WHITE PAPER ON POLLUTION IN DELHI

WITH AN ACTION PLAN

GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT & FORESTS
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CHAPTER 1

Introduction

1.0 The rapid growth of Delhi in recent times has resulted in significant increase in environmental pollution. It is widely perceived that the problem is threatening to get out of hand. Hence, effective and co-ordinated measures for controlling pollution need to be put in place without delay. In view of the seriousness of the issue, the Minister of Environment and Forests decided to have a series of interactive meetings with concerned government agencies, NGOs, experts and citizens, with the objective of defining a plan of action to combat the problem. The outcome of these meetings is a White Paper on Pollution in Delhi with an Action Plan (henceforth, Action Plan) covering various aspects of pollution control, including vehicular and industrial pollution, solid waste management and noise pollution.

2.0 Increasing Pollution in Delhi: Rise in population and growth in economic activity has led to increase in pollution in Delhi. After Independence, the city became a major centre of commerce, industry and education. The growth of government departments and office complexes has also contributed to the spread of the city. Civic amenities have not kept pace. Unabated in-migration has compounded the problem. Land use regulations have been flouted. The green cover has dwindled.

2.1 According to the 1991 census, Delhi had a population of 94.21 lakhs. The population is projected to touch 132 lakhs in 2001. Presently, about 30% of the population lives in squatter settlements. The number of industrial units in Delhi in 1951 was approximately 8,000. By 1991 this number had increased to more than 1,25,000. The vehicular population has increased phenomenally, from 2.35 lakhs in 1975 to 26.29 lakhs in 1996, and expected to touch 60 lakhs in 2011. In 1975 the vehicular population in Delhi and Mumbai was about the same; today Delhi has three times more vehicles than Mumbai. Vehicular pollution contributes 67% of the total air pollution load (approximately 3,000 mt per day) in Delhi. Another 25% of air pollution is generated by industries and coal based thermal power plants. The three power plants in Delhi generate 6000 mt of fly ash per day. 16 drains are discharging about 1,900 mld of municipal sewage and waste water into the river Yamuna. The industrial effluent load is 320 mld. Municipal solid waste generation is estimated to be 5,000 mt per day. In certain localities noise levels are attaining alarming levels.

3.0 Action Plan: For controlling pollution in Delhi, the Ministry of Environment and Forests has now prepared an Action Plan. This is the result of a series of interactions and meetings which the Minister of Environment and Forests had with concerned agencies and informed citizens. Also included in the plan are the existing projects for pollution abatement. The plan stipulates the implementation of a time bound programme entailing a coordinated inter-departmental strategy. It is recognised that environment protection measures are inherently multi-agency. Though the main responsibility for implementation of such measures rests with government agencies, a key role also has to be played by community and local residents organisations.

3.1 It may be mentioned that in the first of the aforementioned series of meetings, held on 21.5.1997, suggestions were invited. A number of informal consultations were held by the Minister. The ideas generated were considered in a meeting on 20.6.1997. A draft Action Plan was drawn up which was circulated to the various Ministries and Departments of the Central Government and Delhi Government. In a meeting chaired by the Minister of Environment and Forests on 15.7.1997 representatives of the various implementing Ministries/Departments of the Central Government and the Delhi Government concurred with the draft plan. The plan was also referred to the Lt Governor and the Chief Minister of Delhi. The Minister held discussions with the Lt Governor on 7.8.1997 and with the Chief Minister on 4.8.1997 and 8.8.97. The Lt Governor and the Chief Minister concurred with the proposals in the Action Plan and stressed the need for its implementation without delay.

4.0 Target: The target being pursued by the Action Plan is the protection and improvement of the environment keeping in view pollution trends and the prescribed ambient standards. The ambient standards for air (residential-industrial) in respect of sulphur dioxide, oxides of nitrogen and suspended particulate matter are, respectively, 60-80 micrograms per m3, 60-80 and 140-360 microgrammes per m3, on annual average basis. The ambient standards for water in the rivers (bathing quality) in respect of dissolved oxygen, biological oxygen demand, and total coliform are 5 mg/l or above, 3 mg/l or below and 500/100 ml, respectively. The ambient noise standards range between 40 to 75 decibels depending on the designated zone, with different standards for night and day. Presently, the ambient air quality in respect of the levels of sulphur dioxide, oxides of nitrogen and suspended particulate matter is 15-26 microgrammes per m3, 28-46 microgrammes per m3 and 362-452 microgrammes per m3 respectively. The ambient water quality of river Yamuna in respect of dissolved oxygen, biochemical oxygen demand and total coliform at Okhla is 1.3 mg/1, 16 mg/1 and 3,29,312/100 ml respectively. The ambient noise quality in many areas ranges between 75 to 85 decibels.

CHAPTER 2

Air Pollution

1.0 It is estimated that about 3,000 mt of air pollutants are emitted everyday in Delhi. The sources of air pollution in Delhi are: emissions from vehicles (67%), coal based thermal power plants (13%), industrial units (12%) and domestic (8%). In 1991 the air pollutants emitted daily were 1,450 mt. There has been a rising trend, 1992 : 1,700 mt, 1993 : 2,010 mt, 1994 : 2,400 mt, 1995 : 2,890 mt.

2.0 National Ambient Air Quality Standards: The national standards for ambient air quality have been notified under the Air (Prevention and Control of Pollution) Act, 1981 and in the Environment (Protection) Act, 1986.

National Ambient Air Quality Standards

Pollutant	Time-Weighted Average	Concentration in Ambient Air		
(micrograms per m3)		Industrial	Residential	Sensitive
Sulphur Dioxide (SO2)	Annual Average	80	60	15
	24 Hours	120	80	30
Oxides of Nitrogen as NO2	Annual Average	80	60	15
	24 Hours	120	80	30
Suspended Particulate Matter (SPM)	Annual Average	360	140	70
	4 Hours	500	200	100
Respirable Particulate Matter (Size less than 10æm)	Annual Average	120	60	50
	24 Hours	150	100	75
Lead	Annual Average	1.0	0.75	0.50
	24 hours.	1.5	1.00	0.75
Carbon Monoxide (mg/M3)	8 hours	5.0	2.00	1.00
	1 hour	10	4.00	2.00

The standards specify the maximum limit to which major air pollutants, such as sulphur dioxide, oxides of nitrogen, suspended particulate matter, etc. are permitted in various zones which could be industrial, residential and sensitive zones. The monitoring of air quality is undertaken under the National Ambient Air Quality Monitoring Programme.

3.0 Monitoring: The Central Pollution Control Board has been monitoring the ambient air quality regularly at various locations in Delhi, measuring sulphur dioxide, oxides of nitrogen and particulates. The atmospheric concentrations of air pollutants show a rising trend. The monitoring stations are located at Ashok Vihar, Shahzadabagh, Siri Fort, Janakpuri, Nizamuddin, Shahdara. The ambient air quality data indicates high values of suspended particulate matter at all the monitoring stations, namely, 367-452 microgrammes per m3 on annual average basis as against the prescribed standard of 140-360 microgrammes per m3. Though the annual mean value of sulphur dioxide (15-26 microgrammes per m3) and oxides of nitrogen (28-46 microgrammes per m3) remain within the prescribed limits of 60-80 microgrammes per m3, there is a rising trend. Compared to 1989, sulphur dioxide atmospheric concentrations in 1996 have registered a 109% rise, and oxides of nitrogen a 82% rise. The suspended particulate matter atmospheric concentration has shown only a nominal rise, because of the installation of electrostatic precipitators by the thermal power plants in Delhi.

3.1 The table below gives the average ambient air quality from 1989 to 1997 along with percentage variation.

Ambient Air Quality Data of Delhi

(All concentrations are in micrograms per cubic metre)

Year	Sulphur Dioxide		Nitrogen Dioxide		Suspended Particulate Matter	
	Annual Mean	% Variation (base 1989)	Annual Mean	% Variation (base 1989)	Annual Mean	%Variation (base 1989)
1989 (Jan-Dec)	8.7		18.5		373	
1990 (Jan-Dec)	10.2	(+)17.0	22.5	(+)22	338	(-)10.0
1991 (Jan-Dec)	13.3	(+)53.0	27.2	(+)47	317	(-)15.0
1992 (Jan-Dec)	18.4	(+)111	30.4	(+)64	377	(+) 1.0
1993 (Jan-Dec)	18.5	(+)113	33.2	(+)79	372	(-) 0.3
1994 (Jan-Dec)	19.5	(+)124	33.0	(+)78	377	(+) 1.0
1995 (Jan-Dec)	19.0	(+)118	34.1	(+)84	407	(+) 9.0
1996 (Jan-Dec)	19.0	(+)109	33.7	(+)82	387	(+) 4.0
1989 (Jan-Aug)	10.1	-	20.2	-	377	-
1997 (Jan-Aug)	16.2	(+)60	33.0	(+)63	370	(-)2.0

4.0 Sources of Pollution: The contribution of industrial (including thermal power plants), vehicular and domestic sources of pollution to the ambient air is as follows:

Source	1970-71	1980-81	1990-91 (projected)	2000-01
Industrial	56%	40%	29%	20%
Vehicular	23%	42%	64%	72%
Domestic	21%	18%	7%	8%

5.0 Vehicular Emissions: Vehicular emissions constitute a very important component of any strategy to control air pollution in Delhi. This subject is discussed in detail in the following Chapter 3. To assess the impact of vehicular emissions on the ambient air, the Central Pollution Control Board monitored the air quality in terms of sulphur dioxide, oxides of nitrogen and carbon monoxide at 10 major traffic intersections and at the IARI campus, a relatively low pollution area. The study revealed marked differentials in air pollution between the IARI campus and the intersection points. It is notable that two thirds of the vehicles in Delhi are two-wheelers, operated on two stroke engines accounting for 70% of hydrocarbon and 50% of carbon monoxide emissions. The Central Pollution Control Board has been monitoring carbon monoxide at the ITO traffic intersections since 1989. The concentrations of carbon monoxide in 1996 show an increase of 92% over the values observed in 1989. The annual average values are given in the table below.

