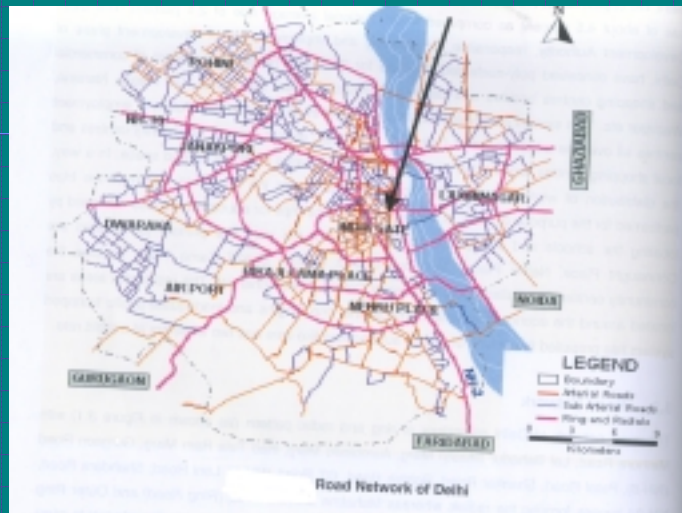


Air Quality Management in Delhi

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&
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Ministry of Environment and Forests
New Delhi



Monitoring Stations in Delhi: 11

ITO, Ashok Vihar, Shahzada bagh, Nizamuddin, Siri Fort, Janakpuri, Shahadara,

Vehicular population in Delhi as on January 2002:

- 4 wheelers- 960799
- 2 wheelers- 2261132
- Auto rickshaws -86985
- taxis- 38481
- Buses- 47085
- Goods vehicle -161022

Total- 3555504

**Ambient Air Quality Data of Delhi in Microgramme per Cubic Metre
 (Annual Averages of Residential Areas)**

City	2000				2001				2002 (Jan. to Oct.)			
	SPM	RSPM	NOx	SO2	SPM	RSPM	NOx	SO2	SPM	RSPM	NOx	SO2
Delhi	311	154	29	16	334	120	29	14	362	125	31	11

CO Data of BSZ Marg (ITO Traffic Intersection) in Microgramme per Cubic Metre

City	2000	2001	2002 (Jan. to Oct.)
Delhi	4686	4183	2984

Note:- RSPM data of Delhi for residential areas for 2000 is average from June to Dec. National Ambient Air Quality Standard for Residential Areas (Annual average) for SO₂,NOx and RSPM = 60 microgramme per cubic metre and for SPM = 140 microgramme per cubic metre

Estimated Daily Traffic Load on Delhi Road Network

S. No.	Vehicle Type	Vehicle - Kms / day (in Lakhs)		Registered Vehicles ('000)	Estimates of In-use Vehicles ('000)
		Roadside Counts	Fuel Stations		
1	Cars + Taxis	306.89 (38.7)	267.99 (34.9)	Private Cars - 921 Taxis - 18	711
2	Two Wheelers	338.23 (42.7)	387.00 (50.5)	2231	1062
4	Autos	93.57 (11.8)	57.79 (7.5)	87	87
5	Goods Vehicles	25.14 (3.2)	29.90 (3.9)	158	64
6	Buses	28.51 (3.6)	24.28 (3.2)	41	NA
Total		792.34 (100.0)	766.96 (100.0)	3457	1924

Note: i. Figures within brackets refer percentages
ii. NA - Not Applicable because of the non-representative sample size in the case of buses from Fuel Station Surveys

