



Neighborhood Urban Green Spaces for Senior Citizens and Children, Case Study: Delhi

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Abstract

Due to rapid urbanization trend, the distance between city inhabitants and nature is increasing day by day and it is necessary to bridge this gap by promoting urban green spaces in the city. Green spaces are important for sustained well-being of people from different age groups, ensuring diverse benefits including improved health, social bonding, recreation, and sheer experience of nature while being in the city. During the past few decades, the Master Plan of Delhi has made efforts in improving and increasing the provision planned green spaces. Delhi is the greenest city in India with 19% green cover having different types of green space at different levels such as regional, city, district, community, neighborhood, and housing play area. Now, the research question is that, are the neighborhood parks accessible to senior citizens and children, if they are accessible then, are they usable to senior citizens and children? How much is the usage? This paper describes how the parks are designed? And what are its components? What issues are coming in using the parks? The aim of the study is to analyze the utilization pattern of neighborhood urban green spaces by our target age groups and develop a plan for better utilization in Delhi. Only the neighborhood level parks (daily use parks) are taken into account for the study. There are three parameters used for the calculation of urban green spaces usage: (i) number of users, (ii) length of stay (time spent), and (iii) frequency of visits. There are three parameters used for calculating the usability of the selected parks: (i) ease of accessibility, (ii) provision of facilities, (iii) maintenance. To assess the usage of

neighborhood green spaces in Delhi, the primary survey of senior citizens and children was conducted. Analysis of the collected data shows that the sector-6, Dwarka neighborhood park has a higher number of users than the sector-8, Dwarka neighborhood park due to availability of facilities, distance traveled by the users, and the population living near to the park. Issues related to maintenance and availability of facilities in both the parks are also observed.

Keywords

Urban • Green spaces • Neighborhood • Senior citizens • Children • Delhi

1 Introduction

Due to rapid urbanization trend, the distance between city inhabitants and nature is increasing day by day. In order to reduce this distance, it is necessary to promote green spaces in the city. In the past few decades, many environmental activists and society have placed a much greater emphasis on urban green spaces in order to improve the quality of life in urban areas. Green spaces have been incorporated in urban planning of Delhi since its earliest planning. These green spaces integrate economic, environmental, and social aspects together. Green spaces are important to human health, balance out built structure, social gathering, and recreation and interaction with nature. People of the different group have their specific needs, which in turn are interrelated. Among these, children are in their growth phase and considered to be the weakest age group. Senior citizens have limited capabilities and are more susceptible to disease, syndromes, and sickness in comparison to younger adults. They also face other social problems such as retirement, loneliness, and agism.

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To boost the greening efforts, 18 greening agencies have been discovered which majorly includes government agencies and municipal bodies. Some of them are Municipal Corporation of Delhi (MCD), Delhi Development Department (DDA), Public Works Department (PWD), Central Public Works Department (CPWD), Delhi Parks and Garden Society (DPGS), North Delhi Municipal Corporation (NDMC), Education Department, Transport Department, Flood Control Department, Development Department, Delhi Metro Rail Corporation (DMRC), etc. These agencies were assigned with certain plantation objectives annually which were done by them using their own resources. Most of the agencies have their own nurseries and infrastructure. All these greening activities are coordinated by the Forest Department. Ceremonial Plantations were carried out at regular intervals for giving proper awareness among the citizens (Sinha, 2013).

Recreation is the activity or activities engaged in during leisure time. In a deeper psychological sense, recreation refers to the human emotional and inspirational experiences arising out of the recreation act. Father of the playground movement, Joseph Lee, defined “recreation for adults as the renewal of life and for children as the gaining of life” (Jewell, 1997). Another author Rodell E. Sinamban defined “Recreation is the expenditure of time with an intent to gain some refreshment. It is a break from the monotony and a diversion from the daily routine. It is a positive change from the stereotypical lifestyle and involves active participation in some entertaining activity” (Rodell, 2010). Recreation activities render an essential approach to refill people’s energy and prepare them for the next task. It also restores people’s senses and makes them feel refreshed and pleasant (Wang, 2012).

Census of India has divided the total population into three different age groups, i.e., 0–14 years, 15–59 years, 60 years, and above. The “senior citizens” population, i.e., people of age 60 years and above and “children” population, i.e., people of age 0–14 are important groups among the city population whose requirements are different. The percentage of the elderly population (persons aged + 60) is expected to increase from 5.9% in 2001 to 10.7% in 2021. At the same time, population of children

(aged 0–14 years) would decrease from 29.5% in 2001 to 21.75% in 2021. The percentage of the elderly population (persons aged + 60) was increased from 4.8% in 1991 to 5.9 in 2001. On the other side, the population of children (aged 0–14 years) decreased from 34.8% in 1991 to 29.5% in 2001 (Table 1).

“The age-group wise distribution of population should form the basis for providing special facilities to the elderly such as old age homes, low floor buses, special seats in buses, and special seats in public toilets and ramps in public buildings.” Master Plan of Delhi-2021 (Delhi Development Authority, 2010a, b).

This research study examines the policies and provisions of green spaces for senior citizens and children in the current planning practices, analyzes the usage and usability of neighborhood green spaces by targeted age group in case study green spaces. This study discusses guidelines and recommendations for both existing and future neighborhood green spaces taking into consideration the requirements of senior citizens and children.

2 Need of the Study

As discussed in the previous section, the senior citizens and children segment of Delhi’s population is increasing. The increasing population requires emphasis and a different approach to design for better mobility of the selected target age group. Children who are generally more active being in their growth phase and are considered to be the weakest age group and elderly, who often have limited capabilities and are more susceptible to disease, syndromes, and sickness in comparison to younger adults. They also face other social problems such as retirement, loneliness, and agism, and for whom the provision of green space is inadequate. Future green spaces should be innovative and targeted in their design.

According to MPD-2021, Delhi has not yet seen a shift in emphasis from quantity of green space to quality, a shift may be required for future plans. New green spaces will need to stress on use and quality rather than quantity, that will require flexibility in design.

Table 1 Elderly and children population in Delhi (1991–2021)

Year	Population in lakhs	
	Elderly (60+ year)	Children (0–14 years)
1991	4.5 (4.8%)	32.8 (34.8%)
2001	8.1 (5.9%)	40.6 (29.5%)
2011	14.2 (7.8%)	45.0 (24.7%)
2021	24.6 (10.7%)	49.9 (21.7%)

Figures (in bracket) indicate percentages to the total population

Source Census of India and projections by DDA Sub-Group (Delhi Development Authority, 2010a, b)

3 Literature Study

This section of the paper is divided into five subsections. First part is about the basic concept of green spaces and their types, functions, benefits, usability, and supporting elements. The second section talks about the provision of green spaces in MPD-2021: Delhi. The third and fourth part is describing the requirements of senior citizens and children. Last and fifth part explains the neighborhood concept.

3.1 Green Spaces

3.1.1 Concept of Green Spaces

United State Environmental Protection Agency defines urban green space as any open piece of land that is not developed (has no buildings or other built structures) and can be accessed by the public. Green space (land that is partly or completely covered with grass, trees, shrubs, or other vegetation) includes parks, community gardens, and cemeteries.

