARGES & FINE

ENCOURAGING CAR POOL

AWARENESS CAMPAIGNS

# PERCENTAGE TRIPS FOR DIFFERENT PURPOSES IN MEGA CITIES

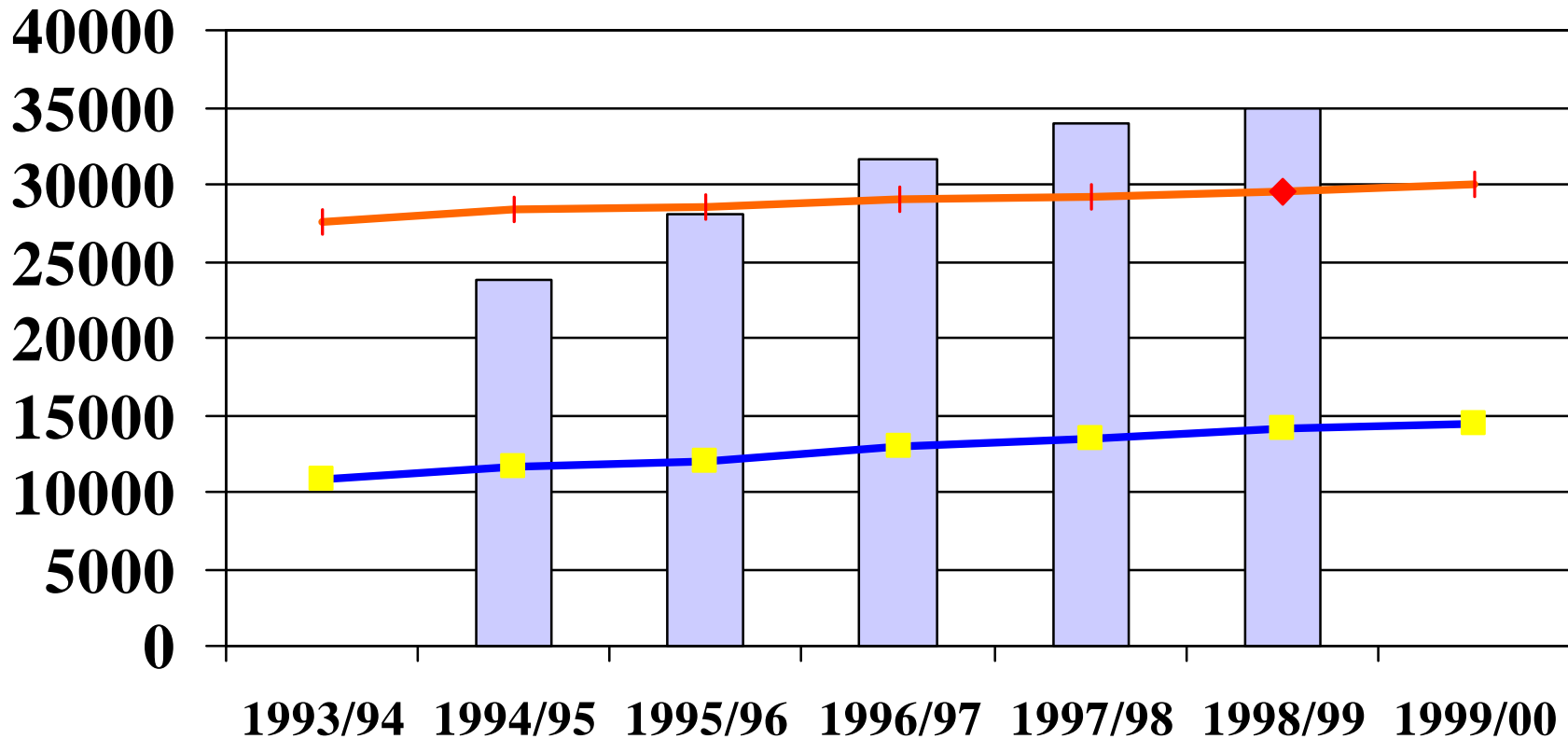
**WORK** **EDUCATION** **SOCIAL**



# ECONOMIC