

Chapter – 4 : City Environment Profile



CHAPTER – 4 CITY ENVIRONMENT PROFILE

4.1 INTRODUCTION

Delhi's unprecedented rate and scale of urbanization over the last few decades has created enormous stress on the natural resources of the city. In comparison to the urbanization rate in the last 50 years, the rate of environmental degradation grew at a much higher rate. The alarming fact is that it has not ended. This degradation includes loss of green cover, loss of biodiversity and aesthetics, air pollution, surface and ground water pollution, loss of water bodies, receding water table, high incidence of diseases and mortality. According to World Bank estimates, the pollution itself caused nearly 9900 deaths in the year 1995.

Environment degradation cannot be 'cured'. The cure is never complete, losses are too high and remediation is far too expensive. Given this complex scenario, the approach to manage and control has to be strictly adhered to, which will support the smooth development of the city.

This chapter gives a description of the existing status of environmental conditions in the city of Delhi

4.1.2 Environmental Management

Environmental regulation, although not new to India, has been given focus only in the eighties. Although the laws are comprehensive, enforcement has been weak and this has been one of the major causes of environmental degradation in Delhi.

"The State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country".

There are several regulatory agencies operating at the national and city level for implementation of regulations. Table 4.1 shows the various agencies and their roles.

Table 4.1: Agencies in Environmental Management and their Role

| Agency | Role |
|---|---|
| Delhi Pollution Control Committee (DPCC) | Compliance of water, air, noise parameters at Delhi level |
| Central Pollution Control Board | Compliance at national level, monitoring of water quality of the Yamuna and discharging drains at various locations |
| Delhi Jal Board | Ensuring water supply & managing raw water in Delhi, discharges in Yamuna |
| Municipal Corporation of Delhi (MCD) | Solid Waste Management, drainage and sewerage, street cleaning |
| Environmental Pollution (Prevention and Control) Authority (EPPCA) | Enforcement of environmental regulation in NCR, hazardous substances |
| Department of Industry - Delhi State Industrial Development Corporation (DSIDC) | relocation of polluting and non conforming industries |

| | |
|---|---|
| Delhi Development Authority (DDA) | Development of parks and open spaces |
| New Delhi Municipal Corporation (NDMC) | Solid waste management, drainage and sewerage, street cleaning of the New Delhi area |
| Delhi Police | Auto emissions, noise pollution, public health and hygiene |
| Delhi Cantonment Board (DCB) | Solid waste management, drainage and sewerage, street cleaning of the Delhi Cantonment area |
| Central Water Commission | Monitors the river flow and water quality at three regular stations |
| Central Ground Water Board | Ground water monitoring through 108 stations |
| Ridge Management Board | Management of Delhi Ridge |
| Irrigation and Flood Control Department | Management of water bodies - lakes, tanks and ponds of Delhi |
| NGOs - TERI, CSE, TAPAS, INTACH | creating awareness, research and conducting studies, publications, creating awareness |

Source: Discussions with Stakeholders

All the above mentioned agencies are concerned with activities directly dealing with environmental services, environmental infrastructure investment, environmental planning at the project and sectoral levels. Only two agencies, DPCC for Delhi and EPPCA for NCR are responsible for regulating, monitoring and enforcing environmental concerns.

4.2 NATURAL ENVIRONMENT BASELINE

4.2.1 Physical Features

The city of Delhi lies in the fertile Northern Plains of India. The main features of Delhi are the Aravalli hill ranges and the Yamuna river. The Aravalli hill ranges are covered with forest called the Ridges. The Yamuna is the main source of drinking water for the citizens of Delhi. There is a forest cover of nearly 11.5% of the total area in Delhi. Delhi's mineral sources are primarily sand and stone which are used for construction activities.

4.2.2 Geology

The geology of Delhi features pre-Cambrian to Quaternary formations in age. The pre Cambrian formations are represented by the Alwar Quartzites. These are overlain by the Aeolian deposits, which are further overlain by the old and the new alluvial deposits.

Environmental protection is a fundamental duty of every citizen of this country under Article 51-A(g) of our Constitution which reads as follows:

"It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures."

4.2.3 Climate

Delhi has a semi arid climate, with hot summers, average rainfall and moderate winters. Mean monthly temperatures range from 14.3° C in January to 34.5° C in June. However, the temperatures go upto 40-45° C in summers and 4-5° C in winters. The annual precipitation is about 711 mm falling largely during the monsoon months (July - September). Dust storms are frequent during the summer months leading to an immense build-up of particulate matter in the atmosphere.

4.2.4 Wind Direction

Wind directions vary with season. In the summers, the predominant wind directions are from the west in the morning and either west or northwest in the evening. In the monsoons, the predominant wind directions are from the south-east or west in the morning and from east (in July and August) or north-west (in September) in the evenings. During the post monsoon season, west and calm winds predominate in the mornings while in the evenings, north and northwest winds are most frequent. In the winter mornings, southwest and west winds dominate, while in the evenings, northwest and north winds are frequent

4.2.5 Land Resources

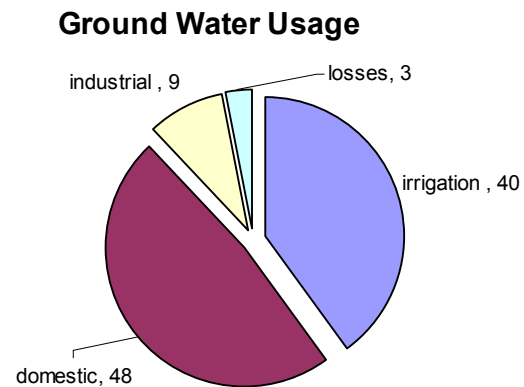
Delhi covers an area around of 1483 sq kms based on the estimations in the Master Plan. It consists of the Yamuna Flood Plain, the old Khadar (earlier flood plain) and the Bangar (upper alluvial plain). Majority of the land is covered by fine-to-coarse loamy soils with different levels of moisture-retention capacity. This land has been converted to urban use.