University College London (UCL) Institute of Health Equity “They include areas of greenery such as local parks, public gardens and playing fields, but also ‘spaces’ such as streets where there are trees planted, and cycleways. ‘Accessible’ green space is considered to be that which is located close to residents’ homes, easy to walk to, physically accessible, safe to use, and provides well-maintained facilities” (UCL Institute of Health equity, 2014).

The Delhi Master Plan states, “green spaces are generally considered as the developed parks and green belts.”

3.1.2 Types of Green Spaces

Types of urban green spaces as per provision at hierarchy level are as follows:

- Local level—Totlots, housing area, neighborhood parks
- City/zonal level—Community, district, city parks.
- Regional level—Regional parks.

3.1.3 Functions of Green Spaces (Vijai Shanker Singh, 2010)

The functions of the urban green space can broadly group into three major categories:

- Utilitarian: The utilitarian functions refer to the more tangible aspects like optical and thermal comforts inside the green spaces, providing access to these spaces.
- Social: These functions usually involve the direct and active participation of the human being in these spaces. These may include social interaction and recreation, etc. It is the green spaces where the infants and children come into contact with society and its culture.

- Perceptual: There are two important aspects to the perceptual functions. First, the green spaces may be used as one of the evaluative criteria by residents or visitors. The second aspect relates to the even more intangible aspects of creating a distinct identity of a given residential area.

3.1.4 Usability of Urban Green Spaces

Usage of the urban green spaces is given by number of users, length of stay (time spent), and frequency of visits and its usability is dependent primarily on three factors as follows:

- Ease of accessibility
- Provision of facilities
- Maintenance.

3.1.5 Benefits of Urban Green Spaces (Center for Urban Green Spaces, 2012; The Benefits of Green Space, 2015)

The green spaces in urban areas play an important role in the urban living of a large population. The benefits and uses broadly classified as environmental, economic and social and trifurcated as follows:

- (a) Social and psychological benefits: As per WHO, health is not only the absence of illness but means mental, physical, and social well-being and the green spaces provide ample opportunity for social, physical, and psychological benefits with recreation and health.
 - Recreation and well-being: Resource for relaxation and social interaction, interaction with nature and environment, lower crime and enhance self-esteem, provide safe play space for children, provides a perfect outing place for elderly people and family as a whole, contribute to physical, mental, and social development (Brodhead, 2009).
 - Human health: Reduce stress, decrease in respiratory illness, increase in work productivity (Barton, 2009).
- (b) Environmental benefits: The environmental benefits of the green spaces can be summarized as ecological, pollution control, and biodiversity and nature conservation (Brodhead, 2009):
 - Ecological benefits: Regulation of urban climate, reduce temperature, reducing urban heat island effect, groundwater recharge during monsoon, increase precipitation/rainfall (Consulting, 2013).
 - Pollution control: Reducing pollutants and smoke particles, reducing noise levels (Consulting, 2013).
 - Biodiversity and nature conservation: Protection of species, conservation of plants, soil, and water quality (Consulting, 2013).
- (c) Economic and aesthetic benefits: The economic and aesthetic benefits of the green spaces can be

summarized as energy-saving and property value (Brodhead, 2009):

- Energy saving: Reducing overall energy consumption for heating and cooling reduces the cost of cooling of the building (Haq, 2011).
- Property value rise: Increase in property values and returns, increase scenic value, employment, and tourism boost (Haq, 2011).

3.1.6 Supporting Elements of a Park (Christiansen, n.d.; Riverside General Plan 2025; Amended, 2012)

The supporting elements of park change with its hierarchy. But in the study, the focus is on neighborhood level parks. The elements of neighborhood parks are as follows:

- (a) Pedestrian circulation: It is important to plan for specific pedestrian needs when developing a system of walkways in a park. Pedestrian routes may be utilitarian linkages between activity areas and other supporting facilities. Nature walk and jogging paths are examples of pedestrian ways that are directly activity-related. The proper walking surface is important to pedestrians' comfort and satisfaction.
- (b) Lighting: The provision of an adequate level and quality of illumination in a park is a basic support consideration. Lighting can be provided for five functions such as (i) activity lighting: necessary for providing illumination to do a specific task or performance like washing hands and playing a ball game, (ii) safety lighting: provides necessary illumination during normal situations to protect human well-being and reduce the chances of accidents or harm to people, it is for walks, steps, ramps, and road crossing, (iii) security lighting: provides a degree of protection to property, equipment, and goods, (iv) emergency lighting: is needed when normal lighting provisions fail and people need temporary supplementary illumination to evacuate essential tasks, and (v) aesthetic lighting: is used to enhance the beauty and attractiveness of a visual element. It may be used to illuminate fountains, statues, trees and shrubs (Dillon Consultant Limited, 2014).
- (c) Water system: The provision of a sufficient and safe supply of water in a park or recreational area is essential for public consumption and use, fire protection, removal of sewage and park maintenance and operation. Park visitors need water for drinking, washing, and flushing. In addition, water is used for park irrigation, sprinkling, and cleaning. Water fountain increases the aesthetics of the park.
- (d) Waste water and solid waste: A proper control of human and domestic wastes (leaves of trees) in park

areas is an essential factor. A well-planned and operated park system is necessary to protect the health and convenience of the users, protect vegetation from harmful pollution. A park sewerage plan should include proper and efficient collection, storage, treatment, and disposal of the solid.

- (e) Plantation and play area: Trees and other shrubs add to the aesthetics of the park. Also, give shades to persons using parks. They are mostly used by senior citizens. Swings, sliders, sand-pit, and mini-basketball increase the usability of the park.
- (f) Washroom or toilets: They are also important amenities of a park for the cleanliness and health reason (Dillon Consultant Limited, 2014).

3.2 Provision for Green Spaces in MPD

In MPD-2001, neighborhood parks were proposed to be planned with 7.5 ha for 15,000 population, whereas in MPD-2021, it is proposed to be planned with 3.5 ha for 10,000 population. Comparison of three Delhi Master Plans (Table 2).

The green area and green area per person are decreasing from 1962 to 2001, but Master Plan of Delhi-2021 made an effort in increasing these green spaces. But it is not talking about the special provision in the green spaces for senior citizens. Master Plan has also included neighborhood-level parks from 1962, which can be used by the senior citizens and children.

3.3 Children

- (a) **Definition of a child** (Lemish, 2011)

A child is biologically defined as a human being between the stages of birth to puberty and legally referred as a minor who has not attained the age of maturity. The age of majority accepted and specified by each country differs from fourteen to eighteen. The UN Convention on the rights to children defines a child as a majority is attained earlier. The Indian law, as specified in the National Action Plan for children, also defines a child as defined by the UN Convention on the rights of the child. The child undergoes different stages of development as they grow and based on the stages of development the growth of the child has been classified into different phases, like infancy, early childhood, middle childhood, and adolescents.