Source: CRRl

Estimated Pollution Loads by Vehicle Type in Delhi

Vehicle Type	Vehicle - Kms (in lakhs)	Pollution Load in Tonnes Per Day			
		CO	NO _x	HC	PM
Cars	300.88 (37.87%)	198.94 (47.16%)	43.15 (29.07%)	35.13 (19.05%)	3.32 (25.96%)
Taxis	6.01 (0.76%)	0.93 (0.22%)	1.81 (1.64%)	0.24 (0.13%)	0.01 (0.02%)
Two Wheelers	338.23 (42.69%)	167.77 (38.77%)	3.89 (3.52%)	111.37 (60.4%)	4.93 (28.58%)
Auto_CNG	71.37 (9.01%)	0.75 (0.18%)	1.88 (1.7%)	15.57 (8.44%)	0.15 (1.18%)
Auto_Petrol	22.20 (2.8%)	18.47 (4.38%)	0.24 (0.22%)	12.68 (6.89%)	0.36 (2.78%)
Goods_Local	14.34 (1.81%)	10.06 (2.39%)	5.24 (4.75%)	0.63 (0.34%)	0.75 (5.89%)
Goods_Inter City	10.80 (1.36%)	7.91 (1.87%)	6.59 (5.87%)	1.03 (0.56%)	1.19 (8.21%)
City Bus (CNG)	10.53 (1.33%)	9.55 (2.26%)	21.60 (19.56%)	5.79 (3.14%)	0.09 (0.7%)
City Bus (Diesel)	11.03 (1.39%)	6.23 (1.48%)	21.73 (19.68%)	1.61 (0.87%)	1.65 (12.94%)
Inter City Bus	6.95 (0.88%)	1.23 (0.29%)	4.31 (3.9%)	0.32 (0.17%)	0.33 (2.58%)
Total	792.34 (100%)	421.84 (100%)	110.44 (100%)	184.37 (100%)	12.77 (100%)

Source: CRRl

SPM concentration in micro gram per cubic metre in the ambient air
(Average of annual mean concentration in residential areas)

City	SPM						
	1995	1996	1998	1999	2000	2001	2002 (Jan. to Oct.)
Delhi	415	376	383	373	368	311	362

Source: CPCB: National Average: SPM - 140 ug/m3 (annual average)

Ambient air quality data of various cities for SPM/RSPM (in ug/m3) (Annual average of residential areas)

City	2000			2001			2002 (Jan. to Oct.)
	SPM	RSPM	RSPM as % of SPM	SPM	RSPM	RSPM as % of SPM	RSPM
Delhi	368	199	54	311	180	58	125

Source: CPCB National Standard: SPM - 140 ug/m3 (annual average)
RSPM - 60 ug/m3 (annual average)

Nox concentration in microgramme per cubic metre in the ambient air
(Average of annual mean concentration in residential areas)

City	NOx						
	1995	1996	1998	1999	2000	2001	2002
Delhi	33	41	35	34	29	29	31

Source: CPCB National Standard: 60 ug/m3 (annual average)

Ambient air concentration of sulphur dioxide in metropolitan cities (Annual average in ug/m3 in residential areas)

City	Sulphur Dioxide							
	1995	1996	1997	1998	1999	2000	2001	2002 (Jan. to Oct.)
Delhi	16.5	16.5	15.0	15.8	16	14	11	11

Source: SPCB/CPCB/NEERI National Limit: 60 ug/m3 (annual average)

Ambient Ozone Concentration in Delhi (ug/m3)

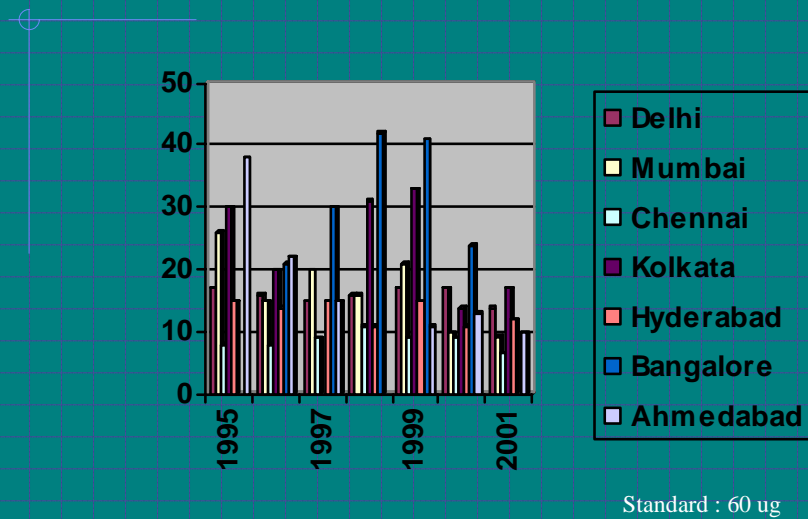
Area/ City	1998	1999	2000	2001	2002 (Up to November)
Delhi	32-104	26-82	10 - 77	10 - 130	10 - 65

USEPA limit : 235 ug/m3 (1 hr.)/157 ug/m3 (8 hrs)
WHO limit : 120 ug/m3 (8 hrs).