4.2.6 Water Resources

Delhi's sources of water consist of surface and ground water.

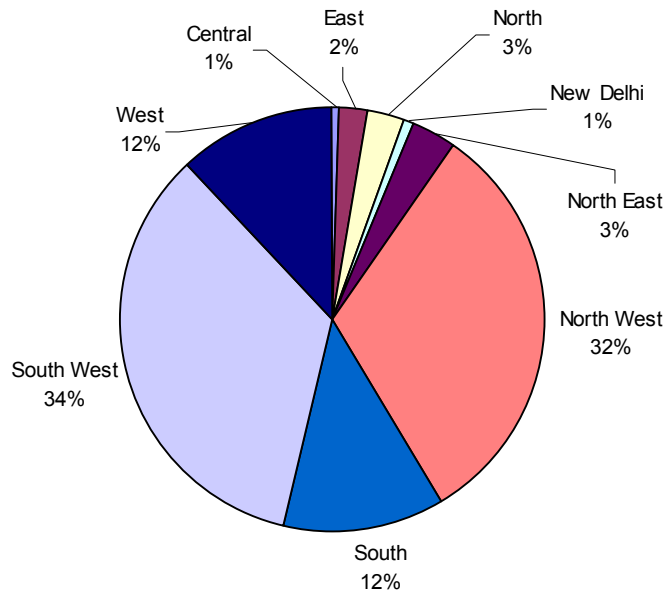
Ground Water

Ground water exploration is carried out at a depth range of 50 to 150 m in the Delhi Quartzite. The Quaternary deposits constitute the major repository of ground water. Total ground water resources in the NCT Delhi are estimated around as 28156.32 ha m (Central Ground Water Board). The annual extraction of ground water is estimated around 47945.18 ha m (Central Ground Water Board).



Source: CGWB

Net Ground Water Availability in Delhi - Unit-wise



Source: Ground Water Resources of National Capital Territory Delhi, CGWB, 2006

Pre Monsoon Water Level

The Pre Monsoon Water Level is measured in the month of May. The levels at various locations done on the year 2003 by CGWB are shown in Table 4.2 & Table 4.3.

Table 4.2: Pre Monsoon Levels of Ground Water in Delhi

| Location | Level (m below ground level, bgl) |
|---|-----------------------------------|
| Asola Bhatti, Tuglakabad, Ladosarai, Satbari, Pushpvihar, Balbirnagar | 40-60 |
| Ghottorni, JNU | 40-60 |
| NCERT, Vasant Kunj, Ayanagar, R K Puram, Shekhawati Line, Palam Road, Basant Gain, Samalkha | 30-40 |
| Central Parts, North of Najafgarh Jheel, South Eastern Part of West Districts | 10-20 |
| Along Yamuna, Parts of North, Northwest Parts | 5 |

Source: CGWB

Table 4.3: Post Monsoon Levels of Ground Water

| Location | Level (m below ground level, bgl) |
|---|-----------------------------------|
| Asola Bhatti, Tuglakabad, Ladosarai, Satbari, Pushpvihar, Balbirnagar | 20-40 |
| Ghottorni, JNU, Palam Board, Kabul Line, R. K. Puram, Shanti Path, Chanakyapuri, IIT Gate, Lado Sarai | 20-40 |
| NCERT, Vasant Kunj, Ayanagar, R K Puram, Shekhawati Line, Palam Road, Basant Gain, Samalkha | 20-40 |
| North, Western & Southern Parts of Northwest, Northern Part of West District | 5-10 |
| Central Parts, South Eastern Part of West Districts, | 10-20 |

| Location | Level |
|--|-------|
| Samalakhya, Dwaraka, Naraina belt, Mahavir Banasthali, Talkatora, Rail Bhawan, Cannought Place, Kidwai Nagar | |
| Along Yamuna, Parts of North, Haroli-Sanoth-Kherakala-Libaspur-Banda bahadur Marg belt | < 2 |
| Northwest Parts, North, North East, Najafgarh Jheel, South Western Parts | < 5 |

Source: CGWB

Around 44% of the ground water is recharged by the rainfall during monsoons, 31% from other sources during non monsoon, 19% from other sources in monsoon and 6% from rainfall during non monsoon.

Surface Water

Surface water contributes to over 86% of Delhi's total drinking water. Yamuna provides the major share of this water. Other sources of drinking water supply to Delhi include the Himalayan rivers through different interstate arrangements and sub-surface sources like Ranney wells and tube wells.

Table 4.4: Quantity of Surface Water

| Source | Total Quantity (MGD) | Total Quantity (MLD) |
|--------------------------------|----------------------|----------------------|
| Yamuna | 210 | 950 |
| Bhakra Storage | 200 | 905 |
| Ganga | 100 | 450 |
| Surface Water Sub Total | 510 | 2305 |
| Ranney Wells/ Tubewells | 81 | 365 |
| Total Raw Water | 591 | 2670 |

Source: Delhi Urban Environment & Infrastructure Improvement Project, Status Report for Delhi-21

It is reported that there are 611 water bodies including lakes, ponds and reservoirs in Delhi as reported by the Deptt of Irrigation & Flood Control and Directorate Panchayat of Delhi. Most of them have depleted. More than half of these bodies have vanished and another half can not be revived based on data of the Irrigation Department. However, rejuvenation is being taken up in Sanjay Lake, Hauz Khas, Purna Qila, Tihar Lake, Khooni Jheel and a couple of other lakes.

Forest Resources

As per the State of Forest Report, 2003 of Forest Survey of India, Dehradun, Delhi has 170.17 sq kms as forest and tree cover against the total geographical area of 1483 sq kms.