Table 2 Comparison of three Delhi Master Plans (1962, 2001, 2021)

Category	MPD-1962	MPD-2001	MPD-2021	UNIT
Catering population	53,00,000	82,00,000	230,00,000	Nos.
Total urban area	44,777	44,777	148,300	Ha
Green area	9101	8722	22,245–29,660	Ha
Green area %	20.3	19.5	15–20	(approx)
Urban green per person	17.2	9.7	9.7–12.9	m ²

Source MPD-1962, 2001, 2021 (Delhi Development Authority, 1962, 1981, 2010a, b)

Note MPD-2001 Additional 40 Lakh Population to be accommodated in urban extension with open space at 9.7 m² per person. MPD-2021 has not given any thought to the recreational facilities for senior citizens and children who need the spaces more. The standards are only quantity oriented and not quality (Table 3)

Table 3 Increase in hierarchy of urban green spaces in MPDs (1962, 2001, 2021)

Level	Hierarchy	MPD-1962	MPD-2001	MPD-2021
Shown in land-use plan (Master Plan)	Regional park	Yes	Yes	Yes
	City park	No	Yes	Yes
	District park	Yes	Yes	Yes
	Community park	No	No	Yes
Part of the residential land use	Neighborhood park	Yes	Yes	Yes
	Housing park	Yes	Yes	Yes

Source MPDs-1962, 2001, 2021 (Delhi Development Authority, 1962, 1981, 2010a, b)

(b) **Development stages of the child** (Child Development Institute, 1999; SKIP, n.d.)

The child in his various growth stages undergoes different types of development like physical, emotional, cognitive, and psychological. This section tries to understand the different types of development in children. Biological and psychological changes that take place in human beings between birth and end of adolescence pertains to child development. As the individual grows by age, he or she progresses from dependency to increasing autonomy. Based on the growth stages, the development periods are classified as: (1) infant and toddler (ages 0–2 year), (2) early childhood (ages 3–6 years), (3) middle-age childhood (ages 7–12 years), and (4) adolescence (ages 13–18 years).

(c) **Requirements of the children** (Child Development Institute, 1999)

The needs of the children vary with the various growth stages undergoes. The needs are as follows:

- Infant and toddler (Ages 0–2 year): At this stage, the child depends mostly on their parents for their emotional and physical needs. Child’s attachment to caregivers and other significant people in their life is important to their healthy emotional and psychological development. They

have a determined understanding of their world. They need predictable care giving and routines. They also require nurturing and emotional connections.

- Early childhood (ages 3–6 years): At this stage, child remains mostly with their mother and elders within the home environments. Their movements are generally in and around the house. They prefer to ride their tricycles near their houses. The child wrapped up in itself and is interested in individuals play. The activity does not change between a boy and a girl in this age group. The mobility is very low and passive in nature.
- Middle-age childhood (Ages 7–12 years): At this age, the child starts expanding their social network outside their family. Becoming more independent, their focus is more on their friends and the world outside their family. However, they still need emotional support and guidance of their family. They remain near their home environment and take part in mini cricket, riding bicycles, ball games, running skipping and see-saw.
- Adolescence (ages 13–18 years): They are becoming more independent. They involve themselves in selected activities such as flying kites and playing cricket, football, volleyball, basketball, badminton, table tennis, and tennis. They may also be concerned about having not much time for friends or activities.

3.4 Senior Citizen

(a) Definition of a Senior citizens

National Human Rights Commission defines “Old-Age” as associated with declining faculties, both mental and physical, and reduced social commitments (including sports participation). In India, the people who attained the age of sixty years and above are defined as elderly for availing old-age benefits (Commission, 2011).

In Germany, Prince Bismarck, the chancellor of the German Empire, announced 65 as the age for citizens’ participation in the pension plan. On the other hand, many Japanese believe that the elderly should be characterized by loss of functional independence and defined persons over 70 or 75 years of age as senior citizens (Hajime Orimo, 2006).

In the USA also, people who are more than sixty years of age are usually counted as senior citizens. They often have limited capabilities and are more susceptible to disease, syndromes, and sickness in comparison to younger adults. They also face other social problems such as retirement, loneliness, and agism (Eryn Pleson, 2014).

(b) Requirements of the senior citizens

In this age group, the males and females mostly involve themselves in passive recreation like walking, looking after kids, relaxing, gossiping, and so on. (Kiran, 2014) Some of them are jogging, running, exercise, etc. Some of them not able to walk, talk, and hear properly (Takano, 2002).

3.5 Neighborhood

Often the term “neighborhood” is used to describe the subdivisions of urban settlements. It is a vicinity in which people reside and can access their basic and daily facility within walkable distance. Facilities such as school, commercial area, recreational areas, and streets connecting them.

(a) Clarence Arthur Perry, New York Planner

Clarence Arthur Perry was the first planner given a definition of the neighborhood unit’ in 1929. Perry described six basic features of good neighborhood design which were organized around several institutional, social, and physical design ideals (Perry, 1929). These are:

- Major arterials and through traffic routes should provide boundaries of the neighborhood and should not pass through residential neighborhoods.

- Use of cul-de-sacs, curved layout and light-duty surfacing for designing and constructing interior street to encourage a quiet, safe, and low-volume traffic movement and preservation of the residential atmosphere.
- Neighborhood population should support its elementary school.
- The centrally located elementary school should be the focal point of the neighborhood, along with other institutions that have service areas coincident with the neighborhood boundaries.
- The neighborhood radius should be maximum of one quarter-mile, thus precluding a walk of more than that distance for any elementary school child and
- Shopping districts should be sited at the edge of neighborhoods preferably at major street intersections.

In the below concept (Fig. 1) Clarence Perry had taken 400 m or one quarter-mile radius of walking distance for an elementary school child. But it is concluded from previous section that there are factors affecting the provisions of green space and walking roads are not straight (i.e., walking roads are distance not displacement), so the 200 m radius of walking distance is taken up for this study.



Fig. 1 Neighborhood concept by Clarence Perry (1929). Source http://www.itpi.org.in/files/jul10_11.pdf

4 Methodology and Data Collection

This section of paper is talking about selection of area with some criteria for detailed study of neighborhood-level parks. The type of data to be collected and format of the survey also discussed. First of all two areas are selected as per the following criteria.

4.1 Criteria for Selection of Case Study Areas

The study areas have been selected for the detailed analysis on the basis of following criteria:

- Type of development: For this study, two types of development at neighborhood level have been taken. These are areas having (1) plotted housing: Dwarka sector-8 (2) group housing: Dwarka sector-6.
- Age of development: The neighborhood should be at least 2 years older, so that individuals experience the problems and share them.
- Type of structure: The neighborhood which have different type of structure, i.e., high rise and low rise are selected for the detailed study. (1) High rise: Dwarka sector-6 and (2) low rise: Dwarka sector-8.