Carbon Monoxide Concentration at ITO Crossing), Delhi.

Year	Annual Mean Concentration	% Variation (base 1989)
1989 (Jan-Dec)	2905	
1990 (Jan-Dec)	2688	(-) 7
1991 (Jan-Dec)	3464	(+)19
1992 (Jan-Dec)	3259	(+)12
1993 (Jan-Dec)	4628	(+)59
1994 (Jan-Dec)	3343	(+)15
1995 (Jan-Dec)	3916	(+)35
1996 (Jan-Dec)	5587	(+)92
1989 (Jan-Aug)	2392	
1997 (Jan-Aug)	4847	(+)103

6.0 Lead: The particulate lead concentrations appear to be getting in control which is attributable to the deleading of petrol and

restrictions on lead handling industrial units. The table below compares the 1996-97 position with 1989-90.

Particulate Lead Concentration

Location	1989-90 (micrograms per m3) (Annual Mean)	1996-97 (microgramme s per m3) (Annual Mean)	% Variation Base 1989-90
Ashok Vihar	0.200	0.179	(-) 11
Sirifort	0.117	0.161	(+)27
Janakpuri	0.112	0.142	(+)21
Nizamuddin	0.218	0.092	(-)58
B.S.Z. Marg	0.251	0.210	(-)16
Shahdara	1.570	0.222	(-)86
Shahzadabagh	0.391	0.381	(-) 3
Average of Seven Stations	0.408	0.198	(-)54

7.0 Industrial Emissions: The three thermal power plants at Indraprastha, Badarpur and Rajghat contribute to 13% of the air pollutants, and another 12% is generated by the industrial units in Delhi. The industries emit suspended particulate matter, hydrocarbons, sulphur dioxide, oxides of nitrogen and carbon monoxide. The power plants emit sulphur dioxide, oxides of nitrogen and suspended particulate matter.

8.0 Noise Levels in Delhi: Noise is notified as a pollutant under the Air (Prevention and Control of Pollution) Act. Ambient noise levels have been monitored at 25 monitoring points. The average ambient noise levels are in excess of the prescribed standards during day time.

9.0 Climate and Natural Sources: Climate and natural sources also play an important role in contributing to the pollution levels of Delhi in addition to man-made sources. The region has a semi-arid climate. A sporadic pre-monsoon feature is dust storms when winds from the west deposit large concentrations of suspended particulate matter in the atmosphere of Delhi. Pre-monsoon calms contribute to increased pollution loads due to lack of mixing between different atmospheric levels. In winter, ground-based temperature inversions constrain dispersal of pollutants.

CHAPTER 3

Vehicular Pollution

1.0 Growth in Vehicles: The growth in vehicular population (in lakhs) in Delhi has been as follows:

31.3.1975	2.35
31.3.1985	8.41
31.3.1996	26.29
31.3.2004	46.00*
31.3.2011	60.00*

*projections

Table : Trend of Vehicular Population Growth in Delhi

Sl.No.	Category	31.3.85	31.3.90	31.3.95	31.3.96
1.	Car/Jeep/St.Wagon (Petrol-Driven)	1.57	3.45	5.75	6.33
2.	Scooter/Motor-cycle (Petrol-Driven)	5.79	11.13	16.17	17.43
3.	3-wheeler (Petrol-Driven)	0.30	0.59	0.75	0.79
4.	Taxi (Mostly Diesel)	0.08	0.09	0.12	0.13
5.	Buses (Diesel-Driven)	0.14	0.18	0.26	0.28
6.	Goods Vehicles (Diesel-driven)	0.52	0.92	1.20	1.33
	TOTAL	**8.40**	**16.36**	**24.25**	**26.29**

2.0 Pollution from 2-wheelers: Two-wheelers account for about two thirds of the total vehicular population in Delhi. Because of inherent drawbacks in the design of 2- stroke engines, 2-wheelers emit about 20-40% of the fuel un-burnt/partially burnt. Presently, two-wheelers account for more than 70% of the hydrocarbons and nearly 50% of the carbon monoxide in Delhi. As these emissions are less visible, the general public is not aware of the role of 2-wheelers in the deteriorating air quality. The 2-stroke engine, in spite

of R&D efforts towards improving its design, will continue to be a high emitter of hydrocarbons and carbon monoxide. In absence of a technological breakthrough on the conventional 2-stroke engine and its high pollution potential, it is for consideration that Government consider the phasing out of two-stroke two and three wheelers.

2.1 Pollution from 3-wheelers: Of the 80,000 three-wheelers in Delhi nearly 97% are petrol-driven, powered by 2-stroke engines. These vehicles are also high emitters of carbon monoxide and hydrocarbons. Pollution checks conducted by the Transport Department of Delhi Government has revealed that in some instances the levels are so high that they go beyond the measurable scale of test instruments. In addition, it is widely believed that petrol is adulterated with kerosene which results in emissions of thick black smoke.

2.2 Pollution from DTC nd other privately operated buses: There are about 3,500 privately operated blue line buses and about 3,000 DTC buses in Delhi for public transport. About two thirds of the DTC fleet is beyond the recommended age of 4-5 years, some even beyond 8-10 years. Most of these buses require phasing out as their condition is beyond normal maintenance measures. Their continued use has resulted in emissions of very high levels of smoke and particulates. The manufacturers of these buses have given to understand that there is very little that can be done to improve the performance of vehicles, including pollution control, if such vehicles continue to function beyond the recommended age and carry more than the permitted load of passengers. The blue-line buses, which were introduced in 1992-93, would require phasing out in a couple of years. It is stimated that by the year 2001, Delhi would require 15,000 buses to cater to the peak passenger traffic.

2.3 Overloading: All buses, particularly during peak hours, carry more than the recommended load of passengers. This results in higher smoke emissions. High capacity buses require to be inducted for carrying more passengers. The worst polluters should be taken off the heavy traffic corridors and high density areas. Similarly, for trucks, enforcement of laws related to overloading require to be enforced vigorously.

2.4 Pollution from diesel trucks: The diesel trucks, similar to buses, emit high levels of smoke and particulate matter. An age limit needs to be specified for all commercial diesel trucks. Renewal of permits must be done only if the vehicle conforms to satisfactory inspection and maintenance measures for pollution control.

2.5 Inspection and Maintenance Programme for Vehicles: The present system of checking pollution is only a representative method. A more effective system will be through the setting up of automated testing stations. The system can begin with testing of commercial vehicles and public transport vehicles to be linked with renewal of permits and registration.

2.6 Emission norms: Emission norms for all categories of petrol and diesel vehicles at the manufacturing stage were introduced for the first time in 1990, and made tighter in 1996. Stricter emission norms, already notified, will come into effect from 1.4.2000.

2.7 Improvement of fuels: Fuel quality standards for petrol and diesel have been notified under the Environment (Protection) Act. The quality standards are being implemented by the Ministry of Petroleum & Natural Gas (MoP&NG) through the oil companies. The MoP&NG has introduced low-sulphur diesel (0.25%) recently within the city limits which would be further extended. Considering the serious nature of air pollution problem due to particulates which are emitted mainly from diesel vehicles, it is necessary that diesel with even lower sulphur content is introduced in Delhi.

2.7.1 The MoP&NG is also implementing a programme for introducing pre-mixed fuels (petrol and oil mixture) for use of two stroke vehicles. Presently, 30% of the retail outlets in Delhi are supplying pre-mixed fuels. The MoP&NG plans to expand the number to 50% by December, 1997. This measure would have the desired impact if it is also supported by a ban on supply of loose engine oils for 2 stroke vehicles at retail outlets and service stations.

2.8 Use of clean fuels such as CNG: CNG is a clean burning fuel and its use in the automotive sector would help in reducing pollution from in-use as well as new vehicles. However, availability of CNG in Delhi, presently through 4 retail outlets and 3 on-line stations, is not sufficient and inconvenient in view of the travelling time involved for refills. More facilities would need to be created for CNG supply. Also some buses with dedicated CNG engine and more cars running on bi-fuel mode (CNG-petrol mode) must be introduced. Already, government cars are running on CNG, which can be emulated by private cars.

2.9 Traffic Planning and Management: To relieve congestion on Delhi roads, there is need for constructing fast motorways to enable transit traffic to pass unhindered. The existing road capacity network can be better utilized by upgradation of traffic management systems. The network of synchronised signals must be expanded.

