

9.0 ENVIRONMENT

Creation of a sustainable physical and social environment for improving quality of life is one of the major objectives of the plan. The almost unprecedented scale and speed of urbanisation in Delhi has resulted in enormous pressures on the physical environment with a severe adverse impact in terms of pollution, and today Delhi is considered to be among the most polluted cities in the world.

The city's environment can essentially be seen in terms of two components of urban management- the environment per se, or the habitat, and services management. The former pertains to the natural features and resources including: the elements of air and noise, water (water bodies-river, lakes, drains and ponds- and ground water) and land with reference to open spaces, green areas and other surface and sub-surface conditions. The latter is related to the built environment and includes the environmental infrastructure - water supply, sewerage, solid waste disposal, and the transportation network.

In the above stated background the following three fold approach and strategy will need to be adopted.

- i) Management of Natural Resources and the related environment infrastructure and services in a manner that would lead to optimisation of use of natural resources, and reduction/abatement of pollution;
- ii) Conservation and Development of the Natural features with a view to enhancing their environmental value; and
- iii) Development and preservation of open spaces, greens and landscape/ recreational areas.

9.1 NATURAL RESOURCES

Natural Resource Conservation includes management of water (surface and ground), air and noise.

9.1.1 WATER (SURFACE and GROUND)

- a) The surface water resources in Delhi are basically comprised of the river Yamuna, drains and the lakes/ponds. The Ground water in Delhi occurs in confined and semi-confined conditions, with depths varying from 1 m to 10 m below the ground level, and, in the alluvial terrain, several sandy aquifers occur at different levels upto a depth of 70 m.

Based on studies and statistics, some of the striking features that are revealed about the surface water resources in Delhi are:

- i. The Yamuna river and the drains are highly polluted;
- ii. The supply of water for human use is too much in absolute terms, but is characterized by iniquitous distribution in per capita terms in different areas, and significant wastage;
- iii. Assuming that 80 percent of the water is converted into waste water, the capacity to treat waste water is grossly deficient;
- iv. The actual quantity of waste water treated is much below the installed capacity on account of missing links in sewer connectivity between the generation points and treatment plants and choking/sitting of sewer lines, etc.;
- v. The planned re-use of treated waste water is minuscule;
- vi. The treated waste water is being largely put back into the drains and gets polluted again before flowing into the river Yamuna, which receives 70 percent of its waste from the 22 kms. of its flow through urban Delhi which, in turn,

constitutes only 2 percent of the total length of the river basin stretching from its point of origin till its merger into the Ganga at Allahabad;

- vii. A large number of the traditional water bodies in the form of ponds, etc. (excluding areas of unintended water logging along railway tracks, highways and canals etc.) have been encroached or have otherwise become defunct.

- b) Groundwater is one of the major sources for water supply in many parts of the country. In Delhi too, ground water contributes a substantial quantity of water supply, but little is known about its quantity or quality. Especially in new development areas, groundwater is largely being used as drinking water resources, mainly because of the insufficiency of the Yamuna water share for Delhi. The Central Ground Water Board (CGWB) assessed the total groundwater potential to be 292 million cubic meters (MCM) in 2003 as compared to 428.07 MCM in 1983, showing an overdraft and reduction of around 130 MCM over the past 20 years. Out of the 6 blocks into which Delhi is divided, significant overdraft/reduction has been observed in the Najafgarh and Mehrauli blocks. Rapid urbanisation leading to reduction in recharge of aquifer, increasing demand in the agriculture, industrial and domestic sectors, stress put on groundwater resources in periods of drought/deficient rainfall, and unplanned withdrawal from the sub soil aquifers, have been mainly responsible for decline in groundwater levels.

