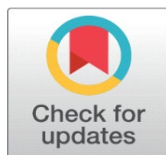


GENDERED ACTIVITY MAPPING ACROSS HIERARCHIES OF URBAN GREEN SPACES: A CASE OF DELHI

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ABSTRACT

Urban green spaces (UGS) are widely acknowledged as critical infrastructures supporting public health, environmental sustainability, and social wellbeing. However, growing evidence suggests that their benefits are not equitably experienced across gender groups. This study examines gendered patterns of use across different hierarchies of urban green spaces in Delhi using systematic activity mapping. Empirical observations were conducted in four parks located in Rohini, North-West Delhi, representing regional, district, and neighborhood-level green spaces. Activities were recorded across weekdays and weekends during morning and evening periods and categorized into active and passive uses, disaggregated by gender.

The findings reveal persistent gender disparities across all park hierarchies. Active recreational zones—including jogging tracks, open gyms, and sports courts—are consistently male-dominated irrespective of park scale. Female participation is concentrated in passive and social activities such as walking, seating, children's play, and group interaction. Women's presence increases during evenings and weekends, indicating that temporal accessibility, crowd density, and perceived safety strongly influence usage. Notably, neighborhood parks exhibit the highest degree of gender imbalance, highlighting everyday spatial exclusion rather than occasional access barriers.

The study demonstrates that overall footfall is an inadequate indicator of inclusivity; instead, selective activity-based usage patterns provide a more accurate assessment of gender sensitivity. Based on empirical evidence, the paper proposes a gender-responsive planning framework emphasizing visibility, comfort-oriented infrastructure, mixed-use zoning, and temporal flexibility. The research contributes to urban planning discourse by offering data-driven insights to support equitable and inclusive design of urban green spaces in Delhi.

Keywords: Gendered Public Space, Urban Green Spaces, Activity Mapping, Gender-Responsive Planning, Park Hierarchy, Safety Perception, Inclusive Design



1. INTRODUCTION

Urban green spaces play a vital role in enhancing urban liveability by providing ecological services, opportunities for physical activity, and platforms for social interaction. In high-density cities such as Delhi, where private open spaces are limited and environmental stress is high, public parks serve as essential everyday spaces for recreation and wellbeing. However, access to green spaces does not necessarily ensure equitable use. Increasingly, scholars argue that public spaces are socially produced environments shaped by power relations, cultural norms, and gendered practices rather than neutral physical settings [1],[2][1], [2][1],[2].

From a feminist urban perspective, cities are historically planned around male patterns of work, mobility, and leisure, often marginalizing women's everyday spatial needs [3][3][3]. Women's engagement with public space is shaped by multiple intersecting factors, including safety perception, caregiving responsibilities, social surveillance, and time availability. In the Indian context, these constraints are particularly pronounced due to entrenched patriarchal norms and widespread concerns regarding harassment and personal security [4],[5][4], [5][4],[5].

Urban green spaces are frequently promoted as inclusive environments that mitigate social inequalities. However, empirical studies increasingly demonstrate that parks often reproduce gendered exclusions rather than eliminate them [6],[7][6], [7][6],[7]. Women's use of parks is often conditional—restricted to specific times, activities, and spatial zones—while men enjoy greater freedom of movement and activity choice. Neighborhood parks, despite being the most proximate and frequently used spaces, often exhibit the strongest gender imbalance due to limited amenities, poor visibility, and lack of social presence [8][8][8].

Despite policy commitments to inclusive urban development, planning frameworks in Delhi, India largely adopt a gender-neutral approach to green space provision. Design guidelines emphasize quantitative standards such as park size and distribution, with limited attention to qualitative aspects of gender inclusion [9][9][9]. As a result, gender disparities persist even in well-maintained parks.

Activity mapping has emerged as a robust methodological tool for examining how different user groups occupy and interact with public spaces. By documenting activities across space, time, and user categories, activity mapping reveals selective usage patterns that remain invisible in aggregate visitor counts [10][10][10]. However, empirical studies applying this approach across multiple park hierarchies in Delhi remain limited.

This study addresses this gap by conducting a detailed activity-mapping analysis of four urban parks of different hierarchies in Rohini, Delhi. The objectives are to:

(i) examine gender-based differences in activity types and temporal use, (ii) identify structural and perceptual barriers affecting women's participation, and (iii) propose a gender-responsive planning framework grounded in empirical evidence.

2. LITERATURE STUDY

2.1. GENDER, SPACE, AND URBAN THEORY

The relationship between gender and urban space has been a central concern within feminist geography, urban sociology, and planning theory for several decades. Early feminist scholars challenged the assumption that cities and public spaces are neutral environments, arguing instead that they are socially produced and structured around dominant power relations, particularly privileging male experiences of work, mobility, and leisure [3],[25]. From this perspective, urban form and public space design reflect and reinforce gendered divisions of labor, time use, and social roles.

Moser's gender planning framework emphasizes that women's everyday spatial experiences differ significantly from men's due to caregiving responsibilities, safety concerns, and unequal access to resources [3]. These differences influence not only where women go but also when, how long, and for what purposes they use public spaces. Rendell et al. further argue that gendered spatial practices are embedded within architectural and planning norms that prioritize efficiency, movement, and competition—qualities traditionally associated with masculinity[25].

Public spaces, therefore, function as arenas where gender norms are reproduced or contested. Valentine highlights that women's presence in public space is often negotiated through strategies of temporal adjustment, group association, and spatial avoidance, particularly in environments perceived as unsafe or male-dominated[31]. These negotiations reduce

2.2. URBAN GREEN SPACES AND GENDER

Urban green spaces are widely recognized for their ecological, psychological, and social benefits. Parks support physical activity, stress reduction, and social cohesion, making them vital components of sustainable urban development [33],[35]. However, recent scholarship reveals that these benefits are not equitably distributed across gender groups.