2.10 MRTS: As per the existing programme, the first phase of the is being taken up. The MRTS project must be kept on schedule, with the remaining phases to follow. The MRTS needs to be integrated with the Regional Rapid Transport System of the National Capital Region Planning Board.

3.0 Vehicular Pollution Control Measures: The table below indicates measures for controlling pollution from in-use vehicles, for traffic management and improvement of fuel quality:

	RESPONSIBILITY	TIME FRAME
In-use vehicles:		
1.0. Delegation of powers by MoST to GNCTD to issue notification under MV Act for fixing life span of all categories of vehicles.	MoST & GNCTD	31.12.97
1.1 Taxis to be phased out in the following manner: By 31.3.1998 >15 years.	GNCTD	31.3.98- 31.3.2000

	By 31.3.1999 >12 years. by 31.3.2000 >10 years.		
1.2	Ban registration of Army disposal vehicles, Govern-ment auctioned vehicles and commercial goods and passenger vehicles (LCVs) beyond a specified life span.	Tpt. Deptt.	31.12.97
1.3	Ban on alteration of vehicles by replacing petrol engines with diesel engines.	Tpt. Deptt.	31.12.97
Traffic Management			
2.0	Traffic management of mostpolluted intersections/ Areas in Delhi, synchronised signals, establishment of area traffic control and central control room for diversion of traffic based on air quality monitoring data.	Traffic Police CRRI, IRTE, CPCB	31.12.98
2.1	Provision of bicycle tracks and greater use of existing tracks.	Traffic Police	1.4.98-1.4.99
2.2	Display of halting time at major traffic intersections. PCRA	Traffic Police/	1.4.98
2.3	Restricting the plying of goods vehicles during the day by further tightening of regulations.	Traffic Police	31.12.97
2.4	Dovetailing Urban and Sub-Urban Mass Transit Rail System on the ring rail with the road transport system.	Railways/ GNCTD	31.12.99
2.5	Construction of road bye-pass for Delhi	GNCTD/PWD	
2.6	Construction of express ways.	MoUAE/GNCTD/PWD	
2.7	MRTS implementation; integration with RRTS.	MoUAE, GNNCTD/ NCR Board	31.12.99-2010
3.0	Fuel quality: Improved quality diesel; further lowering of sulphur.	MoP&NG/ Oil companies.	1.4.99
3.1.	**Pre-mixed fuel-oil mixture:** (I) Expansion of pre-mixed fuel outlets to 50% by December, 1997. (ii) Ban on supply of loose 2-T oils at petrol stations and service garages. (iii) Direction that 2-wheelers and 3-wheelers obtain their fuel only from pre-mixed fuel outlets.	MOP&NG, oil companies AIAM	1.12.97
3.2.	**Fuel Adulteration:** Prevention of fuel adulteration.	Food & Civil Supplies Deptt., Tpt. Deptt., MOP&NG	Regular
3.3	**Alternative Fuels:** Await outcome of pilot project on the use of propane in auto-rickshaws.	GNCTD, MOST, MOP&NG	
3.4	Use of CNG to be extended to private vehicles. MoP&NG with co-operation of the Local authorities to set up additional such as on-line stations.	GAIL/MoP&NG/ GNCTD/D NDMC/MCD/D DA and L&DO	31.12.98
3.5	Expansion of outlets supplying unleaded petrol in entire NCR region, & trunk routes.	MoP&NG	1.4.98

CHAPTER 4

Water Pollution

1.0 The effluents flowing into the river Yamuna comprise of municipal and industrial wastes. The Central Pollution Control Board has been monitoring the water quality of the Yamuna at the upstream of Wazirabad and at Okhla. Upstream of Wazirabad, the dissolved oxygen (DO) level is 7.5 mg/l and biochemical oxygen demand (BOD) level is 2.3 mg/l, whereas, downstream at Okhla, the DO level declines to 1.3 mg/l with the BOD at 16 mg/l, indicating considerable deterioration in water quality in the stretch due to discharge of sewage and industrial effluents. The prescribed ambient water quality in terms of DO is 5mg/l or above, and 3mg/l or below in terms of BOD. The stretch between Wazirabad and Okhla is designated as bathing quality standard in terms of its water use.The coliform count at Wazirabad is 8,506/100 ml whereas at Okhla, it increases to 3,29,312/100 ml, as against the prescribed standard of 500/100 ml.

2.0 River Yamuna: The table below provides data on the water quality of the River Yamuna:

WATER QUALITY OF RIVER YAMUNA IN DELHI

PALLA

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
pH	8.28	8.41	8.1	8.21	8.0	8.1	8.4	8.0	8.31	8.2
DO	7.72	8.86	8.46	8.1	7.1	7.3	6.9	9.0	9.3	7.5
BOD	3.00	1.90	3.00	3.1	3.30	3.6	2.3	2.7	3.1	2.3
COD	105	16.7	11.5	12.6	10.2	10.9	8.3	18.2	49.2	9.5
TC								5483	3645	8506
FC	3300	35950	1505	3435	1580	795	193	3944	2901	743
TKN	0.45	0.74	0.63	0.6		3.1	1.3	1.1		
WT	23.5	23.9	24.3	23.6	24.2	23.6	23	23.6	26.2	25.8
AMM	0.146	0.279	0.21	0.2	1.0	0.7	0.3	0.2	0.7	0.4

NIZAMUDDIN BRIDGE

	1995	1996	1997
pH	7.8	7.6	7.5
DO	3.4	1.1	1.2
BOD	9.7	8.6	18.4
COD	31.0	56.1	63.6
TC	386091	170318	402312
FC	141456	142682	376599
TKN	919.0		
WT	25.3	27.3	26.5
AMM.	4.6	8.8	10.5

AGRA CANAL/OKHLA BARRAGE

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
pH	7.8	7.9	7.6	7.7	7.7	7.6	7.6	7.8	7.5	7.4
DO	1.9	2.7	4.3	2.3	0.0	2.1	1.9	2.1	1.2	1.3
BOD	20.2	24.4	22.6	25.6	19.0	37.5	49.7	15.0	18.2	16.0
COD	67.1	77.6	69.5	58.2	57.0	108.5	87.0	49.2	72.1	61.5
TC								333437	91955	329312
FC	12250	257950	165710	188900	190210	40450	204250	184967	76136	273875
TKN	9.8	10.8	9.2	8.9	9.5	9.2	10.9	13.4	-	-
WT	24.1	23.6	24.8	24.2	24.0	23.2	23.6	24.6	26.5	26.3
AMM	8.1	8.8	6.8	7.2	3.8	7.4	8.1	7.7	13.3	8.3

NOTE: (1) For 1997, data upto August are considered.
(2) Monitoring of Nizamuddin Bridge was started in 1995.

DO = Dissolved Oxygen, mg/l,
FC = Fecal Foliform,no./100 ml,
BOD = Biochemical Oxygen Demand, mg/l,
TKN = Total Kjeldahal Nitrogen, mg/l,
COD = Chemical Oxygen Demand mg/l
WT = Water Temperature, /oC,
TC = Total Coliform, no./100 ml.
AMM. = Ammonia, mg/l

2.1 The low self-purification capacity of the river Yamuna is due to want of minimum flow in the river and discharge of heavy municipal and industrial pollution load emanating from Delhi. Even though Delhi constitutes only 2% of the catchment of the Yamuna basin, yet the area contributes about 80% of the pollution load. There are 16 drains which discharge treated and untreated waste water/sewage of Delhi into the Yamuna. The municipal sector is the main source of water pollution in terms of volume. Approximately 1,900 mld of waste water is discharged from the municipal sector and 320 mld from the industrial sector. The installed capacity for treatment is 1,270 mld. At the same time, the existing capacity for treatment is not up to the desired secondary treatment level. Thus, substantial quantity of untreated sewage and partially treated sewage is discharged into the Yamuna every day. The Najafgarh drain contributes 60% of total waste water and 45% of the total BOD load being discharged from Delhi into the Yamuna. The municipal waste water has increased from 960 mld in 1977 to 1,900 mld in 1997. The capacity for treatment has enhanced from 450 mld in 1977 to 1,270 mld in 1997. The pollution load being discharged into the Yamuna river from the drains, from 1982 to 1996 is presented in the table below:

Pollution Load being discharged into River Yamuna.

Year	BOD load, tonnes/day
1982	117.3
1983	132.3
1984	119.4

1985	123.2
1986	165.1
1987	148.5
1988	159.6
1989	163.4
1990	167.5
1991	179.8
1995	178.4
1996	193.8

2.2 It is mentionable that the water flow in the river is regulated according to the demand (depending on climate and agricultural requirement) in the command areas of the canals taken off from the river, and also according to the agreement on sharing of Yamuna water by the 5 riparian States. This regulation has very significant impact on the water quality of the river. The release of water from Tajewala and Wazirabad is not regular. Therefore, the water quality also alters according to the dilution available in the river. The pollution load added from Haryana in the river is also intermittent. As there is no release of fresh water from Wazirabad in the dry season, it is the Delhi sewage which constitutes the flow in the river. The sewage, although increasing in quantity over a period of time has not changed the quality of the river water substantially because the flow is dominated preponderantly by the sewage without being diluted by river water. Account also has to be taken of breakdowns in the performance of sewage treatment plants in Delhi and addition of water in the river through Hindon-Cut from Hindon river.