4.2 Methods Used to Collect Data

The study is based on a quantitative as well as a qualitative approach. Secondary data such as maps, plans, and population of the study area is collected from different organizations' Web site and office. Primary data through primary survey is collected for the particular research study. There were three types of primary survey: (1) observation survey, (2) park user survey, and (3) residents survey. There are three parameters used for the calculation of urban green spaces usage: (i) number of users, (ii) length of stay (time spent), and (iii) frequency of visits. There are three parameters used for calculating the usability of the selected parks: (i) ease of accessibility, (ii) provision of facilities, (iii) maintenance. Data is collected for weekday as well as weekend for comparison, data of three consecutive Fridays and three Sundays in the month of February 2015. Finally, a comparative analysis has been done for both the sectors.

To determine the utilization of green spaces in Delhi, the main emphasis is given to the primary surveys. Secondary data was collected to understand the existing green spaces system in Delhi.

- Secondary data: Secondary data was collected to understand the existing hierarchy of green spaces in Delhi, their standards and factors determining these standards, and

also information about green spaces areas for hierarchy, and information about administration of the green spaces was collected through secondary sources.

- Primary data: As the study concentrates more on the primary sources of data, so following types of surveys were conducted to gather information regarding design characteristics and usage pattern of neighborhood green spaces.
- Observation survey: To study the design characteristics of various green spaces by senior citizens and children.
- User survey: To study the usage pattern of various green spaces by senior citizens and children.
- Residents survey: to study the household characteristics. This survey was conducted in different study area. The selection of households was done by the random sample survey. The data collected through this survey was regarding the household characteristics, their leisure time activities, their habits of green space utilization.

Dwarka sector-6 and sector-8 have been selected for detailed study which have group and plotted housing, respectively (Fig. 2).

4.3 The Sample Size

In neighborhood concept, Clarence Perry had taken 400 m or one quarter-mile radius of walking distance for elementary school child. But it is concluded from previous section that there are factor affecting the provisions of green space and walking roads are not straight (i.e., walking roads are distance not displacement), so the 200 m radius of walking distance is taken up for this study. Population data within 200 m radius of park is collected and then 2% sample size is taken up for the residents survey.

4.3.1 Dwarka Sector-6, Neighborhood Park

- Population near to the park: 3000.
- Residents' survey sample size: The survey of the residents living within 200 m radius of walking distance around the park has been done for detailed study. The sample size is 2%.
- Users' survey sample size: The survey of users coming within particular park. The sample size is approx. 50%.

4.3.2 Dwarka Sector-8, Neighborhood Park

- Population near to the park: 1500.
- Residents' survey sample size: The survey of the residents living within 200 m radius of walking distance around the park has been done for detailed study. The sample size is 2%.

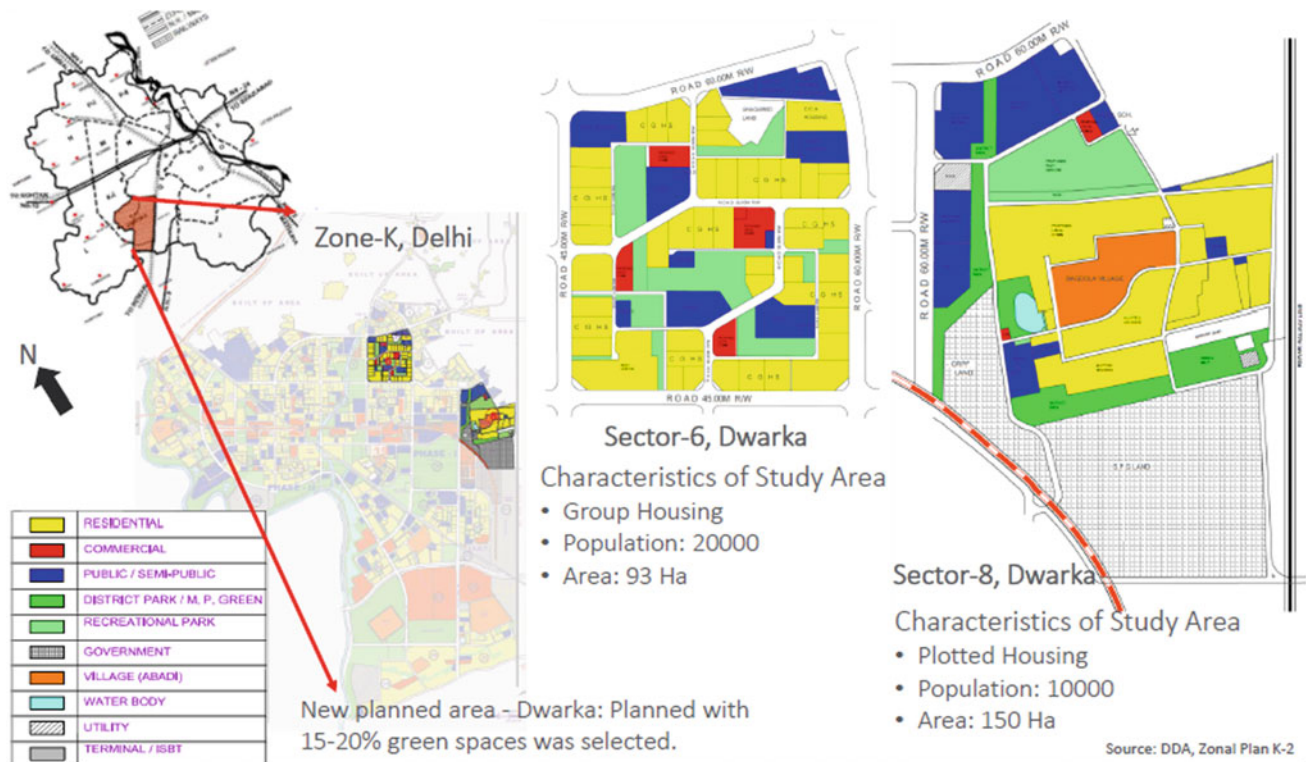


Fig. 2 Data collection and selected case study. *Source* DDA, Zonal Plan K-2 (Delhi Development Authority, 2010a, b)

- Users' survey sample size: The survey of users coming within particular park. The sample size is approx. 50%.

5 Data Analysis

There were three types of primary survey: (1) observation survey, (2) park user survey, and (3) residents survey. There are three parameters used for the calculation of urban green spaces usage: (i) number of users, (ii) length of stay (time spent), and (iii) frequency of visits. There are three parameters used for calculating the usability of the selected parks: (i) ease of accessibility, (ii) provision of facilities, and (iii) maintenance. Data is analyzed by giving weightage to each of the parameters according to its accessibility, availability, and condition.

5.1 Observation Survey

In observation survey ease of accessibility, presence and lack of facilities, maintenance of facilities, and land-use around the parks are observed. These facilities are plants/trees, shed, dust bin, jogging tracks, toilets, water, etc. A comparative analysis has been done for both the parks.

5.1.1 Comparison of Ease of Accessibility of the Parks

These are facilities available and provided around the parks (Table 4).

The ease of accessibility in sector-6 and sector-8 park is 58% and 16%, respectively.

5.1.2 Comparison of Presence of Facilities in the Parks

These are facilities available and provided within the parks (Table 5).