Studies across Europe, Asia, and North America consistently report gendered differences in park use. Wang et al. find that men dominate active recreation spaces such as sports courts and jogging tracks, while women prefer walking

paths, seating areas, and social spaces [8][8][8]. Similar findings are reported by Sang et al., who observe that women's participation in high-intensity or competitive activities remains limited even in well-designed parks [6].

Gauvin et al. highlight that proximity and accessibility significantly influence women's frequency of park visits, particularly for neighborhood parks [15]. However, proximity alone does not guarantee inclusive use. Kajosaari et al. demonstrate that even parks with high footfall can exhibit strong internal gender segregation, underscoring the limitations of access-based metrics [20].

2.3. SAFETY PERCEPTION, VISIBILITY, AND COMFORT

Safety perception plays a central role in shaping women's engagement with urban green spaces. Multiple studies confirm that women avoid isolated zones, dense vegetation, and poorly lit areas within parks, regardless of actual crime levels [10],[11]. Instead, women prefer spaces with clear sightlines, multiple access points, and continuous social presence.

Navarrete-Hernandez et al. emphasize that crowd density and organized activities significantly enhance women's sense of safety, leading to increased park use during peak hours and weekends [10]. This explains why women's participation often rises during evenings and weekends, when parks are socially animated.

Comfort-related infrastructure—such as seating, shade, clean toilets, and smooth pathways—also plays a crucial role. Sreetheran and van den Bosch note that women's duration of stay in parks increases when such amenities are available and well-maintained [43]. Conversely, the absence of these features reinforces brief, task-oriented visits rather than sustained leisure use.

2.4. TEMPORAL DIMENSIONS OF GENDERED PARK USE

Temporal accessibility is a critical but often overlooked dimension of gender equity in public spaces. Research consistently shows that women's use of parks is time-bound, with higher participation during daylight hours and periods of high social presence [13],[21]. Early mornings and late evenings—often associated with fitness activities—remain predominantly male domains.

This temporal disparity reflects unequal leisure time distribution shaped by domestic and caregiving responsibilities [16]. In Global South contexts, where women's unpaid labor burden is higher, these constraints are particularly pronounced [36]. As a result, women often lack the flexibility to use parks during off-peak hours, reinforcing exclusion from certain activities.

Liu et al.'s spatio-temporal analysis further confirms that women's park use peaks during evenings and weekends, while men exhibit relatively stable participation across time periods [21]. These findings highlight the importance of integrating temporal considerations into park design and management strategies.

2.5. GENDER AND URBAN GREEN SPACES IN DELHI

In Delhi, gendered experiences of urban green spaces are shaped by a complex interplay of socio-cultural norms, safety anxieties, and infrastructural inadequacies. Phadke et al. argue that women's presence in public space is often morally scrutinized, leading to self-regulation and avoidance of certain spaces and activities [4]. Parks, despite being perceived as benign environments, are not exempt from these dynamics.

Mahadevia and Lathia's analysis of Delhi's planning frameworks reveals that gender considerations are largely absent from urban green space policies, which focus primarily on quantitative standards [12]. Acharya et al. find that neighborhood parks in Delhi exhibit the highest levels of gender exclusion due to poor surveillance, limited amenities, and lack of activity diversity [16].

Basu et al. demonstrate that women's park use in Indian cities is closely linked to caregiving roles, with higher participation in children's play areas and walking paths [13]. Independent use for fitness or leisure remains limited, particularly in male-dominated zones such as open gyms and sports courts.

2.6. RESEARCH GAP AND CONCEPTUAL POSITIONING

The reviewed literature establishes that gendered inequalities in urban green spaces are persistent and multifaceted, shaped by spatial design, safety perception, temporal accessibility, and socio-cultural norms. While international scholarship has advanced gender-responsive planning concepts, their application within Delhi remains limited and under-evaluated. Guduza and Tshelane (2026)

Notably, few studies compare gendered use across different park hierarchies—regional, district, and neighborhood—using empirical activity-mapping methods. Furthermore, planning evaluations continue to rely on access and footfall indicators, which mask internal inequities.

This study addresses these gaps by employing systematic activity mapping across multiple park hierarchies in Delhi. By focusing on selective usage patterns across activities, time, and space, the research contributes behavior-based evidence to support gender-responsive urban green space planning in Delhi.

3. RESEARCH METHODOLOGY

3.1. RESEARCH DESIGN AND APPROACH

This study adopts a mixed-method, empirical research design grounded primarily in systematic observational techniques, supported by spatial and comparative analysis. The core objective of the methodology is to capture gender-differentiated patterns of use across hierarchies of urban green spaces through direct behavioral evidence, rather than relying solely on perception-based or self-reported data. Such an approach is particularly appropriate for studies examining public space use, where stated preferences often diverge from actual spatial behavior [42][42][42].

The research framework is informed by feminist urban theory and gender-responsive planning principles, which argue that public spaces are socially produced and experienced differently by men and women [3],[25]. Accordingly, the methodology is designed to examine who uses the space, for what activities, at what time, and in which spatial zones, thereby enabling a nuanced assessment of gender sensitivity in urban green spaces.

3.2. STUDY AREA SELECTION

The study was conducted in Rohini, a planned sub-city in North-West Delhi, selected due to its clearly defined hierarchy of urban green spaces, mixed socio-economic profile, and well-established residential sectors. Rohini provides a representative urban context for examining everyday park use in a high-density Indian city.

