CHAPTER - 8

PROBLEMS AND PLANNING

Delhi, the focus of the socio-economic and political life of India, a symbol of ancient values and aspiration and capital of the largest democracy, is assuming increasing eminence among the great cities of the world.

Growing at an unprecedented pace, the city needs to be able to integrate its elegant past as well as the modern developments into an organic whole, which demands a purposeful transformation of the socio-economic, natural and built environment. The city will be a prime mover and nerve centre of ideas and actions, the seat of national governance and a centre of business, culture, education and sports.

Apart from critical issues such as land, physical infrastructure, transport, ecology and environment, housing, and other institutional facilities, the cornerstone for making Delhi a world class city is the planning process itself and related aspects of governance and management. This needs a coordinated and integrated approach amongst several agencies involved with urban services and development along with a participatory planning process at local levels.

PROBLEMS:

(1) Urban expansion and population growth:

Delhi as the National Capital has a distinct and unique character.
It is a growing and expanding magnet of attraction for people from all across the country and also a hub for the region surrounding it. Planning for a metropolis like Delhi, therefore, cannot be limited within its boundaries.

The physical potential for further urbanization within the NCT Delhi is reducing although there is a virtual urban continuum between Delhi and surrounding areas, which lie in the states of Uttar Pradesh and Haryana. With the imperatives of growth and development, the problems of Delhi have become complex, which have to be viewed both as a challenge in terms of the pressures of regular and floating in-migration, as well as on opportunity in terms of planning and development in a regional context.

As per 2001 census, NCT Delhi had a total population of 138 lakh. NCT Delhi is highly urbanized with 93.18% of its population living in urban areas as against the national average of 27.81%. During 1991-2001, the urban population of Delhi increased at 3.87% annual growth rate. With the continuation of the present population trend, the total population of NCTD by the year 2021 would be 230 lac and the net increase of 48% in the total. The population density, which was 6352 persons per sq. km. in 1991 has stretched to 9340 persons per sq. km. in 2001.

(2) Drinking Water:

Delhi has an average water availability of 225 lpcd, the distribution of the same is not uniform. Some areas get 24 hrs. water supply,
whereas some get hardly 1-2 hr. water in a day. In line with the norms laid down in CPHEEO Manual 1999, in respect of mega cities, after taking into account 15% losses, the minimum water supply @ 172 lpcd will have to be ensured for domestic use for the projected population. The water requirement has to be made from river water allocation and ranney wells in Yamuna flood plains. The future supply crucially depends on the progress of the proposed dams in U.P., Uttranchal and H.P.; Satluj Yamuna link canal and Sharda Yamuna link canal. Further it will also depend upon the conveyance system, which should be in place before the release of allocated water to Delhi. However to some extent localized ground water extraction and its supply after treatment to prescribed level of quality may also be required to meet up the demands.

The surface water resources in Delhi are basically comprised of the river Yamuna, drains and the lakes. 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 up to a depth of 70 m.

Ground water 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. Especially in new development areas, ground water is largely being used as drinking water resources. The Central Ground Water Board assessed the total ground water potential to be 292 million cubic meters in 2003 as compared to 428.07 million cubic meters in 1983, showing an overdraft and reduction of around 130 million cubic meters over the past 20 years. Out of the 6 blocks
into which Delhi is divided, significant over drawl/reduction has been observed in the Najafgarh and Mehrauli blocks. Rapid urbanization leading to reduction in recharge of aquifers, increasing demand in the agriculture, industrial and domestic sectors, stress put on ground water resources in periods of drought/deficient rainfall, and unplanned withdrawal from the sub soil aquifers, have been mainly responsible for decline in ground water 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 urbanization, and the runoff getting diverted into the sewers or storm water drains that convey the water into River Yamuna. The annual rainwater harvesting potential has been assessed at 900 billion litres or 2500 million litres per day. If even 25% of this could be harvested it would imply availability of 625 mld, which would be nearly equivalent to the presently estimated deficiency.