The availability of facility in sector-6 and sector-8 park is 58% and 16%, respectively. The comparison of facilities provided shows that sector-6 has major issues of lightening, water only and but, it is better than sector-8 park. Although sector-8 has no other facility, it has the facility of water supply. One of the major issues in sector-8 park is of safety, reason being the drunkards visit every day.

5.1.3 Comparison of Maintenance of Facilities in the Parks

These are facilities available and provided within the parks (Table 6).

The maintenance of facilities in sector-6 and sector-8 park is 58% and 16%, respectively. The weightage percentage indicates that neither of parks maintained fully, there is a

Table 4 Comparative table of ease of accessibility of the parks

	S. no.	Facilities	Neighborhood parks		Maximum weightage
			Sector-6	Sector-8	
Ease of accessibility	1	Ramp	No (0)	No (0)	2
	2	Gates	Yes (2)	Yes (2)	2
	3	Footpath availability	Yes (2)	No (0)	2
	4	Footpath walkability-surface	Yes (2)	No (0)	2
	5	Footpath cleanliness	No (0)	No (0)	2
	6	Footpath height	Not adequate (1)	No (0)	2
	7	Total weightage		7 (58%)	2 (16%)

Source Primary Survey, 2015

Note Number in bracket shows the weightage given according to the ease and availability of facility around the parks. 2—good, 1—satisfactory, 0—bad)

Table 5 Comparative table of presence of facilities in parks

	S. no.	Facilities	Neighborhood parks		Maximum weightage
			Sector-6	Sector-8	
Status of facilities	1	Plants/trees	Not adequate (1)	Not adequate (1)	2
	2	Grass	Yes (2)	No (0)	2
	3	Shed	No (0)	No (0)	2
	4	Water	No (0)	Yes (2)	2
	5	Dustbins	Yes (2)	No (0)	2
	6	Toilets	Yes (2)	Yes (2)	2
	7	Lighting	No (0)	No (0)	2
	8	Benches	Not adequate (1)	No (0)	2
	9	Jogging tracks	Yes (2)	No (0)	2
	10	Swings/slider	No (0)	No (0)	2
	11	Total		10 (50%)	5 (25%)

Source Primary Survey, 2015

Table 6 Comparative table of maintenance of facilities in parks Sector-6 and 8, 2015

	S. no.	Facilities	Neighborhood parks		Maximum weightage
			Sector-6	Sector-8	
Maintenance of facilities	1	Plants/trees	Less maintained (1)	Less maintained (1)	2
	2	Vegetation	Less maintained (1)	No (0)	2
	3	Shed	No (0)	No (0)	2
	4	Water	No (0)	No (0)	2
	5	Dustbins	Yes (2)	No (0)	2
	6	Toilets	No (0)	Yes (2)	2
	7	Lighting	No (0)	No (0)	2
	8	Benches	Less maintained (1)	No (0)	2
	9	Jogging tracks	Less maintained (1)	No (0)	2
	10	Swings/sliders	No (0)	No (0)	2
	11	Overall cleanliness	Less maintained (1)	Less maintained (1)	2
	12	Total weightage		7 (31%)	4 (18%)

Source Primary Survey, 2015

lack of maintenance in both the parks. The comparison of maintenance of facilities shows that, sector-6 is again better than sector-8 in terms of facility maintained. The reason is that sector-8 is not provided with those facilities.

5.1.4 Total Weightage of All the Above Three Parameters

These are facilities available and provided within the parks (Table 7).

5.1.5 Land use Around Both the Parks

Sector-6 park (Fig. 3) is surrounded by residential, commercial and semipublic land use. Whereas sector-8 park (Fig. 4) is surrounded by residential and another proposed playground.

5.2 Park User Survey—A Comparative Analysis

The usage analysis consists of data collected on number of users, age group of users, time spent in the park and frequency of using the park.

5.2.1 Total Number of People Using Park (All Age Group)

The number of users in the given green spaces varies. Well-connected sector-6 park is used more as compared to sector-8 park. In both the parks, user number is higher at the evening time and low in the afternoon time. Although it is weekend the maximum number of users (all age group) is 93 and 51 only (Fig. 5).

5.2.2 Age Group of People Using Park (All Age Group)

The age group of users using the open area varies. The sector-6 park is mostly used by senior citizens (Fig. 6).

5.2.3 Time Spent at the Park (Minutes) (Only Senior Citizen and Children)

The users spent more than 1 h in both the parks (Fig. 7).

5.2.4 Frequency of Using the Park (Only Senior Citizen and Children)

Mostly users come daily in both the parks (Fig. 8).

Table 7 Comparative table of all three parameters

	S. no.	Facilities	Neighborhood parks		Maximum weightage
			Sector-6	Sector-8	
Usability	1	Ease of accessibility ramp	7	2	12
	2	Status of facilities	10	5	20
	3	Maintenance of facilities	7	4	22
	4	Total weightage	24 (44%)	11 (20%)	54

Sector-6 park has 44% usability, while on the contrary sector-8 park has 20% usability



Fig. 3 Land use around the park in sector-6. Source Secondary and Primary Survey, 2015

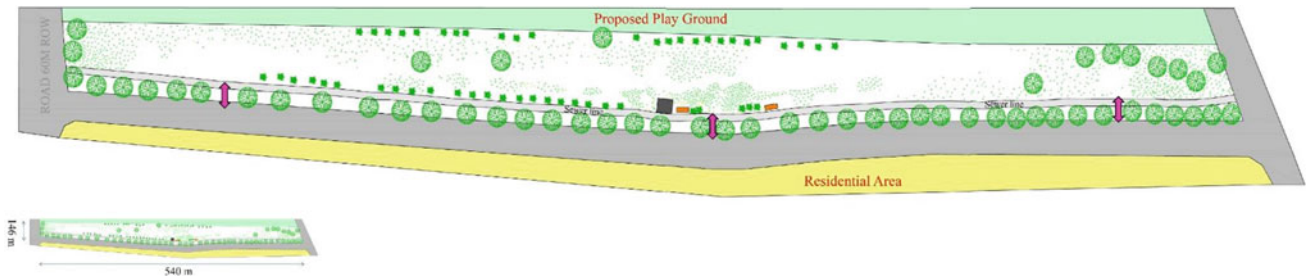


Fig. 4 Land use around the park in sector-8. *Source* Secondary and Primary Survey, 2015

