Chapter 6

Conclusion and Suggestions

6.1 Each city is starting to look like the other and thus loosing identity. Planning the city in such a way that overutilisation or underutilisation of any part of the city can be avoided is the need of the hour. It is true that modern city of today cannot be compared to the earlier towns. Growth of a large city has become an existing reality. This phenomenon has led to increasing residential density within the city limits as well as sprawl that encroaches the surrounding villages in Delhi. This trend stresses on the growing importance of open space within the city. Urban places comprise of open space (e.g. parks), enclosed space (e.g. buildings) and semi enclosed space. The first aim is creating a sustainable landscape. The second aim is the maintenance of this vital resource. Parks and gardens require capital investment as they are highly vulnerable and need a consistent reforestation and landscape improvement plan as well as regular maintenance of infrastructure. Adequate maintenance can be enhanced by public participation and additional funding. The Ground Water recharge has been affected to a great extent with concretization of the open space and footpaths. Some policy and planning system need to be evolved to check the present trend of concretizing the available open space and space along foot paths and drains.

6.2 "Urban open space are defined as public and private space, primarily covered by vegetation, which are directly available for recreation or indirectly having positive influence on environment..Urban areas can comprise large variety of green space, such as Parks/ gardens and playgrounds, green space near institution, Industrial area green space, Private Green space. It also includes woodlands, farm lands, etc. Urban Open Space is critical for keeping our cities habitable and makes them healthy and energy efficient. However, for Urban Open Space to contribute to their fullest to the quality of our cities, they have to be thoughtfully planned, efficiently created and managed. Psychologists say that open space are very important for our mental and physical well-being. But their importance is being ignored, like; the trees that take almost fifty years to grow are chopped to widen roads. Actually, with land prices skyrocketing, open space are considered worthless unless they can be put to

149

commercial use. So space in parks and gardens are built up and shops and recreational facilities are created and green space gets shrunk. The continuous change in the urban land use of a city is a matter of concern. The rapid increase of urban population leads to an ever increasing demand on the urban environment. The unplanned expansion of cities and encroachments by people for various purposes poses serious problems to the environment and the people living in the area. Therefore it is very much necessary to monitor the land use and its changes. Residents must also take active initiative in maintenance of open space. In this manner they will also be motivated to save the open space and parks.

6.2.1 The importance of water supply for the maintenance of any open space can't be ignored. India is a land where rivers form the veins of the country and is blessed with adequate rainfall as a whole. In many cities the quality of groundwater is not good. In such places rainwater harvesting can provide lifeline water for survival. However, this water is often left waste and is little harvested. 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 up to 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:

- The Yamuna river and the drains are highly polluted;
- The supply of water for human use is too much in absolute terms, but is characterized by unfair distribution in per capita terms in different areas, and significant wastage;
- Assuming that 80 percent of the water is converted into waste water, the capacity to treat waste water is grossly deficient;

- 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.

- A large number of the traditional water bodies in the form of ponds, etc. have been encroached or have otherwise become defunct.

6.2.2 The Central Ground Water Board (CGWB), regarding the ground water resource, assessed the total groundwater potential to be 292 million cubic meters (MCM) in 2003 as compared to 428.07 MCM in 1983, showing reduction of around 130 MCM over the past twenty years. 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 rain water falling on roads, private/government vacant places and play grounds etc straight away reaches the nearby drainages and ultimately mixes with sewage water. As a result of this, the entire rain water becomes polluted and eventually it contaminates the ground water. Hence, rainwater harvesting from roads and vacant places becomes essential in order to recharge the ground water. Also, a better management is needed regarding the use of this water as the open space at many places are either swamped with water and are dry at many places. This degrades the condition of any open space and it can't be accessed by people.

6.3 It is estimated that by the year 2030, sixty percent of the world's population will live in cities. Urban areas are experiencing increasing signs of environmental stress, especially in the form of poor air quality, extreme noise and traffic congestion. At the same time, the pace at which land is being used up due to urbanisation is a major concern throughout the world. The enhancement of green areas within and around the urban areas and their management can mitigate the adverse effects of urbanisation in a sustainable way. This will make urban areas healthier place to live in. Therefore, rational management for green space is of absolute necessity to compensate their demand through optimum use. Preserving and maintaining green space in urban environments are important for promoting sustainable development. In India, a very rapid and massive growth (73.29 %) in urbanisation of population has been observed during 1991 – 2011, which reflects the progress and development of India. Population pressure along with immigration from different parts of the country in search of