Four parks were purposively selected to represent different levels of the urban green space hierarchy:

<i>S.No.</i>	<i>Name</i>	<i>Location</i>	<i>Category</i>	<i>Area (Ha)</i>	<i>Foundation Yr.</i>
1	Swarna Jayanti Park	Sector 10	Regional	70	1997
2	Chitragupta Park	Sector 14	District	12.5	1981
3	Maharishi Dayanand Park	Sector 14	Neighborhood	2.1	Early 1990s
4	G-Block Park	Sector 15	Neighborhood	1.9	Early 1990s

Figure 1**Figure 1** Four Parks- (a) Swarna Jayanti Park (Japanese Park), (b) Chitragupta Park, (c) Maharishi Dayanand Park, (d) G – Block Park

The selection criteria included park size, functional diversity, accessibility, surrounding land-use context, and availability of active and passive recreational facilities. This hierarchical selection enables comparative analysis to understand how scale, design, and context influence gendered patterns of use, as emphasized in earlier urban green space studies [6],[16].

3.3. CONCEPTUAL FRAMEWORK

The methodological framework is structured around five analytical Parameters derived from existing literature on gender and public space [1],[7],[18]:

- 1) Individual Attributes – gender, age group (approximate), and group composition
- 2) Connectivity (Accessibility & Mobility) – entry points, internal circulation, proximity to residential areas
- 3) Park Attributes – size, amenities, zoning, visibility, and maintenance
- 4) Activity Characteristics – type of activity (active/passive), intensity, duration
- 5) Perception attributes– inferred safety, crowd presence, comfort and aesthetics

This framework allows for an integrated assessment of how physical design, social context, and temporal factors interact to shape gendered park use.

3.4. DATA COLLECTION METHOD: ACTIVITY MAPPING

Base maps of each selected park were prepared using a combination of official layout plans and on-site verification. The layout plans provided the initial spatial framework, including pathways, activity areas, vegetation, and built elements. These maps were further refined during field visits to capture any recent changes, informal uses, or discrepancies between planned and actual site conditions. The finalized base maps served as the primary tool for recording and analyzing spatial patterns of park usage.

Systematic observation sessions were conducted across all parks to document user activities in real time. During these sessions, activities were plotted directly onto the base maps to ensure accurate spatial representation. For each observed activity, details such as the type of activity, approximate number of users, gender of users (male, female, or mixed groups), and precise location within the park were recorded. This method enabled a detailed understanding of both the distribution and intensity of park use.

All recorded activities were classified into two broad categories to facilitate structured analysis. Active uses included physically engaging activities such as jogging, use of outdoor gym equipment, and sports like cricket, badminton, and

volleyball. Passive uses comprised low-intensity and leisure-oriented activities such as walking, sitting, social interactions, children's play, picnicking, and nature observation. This classification helped in distinguishing between different levels of engagement and types of spatial use within the parks.

The mapped data was then analyzed to identify spatial patterns of activity distribution, user concentration, and gender-wise participation across different zones of the parks. This analysis enabled the identification of frequently used areas, underutilized spaces, and the relationship between specific activities and their preferred locations. It also provided insights into how different user groups interact with park environments.

Finally, the findings were interpreted through a gender-sensitive lens to understand variations in spatial usage and activity preferences among different genders. The analysis focused on identifying disparities in access, participation, and spatial occupation, as well as areas that may restrict or discourage inclusive use. These insights formed the basis for evaluating the effectiveness of park design in supporting gender-sensitive urban green spaces and for developing relevant planning recommendations.

3.5. TEMPORAL FRAMEWORK OF OBSERVATION

Observations were conducted across both weekdays and weekends to capture variations between routine daily use and leisure-oriented use. Two time slots were selected based on peak usage patterns identified in prior research [13],[21] - Morning: 7:00 am – 9:30 am; Evening: 5:00 pm – 7:00 pm.

These time periods are critical for gender analysis, as early mornings are often associated with fitness activities—typically male-dominated—while evenings and weekends tend to show higher female participation due to increased social presence and perceived safety [10],[15].

Each park was observed multiple times within these slots to ensure consistency and reduce temporal bias.

3.6. GENDER IDENTIFICATION AND ETHICAL CONSIDERATIONS

Gender identification was carried out through non-intrusive visual observation, categorizing users as male or female based on outward appearance. No personal interaction, photography of individuals, or collection of identifiable data was undertaken. This approach adheres to ethical standards for observational research in public spaces[42].

The study does not aim to infer personal identity or intent but focuses on aggregate behavioral patterns, thereby maintaining anonymity and ethical integrity. The limitations of binary gender classification are acknowledged; however, given the socio-cultural context and methodological constraints, this approach remains consistent with comparable studies in Indian cities [13],[16].

3.7. DATA ANALYSIS TECHNIQUES

The collected data were analyzed using descriptive and comparative methods. Quantitative summaries were prepared to examine gender distribution across:

- Activity types
- Time periods (morning/evening; weekday/weekend)
- Park hierarchies

Spatial analysis was conducted by examining clustering patterns on activity maps to identify gender-dominated zones, mixed-use areas, and exclusionary spaces. Comparative analysis across the four parks enabled identification of scale-based differences in gender inclusion.

Rather than relying on overall visitor counts, the analysis emphasizes selective usage patterns, which have been shown to be more meaningful indicators of inclusivity [7],[20].

3.8. RELIABILITY AND VALIDITY

To enhance reliability, observations were repeated across multiple days and time slots, and consistent activity categories were used across all parks. The use of standardized base maps and observation protocols minimized observer bias.

Validity is strengthened through triangulation with existing literature on gender and urban green spaces. The alignment of observed patterns with findings from prior studies supports the robustness of the methodology [6],[18],[21].