The average annual rainfall in Delhi is 611 mm. However, recharge of ground water gets limited due to decreased availability of permeable surfaces owing to urbanisation, and the runoff getting diverted into the sewers or storm

water drains that convey the water into the river Yamuna. The annual rainwater harvesting potential has been assessed at 900 billion litres or 2500 million litres per day. If even 25 percent of this could be harvested it would imply availability of 625 mld, which would be nearly equivalent to the presently estimated deficiency. This is in addition to the potential for roof water harvesting assessed at around 27 mld.

The existing drainage basins shall have to be made self-sustainable in water management by integrating water-sewerage-drainage systems. New projects and upgradation of present infrastructure should be taken up in addition to promotion of water conservation through an integrated and a community driven model. Complimentary short term and long term strategies as mentioned above will need to be initiated.

9.1.2 AIR

Despite various initiatives and measures taken over the past few years, like introduction of CNG and EURO II norms etc., the air quality in the city, in terms of pollution levels, has continued to be a matter of concern, and has been responsible for a number of respiratory diseases, heart ailments, eye irritation, asthma, etc. The three main sources of air pollution in Delhi are vehicular emission (around 70 percent) industrial emissions (around 20 percent) with a major element of this coming from the three thermal power plants, and from other sources such as diesel generator sets and domestic cooking, burning of biomass, etc.

Apart from the issue of pollution on account of industries, the major area of planning and intervention would relate to transportation planning. Apart from the phenomenal growth in the number of vehicles, almost 8-10 times in the last two decades in absolute terms, the most significant aspect, in the context of congestion and pollution, relates to the

growth in personalised transport as compared to the availability of public transport. It has been estimated that buses, which constitute barely 1.2 percent of the total number of vehicles, cater to around 60 percent of the total transport load, while personal vehicles – cars and scooters, though almost 93 percent of the total number of vehicles, cater to around only 30 percent of the travel demand. Such a huge share of private vehicles in Delhi, while serving a relatively limited purpose in terms of the transportation modal split, obviously creates tremendous pressure on road space, parking, and pollution directly and through congestion.

Public transportation planning must, therefore, drive the future policy. So far public transport is largely seen as the transport mode for the not so well off and poorer sections of the community, who cannot afford to own/use personal transport. An important element of policy would now also have to aim to make public transport a mode for personal vehicle owners and users through a mix of incentives and disincentives. Apart from aspects like frequency, inter-modal integration, a possible single ticketing systems, use of parking policy as a means to influence vehicle use, etc., the quality of public transport, particularly buses, would need to be significantly upgraded, inter-alia, keeping the element of clean transport in view.

Another issue which has been raised in the context of vehicular congestion and pollution relates to the policy of mixed land use, which will also have to be carefully considered.

The other elements which would need carefully thought out policy measures would relate to the operation of existing Power plants to significantly reduce the pollution arising from them, and industries, both in terms of pollution control in designated industrial areas, and relocation of non-conforming industries.

9.1.3 NOISE

Noise is emerging as a major pollutant and irritant as well as a constant source of disturbance and health hazards. Against a permissible level of 50-60 dB (A), the sound level in Indian cities often exceeds 80 dB (A). Faulty and leaking silencers, over-use of horns and vehicles plying on roads accentuate noise level, besides the noise from commercial and industrial activities, unabated use of sound amplifiers, generator sets and fire-crackers etc.

By proper land use planning, such as location of public, semi-public and commercial activities along major transport arteries, a buffer can be created for residential zones. Green buffer through thin leaved trees, land formations, mounds, embankments, etc. along major roads could also provide effective barriers to transmission of noise. It is also necessary to improve monitoring and effective implementation of the Noise Pollution (Level) Rules 2000 and, to notify certain areas as 'No Horn Zones'. The design and surface material of roads and pavements should also ensure reduction of noise. The concerned authorities should prepare area wise traffic calming schemes and a Noise Monitoring and Control Plan (NMCP).

Working in night shifts for household industries or non-conforming industries in the residential areas should be prohibited. Areas located within the air funnel should be planned with due consideration of noise generated from the aeroplanes.