151

employment has put tremendous pressure on the natural resources – land, water and air of Delhi and surrounding areas known as National capital region (NCR). Various forms of land which were very fertile are some of the worst affected in urban ecosystem. Water bodies including floodplains and smaller lakes are being converted into agricultural land and built up areas; agricultural lands are being converted into urban uses primarily for habitation and factories. In this process the ecosystem services like water recharge, bioremediation (the use of biological methods to restore contaminated land, especially the addition of bacteria and other organisms that consume or neutralize contaminants in the soil), nutrient cycling, waste management etc are being lost without getting noticed by the planners leading to climatic changes in the environment. Data on land use change from the satellite imageries over 1971-2006 of Delhi, clearly indicates the trend where the conversion is taking place from natural areas to agriculture and urban and from agriculture to urban uses. The profound drivers of this change is urbanisation in Indian sub-continent which is happening at a fast pace. There is an urgent need to look for long-term sustainability and environmental planning.

6.4 Findings & Suggestions: The metropolitan cities in India have experienced rapid growth of population, particularly in the post independence era. Many of them have also experienced tremendous expansion of their statutory limits. The metropolitan area has grown beyond the city boundary, which is expected to bring many undesirable changes in the land-use pattern within the city as well as its surrounding areas.

6.4.1 The open space analysis in the metropolitan cities Bangalore, Jaipur, Mumbai and Hyderabad indicates that the built up area has increased tremendously over the years as a result of which the open space is decreasing. Haphazard urban growth and increase in built-up area have resulted into loss of productive agricultural land, green areas, loss in surface water bodies, and open space. The secondary data analysis shows that in Bangalore open space constitutes 7.5 percent of the total area; in Jaipur, open space constitutes 4.0 percent of the total area; in Mumbai, open space constitutes

4.29 percent of total area; in Hyderabad, open space constitutes 7 percent of total area and in Delhi, open space constitutes 7 percent of the total area.

6.4.2 According to the secondary data analysis, in Bangalore, in 1925, open space were 80 percent of the total land area and in 2003, it is just 7.5 percent. In 1971, half of Bangalore urban land was crop land. Over the three decades 1971-2001, crop land proportion in Bangalore declined gradually from 47 percent to 11 percent and to 8 percent in 2001. Due to clearance of crop land after 1981, the open land in Bangalore increased from 6 to 29 percent in 1991. Thereafter it was utilized for non-agricultural uses and declined to negligible proportion. As a result percentage of mixed built up land has increased from 20 to 70 percent. Area under parks and gardens has decreased to 7 percent. The decadal change in the built up area is high with the centre core developing for public/ semi public use. The alarming increase in the built up area at the cost of water bodies and open space and loss of greenery indicate the need to provide green belts encircling urban growth.

6.4.3 In Jaipur, in 1975 the area under residence was 10.58 percent of the total municipal area of Jaipur which has increased to 20.62 percent in 1991. Out of the total agricultural area available in the year 1975, 251.58 sq. km (65.2 percent) has been engulfed by the concretization and it has been reduced to 150.78 sq. km (30.07 percent) in 1991. As stated in the draft CDP of Jaipur, 2001, the 1971 master plan of Jaipur had proposed around 270 hectares of land to be devoted by 1991 to open space, out of which only 80 hectares was developed. In 1991, the ratio was of 0.21 hectare per 1000 population. There was a shortfall by 70 percent. In Jaipur city, as per the existing land use analysis the area under park and open space category is around 5.43 sq. km. in Jaipur city for a population of 3.30 million. Accordingly, per capita open space works out to be 1.60 sq. m per person.

6.4.4 The scene of Mumbai city is no different. Due to growing population pressure the total built-up and industrial area in Mumbai Metropolitan Region has increased from 4.9 percent in 1971 to 12 percent in 1991 and is projected to constitute 31 percent of the total area in 2011. On the other hand, area under forest cover has declined from 30 percent in 1971 to 27 percent in 1991 and is expected to it decline

further to 22 percent by 2011. Mumbai residents often reside in cramped, relatively expensive housing, usually far from workplaces, and therefore requiring long commutes on crowded mass transit, or clogged roadways. Many of them live in close proximity to bus or train stations. Urban planners and activists point out that the drop in the usable open space area has been more than 80 per cent of what had been planned and expected 30 years back. Nearly 202 sq. km of land under different uses was converted to built-up area during 1971-1991, but during 1991-2011 the area of such conversion increases to 717 sq. km. While during 1971-1991, 57 square km of land was added to industrial use; in the later period only 24 sq. km. land is added for such use. During 1991-2011 agricultural land declines by 43 square km, forest land by 593 square km and wetland by 300 square km. According to Urban Design Research Institute (UDRI), the open space ratio of 1.33 per cent to the total area points out that there is something grossly wrong with the urban planning department in this city. The ratio of usable space has dropped substantially in the past 30 years since 1981. This ratio also effectively means that the per capita usable open space is just 0.4 sq. m. compared to the three sq. m. which had been reserved for open space use in 1981.