3.9. METHODOLOGICAL LIMITATIONS

While activity mapping provides rich behavioral data, it does not capture subjective experiences such as fear, comfort, or motivation. Additionally, seasonal variation and weather conditions were not examined within the scope of this study. These limitations are acknowledged and addressed in the Future Work section, where the integration of surveys, participatory audits, and GIS-based analysis is proposed.

3.10. METHODOLOGICAL CONTRIBUTION

The methodological contribution of this study lies in its hierarchy-based, activity-mapping approach applied within an Indian urban context. By systematically comparing regional, district, and neighborhood parks, the methodology moves beyond access-based evaluation and provides behavior-driven evidence for gender-responsive urban green space planning.

4. ACTIVITY MAPPING OF URBAN GREEN SPACES IN ROHINI

4.1. PRELIMINARY ASSESMENT

Urban parks across different hierarchies in Rohini exhibit varying spatial configurations, user capacities, and functional roles, which directly influence patterns of usage. Preliminary assessment indicates that regional parks, district parks and neighborhood parks, cater to distinct user groups and activity intensities. While smaller parks are often embedded within residential areas and primarily support routine, low-intensity uses, larger parks accommodate a wider range of activities, including organized sports and social gatherings. This variation necessitates a systematic approach to understanding how space is utilized across different park hierarchies.

Furthermore, preliminary observations suggest that gendered differences in park usage are not uniform across park hierarchies. Smaller parks may show limited diversity in activities and user groups, while larger parks tend to exhibit more varied but spatially segregated usage patterns. Activity mapping helps in capturing these nuances by documenting where, how, and by who spaces are used, thus revealing potential inequalities in access and participation.

4.2. SPECIFIC PARK ASSESSMENT

Swarna Jayanti Park

Swarna Jayanti Park (Japanese Park) is a regional-level urban park. Owing to its large scale, diverse activity zones, and city-level catchment, the park accommodates a wide spectrum of users and recreational practices, making it a critical case for examining how park hierarchy influences gendered patterns of access, use, and participation.

Figure 2

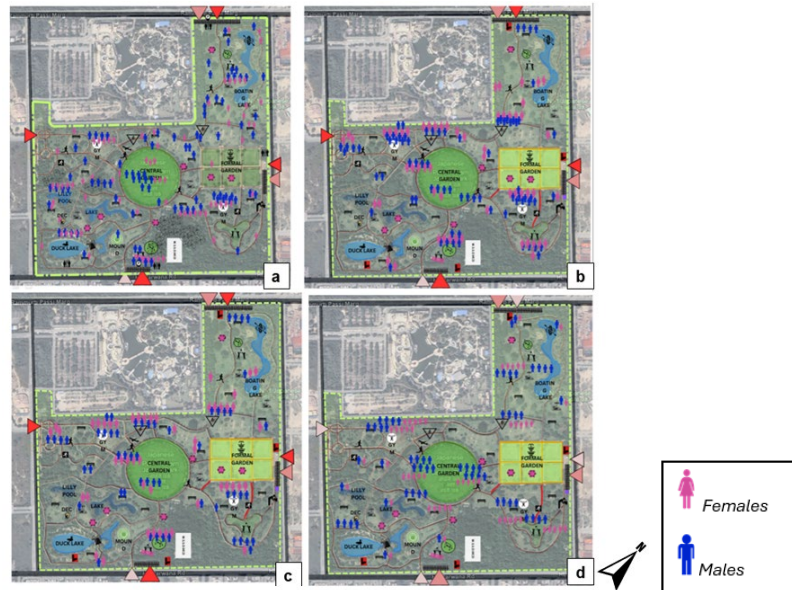


Figure 2 Gender based Activity Mapping of Swarna Jayanti Park, Rohini- a. Weekday (Morning: 7:00am – 9:00am; M – 347, F – 271), b. Weekday (Evening: 5:00pm – 6:45pm; M – 559, F – 518), c. Weekend (Morning: 7:00am – 9:00am; M – 347, F – 271), d. Weekend (Evening: 5:00pm – 6:45pm; M – 559, F – 518)

The activity mapping reveals a temporally dynamic yet relatively inclusive usage pattern. On weekdays, active uses such as walking, jogging, and cycling dominate, with overall gender participation appearing balanced; however, activity-specific differences persist, with male users concentrated in gym and sports activities, while female users are more engaged in walking and passive uses such as seating and social interaction. Evening hours witness increased footfall and a noticeable reduction in gender disparities, indicating the role of time in shaping accessibility and comfort.

Weekend patterns demonstrate a significant rise in overall usage and improved gender balance, with female participation increasing across both active and passive activities, including badminton, children's play, and picnicking. The park functions strongly as a social and family-oriented space during this period, with group-based and leisure activities gaining prominence. This shift highlights the importance of temporal availability in enabling more equitable participation, particularly for women.

Despite its inclusive potential, persistent gendered spatial patterns remain evident, with male dominance in certain active zones and comparatively lower female presence in these areas. These disparities point to underlying factors such as safety concerns, socio-cultural norms, and limitations in gender-responsive design. As a regional park, Swarna Jayanti Park demonstrates a greater capacity for inclusivity compared to lower-order parks; however, the findings underscore the need for targeted planning and design interventions to ensure equitable access.

Chitragupta Park

Chitragupta Park is a district-level urban park. Located in Sector 14, Rohini, the park primarily caters to surrounding residential communities and is characterized by moderate scale, accessible location, and a mix of active and passive recreational spaces. Its layout, comprising central lawns, looped walking tracks, interconnected pathways, and distributed activity zones, supports a range of daily-use activities and facilitates ease of movement, visibility, and accessibility for diverse user groups.