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% of the water is converted into waste water, the capacity to treat waste water is grossly deficient; various options for the re-use of treated waste water must be explored and implemented.
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/silting of sewer lines, etc. The missing links in sewer connectivity must be covered for its continuity from the generation point to the treatment plant.

v. The planned reuse 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% of its waste from the 22 kms. Of its flow through urban Delhi which, in turn, constitutes only 2% 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.

viii. The standards of STP/CEPT developed by Central Pollution Control Board/Delhi Pollution Control Committee should be adhered to.

(3) DRAINAGE AND SEWERAGE:

Drainage has two aspects: flood protection and storm water discharge, which are interrelated. The storm water and flood protection in Delhi are not local but have regional bearing including areas of Haryana
and Rajasthan. The main drainage system of Delhi is such that all water collected through main drains, link drains and small rivulets is discharged into Yamuna. On the basis of topographical characteristics and existing drainage network. NCT of Delhi has been divided into five drainage basins namely Najafgarh, Alipur, Shahdara, Khushak Nallah and Mehrauli. The blockage of Natural channel is a matter of concern. It is mainly because of the encroachment by slum dwellers along the drains which causes choking of drains and flooding in the upstream areas due to reduced carrying capacity. The other major reason is dumping of solid waste in the drains causing blockage. The blockage of natural depression and drainage channels must be prohibited.

Sewerage is the core element of physical infrastructure that determines the environmental status of any city and requires minute planning, development and management. Development of appropriate sewerage system with efficient sewage treatment is vital to facilitate balanced and harmonized development. Augmentation of existing inadequate systems/treatment facilities as well as adoption of new technologies of waste treatment demands special efforts. Further, it is pertinent to point out that the existing capacity of sewerage system in Delhi is grossly inadequate, as only about 55% of the population is covered under organized sewerage system and about 15% under on-site sanitation systems. Rest of the population does not have proper access to sanitation facilities. The sewerage treatment facility is also inadequate. The increasing pollution in the river Yamuna is a major
indicator of lack of sewage treatment facilities.

(4) SOLID WASTE:

The problem of solid waste management in Delhi is assuming serious proportions due to increasing population, urbanization, changing life styles and consumption patterns. The garbage from unauthorized developments, slums, JJ settlements, etc. is not collected which further adds to the environmental degradation. The projected average garbage generation up to the year 2021 is @ 0.68 kg. per capita per day and total quantum of solid waste is 15750 tons/day.

(5) ELECTRICITY:

The population of the city of Delhi in 2021 will be 23 million and that of CNCR will be 64 million. As such future plans for meeting the energy needs are being considered keeping the above demographic structure.

The present total availability of power is 3170 MW. The existing power generation stations within Delhi have installed capacity of 1699 MW and maximum generation capacity of 1435 MW. Delhi’s own generation installed capacity is 994.5 MW. Nearly 28% of Delhi’s power needs are met by its own plants and BTPS23 and remaining 72% by import from NTPC and other sources. Central Electricity Authority has estimated Power requirement of about 11,000 MW in the 17th Annual Survey (March 2007) for the year 2021. However, the actual demand may be higher in view of the realistic growth related to Commonwealth Games 2010. To meet this demand; there is a need to augment the Power
Generation, Transmission, Sub-Transmission & Distribution Capacity within the State. Since the projected load demand is expected to reach 11,000 MW by 2021, the existing generation capacity in Delhi including the proposed additional 2000 MW capacity at Pragati Ph.II, Pragati Ph.III and Replacement units at I.P. will not be sufficient and the gap between the core generation and the load demand will further increase. Also, since coal based generation in Delhi is not permitted due to environmental and ash disposal constraints only gas based Power Plants are envisaged to be installed in Delhi and all thermal power plants located in the NCT of Delhi will be gradually converted to gas based plants.

(6) HEALTH:

The capital city is strategically located and has many specialized health facilities, which serve the city population as well as that of the region, and in many respects the country as a whole. As per available statistics, there are 23 types of health units in Delhi. The total numbers of health units are 1914 and the number of beds is 30,667. The existing bed density per thousand population in Delhi works out to only 2.2. The World Health Organization has recommended a norm of 5 beds per thousand population. It is estimated that the total number of beds required in the year 2021 will be about 1,15,000.