Table 4.5: District Wise Forest Cover of Delhi

| District | Geographic Area | Forest Cover | % of Geographic Area |
|------------|-----------------|--------------|----------------------|
| Central | 24.68 | 05.20 | 21.07 |
| East | 63.76 | 2.94 | 04.61 |
| North | 34.90 | 14.54 | 41.66 |
| New Delhi | 59.16 | 04.70 | 07.94 |
| North East | 60.29 | 02.70 | 04.48 |
| North West | 440.31 | 15.47 | 03.51 |

(sq. km)

| | | | |
|--------------|----------------|---------------|--------------|
| South | 249.85 | 40.61 | 09.66 |
| South West | 420.54 | 78.95 | 31.60 |
| West | 129.52 | 05.06 | 03.91 |
| Total | 1483.00 | 170.17 | 11.46 |

Source: State of Forest Report 2003, Forest Survey of India, Dehradun

There are fourteen city forests developed in the city by the Department of Forests and Wild Life as shown below:

Table 4.6: District Wise City Forests

| S. No. | Name of City Forest | Area (ha) | District |
|--------|-------------------------|-----------|-------------|
| 1. | Nasirpur City Forest | 28.00 | South West |
| 2. | Alipur City Forest | 16.80 | North |
| 3. | Hauzrani City Forest | 28.80 | South |
| 4. | Mitraon City Forest | 40.00 | South-West |
| 5. | Sultanpur City Forest | 48.00 | North-West |
| 6. | Ghummanhera City Forest | 32.00 | South-West |
| 7. | Ghoga | 10.40 | East |
| 8. | Shahapur Garhi | 08.00 | North-East |
| 9. | Mamurpur | 56.00 | North-East |
| 10. | Jindpur | 47.60 | North-East |
| 11. | Mukhmelpur | 53.00 | North-East |
| 12. | Bawana | 32.00 | North- West |
| 13. | Garhi Mandu | 300.00 | East |
| 14. | Anand Vihar | 32.00 | East |

Source: Department of Forests & Wild Life

The Delhi Ridge is an important constituent of the forest cover of Delhi and covers 7784 ha. The Delhi Ridge is an extension of the Aravallis and extends into Delhi from Haryana at Tughlakabad Bhatti Mines - Dera Mandi axis moving north, covering parts of Delhi Cantt, Lutyen's Zone and culminating at Delhi University. This area is also included in the Notified Forest Areas in Delhi.

Table 4.7: Constituents of Delhi Ridge

| S. No. | Name of the Ridge | Area (ha) | Managing Agencies |
|--------|-------------------------|-------------|--|
| 1. | Northern Ridge | 87 | DDA, MCD and Forest Deptt |
| 2. | Central Ridge | 864 | Forest Deptt, DDA, Army, CPWD, NDMC, MCD |
| 3. | South Central Ridge | 626 | DDA |
| 4. | Nanakpura South Central | 7 | DDA |
| 5. | Southern Ridge | 6200 | DDA, Forest Deptt, Sports Authority of India |
| | Total | 7784 | |

Source: Greening Delhi Action Plan, 2006-07, Deptt of Forests & Wild Life

Table 4.8: Protected Forests under Department of Forests and Wildlife

| S. No. | Name of the Protected Forest | Area (acres) |
|--------|------------------------------|--------------|
| 1. | Mitraon | 105 |
| 2. | Sultanpur | 120 |
| 3. | Mukhlampur | 133 |
| 4. | Rajokri | 600 |

Source: Deptt of Forests and Wildlife, Govt of Delhi

There is one man-made wildlife sanctuary in Delhi managed by the Deptt of Forests and Wildlife that is Asola Wildlife Sanctuary. However, the reclamation of Bhatti Mines and the wildlife sanctuary is being done through the Eco Task Force (ETF).

There are 120 species of plants in Delhi, 32 species of mammals, 25 species of reptiles, and 434 species of resident and other birds. There are 1787 species, 585 species of vertebrates and 1202 species of invertebrates, in Delhi.

Parks and Gardens

As per the MPD, 2001, 8422 ha of land has been earmarked for park greens. There are district parks (part of the Delhi Ridge), Neighbourhood Parks, City Forests, Historical Landscapes, Sports complexes, Landmark Greens and Green Belts. There are 14500 big and small parks managed by the local and semi government agencies. Few of the prominent parks of Delhi are: Lodhi Gardens, Garden of Five Senses, Indraprastha Park and Nehru Park.

4.2.7 Natural Hazards

Flood Hazards

Delhi has been prone to flooding from the rivers Yamuna and Sahibi (through Najafgarh drain). The last floods were witnessed in the year 1978 in Yamuna. This river has crossed its danger level 20 times in the last 33 years. The city also experiences floods due to its network of 98 drains whose catchment area extends well beyond the city limits.

Earthquake Hazards

Delhi is in Zone-IV, characterized by a significantly high intensity of seismic activities, where there are periodic occurrences of earthquakes of the magnitude of 5-6 on the Richter scale.

4.3 URBAN ENVIRONMENT BASELINE

4.3.1 Land-use

44% of the geographical area of Delhi is built-up area. This includes the Delhi urban limits, built-up area in rural-use zones and farmhouse. Even though the Delhi ridge and Asola wildlife sanctuary area has been designated as protected area, built up areas are found in certain pockets. 41% of the area is under agriculture.

Table 4.9: Land Use Pattern

| Land Use | Percentage |
|------------------|------------|
| Built up Area | 44 |
| Agriculture | 41 |
| Vegetative Cover | 8 |
| Water Body | 4 |
| Waste Land | 2 |
| Open Land | 1 |
| | 100 |

Source: DEUIP + State of Environment, Report for Delhi, 2001

4.3.2 Industrial Activity

Location and Type

Out of the 1,30,000 industrial units in Delhi, around 25-30,000 are located in the planned industrial areas or comprise permissible household industries. Based on the recommendations of the MPD, it is imperative that a sizeable number of industries be relocated not only for considerations of adherence to the land use pattern, but also because of the pollution caused by them. It has been proposed in the MPD that the classification of the industry in Delhi be of 2 categories; Prohibited and Non-Prohibited. The standards prescribed by the pollution control authorities would have to be met by the industrial units.