GROWTH & VEHICLE GROWTH

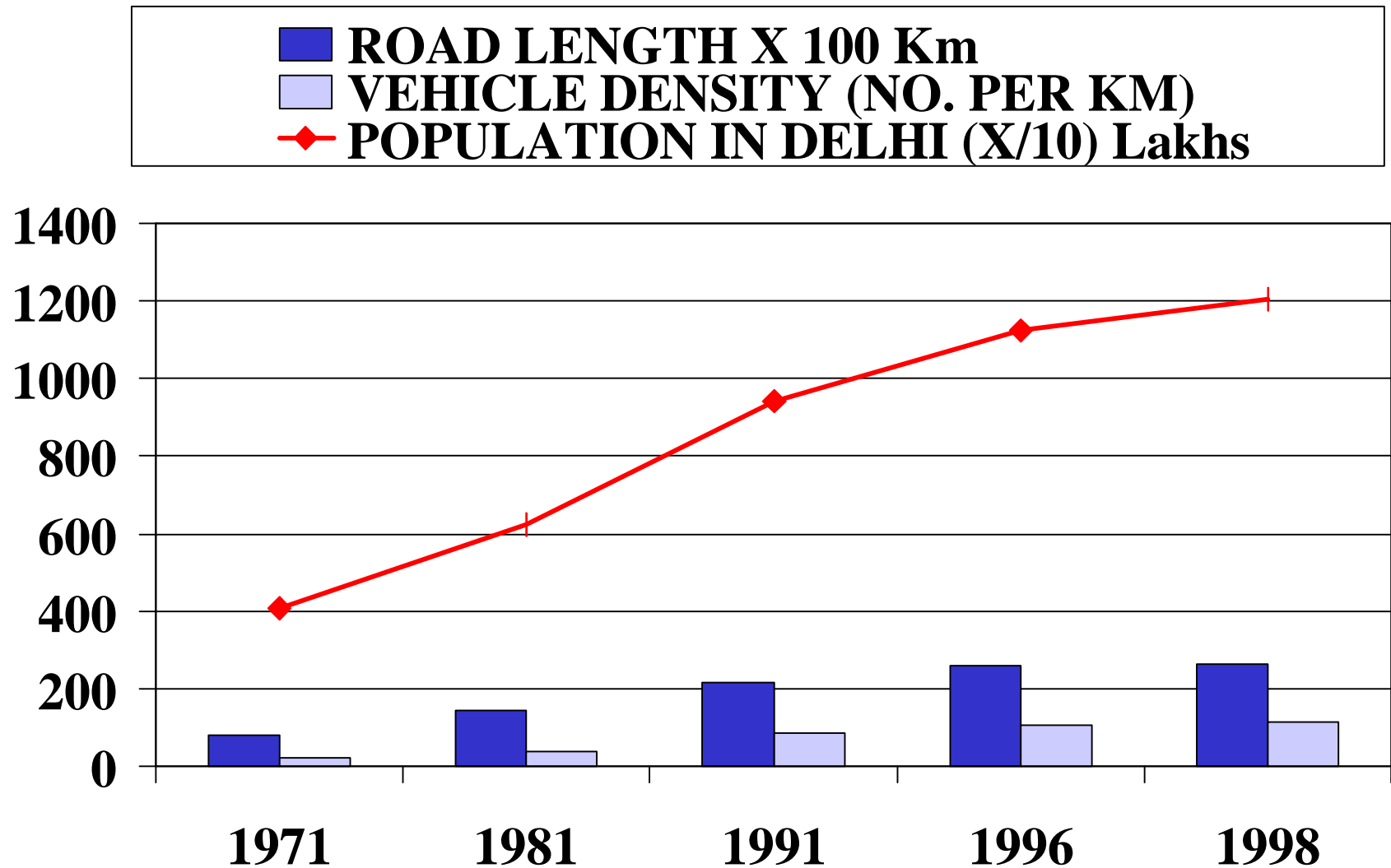
- Number of Vehicles in Delhi X 1000
- Per capita State Domestic Product (Delhi)
- Per Capita Net National Product

Per capita Income (Rs)