(7) TRANSPORTATION:

The period between 1981 and 2001 has seen a phenomenal increase in the growth of vehicles and traffic in Delhi. There has been rise in per
capital trip rate from 0.72 in 1981 to 0.87 in 2001. Keeping in view the population growth, this translates into an increase from 45 lakh trips to around 118 lakh trips. The population of motor vehicles has increased from 5.13 lakh in 1981 to 32.38 lakh in 2001 and the number of buses has increased from 8,600 to 41,483 during this period.

Besides the above, Delhi has developed as a borderless city and an urban continuum comprising of a number of rapidly growing towns in Haryana and U.P.. This has added to the flow and movement of traffic within Delhi.

Despite measures by way of increasing the length of the road network and road surface space through widening, construction of a number of flyovers/ grade separators and, launching of the Metro, the traffic congestion has continued to increase unabated. This has its inevitable consequences in terms of accidents, pollution, commuting time, and wasteful energy/ fuel consumption.

Based on the rate of increase in the number of trips between 1981 and 2001, it is estimated that the total trips would rise to 280 lakh by the year 2021, including 257 lakh motorized trips and 23 lakh non-motorized trips. In this context, it needs to be noted that roads already occupy 21 percent of the total area of the city, which clearly limits the potential for increase in road length.

(8) AIR POLLUTION:

Delhi, in terms of air pollution, was ranked fourth among the 41 most polluted cities in the world, in the 90’s. The annual average levels
of suspended particulate matter increased to 450 g/m³ during 2002, which is nearly three times the National Ambient Air Quality Standard of 140 g/m³ for residential areas as notified by the Ministry of Environment, Govt. of India. During this period, the annual average levels of CO also increased to 5587 g/m³ as against the National Ambient Air Quality Standard of 2000 g/m³ for the residential areas. Vehicles, thermal power plants and large as well as small-scale industrial units in Delhi were the major sources of these pollutants.

**PLANNING :**

(a) **Proposed planning and recommendation for urban area and population growth :**

As already mentioned Delhi has a limited area of 1843 sq. kms., out of which about half of the area is already urbanized. NCR Plan - 2021 has proposed the availability of Urbanisable land in NCT Delhi for 2021, which is given in Table - 8.1.

**TABLE - 8.1**

**AVAILABILITY OF URBANISABLE LAND IN NCT DELHI FOR 2021**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Land Use</th>
<th>Area (Ha.)</th>
<th>Percentage to total Area (Ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Total Geographical Area-NCT Delhi</td>
<td>148300.0</td>
<td>100.00</td>
</tr>
<tr>
<td>2.</td>
<td>Built-up Area (As per IRS IC LISS III Satellite data 1999)</td>
<td>70162.1</td>
<td>47.31</td>
</tr>
<tr>
<td>3.</td>
<td>Natural Features (Forest, Wild Life Sanctuary, Ridge, River Yamuna and other Water Bodies / Drains)</td>
<td>19509.1</td>
<td>13.16</td>
</tr>
<tr>
<td></td>
<td><strong>Sub Total (Built-Up + Natural Features)</strong></td>
<td>89671.1</td>
<td><strong>60.47</strong></td>
</tr>
<tr>
<td>4.</td>
<td>Balanced land available in NCT Delhi</td>
<td>58628.9</td>
<td>39.53</td>
</tr>
</tbody>
</table>
Land to be kept reserved for:

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Area (ha)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Disposal of solid waste generated up to 2051 (Sanitary landfill &amp; statutory green belts)</td>
<td>10000.0</td>
<td>6.74</td>
</tr>
<tr>
<td>ii)</td>
<td>Metro Services / Utilities e.g. power plant, grid station water and sewerage treatment plant, etc.</td>
<td>10000.0</td>
<td>6.74</td>
</tr>
<tr>
<td>iii)</td>
<td>Agriculture Zone in NCT Delhi including dairy farming, horticulture, green belts etc.</td>
<td>11000.0</td>
<td>7.42</td>
</tr>
<tr>
<td></td>
<td><strong>Sub Total (i + ii + iii)</strong></td>
<td><strong>31000.0</strong></td>
<td><strong>20.90</strong></td>
</tr>
</tbody>
</table>

5. Actual Land available for urbanization | 27628.0 | 18.63 |
6. Total Available Area 2021 may be used for further development or expansion | 97790.90 | 65.94 |
7. Population which can be accommodated in 97790.90 ha @ 225 PPH = 220 lac. |   |    |

Source: NCR Plan 2021.