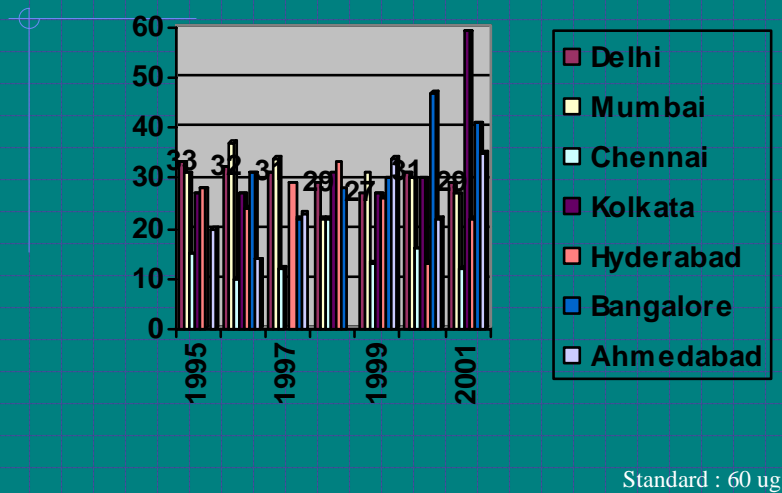
**Ambient Concentration of Poly Aromatic Hydrocarbons (PAH)
in Delhi**

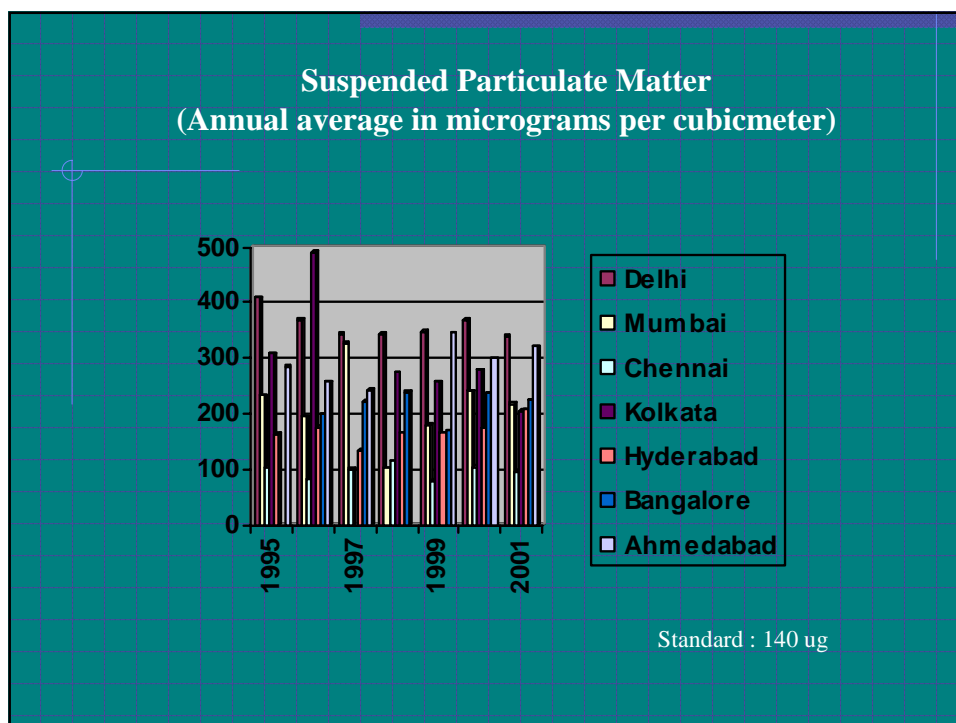
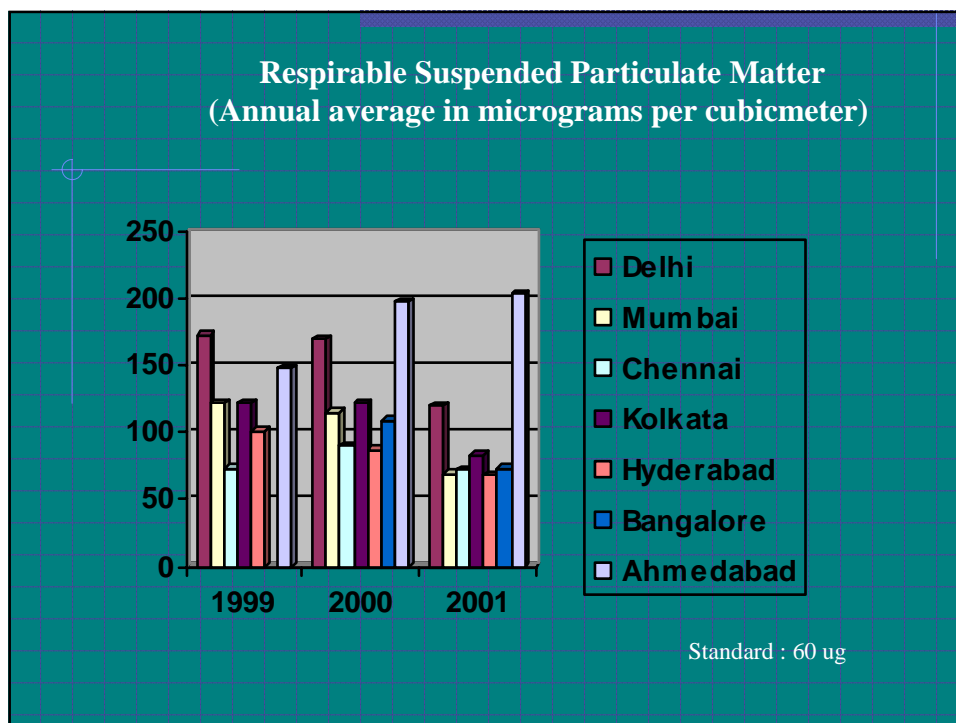
Year	Range of PAH in nanogramms (ng) per cubic metre		
	Winter	Summer	Monsoon
1998	30.3 - 60.9	16.0 - 29.3	9.4 - 27.8
1999	-	-	-
2000 (July, 2000 - June, 2001)	30.5	13.3	14.6