6.4.5 The Hyderabad city has undergone drastic transformation with haphazard growth replacing the planned part of old city. The rapid urbanisation that has taken place after independence has resulted in inadequate parks and open space within the city. The secondary data analysis of urban sprawl of past few decades reveals that the total built up land has gone up from 17,902 hectares in 1964 to 45,550 hectares in 1990 whereas the agricultural land has gone down from 1,03,272 hectares in 1964 to 71,827 hectares. The total water bodies' area has also reduced from 6,348 hectares in 1964 to 3,498 hectares. That is almost half the open space has been eaten away and since then it has still reduced. During the last three decades, population of HUA increased slightly more than three times. During the last three decades, HUA has expanded two and a half times leading to urban sprawl. In HUA, due to clearance of scrub land after 1981, open land increased to 26 percent in 1991. There after due to utilisation for non-agricultural open land declined to 17 percent. As a result of utilisation of land for non-agricultural purposes (residential and commercial), percentage of mixed built-up land has increased from 23 to 37 percent. Area under

parks and gardens in HUA has increased more than 2 and half times reaching 7 percent in 1991 and got stabilized thereafter. This is mainly due to Green Hyderabad Programme. It is noticed that the residential development has taken place in all directions in a contiguous pattern due to availability of land in all directions in case of Hyderabad. Haphazard urban growth and increase in built-up area have resulted into loss of productive agricultural land, green areas, loss in surface water bodies.

6.4.6 It is observed that in developing countries, cities are growing very rapidly i.e. metropolitan area growth has spilled beyond the city boundary, which is expected to bring many undesirable changes in the land-use pattern within the city as well as its surrounding areas.

6.4.7 After analyzing the spatial arrangement of open space in Delhi, it can be said that there is general reduction in open space. In 2011, the urban area of Delhi is 1, 11,365 hectares (Delhi statistical handbook, 2011). Remote sensing data available with the National Capital Region Planning Board (NCRPB) indicates that the built up area in Delhi was 57,880 hectares in 1986, 60,340 hectares in 1993 and 75,000 hectares in 1999 (includes built up area of rural settlements). More than 50percent of the total area of Delhi had been built up by 1999 (Economic Survey of Delhi 1999 – 2000). The satellite imageries used for the study show that the agriculture, forest, and water body land uses have decreased considerably from the year 1977 to 2006. Urbanisation is happening at a very fast pace at the cost of the other land uses and urban land area and the waste land has considerably increased over the last three decades. Out of a total area of 1483 sq km about 50 percent has already been urbanised and the rest is under heavy pressure of urbanisation. The agricultural land has declined. This indicates that probably the process of urbanisation in Delhi has been closely associated with increasing conversion of land from agriculture to urban. Increasing urban activities are putting pressure on the surrounding rural lands. The area under forests has seen a declining trend till 2001 and is increasing after that as per the records. To analyse the open space availability in Delhi a technique was selected to calculate the types of land use as we move from the core to the periphery. Firstly, three cores were identified in Delhi: Karol Bagh, Chandni Chowk and

Cannaught Place. A radius of 7 km was drawn around each core and the type of land use pattern was identified for 1961 and 2001 as per the land use maps of DDA, Delhi. With rise in population, urbanisation, the parks and forests have marginally decreased in the core zones selected., In core zone (after merging the three cores) and the intermediary zone, the residential areas and other land uses are increasing and parks and forests area is decreasing . This is mainly due to high population increase in the core and intermediary zones that are urban areas. With population increase in the urban areas of Delhi, the city is expanding towards the peripheral region with the conversion of rural areas to urban expansions. The built up area has increased that mainly came from agriculture land, waste land, scrub-land, sandy areas and water bodies.

6.5 To study the user profile of open space, parks of different hierarchy i.e. a neighbourhood park, a district park and a city park are selected to analyse the user characteristics. The three parks selected for survey are the Ajmal Khan Park, Nehru Park and the National zoological garden purposively to compare the neighbourhood park, district park and city park in Delhi respectively. The volunteer survey was done to analyse the variation in the user characteristics between weekdays and holidays, variation in the user characteristics between morning, afternoon and evening visitors in the different parks. Total sample size is 600, (200 from each park). The variables selected for comparision from questionnaire are sex, age group, marital status, family type, type of house, number of floor in which residing, education, occupation, household income, purpose of visit, park visited, frequency of visit, time of visit, duration of stay, adequacy of open space for recreational purpose and community purpose, and maintenance of open space. The relative location or situational setting of the parks selected for study is of varied character and thereby it seems apparent that there would be variation in the user characteristic as well.