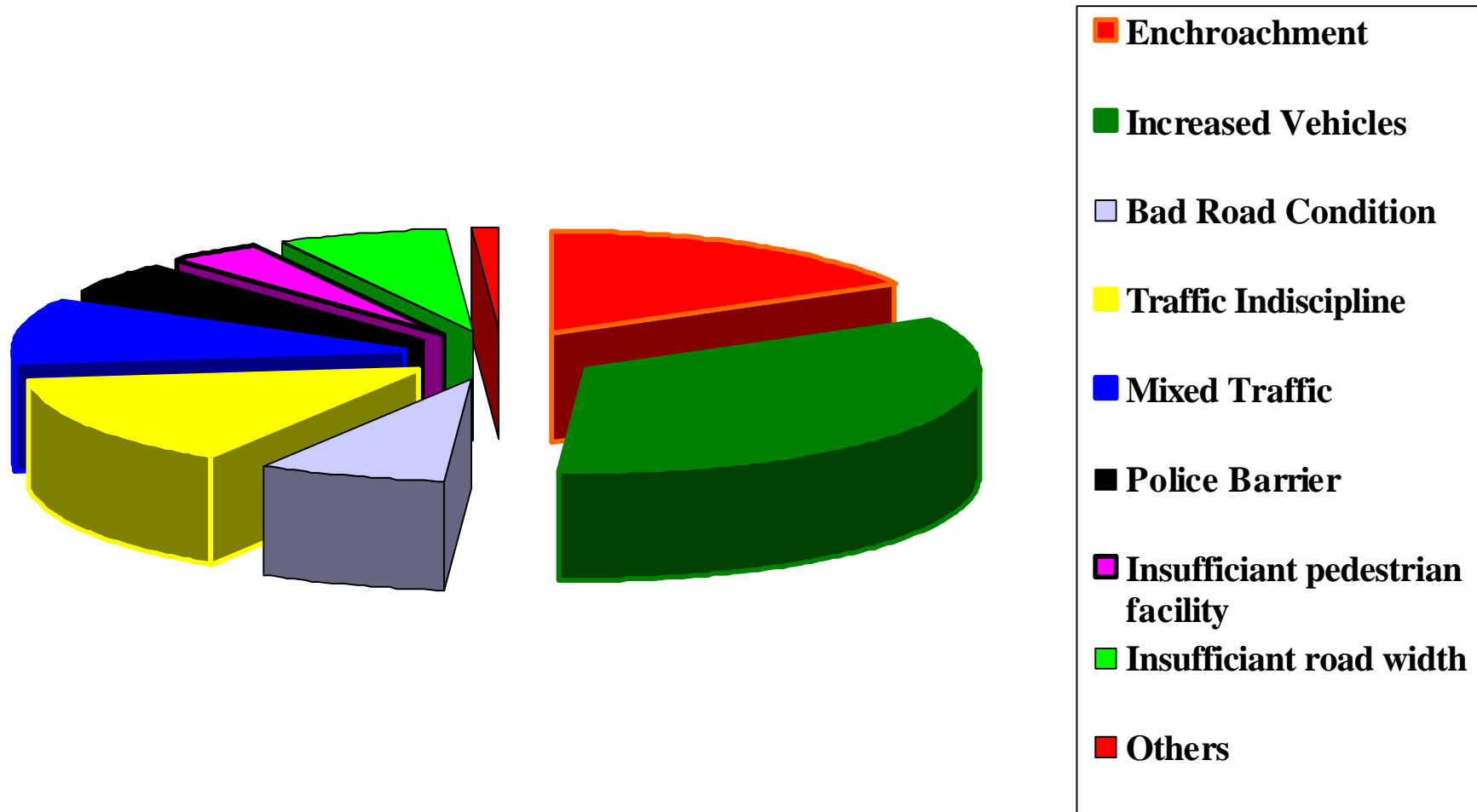
Source-NEERI

# POPULATION- ROAD LENGTH-VEHICLE DENSITY IN DELHI



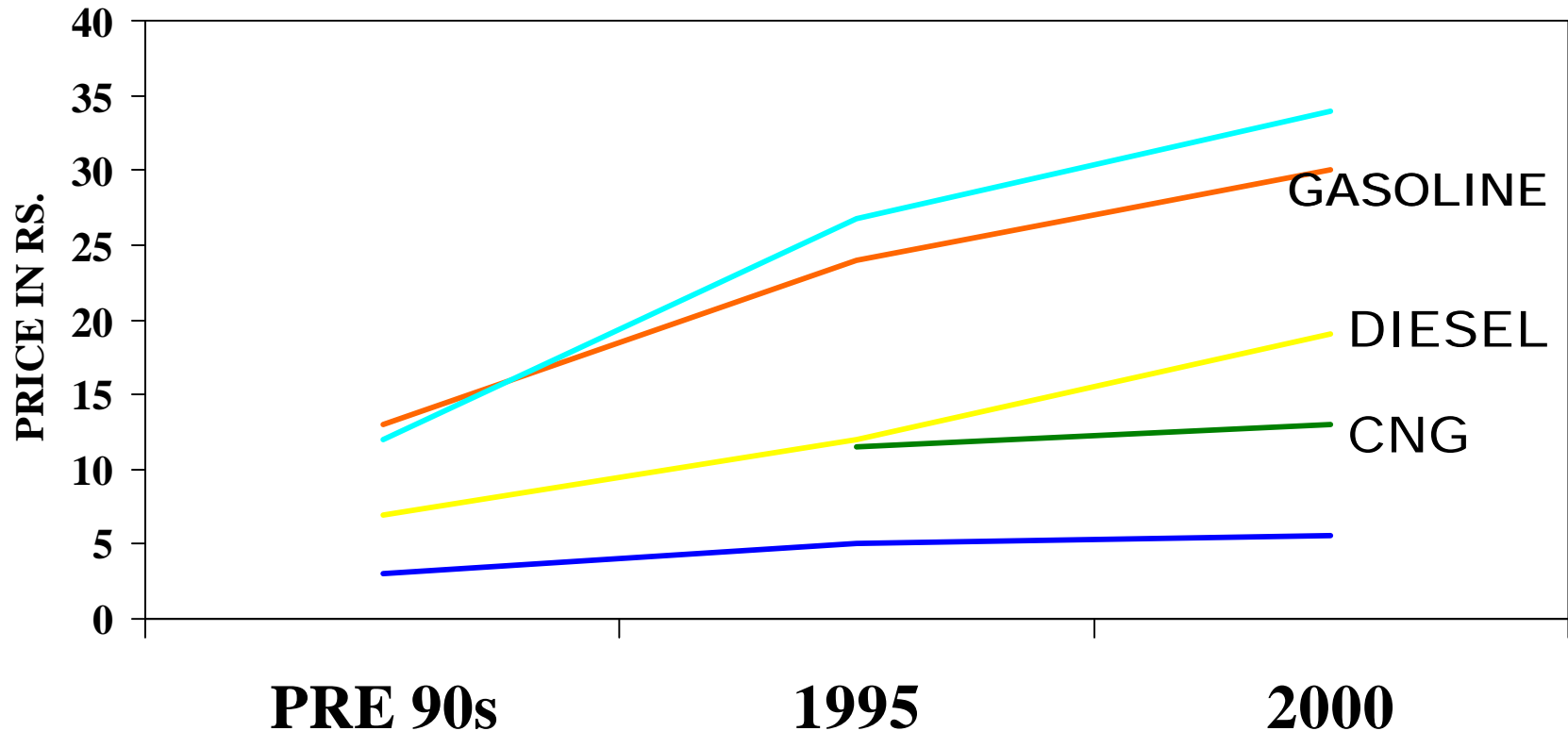
Source-NIPFP

# PUBLIC PERCEPTION FOR TRAFFIC CONGESTION IN DELHI



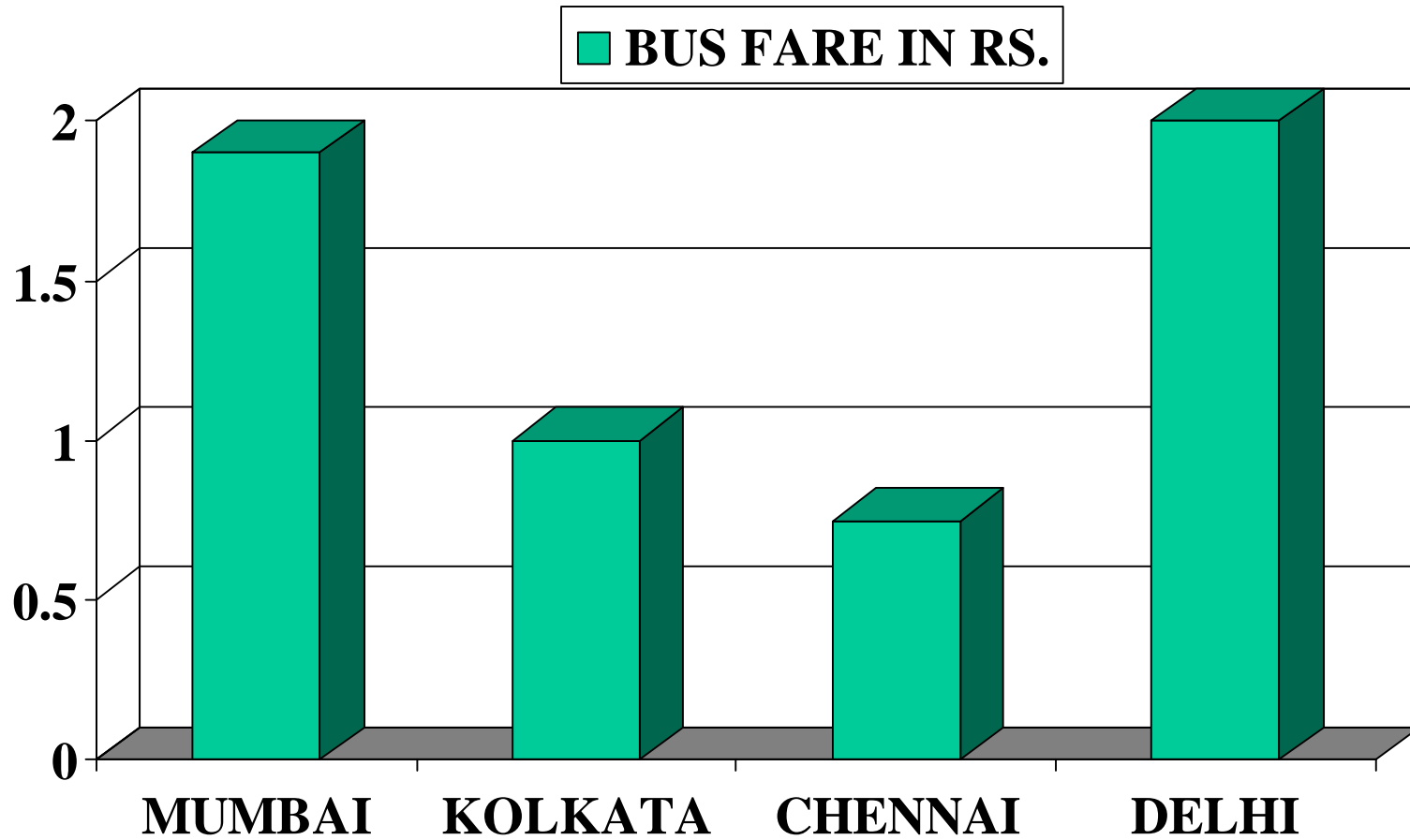
Source-NEERI

# INDICATIVE FUEL PRICING STRUCTURE IN INDIA

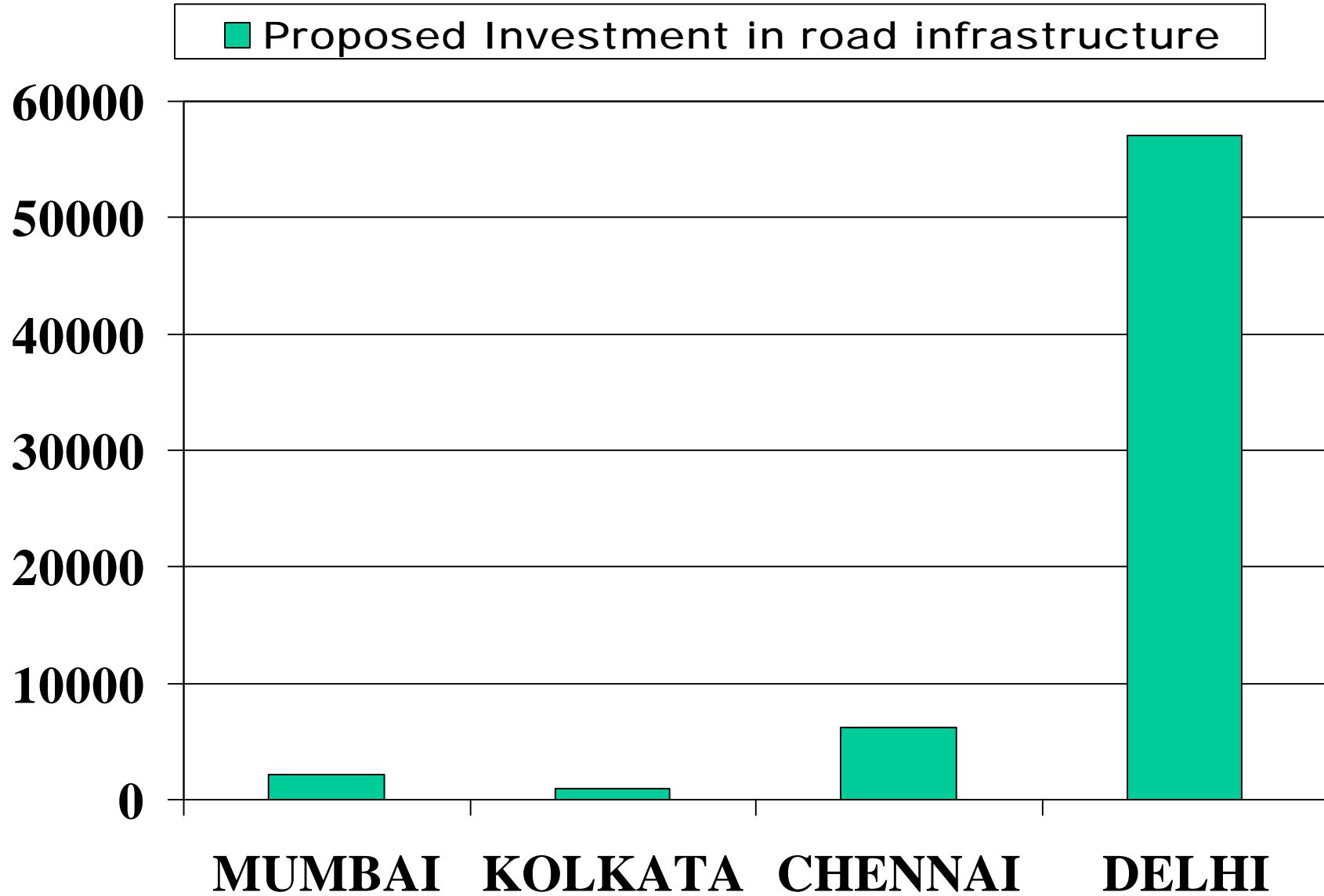


**\* Administered Pricing Mechanism (APM) will be off by 2002.**

# INDICATIVE PUBLIC TRANSPORT FARE IN METROS



Source-T&CPO/GOI