Environmentally stressed zones in Delhi should be identified and local area environment management plans should be prepared for such areas, together with regular monitoring.

9.2 NATURAL FEATURES

The major natural features and eco-systems of Delhi are the river Yamuna, together with a network of streams/drains that empty into the river, and the Aravalli Range. Both of

these are in a state of considerable degradation, and it is of vital importance to conserve and rejuvenate these ecosystems. This has regional bearing, therefore, surrounding states also have to contribute towards their conservation and rejuvenation.

9.2.1 RIVER YAMUNA

Once the lifeline which spawned the many civilisations and Cities that grew in the area of the present NCT of Delhi, the River Yamuna today suffers from inadequate flow and quantum of water and an extremely high degree of pollution. The length of the river in the NCT of Delhi is 48 kms from Palla in the North to Okhla in the South, with a total river bed/flood plane area of around 97 sq.kms. which is about 7 percent of the total area of Delhi. A little over 50 percent of the river lies North of Wazirabad and the rest, around 22 kms., to its South, in the Urban area of Delhi. Apart from being the main sources of water supply for Delhi, it is one of the major sources of ground water recharge. However, over the years, rapid urbanisation, encroachments on the river banks, over exploitation of natural resources/water, and serious deficiencies and backlog in sanitation and waste water management services, have resulted in the dwindling of water flow in the river and extremely high levels of pollution in the form of BOD and Coliforms, etc. As against the stipulated 3mg./l, the designated water quality for bathing purposes, the water quality data for 2003-04 suggests that the BOD values range from 1-3 mg/l at Palla, 5.56 mg/l at Nizamuddin and nearly 7 at Okhla. Similarly, at all locations, except Palla, the total coliform levels are many times higher than the minimum tolerable standards for drinking and bathing purposes.

The major source of the pollution in the river, to the extent of about 80%, is the discharge of treated and untreated waste water through the 19 major drains (Annexure-I) which flow into the river. The CPCB data shows that six of these drains viz. the Najafgarh and the Supplementary Drain, the Shahdra Drain, the Drain near Sarita Vihar, the Maharani Bagh

Drain, the Barapulla drain and the Sen Nursing Home Drain contribute almost 90 percent of the flow and 80 percent BOD load levels respectively.

1. Measures for rejuvenation of River Yamuna

- a) The issue of pollution in the river Yamuna has engaged the attention of the Supreme Court for the last several years, and it constituted a Committee under the chairmanship of Secretary, Ministry of Urban Development to draw up an Action plan for the cleaning/rejuvenation of the Yamuna River. A summary of the recommendations of the Committee is given in Annexure II.
- b) Apart from the above measures, steps would also need to be taken to augment ground recharge from the river. The creation of 'regulated flood plane reservoirs', for storing the excess monsoon overflow at suitable locations would augment the water retention capacity of the riverbed. The upstream of Wazirabad Barrage, and some other areas, offer such a potential. To facilitate ground water recharge it may also be ensured that minimum required flow in the river during lean season exists. The reservoirs may be created in low lying areas.
- c) At another level, a strategy for the conservation/development of the Yamuna River Bed area comprised in the Master Plan Zones O & P, and River Front Development needs to be developed and implemented in a systematic manner. This issue is sensitive both in terms of the environment and public perceptions. Any such strategy will need to take into account the cycle of flood occurrences and flood zones, the ground water recharge potentials and requirements, potential for reclamation derived from the foregoing considerations, designation and delineation of appropriate land uses

and aesthetics of the River Front which should be more fully integrated with the city and made more accessible-physically, functionally and visually.

- d) Environmental study of the existing major drains to be conducted before their covering.