The household industry in Delhi consists of agarbatti, aluminium hangers, electrical and electronic gadgets, sewing machines, assembly of hand tools, candles, cane and bamboo products, brushes and brooms, carpentry, cardboard boxes, packaging, dari and carpet weaving, detergent, dairy products, dry cleaning, embroidery, framing of pictures, pencils and pens, hosiery products, leather belts, paper & stationer items, repair of watches, repair of bicycles, stone engravings, sport goods, tailoring, toys, food processing, jewellery, wool knitting, zari & zardozi.

4.4 URBAN ENVIRONMENT QUALITY

4.4.1 Air Quality

Sources of Air Pollution

The transport, domestic and industrial sectors are the major contributors to the rise in ambient air pollution levels, although certain background sources such as desert dust transported from the Thar desert during dust storms also contribute to the pollution loads. Also, the industrial activities in the peripheral areas of Delhi, including Faridabad, Gurgaon, NOIDA and other towns contribute to the air pollution levels of the city. The past trends in the air pollution levels have been erratic, mainly because of the high share of vehicular pollution. The share of vehicular pollution has increased from 64% to 72% in the last decade. The tremendous increase in the number of vehicles in Delhi has contributed significantly in raising the consumption of petroleum products, mainly petroleum and diesel. However, diesel consumption in the city is not confined alone to vehicles, it is also there in diesel generating sets used in the industry, commercial and domestic sectors. The other two major contributors to air pollution are a fuel combustion in the domestic and industrial activities. Thermal power plants are major part of this activity. The coal based, thermal power plants at Rajghat, Indraprastha and Badarpur are the major power generators in the city.



Table 4.10: Contribution of Various Sectors to Air Pollution

| Sectors | Percentage |
|------------|------------|
| Vehicular | 72 |
| Industrial | 20 |
| Domestic | 8 |

Source: Ministry of Environment & Forests, 2001

Levels of Air Pollution

Ambient air quality monitoring is being carried out regularly at nine stations in Delhi by the CPCB. These include five stations in industrial areas (Nizamuddin, Ashok Vihar, Shahzada Bagh, Najafgarh Road and Shahdara) and four stations in residential areas (Janakpuri, Siri Fort, Sarojini Nagar and Town Hall). The critical parameters for monitoring air pollution levels are SO₂, Suspended Particulate Matter (SPM) and NO_x (Oxides of Nitrogen). However, other parameters including RPM, lead, PAH (Polynuclear Aromatic Hydrocarbons) and Ozone are also being monitored. The permissible limits for these parameters have been set by the CPCB and DPCC. The levels, as monitored by the CPCB, are shown in the table given below.

Table 4.11: Air Quality Levels for Residential Areas in Delhi

| S. No. | Name of the Monitoring Stations | In µg/m ³ | | | | | |
|--------|---------------------------------|----------------------|-----------------|--------|-----------------|-----------------|--------|
| | | Year - 1997 | | | Year - 1998 | | |
| | | SO ₂ | NO _x | SPM | SO ₂ | NO _x | SPM |
| 1 | Nizamuddin | 17.70(L) | 37.40(L) | 362(H) | 15.60(L) | 35.10(L) | 342(M) |
| 2 | Ashok Vihar | 14.20(L) | 22.90(L) | 307(M) | 15.30(L) | 21.40(L) | 313(M) |
| 3 | Janakpuri | 15.70(L) | 34.80(L) | 343(M) | 17.10(L) | 32.10(L) | 340(M) |
| 4 | Siri Fort | 12.90(L) | 29.30(L) | 367(H) | 15.70(L) | 28.00(L) | 384(H) |
| 5 | Netaji Nagar, Post Office | 10.20(L) | 32.20(L) | NA | 7.80(L) | 36.50(L) | NA |
| 6 | Town Hall | 17.50(L) | 37.70(L) | NA | 12.20(L) | 44.00(M) | NA |

| S. No. | Name of the Monitoring Stations | Year - 1999 | | | Year - 2000 | | |
|--------|---------------------------------|-----------------|-----------------|--------|-----------------|-----------------|--------|
| | | SO ₂ | NO _x | SPM | SO ₂ | NO _x | SPM |
| 1 | Nizamuddin | 17.10(L) | 31.70(L) | 283(M) | 18.20(L) | 33.60(L) | 279(M) |
| 2 | Ashok Vihar | 11.50(L) | 19.90(L) | 317(M) | 11.60(L) | 27.00(L) | 306(M) |
| 3 | Janakpuri | 17.40(L) | 30.00(L) | 312(M) | 18.60(L) | 32.50(L) | 242(M) |
| 4 | Siri Fort | 19.60(L) | 24.80(L) | 337(M) | 15.90(L) | 24.60(L) | 225(M) |
| 5 | Netaji Nagar, Post Office | 13.70(L) | 45.70(M) | NA | 8.30(L) | 52.60(M) | NA |
| 6 | Town Hall | 17.40(L) | 54.50(M) | NA | 14.30(L) | 64.00(M) | NA |
| S. No. | Name of the Monitoring Stations | Year - 2001 | | | Year - 2002 | | |
| | | SO ₂ | NO _x | SPM | SO ₂ | NO _x | SPM |
| 1 | Nizamuddin | 16.90(L) | 35.70(L) | 261(M) | 13.10(L) | 39.30(L) | 329(M) |
| 2 | Ashok Vihar | 8.20(L) | 19.50(L) | 273(M) | 6.40(L) | 26.00(L) | 425(H) |
| 3 | Janakpuri | 16.40(L) | 37.30(L) | 278(M) | 13.70(L) | 39.50(L) | 442(H) |
| 4 | Siri Fort | 13.80(L) | 22.50(L) | 324(M) | 11.80(L) | 27.30(L) | 378(H) |