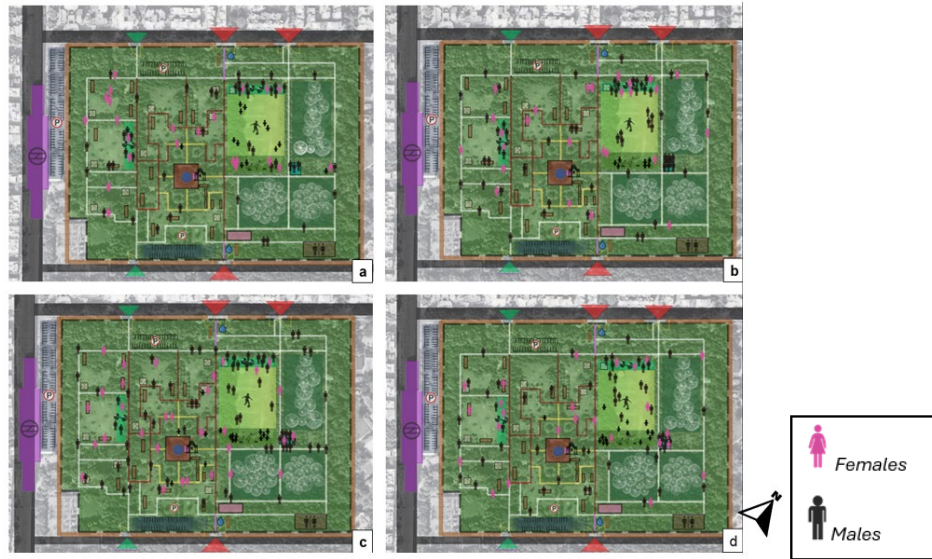
Figure 3

Figure 3 Gender based Activity Mapping of Chitrugupta Park, Rohini- a. Weekday (Morning: 7:30am – 9:30am; M – 85, F – 64), b. Weekday (Evening: 5:00pm – 6:45pm; M – 119, F – 118), c. Weekend (Morning: 7:30am – 9:30am; M – 189, F – 224), d. Weekend (Evening: 5:00pm – 6:45pm; M – 234, F – 249)

The activity mapping reveals distinct gendered patterns with moderate inclusivity, varying across time and activity type. On weekdays, active uses such as walking, jogging, gym, and sports dominate, with males showing higher participation in physically intensive and competitive activities such as gym and cricket. In contrast, females are more engaged in walking, yoga, children's play, and passive uses such as social interaction and seating. Evening hours witness an increase in overall footfall and relatively improved gender balance, although activity-based distinctions persist, with women continuing to prefer social and group-oriented spaces.

Weekend patterns indicate a significant rise in overall usage and a noticeable increase in female participation, particularly in both active and passive activities. Walking, yoga, and children's play zones are female-dominated or balanced, while social gatherings, seating, and picnicking emerge as key areas of female engagement. The park functions as a vibrant community space during this period, supporting family-oriented and group activities. However, certain activities such as cricket remain strongly male-dominated, highlighting the persistence of gendered preferences even under conditions of higher temporal availability.

Despite its accessibility and community-oriented design, clear gendered spatial and behavioral patterns remain evident. Male dominance in sports and gym areas, along with lower female participation in individual or competitive fitness activities, suggests the influence of safety perceptions, socio-cultural norms, and possible design limitations. Women's preference for group activities and specific time periods further indicates temporal and social constraints affecting their park use. As a district park, Chitrugupta Park demonstrates a moderate capacity for gender inclusivity compared to higher-order parks; however, these findings reinforce the need for targeted design and management interventions. The case highlights that park hierarchy significantly shapes gendered activity patterns, and that enhancing safety, visibility, and inclusive programming is essential to achieving equitable access across all urban green spaces.

Maharishi Dayanand Park

Maharishi Dayanand Park is a neighbourhood-level urban park. Located in Sector 14, Rohini, and spread over approximately 2.1 ha, the park primarily serves nearby residential communities. Its organized layout, consisting of looped walking tracks, open lawns, shaded areas, and accessible entry points, supports routine recreational activities and ensures ease of movement and visibility, making it a key every day-use green space.

Figure 4

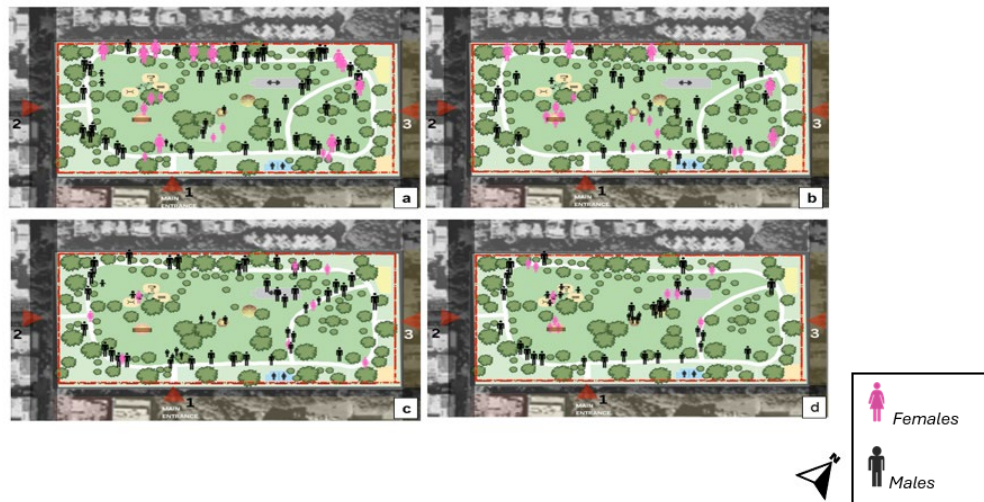


Figure 4 Gender based Activity Mapping of ChitraguptaPark, Rohini- a. Weekday (Morning: 7:30am – 9:30am; M – 32, F – 16), b. Weekday (Evening: 5:00pm – 6:45pm; M – 44, F – 45), c. Weekend (Morning: 7:30am – 9:30am; M – 52, F – 27), d. Weekend (Evening: 5:00pm – 6:45pm; M – 41, F – 36)