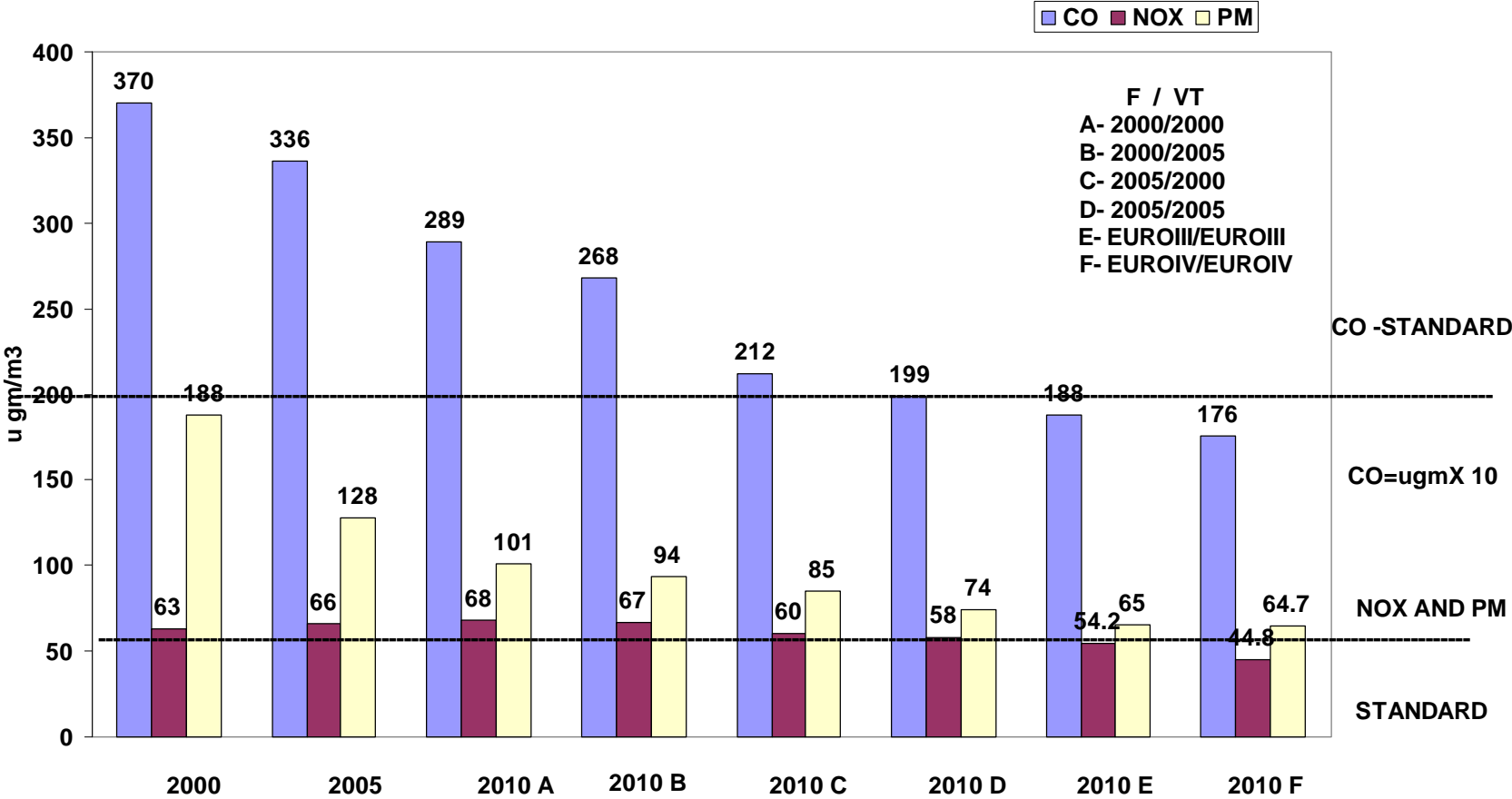


Source-T&CPO/GOI

## VEHICULAR POLLUTION CONTROL MEASURES TAKEN AND THEIR IMPACT ON AIR QUALITY IN DELHI

	1994	1996	1998	2000	2001 (Jan-Jun)
<b>Emission Norms of Vehicles</b>	.Relaxed norms	.Emission norms made stringent as compared to 1991.	.Emission norms for cat.converter fitted vehicles made stringent. .Hot-start replaced by cold –start tests which gives less emissions.	