3.0 Augmentation of Domestic Waste Water Treatment Capacity: The capacity for treatment of domestic waste water is being increased in the Yamuna Action Plan from the existing 1,270 mld to 2338 mld as per the details given below:

Sl.No.	Location	Present Capacity	Proposed Capacity
1.	Okhla	562	636
2.	Keshopur	327	509
3.	Coronation Pillar	90	182
4.	Rithala	182	364
5.	Kondli	45	205
6.	Vasant Kunj	---	23
7.	Yamuna Vihar	---	68
8.	Ghitorni	---	23
9.	Pappan Kalan	---	91
10.	Narela & Alipur	---	91
11.	Najafgarh	---	23
12.	Badarpur	---	9
13.	Timarpur	55	46
14.	Rohini	---	68
	TOTAL	**1270**	**2338**

3.1 Apart from the setting up of sewage treatment plants with a total capacity of about 1,000 mld, two more plants of 10 mld capacity each, near Sen Nursing Home and Delhi Gate, have been taken up under the Yamuna Action Plan ofthe Ministry of Environment and Forests which is being implemented by the Delhi Government. In addition, low cost toilets and plantations in the fringe area of the river, an electric crematorium, a bathing ghat and a scheme of community participation are also proposed under the Yamuna Action Plan.

4.0 Maintenance of Minimum Flow in the Yamuna: The dry weather flow in the river Yamuna along Delhi is nearly zero. This has resulted in almost total depletion of the self cleansing capacity of the river of Wazirabad. Pollution in the Yamuna cannot be controlled fully unless a minimum flow is maintained in the river. It is mentionable that sewage treatment plants are designed for reducing the pollution in sewage to a certain economically achievable level only. The rest of the pollution is controlled by the dilution available in a water body. To maintain the water quality of the river within the bathing class standard, nearly 10 times the discharge of the fully treated municipal waste water is required.

5.0 Activities: The principal activities for controlling water pollution in Delhi are given below:

5.1 Designing a strategy for augmentation of water resources in the upper stretches of Yamuna and for conserving water both in domestic and irrigation use (activity: Ministry of Environment & Forests/Governments of Uttar Pradesh/Haryana/Delhi).

5.2 Maintaining minimum flow in the river Yamuna (activity: Central Water Commission/Upper Yamuna Board).

5.3 Controlling pollution discharges in the upper stretches of the river Yamuna and the western Yamuna Canal (activity: Government of Haryana/Haryana State Pollution Control Board).

5.4 Construction of sewage treatment plants upstream of Delhi at Yamuna Nagar, Karnal, Panipat, & Sonepat, etc. (activity: Ministry of Environment & Forests/Government of Haryana).

5.5 Pumping of sewage to the full capacity of existing sewage treatment plants and regular maintenance of sewers and pumps (activity: Delhi Water Supply & Sewage Disposal Undertaking).

5.6 Construction of sewage treatment plants to meet effluent treatment requirements (activity: Delhi Water Supply & Sewage

Disposal Undertaking).

5.7 Statutory regulation of ground water (activity: Ministry of Water Resources/Ground Water Board).

CHAPTER 5

Solid Waste Management

1.0 About 5,000 mt of municipal solid waste is generated every day in Delhi. Disposal is mainly in landfills. Fourteen landfill sites have already been filled up. Four landfill sites at Ghazipur (East Delhi), Bhalswa (North), Hasthal (South West) and Okhla (South East) are operational present, though these will soon get filled. According to a recent study by the National Environment Engineering Research Institute, Nagpur, the expected quantity of solid waste generated in Delhi would be about 12,750 tonnes per day by 2015. Due to growing pressure on land in Delhi and the projected increase in the quantum of solid wastes, the scope for disposal through landfill sites is limited. Too much land is being consumed accompanied by increasing danger of ground and surface water contamination. Contiguous ground water sources indicate high total dissolved solidsconcentration. Solid waste samples from the surface and various depths of the landfills have been found to contain high levels of faecal coliforms and faecal streptococi. Other "best practices" in disposal technologies will have to be adopted on a large scale, including aerobic composting, vermiculture, pelletisation, incineration, etc. The private sector needs to be accorded a greater role. In recent times, the spotlight has also been on the problem of managing plastic wastes and the increasing hazards posed to human health from bio-medical wastes.

2.0 Additional sites for disposal of MSW: The following additional sites have been proposed for disposal of municipal solid wastes in landfills:

Sl. No.	Site description	Area in ha.
1.	Site near Hasthal Village in West Delhi.	26.0
2.	Site on Ring Road near Village Sarai Kale Khan.	20.0
3.	Site in the North West Delhi	58.5
4.	Site near Ghazipur Dairy Farm, Trans-Yamuna Area.	52.0
5.	Site near Timarpur existing village.	40.0
6.	Site near Gopalpur village in North Delhi.	20.0
7.	Site near Jahangirpuri.	12.0

3.0 Supreme Court: The Supreme Court had heard a public interest litigation on the subject of solid waste management by the municipal agencies. Due to organizational deficiencies and financial constraints the municipal agencies have not been able to deliver satisfactory results. The Court directed the Municipal Corporation of Delhi to improve the performance of the solid waste management system. The CPCB will submit reports from time to time. The National Environmental Engineering Research Institute, was retained by the MCD to prepare a report suggesting solutions and defining an action plan.

4.0 NEERI Studies: The studies have established the baseline data regarding solid waste quantities produced in the MCD area, its characteristics, suitability and adequacy of collection implements and transportation vehicles and also the environmental pollution caused by existing landfill sites. These studies have highlighted the shortcomings in the existing transportation disposal components and also elucidated the necessity of designing an optimised system. Measures along with the financial requirements were suggested for urgent and immediate improvements in the system.

4.1 The NEERI studies show that the treatment of solid waste not reduces the quantity requiring disposal but also reduces its pollution potential thereby preventing its adverse impact on environment. Some treatment methods also yield a product which can be recycled. Thermal treatment methods such as incineration or conversion of waste to briquettes and its subsequent use as fuel are not feasible due to the low heat value of the municipal solid waste in MCD area. The experience of the incineration plant at Timarpur, Delhi and the briquetting plant at Bombay support the fact that thermal treatment of municipal solid waste is not feasible, in situations where the waste has a low calorific value. A critical analysis of biological treatment as an option was undertaken for processing of municipal solid waste in Delhi and it has been recommended that composting will be a viable option. Considering the large quantities of waste requiring to be processed, a mechanical composting plant will be needed. NEERI has indicated that vermicomposting is suitable when practised on a small scale only.

4.2 Analyses by NEERI of solid waste at the landfills demonstrates that in most parts of the landfill the deposited waste is stabilized with the passage of time. However, such stabilisation requires prolonged periods of time and invariably causes environmental pollution, due to the escape of generated gas and leachate, if land disposal is practised in the present manner. In the proposed system, biogas generated during landfilling will be recovered and utilised gainfully. NEERI has suggested Optimal Design of System Elements, including collection, transportation, processing and disposal. The resource requirement for the proposed system for the collection equipment and its replacement has been estimated.

5.0 Variation in Composition of Garbage: A systems approach in managing solid wastes is also necessitated in view of the variation in the composition of garbage from area to area. The waste composition has a bearing in the extent of recycling possible. The variation is brought out in the statement placed below:

Zonewise Municipal Solid Waste Survey (in percentage)

Location	Organic	Paper	Plastic	Silt	Rags	Glass/Crockery	Metal
Mongolpuri	9.7	2.7	1.9	70.1	12.4	2.3	0.9
Ahta Thakur Das	5.6	8.6	11.1	23.0	11.4	8.6	6.7
Green Park	40.7	5.9	4.7	34.2	4.0	4.8	1.7
Subhas Nagar	5.5	8.7	6.2	56.9	6.5	6.1	4.4
Trilokpuri	10.6	9.7	5.8	39.4	5.6	8.1	3.2
Navin Shahdara	9.6	2.7	2.0	69.9	12.6	2.3	0.9
Shakur Pur	3.7	4.1	3.3	72.0	0.7	3.3	3.4
Chandni Mahal	42.1	3.8	1.3	19.1	10.1	4.4	1.2
Outrem Line, Delhi	57.7	7.7	5.8	11.5	7.7	5.8	3.8
Qutab Road	5.6	8.6	11.2	22.9	13.0	9.1	6.8
Arya Samaj Road, Kureni	6.0	10.5	9.9	16.5	13.3	16.9	14.8
Sunder Nagri	8.0	6.1	48.0	24.9	3.7	5.0	1.2

6.0 Street Sweeping and Collection: The community bin system has been adopted in the MCD area for solid waste collection. Street sweeping work is carried out manually and the solid waste thus collected is deposited in community bins located at various points. At several sites, the waste accumulates due to non-availability of dustbins in the vicinity, and these are referred to as "Open Spots". According to the above mentioned NEERI report, the "dalaos" have no standard designs and are not always placed at the best locations. The present designs do not permit thorough cleaning with the use of front end loader. Public participation in improving the efficacy of collection work is marginal. Although ward committees exist, they require restructuring.

7.0 Plastic Waste Management: The quantity of plastic wastes generated in Delhi is estimated to be 300 mt per day. The problem pertaining to the management of plastic wastes is its non-biodegradability. The plastic waste reprocessed is about 1,000 mt per day, a substantial amount of which comes sources outside Delhi.