| S. No. | Name of the Monitoring Stations | SO ₂ | NO _x | SPM | SO ₂ | NO _x | SPM |
|--------------------|---------------------------------|-----------------|-----------------|--------|-----------------|-----------------|--------|
| 5 | Netaji Nagar, Post Office | 7.60(L) | 52.50(M) | 398(H) | 7.30(L) | 42.60(M) | 421(H) |
| 6 | Town Hall | 13.30(L) | 70.1(M) | NA | 11.50(L) | 53.30(M) | 534(H) |
| Year - 2003 | | | | | | | |
| S. No. | Name of the Monitoring Stations | SO ₂ | NO _x | SPM | | | |
| 1 | Nizamuddin | 12.20(L) | 43.30(M) | 315(M) | | | |
| 2 | Ashok Vihar | 6.10(L) | 32.20(L) | 356(M) | | | |
| 3 | Janakpuri | 11.70(L) | 44.20(M) | 291(M) | | | |
| 4 | Siri Fort | 9.00(L) | 31.80(L) | 281(M) | | | |
| 5 | Netaji Nagar, Post Office | 7.20(L) | 46.40(M) | 352(M) | | | |
| 6 | Town Hall | 11.50(L) | 58.90(M) | 478(H) | | | |

Source: CPCB

Table 4.12: Air Quality Levels for Industrial Areas in Delhi

| S. No. | Name of the Monitoring Stations | Year - 1997 | | |
|--------------------|---------------------------------|-----------------|-----------------|--------|
| | | SO ₂ | NO _x | SPM |
| 1 | Shahzada Bagh | 24.20(L) | 44.80(M) | 282(M) |
| 2 | Shahadra | 16.00(L) | 29.30(L) | 313(M) |
| 3 | E.S.I. Disp., Najafgarh Road | 18.70(L) | 38.00(L) | NA |
| Year - 1999 | | | | |
| S. No. | Name of the Monitoring Stations | SO ₂ | NO _x | SPM |
| 1 | Shahzada Bagh | 20.60(L) | 44.00(M) | 316(M) |
| 2 | Shahadra | 20.20(L) | 25.00(L) | 345(M) |
| 3 | E.S.I. Disp., Najafgarh Road | 19.60(L) | 47.30(M) | NA |
| Year - 2001 | | | | |
| S. No. | Name of the Monitoring Stations | SO ₂ | NO _x | SPM |
| 1 | Shahzada Bagh | 13.60(L) | 35.40(L) | 378(H) |
| 2 | Shahadra | 13.00(L) | 22.50(L) | 291(M) |
| 3 | E.S.I. Disp., Najafgarh Road | NA | NA | NA |
| Year - 2003 | | | | |
| S. No. | Name of the Monitoring Stations | SO ₂ | NO _x | SPM |
| 1 | Shahzada Bagh | 6.90(L) | 39.30(L) | 354(M) |
| 2 | Shahadra | 11.40(L) | 32.60(L) | 343(M) |
| 3 | E.S.I. Disp., Najafgarh Road | 13.40(L) | 45.20(M) | 425(H) |

Source: CPCB

Table 4.13: Permissible Limits

| Limits | In $\mu\text{g}/\text{m}^3$ | |
|--------------|-----------------------------------|---------|
| | SO ₂ & NO ₂ | SPM |
| Low (L) | 0-40 | 0-180 |
| Moderate (M) | 40-80 | 180-360 |
| High (H) | 80-120 | 360-540 |
| Critical © | > 120 | >540 |

Source: CPCB

The above levels include the excessive levels during festival times especially Diwali.

4.4.2 Water Quality

Sources of Water Pollution

Waste water is generated by the domestic, industrial and commercial sectors in Delhi. With the increased human activities, there has been a corresponding rise in the amount of waste water generation in the city.

Levels of Water Pollution

The critical parameters of measuring water pollution are Biochemical Oxygen Demand (BOD) and Dissolved Oxygen (DO). Another critical parameter which has emerged over the last few years is the faecal coliform.

Depletion in DO and increase in BOD levels are prominent features of the stretch of river Yamuna passing through Delhi.

| LOCATION | DESIRED CLASS | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|---------------|-----------------------------|--------------|-----------------------------------|-----------------------------|----------------------|
| Najafgarh drain at Wazirabad before conf. to river Yamuna, Delhi | | NA | NA | NA | NA | NA |
| Western Yamuna canal at Haiderpur water works, Delhi | | NA | C | D Totcoli | D Totcoli | DO Totcoli |
| Yamuna at Wazirabad (Palla), Delhi, CPCB | C | D Totcoli | D Totcoli | D Totcoli | D Totcoli | D Totcoli |
| Yamuna At Ring Road, Delhi, CPCB | C | E DO, BOD, Totcoli | D Totcoli | E BOD, Totcoli, Fammonia | E DO, BOD, Totcoli | D BOD, Totcoli |
| Yamuna At Agra Canal, Delhi, CPCB | C | E DO, BOD, Totcoli | NA | NA | NA | NA |

Source: CPCB

| Designated-Best-Use | Class | Criteria |
|---|-------|---|
| Drinking Water Source without conventional treatment but after disinfection | A | 1 .Total Coliforms Organism MPN/100ml shall be 50 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 6mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 2mg/l or less |
| Outdoor bathing (Organised) | B | 1 .Total Coliforms Organism MPN/100ml shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 5mg/l or more |

| | | |
|---|---------|---|
| | | 4. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less |
| Drinking water source after conventional treatment and disinfection | C | 1 . Total Coliforms Organism MPN/100ml shall be 5000 or less 2. pH between 6 to 9 3. Dissolved Oxygen 4mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less |
| Propagation of Wild life and Fisheries | D | 1 .pH between 6.5 to 8.5 2. Dissolved Oxygen 4mg/l or more 3. Free Ammonia (as N) 4. Biochemical Oxygen Demand 5 days 20oC 2mg/l or less |
| Irrigation, Industrial Cooling, Controlled Waste disposal | E | 1 .pH between 6.0 to 8.5 2. Electrical Conductivity at 25oC micro mhos/cm Max. 2250 3. Sodium absorption Ratio Max. 26 4. Boron Max. 2mg/l |
| | Below-E | Not Meeting A, B, C, D & E Criteria |