The activity mapping reveals limited inclusivity with pronounced gender disparities, particularly across time periods. On weekdays, morning usage is largely male-dominated in active pursuits such as walking, jogging, and gym activities, with minimal or no female participation in certain activities like jogging. In contrast, female users are more visible in children’s play and passive uses. Evening hours show a relative increase in overall footfall and improved gender balance, with women participating more in walking, kids’ play, and social activities, indicating the importance of time and social context in shaping park use.

Weekend patterns demonstrate a rise in overall usage and moderate improvement in gender balance, though disparities persist. Morning hours continue to reflect higher male participation in active uses, while evenings show more equitable engagement, particularly in walking, gym, and children’s play. Passive activities such as social gathering and seating increase significantly during evenings, reinforcing the park’s role as a community interaction space. Female participation is notably higher in group-oriented and caregiving-linked activities, highlighting the social dimension of park use at the neighbourhood level.

Despite its accessibility and community focus, clear gendered constraints in access and engagement are evident. The consistent underrepresentation of women in morning active uses and individual fitness activities suggests the influence of safety concerns, socio-cultural norms, and time-related limitations. Women’s greater presence during evenings and in group activities indicates reliance on social support and perceived safety. As a neighbourhood park, Maharishi Dayanand Park demonstrates comparatively lower gender inclusivity than higher-order parks, emphasizing that park hierarchy significantly influences gendered activity patterns. These findings highlight the need for targeted design, programming, and safety interventions to enable equitable and independent use of such everyday urban green spaces.

G-Block Park

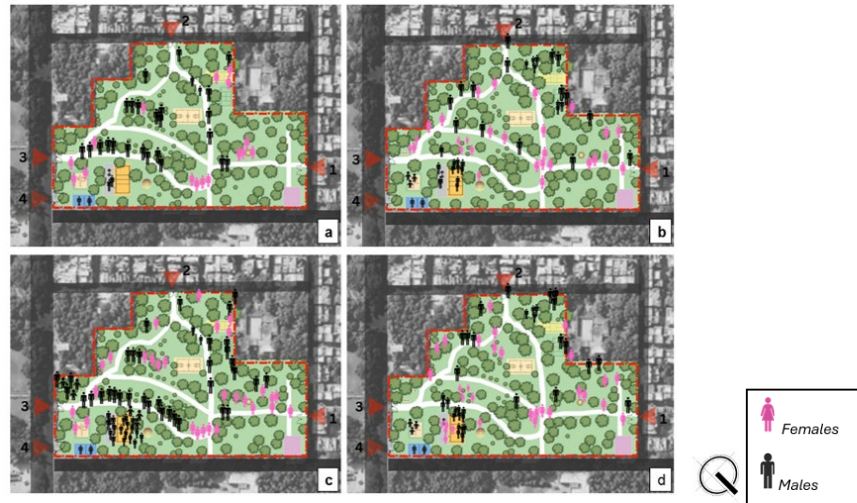
Figure 5

Figure 5 Gender based Activity Mapping of ChitraguptaPark, Rohini- a. Weekday (Morning: 7:30am – 9:30am; M – 31, F – 26), b. Weekday (Evening: 5:00pm – 6:45pm; M – 66, F – 29), c. Weekend (Morning: 7:30am – 9:30am; M – 74, F – 24), d. Weekend (Evening: 5:00pm – 6:45pm; M – 80, F – 31)

G Block Park a neighbourhood-level urban park. Situated in Sector 15, Rohini, and spread over approximately 4.7 acres, the park serves surrounding residential communities and is characterized by its organized layout, multiple sports facilities, open lawns, and accessible circulation network. Its design supports a mix of active recreation and passive leisure, with well-defined pathways and clear sightlines that facilitate ease of movement and user safety.

The activity mapping reveals pronounced gender disparities, particularly in active and sports-oriented spaces. On weekdays, morning usage is dominated by male participation in activities such as jogging, walking, and group sports, with minimal or no female presence in several athletic zones. Female users are more engaged in walking, gym, and passive activities such as seating and social interaction. Evening hours show increased overall usage, but gendered distinctions persist, with males dominating organized sports like volleyball and badminton, while females are more visible in walking, children’s play, and seated or social activities.

Weekend patterns indicate a substantial rise in park usage, yet continued gender imbalance in active recreation. Males overwhelmingly dominate physically intensive and group sports activities, particularly during morning hours, while female participation remains concentrated in walking, kids’ play, and passive or social uses. Evening periods, however, demonstrate relatively improved gender balance, especially in walking and social gathering, with the park functioning more as a communal and family-oriented space. This temporal shift highlights the role of time and social context in enabling greater female participation.

Despite its accessible design and diverse activity zones, strong gendered spatial patterns persist, with sports infrastructure largely functioning as male-dominated spaces. Female users tend to cluster in circulation paths, play areas, and seating zones, indicating a preference for safer, more socially active environments. These trends suggest the influence of safety perceptions, socio-cultural norms, and possible design limitations that restrict equitable participation. As a neighbourhood park, G Block Park demonstrates lower levels of gender inclusivity compared to higher-order parks, reinforcing the study’s premise that park hierarchy significantly shapes gendered activity patterns. The findings emphasize the need for more inclusive design strategies, diversified programming, and enhanced safety measures to support balanced use across all activity zones and user groups.