9.2.2 ARAVALI RIDGE / REGIONAL PARK

The Aravalli Range in the NCT of Delhi comprises the rocky outcrop stretching from the University in the North to the NCT Border in the South and beyond, and sizeable areas of the same have been designated as the Ridge. This is not a continuum as various intervening stretches have, over a period of time, been brought under urbanisation - for example the Central Ridge area was planned as an integral part of New Delhi, at the time of the development of New Delhi as the Capital in the early part of the twentieth century. The Master Plan of 1962 identified a further stretch of the South Central Ridge near Mehrauli. Master Plan -2001 has designated the total ridge as Regional Park, which is divided in four parts as below:-

1. Northern Ridge	87 ha.
2. Central Ridge	864 ha.
3. South Central Ridge (Mehrauli)	626 ha.
4. Southern Ridge	6200 ha.

The area of the Ridge as per MPD- 2001 is 7777 hectares and has been notified as Reserve Forest under section 4 of the Indian Forest Act, 1927 vide notification dated 24.5.94. The final notification under Section 20 is still awaited as there are discrepancies between the area notified and the physical boundaries of the total area owned by various agencies - DDA, CPWD, NDMC, MCD, Forest Department and the Ministry of Defence. The Forest Department, GNCTD is identifying the boundary of the said Ridge as per the direction of the Supreme Court. Till the exact boundaries are identified by the Forest Deptt., the boundary indicated in the

land use plan in MPD-2001 as Regional Park shall continue and be designated as the Ridge.

9.3 GREEN / RECREATIONAL AREAS

Delhi has a much larger green cover than any of the other metropolitan city in the country, and could well be called a “Green City”. The green/ recreational use constitutes 8,722 ha of land as per MPD 2001, which is around 19% of the total urban land area of 44,777 ha. This includes 1577 ha under the Northern, Central and South Central Ridge (the remaining area of the Ridge is in the rural area). The balance area under recreational/ green use i.e. 7145 ha. is in the form of District Parks, City Parks, Community Parks etc. comprising around 15% of the total urban land area. In addition to this, a large chunk of green area is provided in the form of Neighborhood Parks/ Tot lots in the gross residential use zones, plantations/ greens in large campuses like President’s Estate, JNU, IARI, Delhi University etc., roadside plantations, plantations along drains etc.

In the Urban Extension Plan for 2021 the green cover is to be provided at the rate of 15% of the total land excluding the Ridge/ Regional Park. Out of this some area shall be developed in the form of formal parks for the community and the rest shall be developed as woodlands and incidental greens for balancing the environment. This will be in

addition to the development of greens in specialized areas like Bio-Diversity Parks, plantation along the roads, drains, river bank, etc. Further, Sports Complexes which were included in the green/ recreational use category under the MPD-2001 will be seen under a separate category of sports. One of the main reasons for this modification is that, Delhi is emerging as an important centre for National and International sports events. Sports facilities are being developed by various agencies besides DDA in Delhi, mostly as a part of recreational activity/ facility. As a result there is still a need for planned and structured sports infrastructure which can take care of training needs of sportsmen and also act as integrated sports complexes for national and international events. This will not disturb the green areas which are meant for recreational purposes. Keeping this in mind, Draft MPD-2021 has included sports facilities as a part of social infrastructure, which in turn may help to develop better sports infrastructure for training needs, related logistics and sports medicine etc. It will also facilitate private participation. Integrated sports complexes are envisaged under one roof to accommodate variety of sports and related functions, by way of facilitating wide-range of permissibility, ground coverage and FAR.