.Euro-I equivalent norms for all types of vehicles except passenger vehicles which are Euro-II equivalent.	CNG/LPG Norms finalized.
<b>Fuel Quality Improvement</b>	.Diesel S 1% .Gasoline lead 0.56 g/l .Benzene no limit	.Fuel quality specifications notified under EPA for the first time. Pb (g/lit)=0.15 Diesel S=0.5% Gasoline Benzene=5%	.Diesel sulphur reduced to 0.25% .Gasoline Benzene reduced to 3% .Gasoline Lead phased out	.Diesel sulphur reduced to 0.05% in selected outlets. .Gasoline Benzene reduced to 1% .Gasoline sulphur with 0.05% max.sulphur in all outlets. .Low smoke 2-T oil introduced	.Diesel with 0.05% sulphur throughout retail outlets in NCT.
<b>Other Measures</b>	-	.Govt. vehicles to run on CNG/Catalytic Converter.	.15 years oldcommercial vehicles banned .Pre-mix 2-T oil in retail outlets	. Buses more than 8 years old phased out . Replacement of pre-1990 autos/taxis with vehicles on clean fuels .Conversion of post-1990 autos to CNG initiated . Fuel testing lab established	.All autos/taxis and buses to run on CNG. . At present 1600 buses, 11000 taxis and cars, 25000 autos on CNG.
<b>CO (ug/m3)</b>	3343	5587	5450	4686	3069
<b>SO2 (ug/m3)</b>	42	35	25	18	16
<b>NO2 (ug/m3)</b>	66	75	63	59	-
<b>Pb (ng/m3)</b>	408	312	136	101	-
<b>RSPM (ug/m3)</b>	-	-	200	191	163
<b>Vehicle No.(Lac)</b>	23.72	27.96	31.67	34.0	-
<b>% Calm Wind</b>	-	-	41.69	43.0	-

# POLICY IMPLEMENTATION & EMISSION EVALUATION PRESENT & FUTURE PROJECTION FOR DELHI



THANKYOU