6.5.1 It is generally felt that nature and characteristics of park user will definitely vary as the size and type of parks are different from each other. Chi-square test was done to analyse this difference between different parks for same variables. Inter park variations show that age group, family type, type of house, education, occupation,

household income, purpose of visit, park visited, frequency of visit, time of visit, duration of stay, adequacy of open space for community and recreational purpose, maintenance of open area are significantly different in the parks, whereas, sex, marital status and number of floor in which residing are insignificant. The tetrachoric correlation shows that the highest ϕ value is for 'Occupation and household income'. This shows that the need for open space is less for high income residents who live in low density areas and the low income residents have more requirement of open space as they live in high density areas and need some breathing space in the hours of leisure.

6.5.2 Park user characteristics were analyzed on weekends and weekdays. This was done to study the user characteristics variation in preference of the same factors and also how the users differ on weekdays and weekends. Here sex, marital status, family type, occupation, number of floor in which residing are insignificant. Whereas age group, type of house, education, income, purpose of visit, frequency and maintenance of open space are significantly different. The tetrachoric correlation shows that the highest ϕ value is for 'frequency of visit'. The reason can be that be it any occupation, people can come more to public places on weekends as a result the parks are bubbling more with life on weekends.

6.5.3 In comparing morning, afternoon and evening time slots, not much difference was found in the user characteristics. However, sex, age, frequency of visit, duration of stay, and type of house are significantly different. The tetrachoric correlation shows that the highest ϕ value is for 'frequency of visit'. Morning and evening visitors are more than afternoon visitors as people have more time at their disposal in those hours.

6.5.4 However, there are several limitations to the study as the user survey cannot be generalized because the survey can vary from park to park, person to person; also, visiting any park depends on location, affordability, purpose, time available and above all human nature. The study conducted gives some important findings like:

- Elderly people (>60) prefer coming to district park or Neighbourhood Park regularly as they can engage in different activities like yoga or they also have

different club/ society/ group membership, and they can easily meet their friends in these parks on daily basis.

- Joint family members prefer going to neighbourhood park more in comparision to nuclear families who prefer City Park or district park. This trend may be because the neighbourhood park is closer in approach in comparision to district and city park.

- The high income residents who generally live in low density areas, where the need for large open public space is less and for the low income group that lives in high density areas, such common open space requirements are more.

- Low income group that is people with income less than 1lakh and 1-3 lakh are more regular to the neighbourhood parks. Above 3 lakh income household prefers going to City Park and District Park as the need for open space is less for high income residents who live in low density areas as they are already surrounded by such open areas and the low income residents have more requirement of open space as they live in high density areas. Also, the high income group is more mobile and can easily access the open areas farther off. So we can say that the user characteristic varies with income. On comparing the education, occupation and household income, it can be said that education levels are related to occupation that is defining the income levels of residents.

- User is influenced by the site and situation of the park and the purpose of visit are varying accordingly.

- Security is the most important concern for people when moving alone anywhere in Delhi, especially for women. Neighbourhood parks being nearer in location has more of alone/single visitors and as the distance increases so the choice of travelling as 'couple' or 'group' increases.

- People coming to Neighbourhood park and district park stay for less than 60 min, whereas it generally takes two or more hours time in city park. The purpose of visit and size of the park and the commuting time are the factors that should influence the duration of stay in any park.

- As far as recreational purpose is concerned, City Park and District Park are much better than the Neighbourhood Park. Reason being, the management of city park and district park is maintaining the aesthetic condition and

neighbourhood park is poorly managed or is totally being ignored.

- People less than 30 years of age and above 60 years are also coming more on weekends, middle age group come to the park more on weekdays as they come there because of their job timings or for physical exercise that is a regular activity.

- Regularity may be in terms of physical activity or income oriented on weekdays whereas weekends are for social get together and entertainment/ leisure activities.

- The high income residents i.e. above 3 lakh are more regular in their physical activity routine to the parks on weekdays in comparision to low income residents.

- People come to parks more on weekends as they have more time to spend for leisure. The reason can be that be it any occupation, people can come more to public places on weekends.

- Maintenance of open space is much better on weekends in parks than weekdays as parks have more visitors on weekends. This is to because the number of tourists is more on weekends.