Formal parks shall be developed as per the hierarchy as given in the table below:-

Table 9.1: Planning Norms, Standards for Formal Recreational Areas/ Parks at Sub-City Level:

S.No	Category	Planning Norms & Standards	
		Pop./ Unit (Approx.)	Plot Area (Ha)
1.	City Park	10 lakh	100
2.	District Park	5 lakh	25
3.	Community Park	1 lakh	5

Table 9.2: Planning Norms, Standards for Formal Recreational Areas/ Parks at Neighbourhood Level:

S.No	Category	Planning Norms & Standards	
		Pop./ Unit (Approx.)	Plot Area (Ha)
1.	Neighbourhood Park	10000	1.0
2.	Housing Area Park	5000	0.5
3.	Tot lot at Housing Cluster Level	250	0.0125

9.4 MULTIPURPOSE PARKS

Experience shows that formal parks are fouled if used for marriages/ public functions etc. Therefore, a special category in addition

to formal parks is proposed to take care of the same at three levels in the following manner:

Table 9.3: Planning Norms, Standards for Multipurpose Parks:

S.No	Category	Planning Norms & Standards	
		Pop./ Unit (Approx.)	Plot Area (Ha)
1.	City Multipurpose Park	10 lakh	8
2.	District Multipurpose Park	5 lakh	4
3.	Community Multipurpose Park	1 lakh	2

Other Controls:

- i) 50% of Total area under Soft Parking. Remaining 50% to be utilized for functions.
- ii) 3% of the remaining area (excluding Soft Parking) shall be utilized for Electric Sub Station, Toilets, Change rooms for marriages, Security and other related activities etc.
- iii) Multipurpose park can be sub-divided suitably with minimum of 0.5 ha of plot area to accommodate more no. of functions at one time.

9.5 AMUSEMENT PARKS

Suitable area of about 20 ha, one each along National Highway, may be permitted for Amusement parks in the proposed green belt.

9.6 GREEN BELT

The previous Master Plan proposals for retention of Green Belts have not been maintained and a considerable part of the green belt has already been utilised for both planned and unplanned developments.

This Plan provides for agricultural land as Green Belt along the border of NCT of Delhi in synergy with the provision of Regional Plan 2021 of NCR. This belt extends from the NCTD boundary upto a depth of one peripheral revenue village boundary, wherever possible.

Table 9.4: Permission of Use Premises in Sub Use Zones

S.No	Use Zone	Activities Permitted
1.	Green Belt	Forest, Agriculture use, Vegetation belt, Dairy Farms, Wild life sanctuary, Bird sanctuary, Park (Theme park for eg. Biodiversity Park), Smritee Van, Plant Nursery, Orchard, Area for water-harvesting, Floriculture farm, Open Playground, Agro forestry, Amenity structures (List given in note) Any structure in this zone shall be of temporary nature.
2.	Ridge/ Regional Park	As per Govt. Notifications from time to time (Use permissibility same as MPD 2001).
3.	City park	Aqua park/water sports park, Arboretum, Botanical Garden, National Memorial (as approved by Cabinet/ Govt. of India), Amphitheatre, Open Playground, Aquarium, Other activities same as permitted in District Park. 30% of the area shall be developed with plantation of native species.
4.	District Park	Theme park, Open-air food court, Children Park, Orchard, Plant Nursery, Area for water harvesting, Archaeological park, Specialised park, Children Traffic Park, Sports activity, Playground, Amenity structures (List given in Note). Restaurant in a District Park having an area above 40 ha subject to following: <ul style="list-style-type: none"> a. Area of the restaurant plot is not more than 0.8 Ha (2acres) or 1% of the district park whichever is less b. Restaurant plot has no physical segregation from the rest of the district park area. c. The building is to be a single storey structure with max. FAR of 5 and height not more than 4m. without any residential facility and to harmonies with the surroundings. d. In case there is no parking lot in the vicinity parking should be provided at a reasonable distance from the restaurants: the parking should not form a part of the restaurant complex/greens. 30% of the area shall be developed with plantation of native species.
5.	Community Park	Park, Children Park, Open-air food court, Playground etc.
6.	Multipurpose Park	Public meeting ground, Public address podium, Marriages, Soft drink and snack stalls etc.