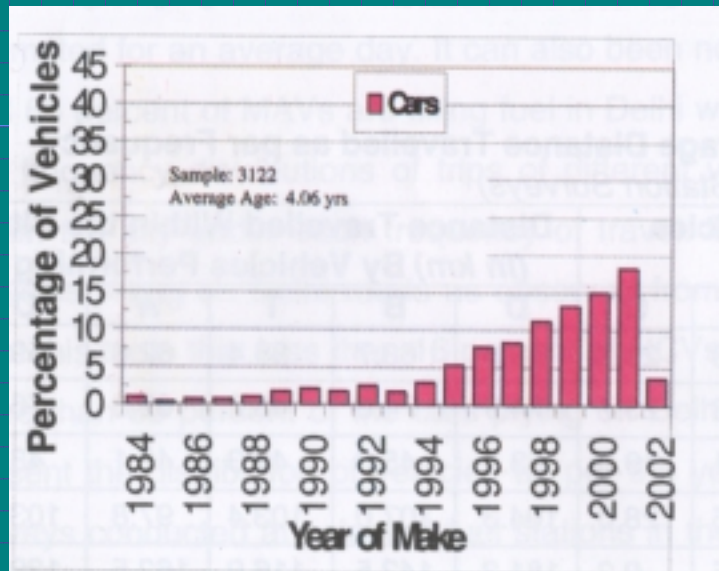
Sulphur dioxide (Annual average in micrograms per cubicmeter)