Source: CPCB

Ground Water Quality

Groundwater quality in Delhi varies with depth and space. Generally the quality of ground water is alkaline with pH ranging from 7.1 to 9.2, chloride content ranges between 21 and 1380 ppm. South of Delhi average chloride content is 250 ppm while in Najafgarh area it is around 1000 ppm. The ground water study done by the NEERI for MoEF revealed high nitrate and fluoride concentrations. High metallic content, particularly manganese and iron have also been observed in the samples collected. The manganese content was found to be 0.1 mg/L against the permissible limit of 0.5-mg/L and iron concentrations of 4.05 mg/L to 0.337 mg/L have been observed. Ground water in the maximum part of the South district is fresh and potable with electrical conductivity ranging from 320 to 4130 micro-mhos/cm at 25` C. Electrical conductivity values more than the permissible limit are observed at Deragaon, Molarbund and at Gadaipur. High values of nitrate are found at four locations i.e. at Gadaipur, at Rajokri and at Jaunapur. In north Ghitorni and Andheri More, Fluoride is more than permissible limits. Except chromium concentrations at one locality, ground water is devoid of pollution by heavy metals. A comparison of ground water quality from 1983 to 2000 shows quality deterioration in the central part of the Chhattarpur basin and in the areas around Nizamuddin. The electrical conductivity of shallow ground water in the Southwest district varies from 630 to 13200 micro-mhos/cm at 25` C. In the detailed Electrical Conductivity map prepared for this district, ground water quality is fresh with electrical conductivity 1000 to 2000 micro-mhos/cm at 25` C. Thus, with over-development of ground water resources in the district, more and more areas are becoming brackish.

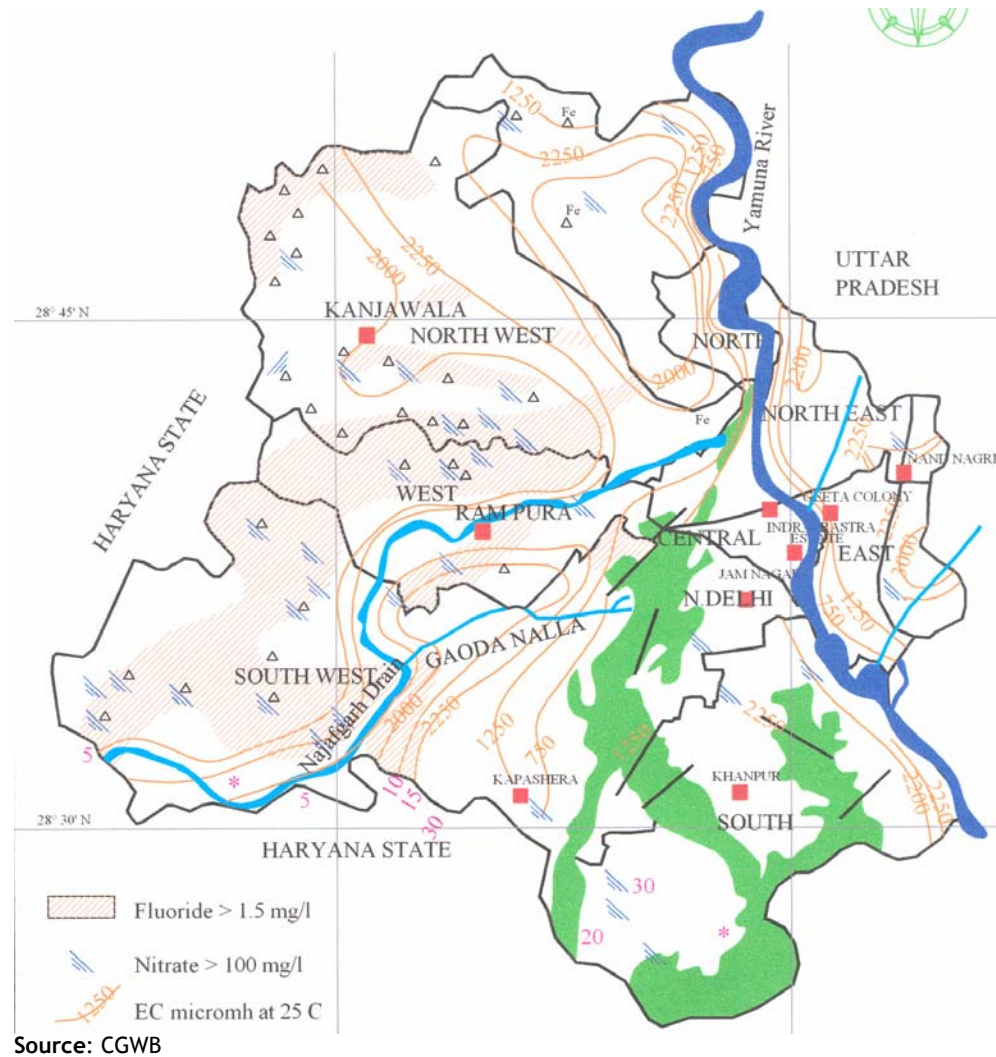


Figure 4.1: Ground Water Quality in Delhi

4.4.3 Noise

Sources of Noise Pollution

Delhi has excessive noise. This is generated by the traffic, industry, celebration of festivals, construction activities, diesel generating sets, etc.

Levels of Noise Pollution

Noise is notified as a pollutant under the Air (Prevention and Control of Pollution) Act. Although stringent permissible noise level regulation has been set by the CPCB, noise levels exceed these limits almost everywhere in the city. Monitoring is also done by CPCB and few private agencies. Noise limits have also been prescribed to the automobile manufacturers, domestic appliances, construction equipments and others.