Table 8.1 shows that the total urbanisable area for 2021 (including built-up area 1999) in NCT Delhi is 97790.90 ha. This is 65.94% of the total. Taking into account, the population estimates for NCTD at the five year intervals are given in the following table:

**TABLE - 8.2**

Five yearly estimates of Projected Population

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (in lac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>138.0</td>
</tr>
<tr>
<td>2006</td>
<td>162.0</td>
</tr>
<tr>
<td>2011</td>
<td>182.0</td>
</tr>
<tr>
<td>2016</td>
<td>199.0</td>
</tr>
<tr>
<td>2021</td>
<td>230.0</td>
</tr>
</tbody>
</table>

Source: Census of India and projections by D.D.A. Sub-Group (MPD-2021)

As shown in table 8.2 the estimated population will be
around 230 lac by 2021, in which 24.0 lac people would be in migrants and 24.0 lac addition by natural growth, so, to accommodate this projected population a three pronged strategy is recommended:

(a) To encourage the population to deflect in the NCR towns.

(b) To increase the population holding capacity of the area within existing urban limits through redevelopment; and

(c) Extension of the present urban limits to the extent necessary.

The area within the urbanisable limits of Delhi Urban Area-2001 consists of the planning zones A to H and Dwarka, Rohini, Narela Sub-city projects (Map 8.1). Population holding capacity of A to H zones is to be enhanced through a redevelopment strategy and modified development norms. This will be related with:

(a) Residential development types and their potential for higher absorption.

(b) Redensification of housing areas developed at lower densities and along selected sections of the Metro corridor.

(c) Redevelopment areas should be identified by the concerned agencies and Special Redevelopment Schemes should be prepared with regard there to for implementation within a stipulated time framework.

(d) Augmentation and rationalization of infrastructure-physical and social.
Increase in transportation network capacity.

The holding capacity of Dwarka, Rohini Phase III, IV & V and Narela is proposed to be enhanced through:

(a) Early and full utilization of the planned areas and,
(b) Implementation of the schemes under planning stages.

Existing residential areas may provide a potential to accommodate about 153 lac population ultimately i.e. 114 lac in Zones A to H and 39 lac in Dwarka, Rohini Phase III, IV & V and Narela (Table-8.3).

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(d) Augmentation and rationalization of infrastructure-physical and social.

(e) Increase in transportation network capacity.

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**TABLE - 8.3**
Zone wise Estimated Holding Capacity of Existing Urban Area

<table>
<thead>
<tr>
<th>Zone</th>
<th>Holding Capacity MPD 2001</th>
<th>Existing population 2001</th>
<th>Holding capacity 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>420</td>
<td>570</td>
<td>570</td>
</tr>
<tr>
<td>B</td>
<td>630</td>
<td>624</td>
<td>630</td>
</tr>
<tr>
<td>C</td>
<td>751</td>
<td>679</td>
<td>788</td>
</tr>
<tr>
<td>D</td>
<td>755</td>
<td>587</td>
<td>813</td>
</tr>
<tr>
<td>E</td>
<td>1789</td>
<td>2798</td>
<td>2800</td>
</tr>
<tr>
<td>F</td>
<td>1278</td>
<td>1717</td>
<td>1975</td>
</tr>
<tr>
<td>G</td>
<td>1490</td>
<td>1629</td>
<td>1955</td>
</tr>
<tr>
<td>H</td>
<td>1865</td>
<td>1226</td>
<td>1865</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td><strong>8978</strong></td>
<td><strong>9830</strong></td>
<td><strong>11400</strong></td>
</tr>
</tbody>
</table>

Dwarka | 597 | 1300 |
Rohini III | 96 | 160 |
Rohini IV & V | 198 | 820 |
Narela | 179 | 1620 |
| **Sub Total** | **3222** | **1070** | **3900** |

**GRAND TOTAL** | **122 Lac.** | **109 Lac** | **152 Lac.**

Note: Population figures are only broad planning guidelines.
The remaining population for the year 2021 will have to be accommodated in the planned new urban extensions.
Out of the remaining 77 lac (239–153 lac) population, 29 lac already exists in villages, census towns, unauthorized colonies and JJ clusters in the present rural areas. Therefore about 48 lac additional population is to be accommodated in the future urban extensions.