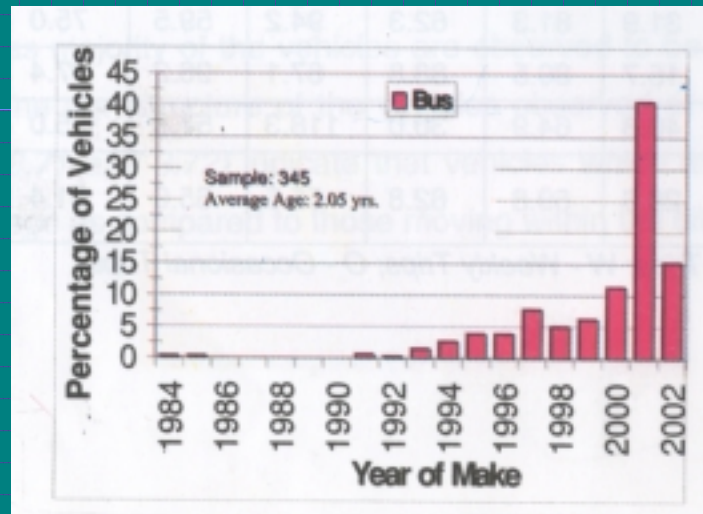
Nitrogen dioxide (Annual average in micrograms per cubicmeter)