7.1 The fire in Jwalapuri in June 1995 and the consequent gutting of the market demonstrated the hazards of the plastic recycling industry. Subsequent to the Jwalapuri incident, the Delhi Government constituted a fact-finding committee. Consequently, it was decided that the plastics waste market be shifted from Jwalapuri to Tikri Kalan.

7.2 The informal network of rag pickers, waste collectors and recyclers has displayed entrepreneurship in the handling of plastic wastes. However, various waste management aspects can be better served by involving the organised sector also in collection and recycling operations.

7.3 The National Task Force on Plastic Waste Management, constituted by the Ministry of Environment and Forests, has made recommendations which lay emphasis on raising consumer and public awareness, upgrading methodology of waste collection and segregation, recycling and reprocessing systems and promoting end-product applications with desired recyclable component based on Guidelines for Recycling of Plastics to be issued by the Bureau of Indian Standards. The preventive, promotional and mitigative aspects have been highlighted. The Task Force has suggested the specifications of plastics suitable for recycling. There are guidelines for packaging and processing. Buy back systems have been suggested through user-producer shared responsibility. Deterrent penalties have been proposed for littering. The recommendations of the Task Force stress that appropriate fire protection and safety measures be planned in and around plastic waste dumps and waste dealers markets.

8.0 Bio-medical Wastes: There are 630 hospitals and nursing homes in Delhi. It is estimated that 30 mt of medical wastes is generated every day. Though, some hospitals have disposal facilities with incinerators, the substantial portion of the medical wastes is disposed off along with domestic wastes with attendant danger of serious infections.

8.1 Around 2,500 goats, sheep and buffaloes are slaughtered in the single authorised abattoir in Delhi, generating 50 mt of wastes per day. The number of small slaughter houses in Delhi is about 400. It is estimated that the total number of animals slaughtered in Delhi is about 15,000-20,000 per day.

8.2 The Bio-Medical Waste Rules, presently in a draft stage, are expected to come into operation by the end of this year. The Rules will regulate the disposal of bio- medical wastes, including human anatomical wastes, blood and body fluids, medicines and glassware and animal wastes. All persons handling such wastes will be required to obtain authorisation/permission from the appropriate designated authority. Segregation of wastes at the source of its generation has been made mandatory for all institutions and organisations dealing with them. The Bio-Medical Waste Rules make the generator of wastes liable to segregate, pack, store, transport, treat and dispose of the bio-medical wastes in an environmentally sound manner.

8.3 The agencies responsible for implementation of the Rules include the State/District level Medical and Health Authorities, Animal Husbandry and Veterinary Services, State/UT Pollution Control Boards/Committees and Municipalities. The tasks of the administering agencies include the grant of approval, record keeping, monitoring waste handling and accidents, and supervising the implementation of the Rules. The details pertaining to the types of containers to be used, their colour coding and labelling have also been provided in these Rules. Recycling and re-use of bio-medical wastes except plastic and glass wares have been prohibited.

9.0 The salient activities for managing solid wastes are given below:

ACTIVITY	RESPONSIBILITY	TIME FRAME
1. To monitor collection, transportation & disposal practices adopted by MCD & NDMC.	CPCB	Regular
2. Feasibility of the NEERI study on solid waste management in MCD area	MCD study	31-12-97
3. Public participation in waste segregation at door step; and collection tie up with local authorities.	MCD/NDMC/ NGOs/ DPCC	31-12-97
4. Notification of Rules for Biomedical Waste Man-agement.	MoEF	31-12-97
5. Implementation of guide-lines for treatment and disposal of biomedical wastes.	DPCC/GNCTD	31-12-98
6. Setting up of common facility for treatment, disposal and incineration of bio-medical wastes.	DPCC	31-12-98
7. Implementation of recommendations of Task Force - on Plastic Waste Management.	MoEF,DOC & PC, CPCB.	30-06-98

CHAPTER 6

Industrial Pollution

1.0 The major sources of industrial pollution in Delhi include thermal power plants, brick kilns, hot mix plants and industrial units. The thermal power plants in Delhi are at Indraprastha, Badarpur and Rajghat.

2.0 Industries in Non-conforming Areas: According to a survey by the Delhi Government, out of a total of 1,25,000 industries, there are 98,000 industries in non- conforming areas as per the Master Plan of Delhi. Non- conforming industries are located in unauthorised colonies, "lal dora" villages, resettlement colonies, the walled city and other residential pockets. In accordance with directives of the Supreme Court the Delhi Government has constituted a high powered Committee headed by Principal Secretary-cum-Commissioner of Industries for ensuring that the provisions of the Master Plan are complied with. All industries in the National Capital Territory of Delhi were required to approach the Committee for grant of permission to operate their industries in the industrial areas. The Supreme Court has ordered closure of industries as per the details given below.

Date of Order	Type of Industry	Date of Closure
08-07-1996	168 (hazardous industries)	30-11-1996
06-09-1996	513 (ordered to relocate outside Delhi)	31-01-1997
10-10-1996	46 (Hot mix plant)	28-02-1997
26-11-1996	243 (Brick kilns - to stop functioning and relocate outside Delhi)	30-06-1997
26-11-1996	21 (Arc/induction furnaces)	31-03-1997

2.1 The Delhi Government under directions from the Supreme Court has identified 102 acres of developed land in the existing industrial estates and seven other locations with an area of approximately 4,800 acres for relocation of the industries. 1,300 acres have been notified for acquisition and development of new industrial estates for relocation of industrial units. The government has invited applications from industrial units operating in non-conforming areas for allotment of industrial plots.

3.0 Common Effluent Treatment Plants: Efforts to control pollution from industries include the setting up of 15 Common Effluent Treatment Plants (CETPs) in industrial areas. The funding pattern is in accordance with a World Bank scheme. The State government and the MoEF have each deposited 25% (Rs.22.5 crores) of the total cost of Rs.90 crores of the CETPs with the Delhi State Industrial Development Corporation as the executing agency. The Industrial Development Bank of India (IDBI) is yet to make available the requisite credit to the entrepreneurs. The entrepreneurs are in the process of constituting associations and approaching the IDBI for credit. The 15 CETPs are being set up under directions of the Supreme Court. Necessary steps need to be taken by the Delhi Government for expediting the construction and commissioning of the CETPs.

4.0 Air Pollution from Thermal Power Plants: There are three coal based thermal power plants in Delhi, at Indraprastha, Rajghat and Badarpur. The air pollutants emitted by the thermal power plants are: sulphur dioxide, oxides of nitrogen and particulates. Electrostatic precipitators have been installed at the three power plants to control particulate emissions. Sulphur dioxide and oxides of nitrogen are emitted through stacks of specified height to facilitate wider dispersal so that the ground level concentrations of these gaseous pollutants are kept controlled. Stack monitoring is being done on a regular basis.

5.0 Fly Ash from Thermal Power Plants: The total quantity of fly ash from the three power plants is about 6,000 tonnes per day (Badarpur 3,500-4,000 TPD, Indraprastha 1,200-1,500 and Rajghat - 600-800 TPD). While Badarpur and Rajghat have dry fly ash collection facilities, they do not have adequate storage facilities. By and large the fly ash generated is disposed of in ash ponds. The ash ponds are located close to the river Yamuna in case of Rajghat and Indraprastha power plants. The river Yamuna is vulnerable to overflows from the ash ponds, particularly during the monsoon. Besides, ground water contamination may take place due to leaching of heavy metals present in the fly ash.

5.1 None of the thermal power plants in Delhi has an action programme for mass scale utilisation of fly ash. The Central Pollution Control Board has issued directions to the plants under Section 5 of the Environment (Protection) Act to submit detailed Action Plans for committed utilisation of fly ash to achieve a minimum 20% utilisation by December, 1997. The Action Plans were to have been submitted in October, 1996. The power plants were also advised to set up facilities for fly ash utilisation within the premises as ancillary units. This has not been done so far. Necessary assistance will need to be made available to the entrepreneurs, accompanied by necessary financing, for establishing units manufacturing fly ash products.

5.2 For new thermal power plants, as in the case of the Rajghat plant, the Ministry has prescribed that at least 20% fly ash should be utilised in the first year of the commissioning of the unit, with an increase of 10% every year, thereafter so that by the end of the ninth year 100% of the fly ash comes to be utilised. The terms of supply of fly ash would be settled mutually between the power plants and the concerned entrepreneurs. For providing the necessary impetus to the utilisation of fly ash, the Ministry of Environment and Forests proposes to prohibit the use of top soil in brick/block manufacturing and in use on roads and embankments within a specified radius from the location of thermal power plants. Simultaneously, appropriate technology dissemination is required for fly ash utilisation and other institutional support. Directives for mandatory utilisation of fly ash bricks will have to be given to the construction agencies. Fly ash can also be used in Portland Pozzolona cement, cement concrete, cement mortar, building components, landfill embankments and in pavements.