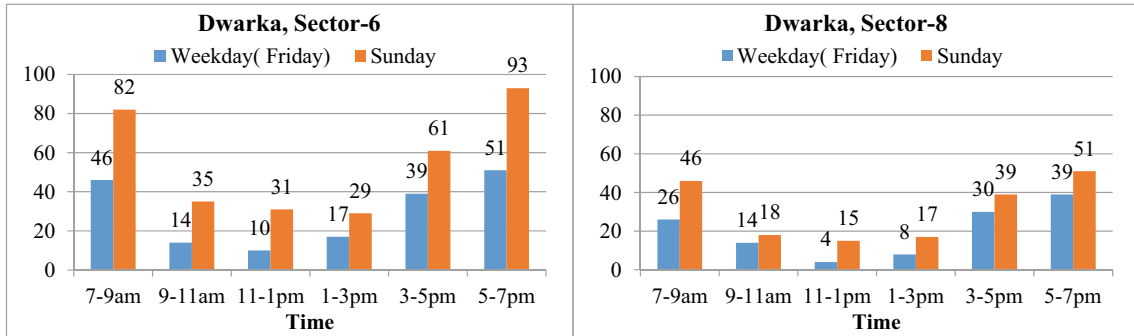


Fig. 5 Total number of people using park, 2015. *Source* Primary Survey, 2015

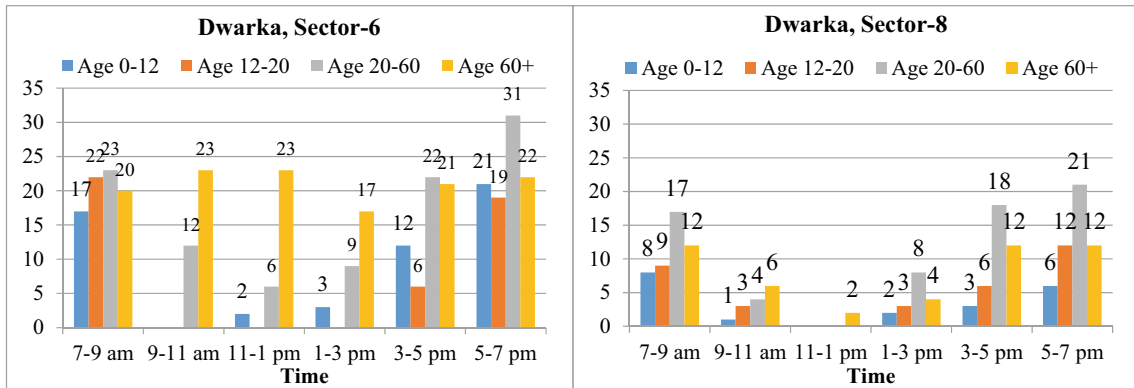


Fig. 6 Age group of people using park, 2015. *Source* Primary Survey, 2015

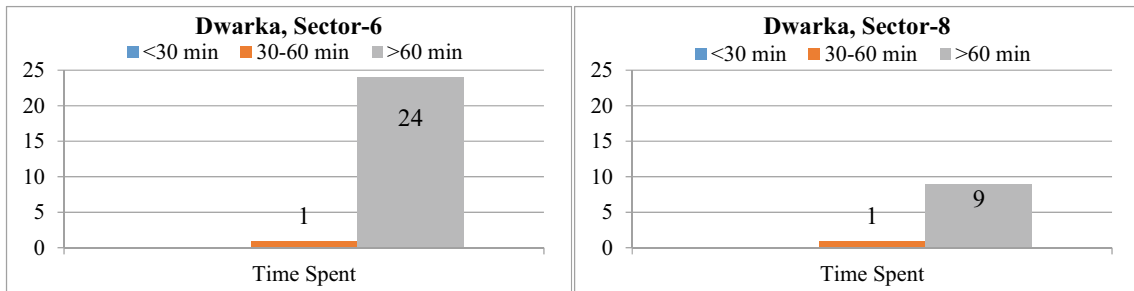


Fig. 7 Time spent at the park. *Source* Primary Survey, 2015

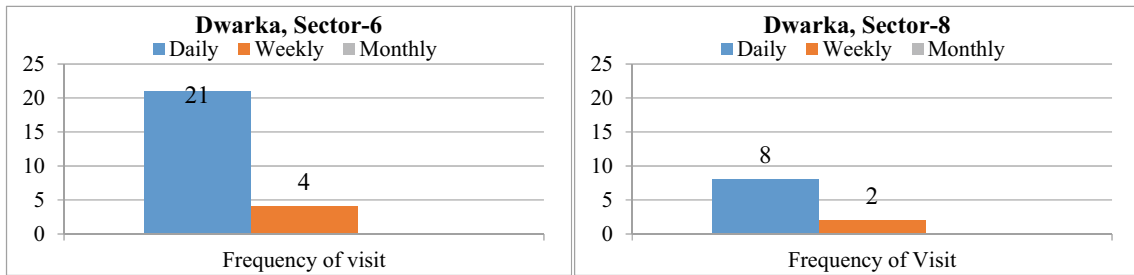


Fig. 8 Frequency of using the park. Source Primary Survey, 2015

5.3 Residents Survey

From residents survey, it is found that out of 3000 population 20% are children and 12% are senior citizens in sector-6 case. On the other side in sector-8, out of 1500 population, 21% are children and 12% are senior citizens as shown in Fig. 9.

5.3.1 General Characteristics and Population of the Study Areas

From the user survey, it is noticed that out of 3000 population only 3% area park users in sector-6 case. While in case of sector-8 out of 1500 population only 4% area park users and rest all area non-users.

5.3.2 Activities Performed at the Park (All Age Group)

The number of users for “walking” activity is highest for both the study areas (Fig. 10).

5.4 A Summary of Analysis of Study Areas

Characteristics of the study area, neighborhood park and land use around it are detailed in below Table 8. Now we know that population within 200 m radius of sector-6 park is 3000 and the population within 200 m radius of sector-8 park is 1500. Secondly population of children and senior citizens is also collected within 200 m radius of both parks which is also detailed in Table 8.