Due to land constraint in the NCTD, the areas earmerked as rural/agricultural in the previous Master Plans have always been under pressure for utilization for various urban activities and have virtually lost their original character. In future, urbanization has to be in the areas that have developed pressure/potential like the areas along the major transport corridors and fringes of already urbanized areas. It is envisaged that major rural areas would be absorbed as urban extension from time to time with due regard to balanced city development.

At the first instancs, to accommodate the projected additional population @ 250-300 pph average city level density, the requirement for urban extension would be 20,000-22,000 ha. Of land within development time frame of 15-16 years. Map 8.1 shows, that, the immediate urban extension could be in the zones of J to L, N & P (I & II). The land required for urban extension, will have to be assembled for planned development.

The scope for development of urban extensions on a large scale is restricted due to limitations of buildable/ urbanizable land in Delhi. Therefore, the option of redevelopment through a
process of reorganization and utilization of the land already developed will be a major element of the overall city development plan. A redevelopment strategy for accommodating more population in a planned manner is to be taken up on priority in all use zones for efficient and optimum utilization of the existing urban land, both in planned and unplanned areas. The following vertical and horizontal development planning may be a major part to encourage the growth impulse for regeneration in the target redevelopment areas.

1. Vertical Development –
   a) Vertical development, reorganization and utilization of the already developed built-up areas should be a major element for accommodating more population in a planned manner.
   b) Much more elevated road and railway with flyovers network should be developed as an essential infrastructure.
   c) Well organized elevated multi storied parking places should be developed.
   d) Over lap green areas should be developed.

2. Horizontal Development –
   a) The horizontal and mixed planned development, in which, less built-up area with multistoried should be developed in those areas which are available for further development.
   b) The maximum open area and plantation with parks should be developed along with road and railway tracks.
For the optimum utilization of land, it is necessary to prepare an Urban Land Policy, which should be located on those land areas which have low productivity in agriculture and waste lands. The urban land laws and policies are to be changed accordingly.

A time bound action plan should be prepared together with suitable incentives and disincentives.

Attempts should be made to restrict the population of Delhi lower than 200 lac by 2021 as shown in figure 8.1 to reduce the demand-supply gap of civic amenities. This should be made effective implementation by the Govt. of NCT Delhi/ Agencies concerned Central Govt. Department and other NCR participating states by making Population Control Policy.

![Proposed Planning to accommodate the Population](image)

*Figure 8.1*

In-migration should also be strictly restricted in NCT Delhi. The resources and the opportunities of employment should be equally developed in those neighbour states from where the people in-migrate to NCT.
(b) **Proposed planning and recommendation for Drinking Water:**

Delhi depends largely on River Yamuna and partially on River Ganga for its share of raw water. For sustainable development of Delhi, it is essential to ensure adequate supply of water in terms of reliability, quality and quantity.

The Delhi Jal Board has an installed capacity of 805 MGD against which on an average 800 to 820 MGD potable water is expected to be produced by optimization Water Treatment Plants. The present water demand for potable water in Delhi has been assessed as 990 MGD @ 60 gpcd for all uses. The Delhi Jal Board anticipates that by the year 2021 about 1380 MGD potable water @ 60 gpcd for a population of 230 lac shall be required. The present sources of raw water available to Delhi are as under:

<table>
<thead>
<tr>
<th>1. Yamuna Water</th>
<th>750 cusec (includes 130 cusec transit losses from Tajewala to Haiderpur)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Ganga Water</td>
<td>470 cusec at Bhagirathi and Sonia Vihar water works.</td>
</tr>
<tr>
<td>3. BBMB water</td>
<td>225 cusec (Ex. Nangal 371 cusec)</td>
</tr>
<tr>
<td>4. BBMB water</td>
<td>40 cusec (Ex. Nangal 60 cusec)</td>
</tr>
<tr>
<td>5. Ground Water</td>
<td>185 cusec</td>
</tr>
</tbody>
</table>