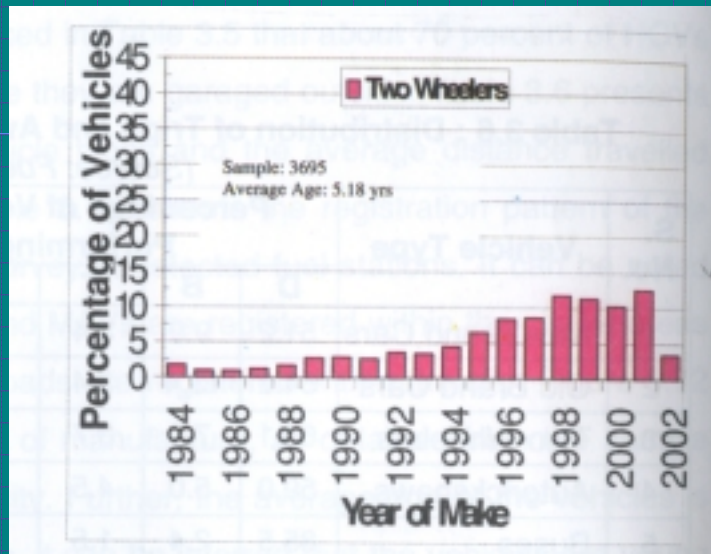




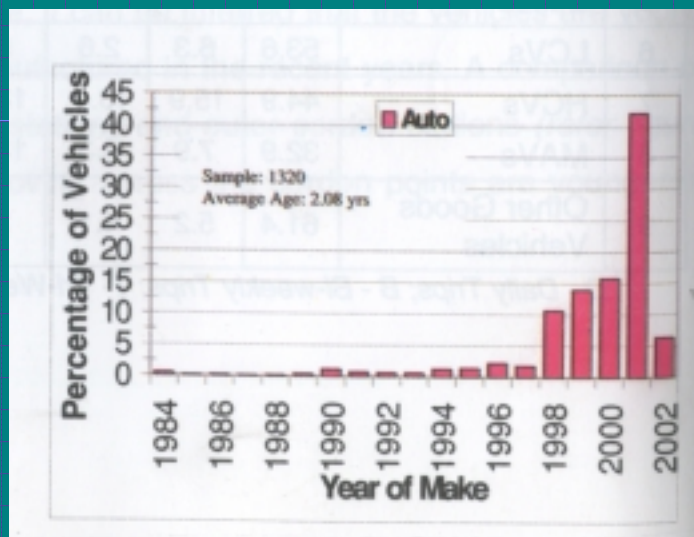
Source: CRRI



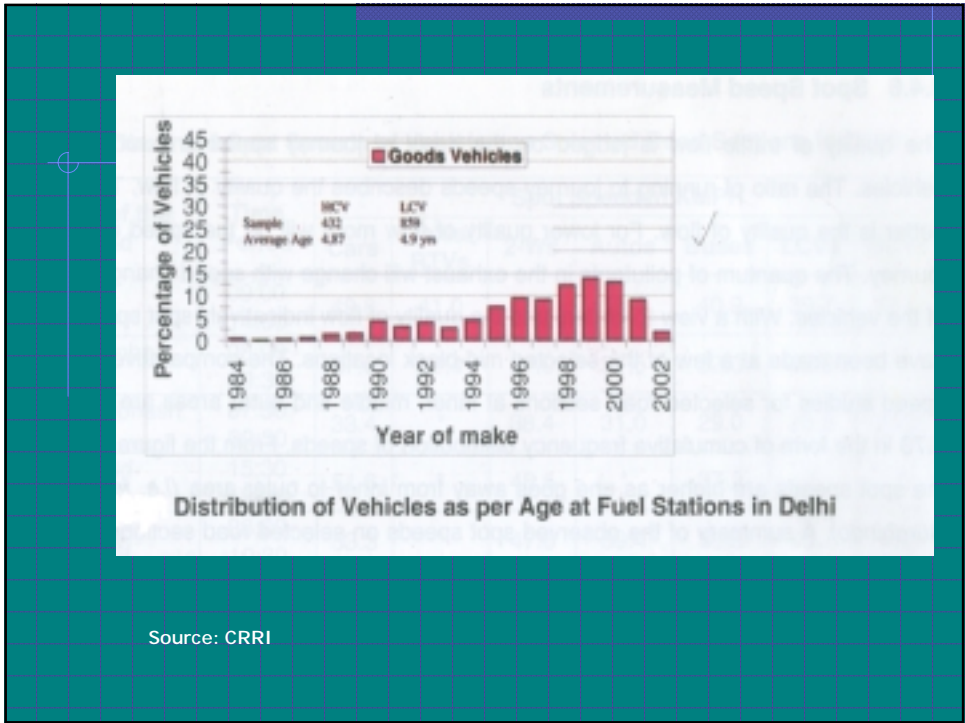
Source: CRRI



Source: CRR



Source: CRR



Source: CRR

Delhi CNG supply scenario

Length of pipeline: 23 kms.
 Cost: Rs. 25 crores

	As on March 2001	As on November 2002	Percentage Increase
No. of stations	68	101	48
Compression capacity	2.0 lakh kg/day	9.65 lakh kg/day	382
No. of vehicles serviced	26,100	74,000	183
Capital expenditure	Rs. 123 crore	Rs. 341 crore	177

Target for 30th June, 2003

- Number of stations: 110
- Compression Capacity: 16.1 lakh kg/day
- Capital expenditure: Rs.522 crore

Source: IGPL

Details regarding CNG vehicles and availability of CNG in Delhi

	As on March 2001	As on November, 2002	Percentage Increase
Number of stations	68	101	48
Compression capacity	0.2 million kg/day	0.96 million kg/day	382
No. of vehicles serviced	26,100	74,000	183
Capital expenditure	Rs. 123 million	Rs. 341 million.	177

...Target for 30th June, 2003

- Number of stations : 110
- Compression Capacity : 1.6 million kg/day
- Capital expenditure : Rs. 522 million

Gasoline Lead Phase Out Program in India

Phase	Implementation Date	Gasoline Lead Content	Areas Covered
Phase-I	June, 1994	Low leaded (0.15g/l)	Delhi, Mumbai, Calcutta and Chennai
Phase-II	1.4.1995	Unleaded (0.013 g/l)	Delhi, Mumbai, Calcutta and Chennai
Phase-III	1.1.1997	Low leaded (0.15g/l)	Entire Country
Phase-IV	1.9.1998	Unleaded (0.013 g/l)	NCT-Delhi and 45 other cities
Phase-V	31.12.1998 (Advanced to 1.9.1998)	Unleaded (0.013 g/l)	All capitals of States/UTs and other major cities
Phase-VI	1.1.1999	Unleaded (0.013 g/l)	National Capital Region
Phase-VII	1.2.2000	Unleaded (0.013 g/l)	Entire Country

Note: Gasoline Lead content prior to June, 1994=0.56g/L
 Source: Air Quality status and trends, CPCB Report NAAQMS/14/2000-2001

Gasoline Benzene Reduction Program In India

Period	Benzene Content	Area Covered
Before 1996	No specification	Entire country
April, 1996	5%	Entire Country
April, 2000	3%	Metropolitan Cities
November, 2000	1%	National Capital Territory (NCT) and Mumbai

Source: Air quality Status and trends, CPCB Report NAAQMS/14/2000-2001

Air Quality Management Strategies adopted in Delhi

Following measures have been taken for control of air pollution in Delhi:

(1) Industrial pollution control:

- Industries directed to comply with emission and liquid effluent standards;
- Installation of Opacity meters for measuring emissions of particulate;
- Coverage of abandoned ash pond with top soil;
- All stone crushers have been closed down in Delhi;
- All the hot mix plants have been closed down in Delhi;
- 168 hazardous industries have been closed down in Delhi;

Vehicular Pollution Control:

Vehicular Emission Norms:

- During 1990-91, Mass emission norms were notified from vehicles at manufacturing stage as also for the vehicles in use under EPA and Motor Vehicles Act;
- Crank case emission norms and evaporative norms were introduced for the first time;
- Testing methods for passenger cars norms were change to cold start from hot start w.e.f. April, 1998 which is a stricter procedure than previous one;
- Norms for tractors were notified under MVR;
- Bharat Stage-I Norms (Euro-I Norms) introduced throughout the country from 1.4.2000;
- Bharat stage-II Norms (Euro-II Norms) introduced in Delhi from 1.4.2000;
- Euro-III Norms proposed from 1.4.2005 in Delhi;
- Euro-IV Norms proposed from 1.4.2010 (to be reviewed);
- Mass Emission Norms for CNG vehicles have been notified on 9.2.2000;

Fuel Quality Specifications:

- Diesel and gasoline fuel quality standards under EPA notified in April, 1996 which included unleaded gasoline and low sulphur diesel;
- Gasoline with 0.05% sulphur has been introduced in NCR for all categories of vehicles from 1.4.2000;
- DPCC has notified the approved fuels to be used in Delhi;
- For checking adulteration of fuel independent testing laboratories established at Noida and Gurgaon;

(a) Unleaded Gasoline:

- Unleaded (0.013 g/l) petrol introduced w.e.f. 1.4.1995 in Delhi, Mumbai, Kolkata and Chennai;
- Unleaded petrol in the entire country from 1.2.2000;

(b) Reduction of Sulphur in Diesel:

- 1% sulphur content before April, 1996;
- 0.25% sulphur content from August, 1997 in Delhi and entire country from September, 1999;
- 0.05% sulphur content from April, 2000 in NCR in Delhi for private vehicles and from June, 2001 for all categories of vehicles;

Pollution Reduction through Pre-mixed 2T Oil Dispenser (1% increase gives 15% increase in particulate matter):

- Pre-mixed 2T oil dispensers have been installed at all the petrol filling stations in Delhi. Sale of loose 2T oil has been banned from December, 1998 in NCT, Delhi;
- Specifications for 2T oil have been notified by MoEF which have become effective from 1.4.1999).

Catalytic Converters for Motor Vehicles:

- CAT converters made mandatory since April, 1995 in four metros including Delhi;

CNG/LPG as Auto Fuel:

- As per the order of the Hon'ble Supreme Court, the entire city bus fleet is now on CNG mode;
- Due to fiscal incentives available for CNG kits, a large number of private car owners, taxi drivers and 3-wheelers have switched over to CNG;

Traffic Management:

- Synchronization of traffic signals, construction of fly overs etc. have been undertaken. MRTS is in advance stage of construction

Estimated pollution loads in the cities as per the
BAU and proposed road map in 2010 (in tonnes per day)

City	Business As Usual (BAU)				Road Map Proposed Measures			
	CO	Nox	HC	PM	CO	Nox	HC	PM
Delhi (Metro)	425.8 3	119.6 7	200 .87	12.26	308. 64 (27. 52)	105.66 (11.7)	121.43 (39.55)	7.71 (37.13)

Note: Figures in parenthesis refer to the percentage reduction as compared to BAU

Source: Report of the Expert Committee on Auto Fuel Policy, 2002

Conclusion

- Delhi has become World's largest city using CNG as auto fuel (driving force - Supreme Court Order).
- Improvement in fuel quality and engine technology have gone a long way in reducing vehicular pollution.
- Stringent emission norms have resulted in phasing out old vehicles.
- About 25% pollution load has come down in Delhi due to various measures taken to control vehicular and industrial pollution including use of CNG as auto fuel.
- Air quality monitoring system provided for continuous monitoring of conventional pollutants and air toxins to monitor trend and taking policy interventions.



Thank You