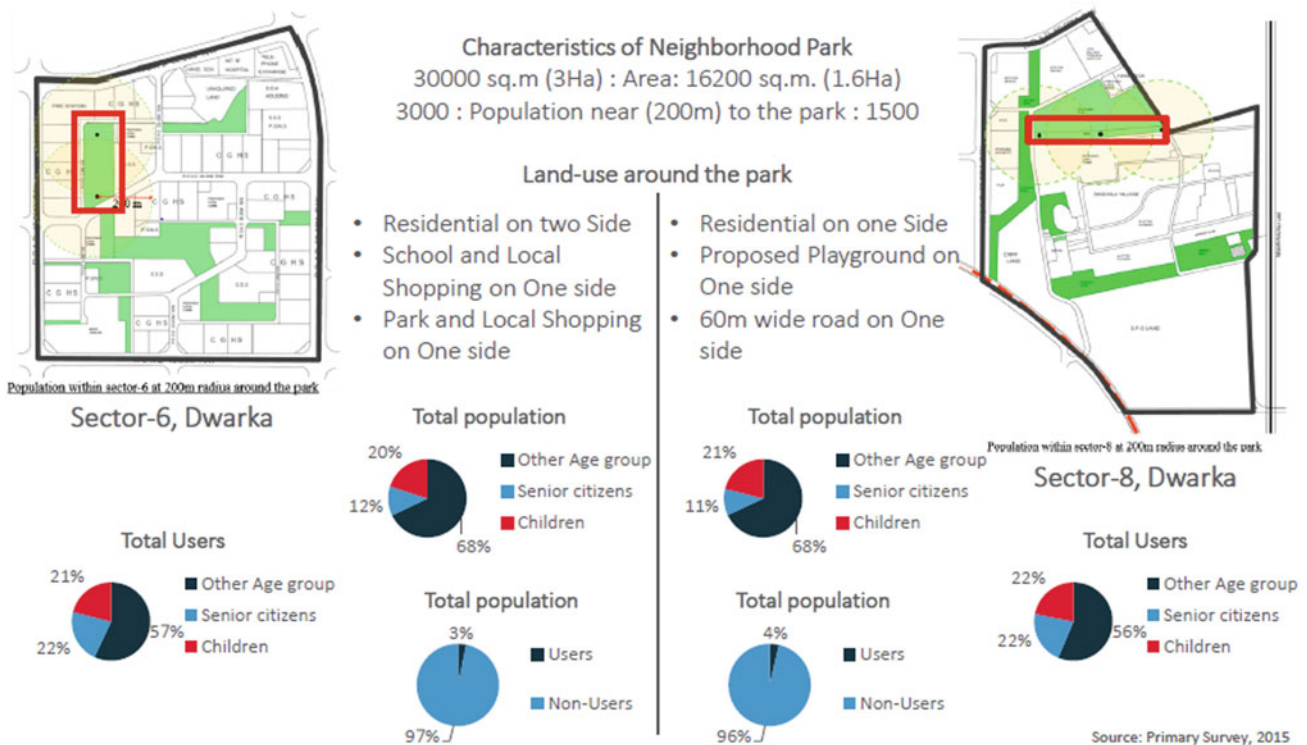


Fig. 9 Comparison of total population, total user, and division of users. Source Primary Survey, 2015

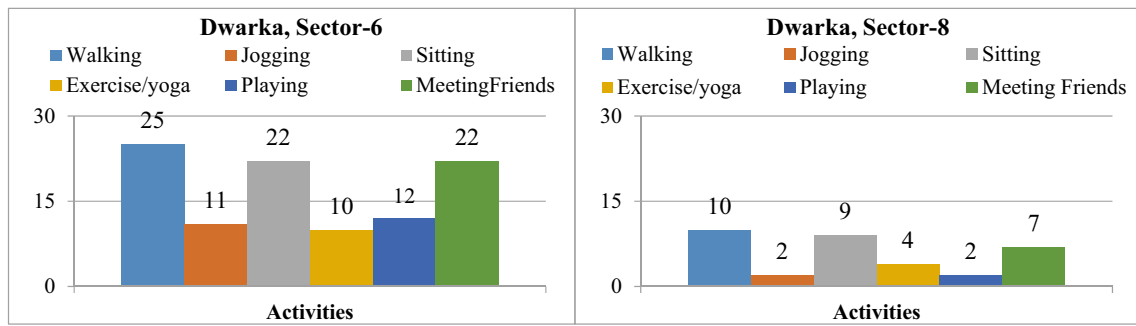


Fig. 10 Activities performed at the park, 2015. Source Primary Survey, 2015

5.4.1 General Characteristics, Usage, and Usability of Both the Study Areas

The maximum number of people using the park at a time (in two hours) is approx. 100 (3.3% of 3000) in sector-6 and 55 (3.6% of 1500) in sector-8. Usage of the parks in both sectors is almost 4%, which is very low.

5.4.2 Comparison of Aspects and Its Issues in Neighborhood Parks

People are using these parks for different activities, even facility is not provided. The usage of parks depends on the

facility provided, safety, development pattern, and land use around it (Table 9).

6 Results and Finding

6.1 Site-Specific Issues and Problems

Out of total users, almost 20–25% park users are senior citizens and children Fig. 9. Out of the total population around the park 20–25% are children and 10–15% are senior

Table 8 General characteristics of both the study areas, 2015

S. no.	General characteristics	Dwarka Sector-6, Delhi	Dwarka Sector-8, Delhi
1	<i>Characteristics of study area</i>		
1.1	Type of development	Plotted housing	Group housing
1.2	Location	Sector-6, Dwarka (Zone: K-2)	Sector-8, Dwarka (Zone: K-2)
1.3	Area (ha)	93	150
1.4	Population	20,000	10,000
2	<i>Characteristics of neighborhood parks</i>		
2.1	Area	30,000 m ² (3 ha)	16,200 m ² (1.6 ha)
2.2	Dimension	100 m × 300 m	540 m × 30 m
3	<i>Land use around the park</i>		
		<ul style="list-style-type: none"> • Residential—two sides • School and local shopping—one side • Park and local shopping—one side 	<ul style="list-style-type: none"> • Residential—one side • Proposed playground—one side • 60 m wide road—one side
4	<i>Population</i>		
4.1	Population near to the park	3000	1500
4.2	Senior citizen population	0.12 × 3000 = 360 (it is concluded from primary survey that 12% population is of senior citizens)	0.11 × 1500 = 165 (it is concluded from primary survey that 11% population is of senior citizens)
4.3	Children population (0–12 years)	0.20 × 3000 = 600 (it is concluded from primary survey that 20% population is of children)	0.21 × 1500 = 315 (it is concluded from primary survey that 21% population is of children)
5	<i>Usage of parks</i>		
5.1	Total maximum number of users (all age group)	100 (3.3% of 3000)	55 (3.6% of 1500)

(continued)

Table 8 (continued)

S. no.	General characteristics	Dwarka Sector-6, Delhi	Dwarka Sector-8, Delhi
5.2	Number of senior citizens using park	22 (6% of 360)	12 (7% of 165)
5.3	Number of children using park (0–12 years)	21 (3.5% of 600)	12 (4% of 315)
5.4	Total number of users (only senior citizens and children)	43 (4.4% of 960)	24 (5% of 480)
6	<i>Usability of parks</i>		
6.1	Ease of accessibility ramp	7 (58% of 12)	2 (16% of 12)
6.2	Status of facilities	10 (50% of 20)	5 (25% of 20)
6.3	Maintenance of facilities	7 (31% of 22)	4 (18% of 22)
6.4	Total weightage	24 (44% of 54)	11 (20% of 54)

Source Secondary and Primary Survey, 2015

Table 9 Comparative table for aspects in neighborhood parks, 2015

S. no.	Indicators	Neighborhood parks		Remarks
		Sector-6	Sector-8	
1	Type of development	Group housing	Plotted housing	Usage varies with type of development
2	Land use of the area	Residential	Residential	
3	Area of the park	3 ha	1.6 ha	Size is varying
4	Accessibility	Three-side road, three gates Footpaths are not walkable and clean, height is more	Three-side road, two gates Footpaths are not walkable and clean, height is more	Not maintained
5	Facilities provided	Plantation	Less plantation	Both the parks are some facilities
		Dustbins	Water	
		Toilets	Toilets	
		Benches		
		Jogging tracks		
6	Activities performed	Recreation	Recreation	Parks are used different activities, even facility is not provided
		Playing	Playing	
		Sitting	Sitting	
		Walking	Walking	
		Jogging	Jogging	
		Meeting friends	Meeting friends	
		Yoga/gathering		
7	Maintenance	Partially maintained	Not maintained	Lack of maintenance
8	Nuisance	Lack of water, lightening, swings	Lack of lightening, swings	
9	User opinion	Need facilities such as water, benches, shed, swings for children and improvement in maintenance	Need facilities like safety, plantation, shed, benches, and improvement in maintenance	Maintenance is the first requirement

Source Secondary and Primary survey, 2015

Table 10 Site-specific issues and problems

S. no.	Neighborhood parks	Issues and problems
1	Sector-6	<ul style="list-style-type: none"> • Lack of ease of accessibility and connectivity • Lack of basic facilities such as drinking water, adequate benches, and lighting • Salty water is available for the plants and trees, which is not good for their survival • Lack of maintenance of facilities • Lack of other facilities such as sitting/walking and swings/sliders
2	Sector-8	<ul style="list-style-type: none"> • Lack of ease of accessibility and connectivity • Lack of basic facilities such as benches, dustbins, lighting, and grasses • Lack of maintenance of facilities • Lack of other facilities such as sitting/walking and swings/sliders • Safety is major problem, reason being drunkard come for playing cards

Source Primary Survey, 2015

citizens Fig. 9. Usage of the park is approx. 4%. Usability of park is 44% in sector-6 and 20% in sector-8 (Table 8).