- Male users are most in morning as they come for physical activity which is regular activity. Evening male users are more than afternoon users as in evening they come for recreation with families. On the other hand, female users are more in the evening hours as they come with children. Also, female users are least in the afternoon as compared to morning as they are also working in schools etc, may be coming to park for physical activity or to escort their kids in evening leisure time.

- Below 30 years and 30-60 years of age people are coming more in morning in routine. Above 60 years of age visitors are more in the evening as they may be coming for social get together/ walks etc.

- Morning and evening visitors are more than afternoon visitors as people have more time at their disposal in those hours. People are staying for longer duration in the morning and evening hours in comparison to afternoon time slot.

6.6 With increasing population and growing pollution, we can't ignore the ill effects of planning on the environment. The preservation of open space and to ensure effective planning for open space, and recreation, it is essential that the needs of the local people are known. Assessment should be done at the regional or sub regional level and it should cover the differing and distinctive needs of the population for open space and recreational facilities. National standards cannot cater to the local circumstances, such as differing demographic profile and the extent of built development in the area. Several planning challenges have emerged in recent years regarding future parks and open space needs. Among these challenges is the need to ensure that an adequate supply of parkland and open space is available to meet the needs of an increasing population. Connecting parks and open space; providing public access to the park system; and protecting existing open space from overuse, conversion to other uses, encroachment by inappropriate new development, or reduction by inappropriate development on adjacent lands are additional challenges that planners are confronting. In order to plan for astounding population increase, the MPD-2021 proposes a three level approach:

• To find ways by which the population growth in Delhi can be checked;

• To increase the population holding capacity of the area within the existing urban limits through redevelopment, and also deflect part of the population into the nearby regions (the National Capital Region, NCR);

• Extension of the current urban limits to the extent necessary.

6.7 Over the years, Master Plan remains to be the only planning instrument which stood test of time despite criticism, severe limitations and slow pace of implementation. Master plan becomes a document which may bring reforms, flexibility and set implementable goals for urban planning process, with some innovative ideas and shift from 'standard based planning' to 'procedure based planning'. Bottom-up procedures are successful for improving the quality of land use planning and resource management. The issue of open space in and around cities depends on ownership of urban and urbanisable land. The provision of open space

reflects inadequacy of urban planning policies. The available open space have been constantly decreasing. The 2021 Master Plan includes an analysis of the "population holding capacity" of Delhi. It assumes an average density of 250 persons per hectare (100 persons per acre), redevelopment of already developed areas to enable higher density, especially along Metro corridors, as well as augmentation of infrastructure and increasing the transportation network capacity. These calculations show that the holding capacity is 15,300,000, significantly less than the forecast population of 23,000,000 by 2021. So, it is clear that additional land must be acquired to accommodate this population. Looking to the future, Delhi will continue to face significant challenges as the population grows.

6.8 On doing a ward wise analysis of open space, we again make three zones i.e. core, intermediary and periphery. In the core zone, the open area per 1000 population comes to 0.65 hectares, in intermediary zone the value is 1.1 hectare, and in the peripheral zone the value is 2.35 hectare. As we move from the core to the periphery, the open space value is increasing but still the population in the core and the intermediary zones do not have open space availability as per the standard mark of 1.5 hectare. The cities can be made better only through its open space system. The quality of open space creates an imageability of the city. A sustainable city provides adequate access to open space, which included parks, playgrounds and recreation facilities to its residents.

6.9 Management and planning of urban space requires spatially accurate and timely information on land use and changing pattern. Monitoring provides the planners and decision-makers with required information about the current state of development and the nature of changes that have occurred. Remote sensing and Geographical Information system (GIS) provides vital tools which can be applied in the analysis at the district and as well as the city level. Remote sensing becomes useful because it provides synoptic view and multi- temporal Land uses / Land cover data that are often required. The need of the hour is a partnership between government, community groups, nonprofit organizations, and private land owners to improve the quality of Open Space in Delhi.

This must focus towards achieving following goals:

- To provide better access of open space to the society;
- To protect diversity of plant and animal species for protection of sustainable ecosystems;
- To protect water quality, including surface and underground drinking water supplies, lakes, streams and coastal waters needed to sustain human life and aquatic ecosystems;
- To promote institutional and community/cooperative open space;
- To improve quality of life and overall health of people, especially those with limited current access to open space;
- To preserve Delhi's historical buildings and surrounding parks and open area;
- To maximise re-use of treated waste wate
- To do controlled exploration of ground water;
- Vertical growth must be carried out wherever necessary. Reason being it is not a solution for all places as it puts immense pressure on resource and infrastructure.

Successful achievement of these goals will thus enhance the quality of life for the people of Delhi.