6.0 Hazardous Wastes: The State Government and the Delhi Pollution Control Committee is still to inventorise the industrial units in Delhi generating hazardous wastes as defined in the Hazardous Wastes (Management and Handling) Rules. The hazardous waste also has to be characterised. Most of the hazardous waste generating units in Delhi are functioning without authorisation required under Rules. Such authorisation is granted by the Committee on satisfaction that the unit is disposing off the wastes in an environmentally sound manner. The large number of hazardous wastes generating units working unauthorisedly is a cause of concern. In January, 1997 the Ministry of Environment and Forests has delegated powers to the Delhi Pollution Control Committee to close down units handling hazardous wastes operating in violation of the Rules.

6.1 The implication of industrial units functioning without authorisation is that hazardous waste is not being handled in an environmentally sound manner. Apart from the environment being affected adversely, there is danger of groundwater becoming contaminated. Those units which have been granted authorisation are disposing of the hazardous waste on-site. Quite possibly, the hazardous waste is just being disposed of in storage pits without pre-treatment. Whether the pits are properly lined to prevent leaching and run-offs is an important question which has not been addressed adequately as yet by the Delhi Pollution Control Committee. There is no common facility for the collective treatment, storage and disposal of hazardous wastes generated by various industrial units in Delhi. The facility should also have arrangements for incineration. Delhi needs such a facility urgently.

7.0 The salient activities for controlling industrial pollution in Delhi are:

ACTIVITY	RESPONSIBILITY	TIME FRAME
1. The three coal based power plants should switch over to beneficiated coal.	DVB/NTPC/MoC/MoP	31.12.98
2. Till availability of beneficiated coal, superior quality of coal (D Grade) should be used.	NTPC/DVB/MoP/MoC	31-12-97
3. Strict enforcement of pollution control measures applicable to industrial boilers.	DPCC/Factory Inspectorate	
4. Shifting of polluting industries from non-conforming to conforming areas	Delhi Admn./DPCC	According to Court directive.
5. Construction and commissio ning of 15 CETPs	Indl. Associa tions (CETP Companies) DPCC/DSIDC.	31-12-98
6. Inventorisation of hazardous waste units: characterisation of wastes.	GNCTD/Indl. Asso./DPCC	Immediate
7. Common facilities for treat-ment, storage, disposal and incineration of hazardous waste.	GNCTD/DPCC	31-12-98
8. Notification for mandating fly ash utilisation.	MoEF	31-12-97
9. Provision for dry collection and storage facilities for fly-ash should be made in three power plants.	DVB/NTPC/MoP	31-12-98

10. Cleaner production cell should be set up for SSIs in the Deptt. of Industry, Govt. of Delhi for promoting clean technologies/waste minimisation.	DSIDC	31-12-97
11. To ensure installation of pollution control devices by all air polluting industries.	DPCC	31-12-97

CHAPTER 7

Noise Pollution

1.0 Noise has been notified as a pollutant under the Air (Prevention and Control of Pollution) Act, 1981. The main sources of noise pollution are automobiles, construction equipments, loudspeakers, bursting of crackers, etc. Noise is described as unwanted sound that produces deleterious effects on health and affects the physical and psychological well being of the people. In general terms, noise induced ailments are preventable but are difficult to cure after they have occurred. In recent times, public concerns about the rising trends in noise pollution have increased. High noise levels result in auditory fatigue and deafness. The non-auditory effects relate to interference with speech, causing annoyance and affecting efficiency. Increasing noise levels are also resulting in major social problems. Ambient standards in respect of sound for different categories of areas - residential, commercial, industrial and silence zones - have been notified under the Environment (Protection) Act. In many areas of Delhi the ambient noise levels far exceed the prescribed standards. In this respect, there is the need for regulating the use of loudspeakers, DG sets and use of horns in vehicles.

2.0 Ambient Noise Standards: Ambient air quality standards in respect of noise for different categories of areas (residential, commercial, industrial and sensitive) have been notified under the Environment (Protection) Act, 1986, which are as follows:

Category of area	Limits in decibels/dB	
	Day	Night
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence Zone	50	40

3.0 Noise Standards at Manufacturing Stage:

Noise limits have also been prescribed at the manufacturing stage for automobiles, domestic appliances and construction equipment, which are as follows:

		Limits in dB(A)
(a)	Motorcycle, Scooters and Three Wheelers	80
(b)	Passenger Cars	82
(c)	Passenger Commercial Vehicles upto 4 MT	85
(d)	Passenger or Commercial Vehicles above 4 MT and upto 12 Mt	89
(e)	Passenger or Commercial Vehicles exceeding 12 MT	91
(f)	Window Air Conditioners of 1 to 1.5 ton	68
(g)	Air Coolers	60
(h)	Diesel Generators for domestic purposes	85-90
(I)	Refrigerators	46
(j)	Compactors (rollers) Front Loaders, Concrete Mixers, Cranes (Movables) Vibrators and Saws	75

4.0 Codes of Practice: Besides above, the Code of practice for controlling noise other than industries and automobiles has been brought out for the following areas:

- Public Address Systems;
- Aircraft Operations;
- Railway Operations;
- Construction Activities and ;
- Bursting of Crackers.

5.0 Survey by Delhi Pollution Control Committee: The Delhi Pollution Control Committee has conducted noise survey in Delhi from August to October, 1996 in different parts of Delhi. The analysis of primary and secondary data and the indices have brought out the following noise pollution scenario in Delhi:

- Three wheelers, trucks and motorcycles remain the chief source or noise pollution on Delhi roads followed by generators in the residential, commercial and industrial locations.

- Fifteen of the forty six residential locations have noise level within the tolerable limits for over 90% of the time of the day. On the other extreme, 12 locations are noisy round the clock. The rural areas which are away from the main National highways have not yet caught up with the noise problem barring the locations where unauthorised industrial activities are taking place.
- All major commercial areas remain noisier than the tolerable limits with Chandni Chowk remaining highly noisy round the clock.
- Industrial areas by and large remained within the prescribed limits.
- Sensitive locations including the silence zones, including hospital areas, are alarmingly noisy.
- All major traffic corridors are highly noisy with peaks even crossing 100 dBA mark. Mahipalpur Crossing on NH-8 is noisiest round the clock. Andrew's Ganj Crossing on Ring Road is also alarmingly noisy.

6.0 Recomme ndations by DPCC to control Noise in Delhi: The DPCC survey report has recommended following steps for control of noise in Delhi:

- Ban on Pressure Horns to be effectively implemented.
- Well designed silencers and mufflers be installed on the vehicles, preferably at the manufacturers level. 3-Wheeler Autos to be phased out.
- Synchronised traffic signalling to be introduced on Ring Road and all other major traffic corridors including National Highways within the city limits.
- A comprehensive Traffic Management Plan including effective implementation and extension of traffic restrictions, construction of sub-ways and fly-overs be chalked out on priority. Only mild slope to be provided on approach roads of the fly overs.
- Use of generators for commercial and residential purposes may be banned. Generators used for industrial purposes should be properly enclosed and equipped with noise muffling devices.
- Extensive plantation of trees on the road curbs and the road side colonies be undertaken in a definite time target. North Delhi to be given priority.
- Hoardings of noise absorbent materials be encouraged.
- Adequate noise barriers be created around the hospitals schools and other locations in silence zones.
- City development plan to take adequate steps in advance to protect the habitants from the road side noise.
- Prescribed standards for home appliances and industrial machinery be enforced effectively.
- Mass awareness programmes be launched for people's participation, in noise abatement programme aided by continuous noise monitoring and display network at important locations in Delhi.

7.0 Loudspeakers: The stipulation of point noise standards for loudspeakers will enable their regulation under the environmental laws. Presently, the use of loudspeakers is regulated under laws pertaining to public nuisance or which relate to maintenance of law and order.

8.0 Generator sets: There are approximately 1 to 1.5 lakh portable electricity generating sets in Delhi in use in commercial and residential areas. The use of generator sets needs to be regulated under the municipal laws. Acoustic hoods should be made mandatory to muffle the sound. Point noise standards for generating sets will have to be prescribed under the environmental laws.

9.0 Regulation of Horns: The Motor Vehicles Act and the rules framed thereunder stipulate that every motor vehicle shall be constructed and maintained so as to conform to the noise standards approved by the Bureau of Indian Standards. While certain noise limits have been prescribed in the Environment (Protection) Act for automobiles at the manufacturing stage, provision also has to be made for regulating the use of horns while a vehicle is in use.

CHAPTER 8

Institutional and Planning Aspects

1.0 The Action Plan goes beyond just controlling pollution. It also emphasises planning and development of infrastructure which will mitigate pollution. Commensurate institutional arrangements, too, need to be brought in place.

2.0 NCR Planning: An objective of planning for the National Capital Region (NCR) is to contain the pressure of population on Delhi. The Plan envisages the deflection of a population of 20 lakhs from Delhi. Accordingly, the development of priority (satellite) towns and complexes in the NCR outside Delhi has been projected. These townships would be developed so as to be centred around core economic activities and office complexes relocated out of Delhi. Development of physical infrastructure and establishing linkages within the region would mean making power available at par with Delhi, developing a fully integrated regional rail transit system, expressways and adequate bypass facilities to divert traffic. The solution for containing the further growth of Delhi lies in framing the Issue in a regional setting. There is need for an integrated planning and development of the NCR. There has to be concerted policy and action for strictly controlling growth in Delhi (NCT), moderate controls in the Delhi Metropolitan Area (DMA) outside Delhi, and induced development in the towns falling outside the DMA. In this light, the techno-economic feasibility of the development programmes for the NCR, as proposed by the NCR Planning oard, should be considered. The investment requirements for the implementation of the NCR proposed projects is very large. A pragmatic assessment of the possibilities of central and state sector funding is required.