Notes:

- i) The following amenity structures are permissible in the above use premises except Central Vista and Heritage areas:
Toilet blocks (max. 20 sq.m), Pump room (10 sq.m), Electric room (15 sq.m), Guardroom (10 sq.m), Equipment room (10 sq.m)

ANNEXURE I – LIST OF DRAINS

List of 19 drains out falling into River Yamuna:

1. Najafgarh drain
2. Magazine Road drain
3. Sweeper Colony drain
4. Khyber pass drain
5. Metcalfe drain
6. Kudsia Bagh drain
7. Moat drain
8. Trans Yamuna MCD drain
9. Mori Gate drain
10. Civil Mill Drain
11. Power House drain
12. Sen Nursing Home drain
13. Drain No. 14
14. Barapullah Drain
15. Maharani Bagh drain
16. Kalkaji drain
17. Okhla drain
18. Tughlakabad drain
19. Shahadara drain

**ANNEXURE II: RECOMMENDATIONS OF COMMITTEE UNDER SECRETARY (UD)
MOUD GOVT. OF INDIA, FOR YAMUNA ACTION PLAN (2004)**

- 1. Minimum flow in river Yamuna to be ensured by Riparian states by releasing adequate water.**
- 2. Refurbishment of Trunk Sewerage System**
 DJB has a network of approx. 130 Kms. length of trunk sewerage system to convey the collected sewage to different STPs for treatment. Nearly 91 Km of sewer lines are in highly dilapidated condition and have been silted to the extent of 50% to 70% at different stretches. Therefore, rehabilitation of following three major trunk sewers is proposed to be taken up under the Yamuna Action Plan.
 - a) Rehabilitation of Ring Road trunk sewer under Yamuna Action Plan-II (YAP-II)
 - b) Rehabilitation of Bela Road trunk sewer under YAP-II
 - c) Rehabilitation of West Delhi trunk sewer under YAP-III
- 3. Treatment of the flows in Najafgarh and Shahdara drains.**
 The drains contributing maximum to the pollution load in the river water are Najafgarh and Shahdara drains. Action plan to check flows in Najafgarh Drain and Shahdara drain is recommended. The untreated sewage results in pollution of the water flowing in the drain and affects its quality by increasing BOD level and suspended solid. Majority of the untreated sewage is contributed by unauthorised colonies. It would be possible to treat this sewage only after laying of internal sewerage system or installation of decentralized treatment plants, which are proposed to be attempted by MCD on pilot basis.
- 4. Laying of Sewer Lines in the unsewered areas of Delhi**
 DJB has pointed that it has laid internal sewerage system in 482 unauthorized / regularised colonies and in 98 urban villages of Delhi. The sewerage systems in 496 unauthorized / regularised colonies and 103 urban villages are likely to be laid by December, 2005. In 516 unauthorized / regularised colonies and 105 urban villages, sewerage systems are expected to be completed by May 2006.
- 5. Slum Cluster and Yamuna River Bed**
 One of the contributory factors to the flow of untreated sewage into river Yamuna is the slum clusters that have come up unauthorisedly on both eastern and western bank of river Yamuna. Local bodies have already removed several JJ Clusters existing on the Western Bank. Slum clusters needs to be cleared from river bed.
- 6. Treatment of Industrial Effluent**
 Delhi Small Industries Development Corporation has constructed 10 Common Effluent Treatment Plants (CETPs) having an installed capacity of 133 mld for treating the industrial effluent before they are discharged into the drains/river. Better capacity utilisation and laying of conveyance system wherever required is needed.
- 7. Utilisation of Treated Effluent**
 Currently 109.5 MGD of treated effluent is being supplied by DJB to CPWD, DDA, Pragati Power Plant and Minor Irrigation Department. Additional 241 MGD is available for other user agencies. The issue of utilising the additional treated water is being deliberated by CPWD.
- 8. Removal of Coliform at STPs**
 The task force has set up a Committee to determine the permissible level of coliform in the treated waste water and the process required for achieving the same keeping in view its techno-economic feasibility.