Table 4.14: Noise Levels at Various Locations in Delhi

| Location | Noise Level (DbA) | |
|---------------|-------------------|-------|
| | Day | Night |
| Maharani Bagh | 73 | 67 |
| Malviya Nagar | 66 | 66 |
| Lodhi Complex | 57 | 48 |
| Palam Colony | 60 | 67 |
| Punjabi Bagh | 70 | 67 |
| Timarpur | 72 | 65 |

Source: NEERI, 1995

Table 4.15: Permissible Limits of Noise Levels

| Category of Area | Limits of Noise Level (DbA) | |
|------------------|-----------------------------|-------|
| | Day | Night |
| Industrial Area | 75 | 70 |
| Commercial Area | 65 | 55 |
| Residential Area | 55 | 45 |
| Silence Zone | 50 | 40 |

Source: CPCB

4.5 ENVIRONMENTAL ISSUES

4.5.1 Depletion of resources

Ground Water

The abstraction of ground water is more than the estimated availability of ground water. CGWB estimates that 47,945 ha m water is extracted for domestic, industrial and irrigation purposes.

Surface Water

There is a high loss in the water bodies of Delhi. Most of them have vanished. A Public Interest Litigation has been filed for the misuse and use for alternate purposes of these water bodies.

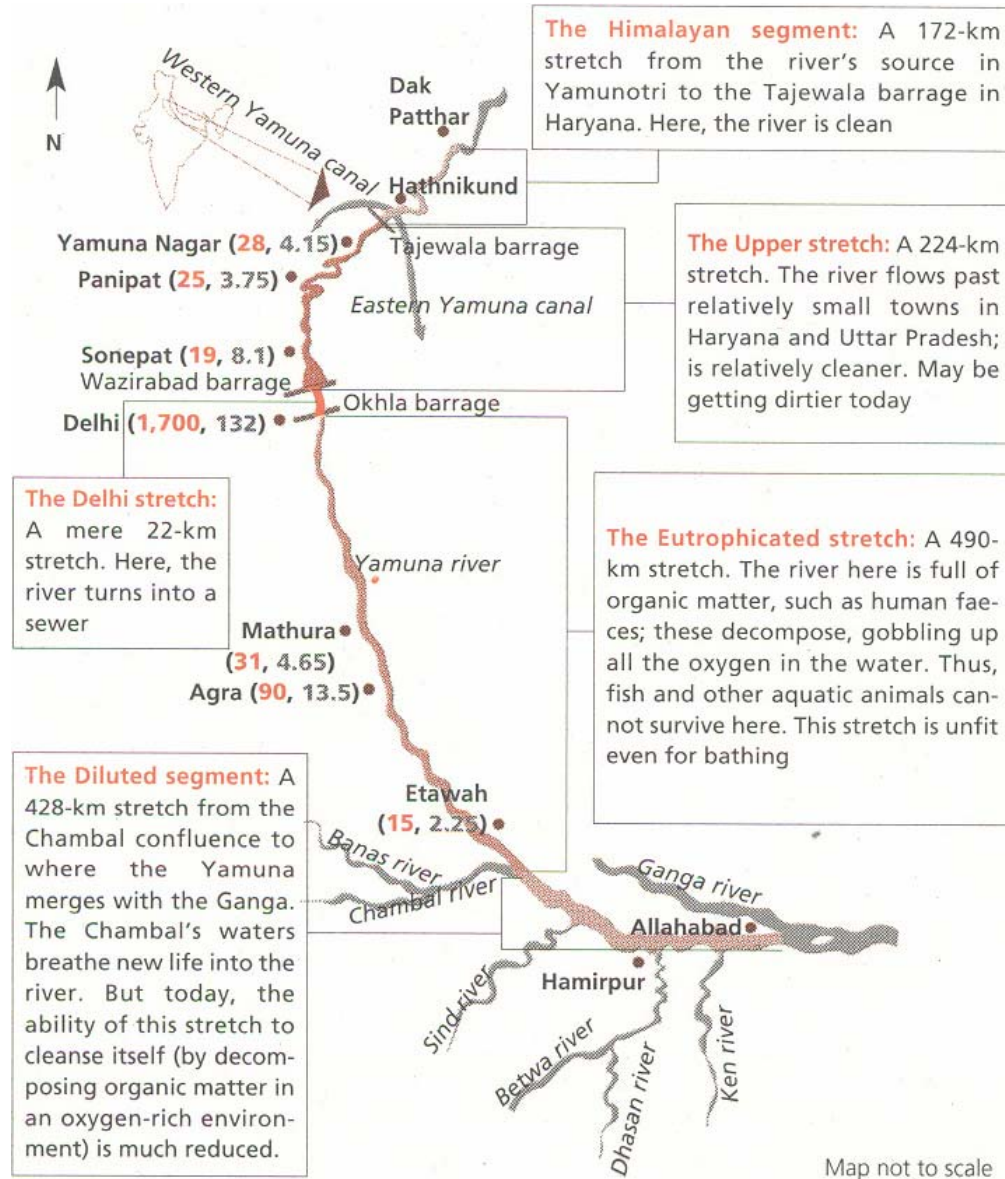
River Yamuna

The city of Delhi was set up on the banks of river Yamuna. The river stretches for 22 kms along the city. The river is a source for drinking water, irrigation and others. However, with the combined effect of a modified flow regime due to water holding structures or barrages, withdrawal of water for various purposes and the cumulative discharge of domestic, industrial & agricultural wastewaters has converted Yamuna into an open sewer particularly in the Delhi stretch. As a result, there is severe impact on the bio diversity of the ecosystem and public health.

Yamuna Action Plans

In 1993, the Union government launched the Yamuna Action Plan (YAP), YAP to tackle the river's pollution. Its first phase (YAP-I) was scheduled for completion during April, 2002, but an extended phase of YAP-I ran from May 2001 to February 2003. Currently it is passing through its second phase (YAP-II, 2004-08).