3.0 Master Plan: The Master Plan for Delhi, 2001 modified the existing spatial plans and specified a land- use pattern for Delhi. The Plan emphasises an efficient circulation network and extensive land spaces. The Plan also provides a framework for controlling haphazard development and building activities. In recent times, there has been comment about the concerned implementing agencies working at cross purposes. The extent to which mixed land use can be permitted has also been a matter of debate. The implementation of the Master Plan will help to improve the environment, simultaneously with due effort for raising the standard of civic services.

4.0 Deficiencies in Civic Services: Environmental planning will have to take account of the projected deficiencies in civic services in Delhi. Presently the water supply is 2,120 mld against the requirement of 2,950 mld. By 2001, this requirement is expected to be 4,030 mld. Municipal sewage treatment exists for only 1,270 mld as against the required capacity for 1,900 mld. The requirement is projected to be 3,170 mld by 2001. Only 2700 tonnes of solid waste out of the 5000 tonnes generated every day is being managed now. By 2001 solid waste generation would be 7,300 tonnes per day. The demand for power has been increasing, and projected to be 4,000 mw by 2001. Against the requirement of 7,500 buses for public transport, only 6,000 are available. For 2001 the requirement is likely to be 16,000 buses.

5.0 Law Enforcement and Delegation of Powers: Further delegation of statutory powers to functionaries of the Delhi Government for carrying out enforcement functions for controlling pollution must be considered. Suitable persons can be appointed as Motor Vehicle Officers. for enforcement of the provisions of the Motor Vehicles Act dealing with dangerous driving or at excessive speeds, and driving under the influence of drugs and alcohol. The Delhi government can empower these officers to detain upto 48 hours any vehicles found to be violating the relevant provisions. Such persons can also be involved in teams constituted for carrying out surprise checks to detect vehicles particularly buses and trucks which do not comply with emission norms. Powers would also require to be vested in private persons for enforcing the relevant provisions of the Municipalities Act to prevent uncontrolled garbage disposal.

6.0 Private Sector: The scope of integrating the effort of the private sector and voluntary non-profit organisations with the resources of the local authorities and government agencies needs to be assessed. Simultaneously, the of the public sector as facilitator and regulator of private sector operations must be defined.

7.0 Squatter Settlements and Sanitation: The problem posed by squatter colonies needs to be addressed along with development of low cost sanitation. The Ministry of Environment & Forests has entered into an agreement with the World Bank to prepare an Urban Environment Management Project which will cover Delhi. The objective of this study is to define ways for improving the management of air quality, waste water and solid waste in Delhi; prepare high priority interventions necessary for the management practices to be effective; and identify long- term investment needs in urban infrastructure services. Special attention will be paid to the needs of the areas where the poorest live for identifying commensurate reforms and investments. The role of improved household domestic practices and self-help schemes needs to be highlighted.

8.0 Environmental Statistics: The status of pollution in Delhi will require constant updating through quantitative information relating to environmental quality and related parameters. Environmental epidemiological studies would be needed to assess the impacts of pollution on human health. A system will have to be institutionalised for collecting and analysing data on the environmental health of the poorest, e.g., data on upper respiratory and gastro-intestinal illness. The costs and benefits of existing municipal and waste collection and management systems needs to be reviewed, including equipment installation, their utilisation and maintenance, using the existing data and field observations. This should be possible through the above mentioned World Bank project, which can also verify the data and physical and chemical analysis about solid waste, and study the impact of leachates on the adjoining surroundings, including water bodies. Monitoring results need to be standardised to facilitate ease of comparison, with the aim of increasing public awareness about environmental quality.

CHAPTER 9

Public Participation and General Awareness

1.0 Public Participation: Any plan to control pollution can succeed only if the people feel initiated and involved in its working and are able to participate in its implementation. The Policy Statement for Abatement of Pollution, 1992 acknowledges the significant role that NGOs and public spirited citizens can play in managing the environment. The National Conservation Strategy and Policy Statement on Environment and Development, 1992 states that NGOs and citizen groups be empowered for mobilising public opinion and participation in development activities. The National River Conservation Programme (NRCP) is a case in point; an important concern expressed by the Minister of Environment and Forests regarding the functioning of the NRCP is the lack of public involvement and popular social action.

2.0 Awareness: Public participation, for controlling pollution in Delhi, will include the element of enhancing the general level of awareness about the effects of rising pollution and measures capable of being taken by the citizenry for abatement of pollution and inducing community spirit. The example of Surat is often cited where the public became motivated to actively participate in cleaning up the city. Special programmes are required for generating awareness focusing on specific and varied target groups. In like manner, self initiated groups like the Civil Defence, Territorial Army or Army regimental units can be motivated for the development of degraded lands and enhancement of green cover.

3.0 NGOs: Involvement of the NGOs and other community groups is essential. The role of "mohalla committees" is important. Though, it is to be expected that such committees will concentrate on their own localities. To the extent possible, the NGOs should be given freedom to choose the issue to be popularised, the method to be adopted and the target group. Monitoring and evaluation of campaigns should also be carried out by NGOs. The NGOs can catalyse the adoption and application of new technologies, methods, and operations, particularly with respect to cleanliness drives. The Ministry of Environment and Forests can equip them with aids, eg., water testing kits designed and developed by the Central Pollution Control Board capable of analysing various parameters, books, literature, etc. The NGO effort will be highlighted through newsletters, the press and TV.

4.0 National Environment Awareness Campaign: The Ministry of Environment and Forests in 1986 had launched the National Environment Awareness Campaign. This is a multi-media campaign for spreading various messages related to environmental issues to diverse target groups.

5.0 Eco-Clubs: School children are an important target group. The Eco-club programme encourages the participation of school children in activities related to environmental protection by creating awareness and motivating interest in ecology. This scheme needs to be expanded to reach every school in Delhi. The Ministry can sponsor competitions in the Delhi schools ranging from essay and painting competitions to quiz and debates.

6.0 Paryavaran Vahini: The Paryavaran Vahini scheme, launched in 1992, also has the potential for giving feedback regarding afforestation and survival of plants. The Vahinis can also monitor water quality and ambient air. The sample meter testing kits developed by the Central Pollution Control Board can be made available to the Paryavaran Vahinis. 7.0 TV: The TV is a powerful tool for getting the message across. The Ministry will approach leading personalities in the field of culture, sports, films and art to disseminate the message of a pollution free Delhi. Focused television spots should be prepared drawing the attention of the citizens of Delhi to the need for protecting the environment and preventing pollution in daily activities.

8.0 Private Sector: The private sector can be made more socially responsive, particularly those manufacturing products which generate pollution, e.g., automobiles, plastics, etc. Initiatives can include inspection and maintenance camps for vehicles, collection of plastic wastes for recycling, etc. Increased public awareness for a cleaner environment will force modifications in overall corporate strategies compelling greater investment in anti-pollution efforts. The Eco-mark scheme with eco-labelling will have to be deployed for shaping consumer preferences through motivations for a cleaner environment.

9.0 Experience Sharing: Experience sharing on methods evolved to combat pollution would greatly help the cause of pollution control and abatement, e.g., interactions between members of Waste Minimisation Circles which is a programme for preventing industrial pollution by technological upgradation. Professional groups, e.g., comprising of medical practitioners, lawyers, etc. must share perceptions about issues like health and safety.

CHAPTER 10

Action Points: General

Apart from the activities outlined in the Action Plan, some action points have been particularly emphasised in the deliberations which Minister of Environment and Forests has had with various government and non government agencies on the subject of controlling pollution in Delhi. These action points relate to:

1. Domestic Refuse: A special drive needs to be organised to motivate the public for depositing domestic refuse in `bin bags.' Segregation will be encouraged to facilitate recycling. The refuse bags will be placed suitably at pre-determined points for collection by the concerned agencies. Dumped refuse would attract fines.

2. Waste Bins: Large waste bins would be made available at all major markets and tourist spots to void littering.

3. Stray Cattle: The problem of stray cattle is increasing. Not only is this a public nuisance but increases the chances of road accidents. The municipality needs to implement a concerted programme to shift stray animals to cattle ponds.

4. Street Dogs: Concerted effort is needed to remove street dogs many of which are carriers of rabies. The municipality must devise methods to sterilise the dogs. Rabid dogs must be destroyed.

5. Removal of Encroachments: Encroachments will be removed for providing more road space to facilitate free movement of traffic. Pavements will be cleared for pedestrians. Pedestrianisation of congested areas in Delhi would be particularly encouraged, e.g., in Karol Bagh, Chandni Chowk, etc. The problem of old trees on pavements posing danger to passers- by will be addressed by the municipality. Where necessary, the old trees will be uprooted. More bicycle pathways are needed.

6. Parking: Parking areas will be developed which are distant from congested market places. Battery perated buses would ferry the shoppers to the market venues. Deterrent parking charges will be levied in certain areas to restrict vehicular movement.