7 Discussion

General recommendation for neighborhood green spaces are listed below:

- Provision of at least one entrance gate.
- Provision of ramps connecting gates and access road for a disabled user.
- Provision of basic facilities such as toilet, drinking water, and other facilities such as lighting, sheds, benches, and jogging/walking tracks.
- Provision of CCTV cameras for safety and security.
- Provision of allocated space for providing special facilities to senior citizens and children in the park.
- Providing special programs at regular intervals.
- Provision of 3–6 labors for maintenance and cleanliness of the park.

Table no. 9.4 of Master Plan of Delhi-2021 is specifying the activities permitted in the Green Belt, Regional Park,

City Park, District Park and community. It is recommended that Master Plan should also specify the activities and facilities of the neighborhood parks which is used on daily basis by the senior citizens and children. Following are the guidelines which Master Plan of Delhi should include (Table 11).

More parks can be studied and their issues and potential can be identified and allocated space senior citizens and children can be defined as per the requirement of particular Park.

8 Conclusions

The studied parks are lacking in many facilities and their maintenance; however, they have the potential of allocated space for senior citizens and children activities and the following facilities should be provided in both the parks.

- Provision of ramps connecting gates and access road for a disabled user.
- Provision of basic facilities such as toilet and drinking water and other facilities such as lighting, sheds, benches, and jogging/walking tracks.

Table 11 General recommendations

S. no.	Proposed guideline	For children	For senior citizens
1	Allocated space in the park	As per requirement	As per requirement
2	Facilities/activities such as	Playing, swings/sliders, mini-hand ball, basketball, riding cycle, and exercise.	Sitting, yoga, daily discussion, exercising, religious and cultural activities.
3	Special programs such as at regular intervals	Charitable programs, sports activities and health check-up camps, volunteering of senior citizens for maintenance of plantation in the park	

Source Concluded from Primary Survey, 2015

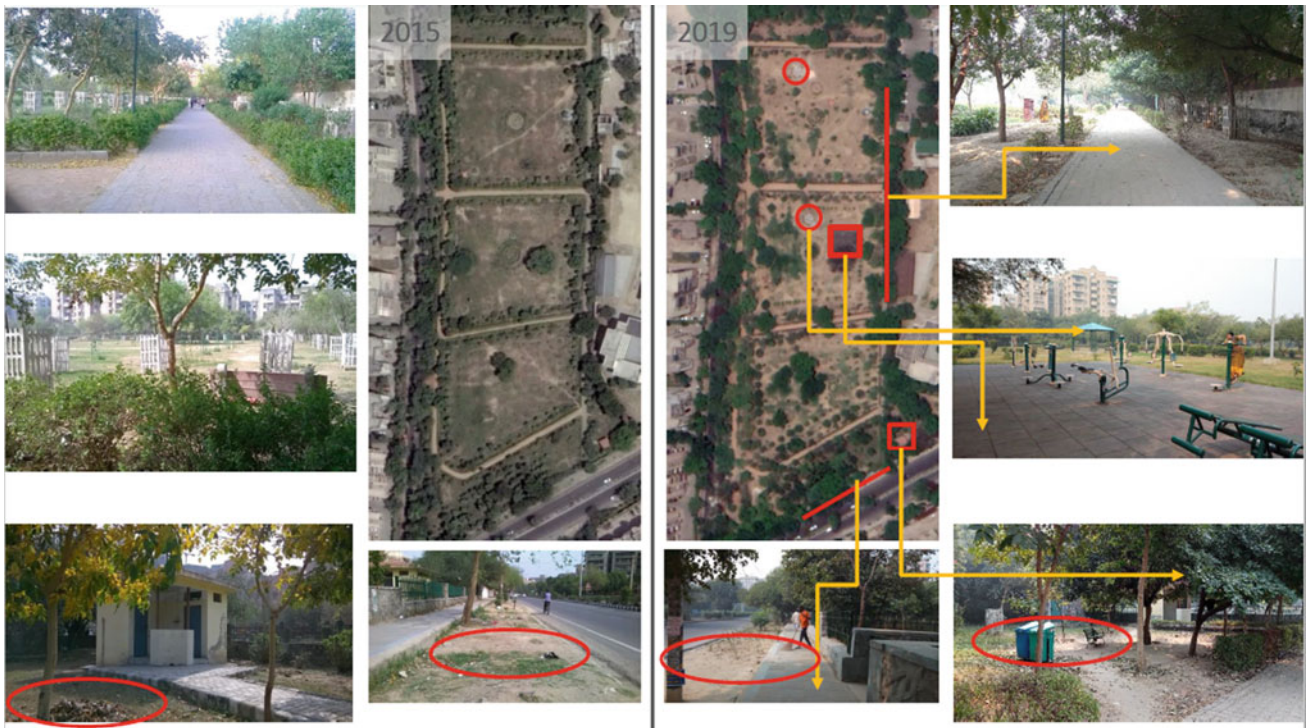


Fig. 11 Sector-6, before and now. *Source* Primary Survey, 2015 and 2019



Fig. 12 Sector-8, before and now. *Source* Primary Survey, 2015 and 2019

- Provision of CCTV cameras for safety and security.
- Provision of allocated space for providing special facilities to senior citizens and children in the park.
- Providing special programs at regular intervals.
- 15–20% park space should be given for senior citizens activities such as daily discussion, exercising, religious, and cultural activities. 20–25% park space should be given for children (0–12 years) playing facilities such as swings/sliders, mini-hand ball, and basketball.

9 Before and Now

In 2017, Master Plan of Delhi has brought a amendment, “Multi-Gym would be permissible in parks having an area of one hectare” (MPD-2021, pg. 9–9). A observation survey is again done in October 2019 to see the impact of amendment (Figs. 11 and 12).

After the amendment of the MPD-2021, more studies can be done because it has brought positive changes within and surroundings of the parks in both cases. The gym/exercise, special area for yoga, sheds, drinking water, toilets, benches, jogging tracks, and swings/sliders facilities are now added/available at both the parks due to which more children started coming in the parks.

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