5. RESULTS, ANALYSIS, AND DISCUSSION

This section presents and critically analyzes the findings derived from activity mapping across four urban green spaces in Rohini, Delhi. The results are discussed thematically to highlight gendered activity patterns, spatial segregation, temporal variation, and the influence of park hierarchy. The discussion situates empirical observations within established theoretical and policy frameworks on gender-sensitive urban planning.

5.1. OVER ALL GENDER DISTRIBUTION ACROSS PARK HIERARCHIES

The activity-mapping results reveal that gender inclusion varies significantly across park hierarchies, confirming that park scale and functional diversity play a crucial role in shaping spatial behavior. Regional and district parks demonstrate comparatively higher gender balance, whereas neighborhood parks exhibit persistent gender exclusion, particularly in active recreational zones.

Table 5

Table 2 Aggregate Gender Participation Across Park Hierarchies				
Park Type	Park Name	Male Participation (%)	Female Participation (%)	Dominant Activity Type
Regional	Swarna Jayanti Park	52–55	45–48	Mixed active & passive
District	Chitragupta Park	56–60	40–44	Semi-active & social
Neighborhood	Maharishi Dayanand Park	65–70	30–35	Passive
Neighborhood	G-Block Park	68–75	25–32	Active

While regional and district parks approach gender parity, neighborhood parks show systematic exclusion of females, especially from active and competitive activities. This finding challenges the assumption that proximity alone ensures inclusivity, reinforcing earlier studies that highlight everyday spatial exclusion at the neighborhood scale [16],[18].

5.2. GENDERED PATTERNS OF ACTIVITY USE

A consistent pattern emerges across all four parks: active recreation spaces are male-dominated, while women's participation is concentrated in passive, social, and caregiving-related activities.

Table 3

Table 3 Gender Distribution by Activity Type (All Parks Combined)		
Activity Category	Male Users (%)	Female Users (%)
Jogging / Running	70–85	15–30
Sports Courts (Cricket, Volleyball, Badminton)	75–90	10–25
Open Gym	65–80	20–35
Walking	45–55	45–55
Seating & Social Gathering	35–45	55–65
Children's Play	30–40	60–70

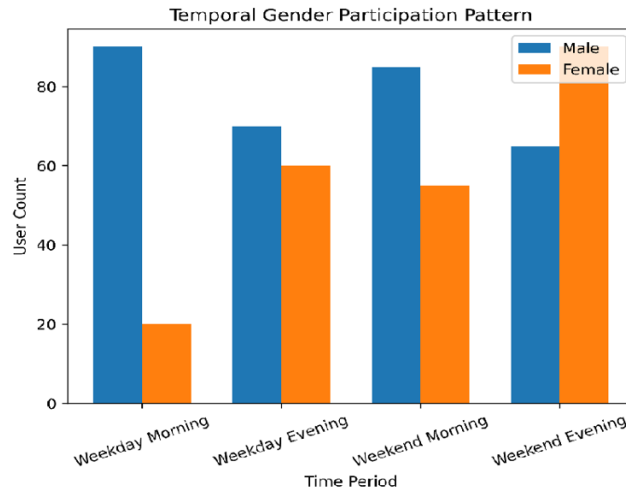
Active recreation spaces are structured around competitive, individual, and high-intensity activities, which are culturally coded as masculine [6],[37]. In contrast, female's greater presence in walking paths, seating areas, and children's play zones reflects caregiving roles and social norms governing acceptable female behavior in public spaces [13],[16].

5.3. SPATIAL SEGREGATION WITHIN PARKS

Despite apparent inclusivity based on footfall, activity mapping reveals internal spatial segregation within parks. Male users cluster around sports courts, open gyms, and jogging tracks, while females remain concentrated in walking tracks. Children play zones or open spaces in the park.

5.4. TEMPORAL VARIATION IN GENDERED PARK USE

Time-of-day analysis reveals that temporal accessibility is a critical determinant of female's participation. Morning hours are overwhelmingly male-dominated, while evenings and weekends show increased female presence.

Figure 5**Figure 5** Temporal Gender Participation Pattern (Conceptual Graph)

Early mornings are associated with fitness routines and low crowd density—conditions perceived as unsafe or socially uncomfortable for females [10],[21]. Evening and weekend peaks correspond with higher social presence, confirming that female’s use of park space is conditional rather than autonomous [15],[31].

5.5. PARK HIERARCHY AND GENDER INCLUSION

5.5.1. REGIONAL PARK (SWARNA JAYANTI PARK)

Swarna Jayanti Park demonstrates the highest degree of gender inclusivity, particularly during evenings and weekends. The park’s large size, multiple entry points, clear visibility, and diversity of activities support female participation across both active and passive uses.

Women’s notable presence in badminton, walking, and children’s play suggests that design diversity and crowd density mitigate safety concerns, consistent with Navarrete-Hernandez et al[10].

5.5.2. DISTRICT PARK (CHITRAGUPTA PARK)

The district park exhibits moderate inclusivity. While male dominate competitive sports and gym activities, females actively engage in yoga, walking, and social gathering. Weekend data shows a narrowing gender gap, highlighting the role of temporal flexibility.

However, the persistence of male dominance in sports zones indicates that gender-neutral provision does not ensure gender-neutral use [6].

5.5.3. NEIGHBORHOOD PARKS (MAHARISHI DAYANAND & G-BLOCK PARKS)

Neighborhood parks display the strongest gender exclusion, particularly during weekday mornings. Female’s use is restricted to - walking tracks, seating areas and children’s play zones. Active zones such as jogging tracks and sports courts remain almost exclusively male spaces.