Till March 2004, YAP's total expenditure stood at Rs. 674 crores. After Rs 55 - 75 Crores spent per kilometer on cleaning it up, the river is more polluted than ever. The condition of depletion and degradation of the river is shown in the map below. (Ref: Down to Earth, April, 2005).



Note: All figures are 1996 levels. **a** = Flow, in million litres per day: the amount of wastewater, domestic and industrial, that falls into the river; **b** = BOD load, in tonnes per day: volume of flow X concentration of BOD, or biochemical oxygen demand — a parameter to measure the amount of oxygen required to break down organic matter floating in it.

Source: Central Pollution Control Board 1996, Report on Water Quality Monitoring of Yamuna, CPCB, New Delhi, mimeo.

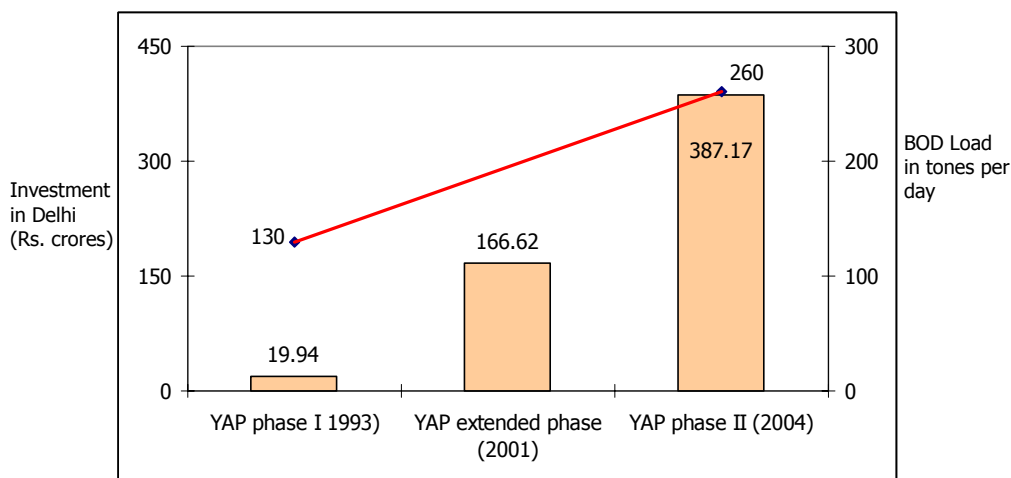
Delhi itself contributes to 70% of the pollution load of the entire river and it got only 2.7% of the treatment capacity created under YAP. Further, the YAP has not taken into account the relation between pollution load generated, state-wise, and sewage treatment created. Under YAP's extended phase, Rs 150 crores was channeled into Delhi, to set up 1146 toilet complexes in 1100 slum clusters and 46 resettlement colonies to tackle the problem of sewage disposal. An analysis by the National River Conservation Directorate shows 60% of these complexes remain unused; they have no water, or are too expensive for people to use, or simply improperly sited or ill maintained.

Yamuna Action Plan I

- Building Sewage treatment plants to treat domestic sewage
- Building common effluent treatment plants to treat industrial waste
- Repairing city sewage systems - drains, pumps and pipes
- Building sewage systems and low-cost toilets to connect the waste of slums and poor settlements to treatment plants
- Building electric crematoria

Despite of all the expenditure and allocations and Supreme Court interventions, the BOD load in the river has been unabated.

Investments v/s BOD



Source: National River Conservation Directorate, 2004 & CPCB

Highlights of YAP II

The focus of the YAP II is to implement schemes which have visible and tangible impact on the immediate improvement of water quality of water, carry out planning of activities for future such as preparation of master plans and feasibility studies and synchronise engineering and non engineering components. The estimated cost for YAP II is Rs 387.17 crores.

The main highlights are:

- Preparation of master plans for wastes of dairy farms, dhobighats, crematoria

- Physical works of STPs at Okhla, Keshopur, Belapur, Wazirabad, Ring Road Trunk
- Public participation and awareness
- Institutional strengthening and capacity building of MCD
- Public relations

Forest Cover

The degradation, misuse and insensitive treatment of the forest cover in Delhi sums up the threat to not only the environment but to the overall sustainability of the city. The Ridge area of Delhi has degraded tremendously due to by roads, buildings, traffic, garbage dumping, lopping of trees and grazing by livestock. Mining and quarrying activities in the past have degraded the South-Central Ridge causing enormous loss to biodiversity. Although as reported by the Deptt of Forests there has been an overall increase in the forest cover in the last 10 years, degradation of the forests in some pockets of the city has increased. An ecologically important location, the Asola Wildlife sanctuary, was established to protect and conserve the city's flora and fauna. However, this sanctuary is again under threat with the proposed scientific land fill at the Bhatti Mines.

The Delhi Ridge was once inhabited by leopards, deers, antelopes, wolves, jackals, hog deer, etc which have vanished over time.

Air Environment

The alarming levels of SPM which are way beyond the permissible levels are a serious area of concern. Even the RPM levels were exceeding the permissible limits. Although the SO_x & NO_x levels are just within the permissible limits, the measures to control and manage these have to be sustained.

Environmental Health

The city suffers from all the health related problems caused by a polluted atmosphere. High occurrence of respiratory infections, heart problems, sickness from water and vector-born diseases and other diseases because of exposure to ambient and indoor pollutants and inappropriate disposal practices of municipal solid waste have become the way of life in the city. Poor living conditions, constant exposure to the pollutants, untreated wastes has resulted in high incidence of diseases like diarrhea, hepatitis, dengue and others.

Green House Gases

Delhi is releasing around 16 million tones of CO₂ emissions, mainly contributed by vehicles, power and residential sectors. This quantity if unabated could be a major threat to stabilizing Climate Change.