Based on the availability of above raw water, those water plants are functioning. Table - 8.4 shows the water supply scenario in 2021:
As seen from above table, Delhi Jal Board will not be in a position to increase its treatment capacity of 941 MGD by the year 2011 from existing resources and raw water sources. The projected demand in 2021 will be of 1380 MGD @ 60 gpcd for 230 lac population, thus, there will be a short fall of about 440 MGD. For sustainable development of Delhi, it is essential to ensure adequate supply of water in terms of reliability, quality and quantity. To improve the water supply in accordance with the projected requirement up to the year 2021 the non-conventional sources proposed for the planning herewith by the table 8.5.
Table 8.5 shows that 340 MGD water can be available from the Non-Conventional Sources to fulfill the remaining shortfall of 440 MGD. For further planning some steps could be important, which are herewith –

A policy should be prepared to reclamation of wastewater by using treatment technology i.e. ultra filtration, reverse osmosis and UV treatment process for domestic purposes.

The existing drainage basins should have to be made self sustainable in water management by integrating water sewerage drainage systems.

A policy should be prepared to rain water harvesting at a mandatory level for residential and industrial units.

Rain water available in monsoon season should be stored and after treatment it may be used for domestic purposes.

To improve the water supply in accordance with the projected requirement up to the year 2021 Inter-State river water allocation is required to be worked out. All measures are to be taken to reduce unaccounted flow of water and production losses.
at existing water treatment plants –

(c) **Proposed planning and recommendation for sewerage:**

Sewerage is the basic part of physical infrastructure and in NCT Delhi, it is grossly inadequate. The increasing pollution in the River Yamuna is an indicator of lack of sewerage treatment facilities. In NCT Delhi only 55% of the population is covered under organized sewerage system and only 15% under on site sanitation system. Rest of the population does not have proper access to sanitation facilities.

By the year 2021 entire Delhi should be served by regular sewerage system. It should be developed in a phased manner. The areas where immediate regular sewerage system is not available, low cost sanitation system by individual families could be adopted as a short range provision. These should be planned in such a way that in the long term regular sewerage could be provided. To improve the sewerage and sanitation, the surface drainage and sewerage systems would have to be developed in an integrated manner.

Planning of the city must incorporate land at appropriate locations for sewage treatment plants (STPs), Sewage pumping stations, recycling plants for waste water, sewage treatment plants, common effluent treatment plants (CETPs) with supportive distributive infrastructure i.e. conveyance system to be laid to carry treated wastewater from STPs to the areas for alternative uses. Decentralised STPs with smaller capacities should to be
provided at the community/sub city level. Possibilities of recovering energy/gas as fuel from sewage should be explored.

The liquid waste would be taken care of by augmenting the capacity of existing treatment plants as well as through new sewerage treatment plants. The sewerage system is designed to handle domestic liquid waste @ 80% of the water supply, which has to cater to 1100 mgd (4950 mld) of waste water by the year 2021. The waste water is also generated due to the use of ground water drawn from the boreholes installed by the public. The needed capacity has to be monitored with provision of water recycling infrastructure and mini/decentralized treatment. The sewage augmentation plan is given in Table - 8.6.

**TABLE - 8.6**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Treatment Plant</th>
<th>Capacity 2001</th>
<th>Additional capacity up to 2011</th>
<th>Capacity 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Okhla</td>
<td>140</td>
<td>30</td>
<td>170</td>
</tr>
<tr>
<td>2.</td>
<td>Keshav Pur</td>
<td>72</td>
<td>--</td>
<td>72</td>
</tr>
<tr>
<td>3.</td>
<td>Nilothi</td>
<td>40</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>4.</td>
<td>Coronation Pillar</td>
<td>40</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>5.</td>
<td>Rithala</td>
<td>80</td>
<td>30</td>
<td>110</td>
</tr>
<tr>
<td>6.</td>
<td>Kondli</td>
<td>45</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td>7.</td>
<td>Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Sen Nursing Home Nalla STP</td>
<td>2.2</td>
<td>--</td>
<td>2.2</td>
</tr>
<tr>
<td>b)</td>
<td>Delhi Gate Nalla STP</td>
<td>2.2</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>c)</td>
<td>Yamuna Vihar</td>
<td>20</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>d)</td>
<td>Timarpur</td>
<td>6</td>
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<td>6</td>
</tr>
<tr>
<td>e)</td>
<td>Mehrauli</td>
<td>5</td>
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<td>5</td>
</tr>
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</table>
Proposed strategies for improving the drainage and sewerage system are as follows:

To improve the drainage system of Delhi, effluent treatment plants should be provided at outfall of drains and aeration units at interceptions with advanced techniques for maintenance of drains. A time bound action program for augmentation and capacity revision of existing and new drains (due to increase in run off from urban extensions) is also vital. Check dams and depression/ lakes may be designed for increasing ground water table and as storm water holding points wherever needed. The design shall preserve the natural drainage pattern after the development of an area.
Drainage should be linked with the ecology and green networks, by adopting the concept of ‘bio-drainage’. Regular desilting of drains and control of dumping of solid waste/ malba into the drains should be taken up.

Drainage should be integral part of Road Development Plans/ flyover/ grade separators. A proper database should be prepared and GIS based drainage mapping and planning should be promoted. Sub-wells should be developed under flyovers for trapping rainwater.

Delhi should be served by regular sewerage system. It should be developed in a phased manner. The areas where immediate regular sewerage system is not available, low cost sanitation system by individual families could be adopted as a short range provision. These should be planned in such a way that in the long term regular sewerage could be provided.

To improve the sewerage and sanitation, the surface drainage and sewerage systems would have to be developed in an integrated manner. The treated sewage effluent should be recycled for non-potable uses like gardening, cooling towers, etc.

(d) Proposed planning and recommendation for solid waste:

The problem of solid waste management in Delhi is assuming serious proportions due to increasing population, urbanization, changing lifestyles and consumption patterns. The projected average garbage generation up to the year 2021 is @
0.68 kg per capita per day and total quantum of solid waste is 15750 tons/day as given in Table-5.7.

The projected composition of municipal waste for the year of 2021 is estimated as given in Table 5.8. For biodegradable and recyclable waste, which is segregated at the source, decentralized treatment at neighbourhood level may be adopted, while for no non-biodegradable, centralized treatment may be followed.

Considering the nature of solid waste and the economic aspects of its disposal, major part of solid waste especially non biodegradable has to be disposed off in sanitary landfills.

Recycling should be preferred than disposing off the waste in sanitary landfill sites wherever possible. The segregation of solid waste should start at the point of generation of the waste.

The sites, which are filled up or are in operation, are given in table 5.9 and Map 5.5 & 8.1. The filled up sites may be reused for plantation or as recreational area. The area required for solid waste disposal through various technologies including sanitary landfill sites should be reserved in the Zonal Plans. This should also include buffer zone of no development around landfill sites.

Keeping in view the fact that finding new sanitary landfill sites in Delhi is becoming extremely difficult, there is no option, but to resort to alternative and decentralized methods of waste treatment, reduction, recycle and use, which include vermiculture, fossilization and composing.
(e) Proposed planning and recommendation for electricity:

Central Electricity Authority has estimated Power requirement of 10,708 MW for the year 2021. However, the actual demand may be higher in view of realistic growth related to Asian Games 2014 which Delhi is competing to host. To meet this demand; there is a need to augment the power generation, transmission, sub-transmission & distribution capacity within the state.

Table below indicates the existing and the proposed power plants/ generation capacity within Delhi:

TABLE - 8.5

Existing and proposed power generation stations in Delhi

<table>
<thead>
<tr>
<th>(a) Existing Power Stations</th>
<th>Installed Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.N.</td>
<td>Name of Station</td>
</tr>
<tr>
<td>1.</td>
<td>IP Power Station</td>
</tr>
<tr>
<td>2.</td>
<td>Rajghat Power Station</td>
</tr>
<tr>
<td>3.</td>
<td>GT Power Station</td>
</tr>
<tr>
<td>4.</td>
<td>Pragati Power Station-I</td>
</tr>
<tr>
<td>5.</td>
<td>Badarpur Thermal Power Station</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>(b) Proposed Power Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
</tr>
</tbody>
</table>

Since the projected load demand is expected to reach 11,000 MW by 2021, the existing generation capacity in Delhi, including
the proposed additional 2000 MW capacity at Pragati Ph. II, Pragati Ph. III and Replacement units at I.P. will not be sufficient and the gap between the core generation and the load demand will further increase. To reduce this gap, at least 3 nos. generating stations each of 1000 MW capacity shall be required. This could be compacted by going for higher generation in one place provided gas is available as required. Balance generation could be brought from outside Delhi.