7. Restrictions on Vehicles: A scheme will be devised for reducing the number of vehicles on the road at any one time. Vehicles of certain zones would not be allowed to ply on a particular day of the week.

8. Afforestation: Afforestation activities will be stepped up. Apart from the State agencies and the local bodies, the resources of Railways, military and para-military forces will also be made use of. Landscaping and afforestation of land adjacent to railway tracks would be undertaken.

9. 'Basti Managers': For preventing the growth of squatter settlements, the Government of Delhi is considering the possibility of deploying `basti managers' who would monitor a register on current residents ensuring that there was no increase in the encroaching households.

10. De-congestion: Action has to be initiated for de- congesting Delhi by shifting offices outside Delhi in accordance with NCR planning. Public Sector Undertakings would not be allowed to build/rent guest houses or develop residential colonies.

11. Expressway: In order to relieve congestion on main Delhi roads one "through traffic" express way without traffic signals shall be constructed by the Central Government (MoST).

12. Ring Railway: The ring railway can be an effective means of public transport provided its services are handling of hazardous wastes. In particular, it needs to be ensured that the sources of drinking water are free of any possibility of being contaminated by hazardous wastes.

14. Bio-medical Wastes : A concerted drive will be launched for the safe disposal of bio-medical wastes generated by hospitals, nursing homes and clinics under strict regulation through incineration and other safe methods.

15. Common Facility for Hazardous Wastes: One major common facility for treatment, storage, disposal and incineration of hazardous and other toxic wastes would be set up in Delhi to be used by such generators of wastes who do not have the capacity to set up individual facilities.

16. Delegation of Powers to Zonal Magistrates: The Zonal Magistrates, 27 in number, will be delegated requisite statutory powers to enable them to undertake enforcement functions for the pollution abatement in Delhi.

17. Private Enterprise: Impetus has to be given to the private sector for participating in the biological processing of municipal domestic waste. The Delhi Government has indicated that private contractors have shown an interest in the commercial possibilities arising from solid wastes. Also for constructing parking lots on a BOT basis investment by the private sector should be encouraged.

18. Citizens' Initiatives: Efforts of the Civil Defence organisation, citizen groups and local residents committees be chanellised into civic projects for abatement of pollution, in particular, handling of domestic solid wastes.

19. School Activity: Extra curricular activities in educational institutions should include environmental projects aimed at community/neighbourhood improvement, while also aiming to suitably sensitise young students to the environmental quality of their surroundings.

20. Cultural Heritage: Preservation of the cultural heritage of Delhi as reflected in monuments like the Lal Kila, Humayun Tomb, Jama Majsjid, Purana Kila, Siri Fort, Tughlakabad Fort, etc. will be intrinsic to environmental planning in Delhi.

Abbreviations in Action Plan

AIAM - Association of Indian Automobile Manufacturers
CETP - Common Effluent Treatment Plant
CNG - compressed natural gas
CPCB - Central Pollution Control Board
CRRI - Central Road Research Institute
DDA - Delhi Development Authority
DPCC - Delhi Pollution Control Committee
DSIDC - Delhi State Industrial Development Corporation
DTC - Delhi Transport Corporation
DVB - Delhi Vidyut Board
DWSDU - Delhi Water Supply and Sewage Disposal Undertaking
GAIL - Gas Authority of India Ltd.
GNCTD - Government of National Capital Territory of Delhi
IARI - Indian Agricultural Research Institute
MCD - Municipal Corporation of Delhi
mcg/m3 - microgrammes per m3 - micrograms per cubic metre
mg/l - milligrams per litre
mld - million litres per day
MoC - Ministry of Coal
MoEF - Ministry of Environment and Forests
MoI - Ministry of Industry
MoP - Ministry of Power
MoP & NG - Ministry of Petroleum and Natural Gas

MoST - Ministry of Surface Transport
MoUAE - Ministry of Urban Affairs and Employment
M V Act - Motor Vehicles Act
mt - metric tonnes
mw - mega watt
NCR - National Capital Region
NDMC - New Delhi Municipal Corporation
NTPC - National Thermal Power Corporation
PCRA - Petroleum Conservation Research Association
PWD - Public Works Department
STA - State Transport Authority

MEETINGS FOR FORMULATION OF THE ACTION PLAN FOR CONTROL OF POLLUTION

21.5.1997 Meeting for formulation of Action Plan. Core Group set up drafting the Action Plan.

22.5.1997 - Draft of the Action Plan prepared by the 19.6.97 Core Group.

20.6.1997 Meeting of the core group with Central government and State governments representatives to discuss the draft Action Plan.

21.6.1997 Circulation and revision of the draft action plan 14.7.1997 based on the comments received.

15.7.1997 Meeting of Government representatives, experts and NGOs to finalize the draft Action Plan.

4.8.1997 First Consultation with the Chief Minister, Delhi on the Draft Action Plan.

7.8.1997 Meeting with the Lt. Governor, Delhi.

8.8.1997 Second Meeting with the Chief Minister, Delhi.

List of Participants in the Meetings Chaired by Minister of Environment and Forests

21st May, 1997

1. Dr. Karan Singh,
   Member of Parliament,
   Rajya Sabha.

2. Dr . T.N. Khoshoo,
   Distinguished Fellow, TERI and
   Former Secretary
   (Environment),
   Govt. of India

3. Shri Samar Singh
   Secretary General
   World Wide Fund for Nature in India

4. Shri PV Jaikrishnan
   Chief Secretary, Delhi

5. Justice (Retd.) R. K. Shukla,
   Environment Impact
   Assessment Authority
   Paryavaran Bhawan

7. Dr. Kiran Bedi
   Special Secretary to
   Lt. Governor, Delhi

8. Shri Kuldip Nayyar,
   Senior Journalist.

9. Ms. Amita Baig
   INTACH
   Bharatiyam Nizamuddin

10. Prof. HP Mathur
    Former Head

Mechanical Engineering Department
Indian Institute of Technology
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11. Shri DK Biswas
Chairman
Central Pollution Control Board

12. Shri Vijai Sharma,
Joint Secretary, MOEF

13. Smt. Kiran Dhingra
Commissioner cum Secretary Transport
Government of NCT of Delhi

14. Shri Imtiaz Khan
Chairman
New Delhi Municipal Corporation

15. Shri VK Duggal
Commissioner MCD

16. Shri D. S. Negi
Secretary Environment
Government of Delhi

17. Shri R. S. Kanade
Joint Adviser
Ministry of Petroleum

18. Shri C. L. Bashal
Joint Secretary
Ministry of Petroleum

19. Shri M. S. Damle
State Level Coordinator
Oil Industry

20. Shri Gautam Thapar
Joint Managing Director,
Ballarpur Industries
Limited & Chairman Confederation of
Indian Industry
Northern Region

21. Shri S. K. Jain
Counseller - Environment
Confederation of
Indian Industry

22. Dr. P. K. Jha
Sulabh International

23. Shri Mallinath Jain
Adviser
Sulabh International Institute of
Technical Research and Training

24. Shri DP Singhal,
Director,
Sulabh International.

25. Dr. A.P. Mitra,
CSIR-NPL,
New Delhi

26. Shri George Verghese
Vice President
Development Alternatives

27. Dr. Hari Dang
International Journal
of Sustainable
Development

28. Shri Gautam Vohra
DRAG
New Delhi

29. Smt. Usha Rai
National Waste
Management Council

30. Prof. JM Dave
Formerly of the JNU

School of Environmental Sciences

31. Shri Rashid Talib
Common Cause

32. Shri Ajai Bagchi
Peoples Commission
on Environment and Development

33. Shri Harsh Jaitley
PRIYA

34. Shri Ranjan Bose
Tata Energy Research Institute

35. Ms. Bharti Chaturvedi
SHRISHTI

36. Ms. Rani Aggarwal
SHRISHTI

37. Shri Anil Aggarwal
Director
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38. Shri C.S. Raghavan,
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39. Shri S.P. Chandak,
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National Productivity Council,

40. Ms. M.S. Archana,
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ASSOCHAM,
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41. Shri Kamal Meattu,
ASSOCHAM, New Delhi

42. Shri Narendra Ahuja,
ASSOCHAM,
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43. Dr. N. Sriram,
FICCI

44. Shri Surendra Kumar,
FICCI

45. Shri Brijmohan Lall,
President,
Association of Indian
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46. Dr. B.P. Pundir,
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47. Dr. S.P. Chakraborty,
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Central Pollution
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48. Dr. B. Sengupta,
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Central Pollution Control Board

49. Dr. S.A. Datta,
Scientist,
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50. Dr. A.B. Akolkar,
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51. Shri SN Burman
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55. Shri SR Sachdeva
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56. Shri HG Gupta
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57. Shri M Prasad
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58. Shri SB Sahai
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59. Shri KR Bhati
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60. Shri JR Kapoor
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61. Shri O Ravi,
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63. Shri LS Kumar
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64. Shri SD Dhiman
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65. Shri P Banerjee
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66. Shri IH Hashmi
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Indian Oil Corporation

67. Shri MS Damle
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68. Shri PK Goel
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69. Shri RS Riyat
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Gas Authority of India Ltd.

70. Shri RP Sharma,
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71. Shri BP Singh
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73. Shri V.R. Ponnalagu,
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19. Dr. G. K. Pandey
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15.07.1997

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