In order to improve the overall power situation in the National Capital Territory of Delhi for the perspective year 2021 for the harmonized and balanced development of the region, following strategies and policies have been proposed:

1. Load management techniques and energy accounting should be adopted. Schemes to minimize power theft/losses by improved metering arrangements should be enforced.

2. Non-conventional energy sources like recovering energy from sewerage, solar energy, etc. should be used for street lighting, lighting at public spaces, open areas, traffic signals, hoardings, etc.

3. To supplement part of the estimated growing power requirement, non-conventional sources/ solar energy and other actions proposed are as follows:

   i. Solar energy should be encouraged for all establishments with floor area of more than 300 sqm. Solar panels for public adver-
tising, lighting in open areas, public utilities, streets, etc.

ii. Tariff restructuring and improved metering arrangement to minimize power thefts/losses.

iii. Interim solutions of single point connection in unauthorized colonies and jhuggies.

(f) Proposed planning and recommendation for health:

The following strategies are proposed to meet the requirement of health related infrastructure:

i. Shortfall in the availability of number of beds per 1000 population is proposed to be met through –

   a) Enhancement in FAR for various levels of health facilities;
   b) Promoting rebuilding of the existing old hospitals and;
   c) Shifting of contagious diseases hospitals from existing urban areas to the proposed urban extension with proper seclusion facilities and connectivity, and using the space thus made available for general hospitals.

ii. Essential provisions shall be made for Old Age Home/care centres for senior citizens and mentally challenged by way of specialized/target group oriented facilities, which will also relieve the pressure on general hospitals to some extent.

iii. Premises earmarked for health facilities should also include other medical streams like Ayurvedic/Homeopathic medicine, governed by any statutory body.
iv. Complementary health facilities at par should be developed in the NCR to reduce burden on NCT Delhi.

(f) Proposed planning and recommendation for transportation:

Based on the rate of increase in number of trips between 1981-2001, it is estimated that the total trips would rise in 280 lac by the year 2021, including 257 lac motorized trips and 23 lac non-motorized trips. Apart from the problems and requirements of transportation at the macro level, there are special problems in specific areas such as old city. The plan and strategy for transportation will have to be worked out in this background. The following strategies are as follows:

Preparation and operationalisation of an integrated and mutually complementary multi-modal transportation and traffic plant comprising the Road, Rail and Metro rail network, so that work centers/residences are within a walkable distance.

Optimal use and utilization of the existing road network and should be new construction of peripheral ring road, Western Express Way (from Kundli to Manesar and Palwal), Eastern Express Way (from Kundli to Ghaziabad and Palwal), and FNG Expresway (from Ghaziabad to Noida and Palwal) as shown in Map 8.2 with full development of ROW by removing all impediments. All arterial roads would be restructured to allow for smooth and safe flow of buses and non-motorized transport to minimize pollution and congestion.
The Ring Rail System and sub-urban rail system should be expanding strengthening/restructuring. High Speed Rail Network as shown in Map 8.2 should be established of a quick and efficient transport network between the NCR and the NCT of Delhi.

(g) **Proposed planning and recommendation for Air Pollution:**

To improve the environment and air quality of Delhi the following strategies and planning have been proposed:

i. The industrial areas and industrial units which are running within the NCTs boundary should be transferred to nearby states.

ii. To minimize the vehicular traffic by half, the Government should make a policy to take actions to limiting drivers to odd or even days based on their license plate number as followed by Beijing.

**CONCLUSION:**

Planning is a dynamic process that demands continuous fine tuning to suit emerging needs and attitudes; to remedy what is hurting the people, to draw lessons from the past, to anticipate the needs and aspirations of the people in time to come. In the democratic system, it becomes the duty of the citizens of Delhi to become active stakeholders in development of Delhi into the best national capital city of the world, one of which all the Indians should feel proud.