This finding is critical because neighborhood parks are everyday spaces, not occasional destinations. Exclusion at this scale reflects routine gender inequality, echoing Acharya et al.’s findings in Indian metros [16].

5.6. PERCEPTION OF SAFETY, COMFORT, AND SOCIAL PRESENCE

Although direct perception surveys were not conducted, behavioral indicators strongly suggest safety-driven spatial choices. Female presence increases in areas with - clear sightlines, seating near activity zones, and continuous pedestrian movement.

Conversely, isolated corners, dense vegetation, and male-dominated sports courts exhibit minimal female participation. This aligns with Lorenc et al.'s assertion that perceived safety outweighs actual crime risk [9].

5.7. DISCUSSION: FROM GENDER-NEUTRAL TO GENDER-RESPONSIVE PLANNING

The findings collectively demonstrate that gender neutrality in design translates into gender bias in use. Parks may comply with quantitative standards yet fail to support equitable participation.

Gender neutral green spaces tend to overlook the differentiated needs, preferences, and constraints experienced by diverse user groups, particularly women and other vulnerable populations. Factors such as safety concerns, accessibility, social norms, and patterns of use influence how individuals interact with these spaces, often resulting in unequal access and participation. Consequently, spaces that appear inclusive in design may, in practice, reinforce existing gender disparities.

A gender-sensitive approach to urban green spaces addresses these gaps by recognizing the varied experiences shaped by gender, age, and social context. It emphasizes inclusive planning strategies that integrate safe and accessible connectivity, diverse and overlapping activity zones, and park attributes that enhance visibility, comfort, and usability. Beyond physical design, it also considers perception-based factors such as safety, social presence, and aesthetics, which significantly influence user behavior. By incorporating these dimensions, gender-sensitive UGS aim to create equitable, inclusive, and responsive environments that support the needs of all users, thereby contributing to more just and liveable urban spaces.

Table 4

Table 4 Gender-Neutral vs Gender-Responsive Park Design		
Parameter	Gender-Neutral Approach	Gender-Responsive Approach
<i>Individual Attributes (gender, age, group composition)</i>	Users treated as a homogeneous group; limited distinction in needs	Recognizes diverse user profiles; design responds to women, children, elderly, and group vs. solo users
<i>Connectivity (Accessibility & Mobility)</i>	Basic access provided; focus on physical entry and movement	Safe, well-lit, and visible access routes; considers last-mile connectivity and ease of movement for all users
<i>Park Attributes (size, amenities, zoning, visibility, maintenance)</i>	Standardized amenities; emphasis on size and infrastructure provision	Inclusive amenities; clear zoning with visual permeability, active edges, and regular maintenance for safety and usability
<i>Activity (type, intensity, duration)</i>	Focus on high-intensity or dominant activities (e.g., sports)	Encourages a mix of active and passive uses; supports varied durations and overlapping activities for inclusivity
<i>Perception Attributes (safety, crowd, comfort, aesthetics)</i>	Safety addressed through physical elements like lighting only	Holistic perception of safety including visibility, social presence, comfort, and aesthetic quality

This study reinforces the argument that selective usage patterns are more meaningful indicators of inclusivity than access alone [18],[20].

5.8. PLANNING AND DESIGN IMPLICATIONS

Drawing on empirical findings, a set of gender-sensitive planning strategies is proposed to enhance inclusivity in urban green spaces. First, active zones should be reconfigured to support mixed-use fitness areas rather than being limited to single-sport courts, thereby accommodating a wider range of users and activities. Second, visibility and spatial overlap must be strengthened by integrating seating areas in proximity to active zones, which can help normalize female's presence and promote passive surveillance. Third, greater emphasis should be placed on neighborhood parks, as they function at the everyday scale and are more frequently accessed by diverse user groups.

Additionally, temporal programming should be incorporated to encourage group-based activities, particularly during early morning hours, when female's participation is often more feasible. Finally, the provision of comfort-oriented infrastructure, including accessible toilets, shaded areas, adequate seating, and child-friendly amenities, is essential to support prolonged and inclusive use. Collectively, these strategies are consistent with established international frameworks, such as those advanced by UN-Habitat and the OECD, which advocate for the development of gender-responsive public spaces [1],[22].

5.9. SYNTHESIS

The results confirm that gendered use of urban green spaces is shaped by spatial design, activity structure, temporal accessibility, and social norms. Activity mapping proves to be a powerful methodological tool for uncovering hidden inequities and translating them into actionable planning insights.

6. CONCLUSION

Urban green spaces are widely positioned as inclusive public assets that promote health, social interaction, and environmental sustainability. However, this study demonstrates that physical access and provision alone do not guarantee equitable use. Through systematic activity mapping across four urban parks in Rohini, Delhi—representing regional, district, and neighborhood hierarchies—this research provides empirical evidence that gendered inequalities persist within urban green spaces, often in subtle and routine ways that remain invisible in conventional planning assessments.

The findings reveal consistent patterns of gender differentiation across activity types, spatial zones, and time periods. Active recreational spaces such as jogging tracks, sports courts, and open gyms are overwhelmingly male-dominated across all park hierarchies. In contrast, females's participation is concentrated in passive, social, and caregiving-related activities, including walking, seating, children's play, and group interaction. These patterns hold true even in parks with relatively balanced overall footfall, indicating that aggregate visitor numbers mask internal spatial exclusion.

A key contribution of this study lies in its comparative analysis across park hierarchies. While regional and district parks demonstrate relatively higher gender balance—particularly during evenings and weekends—neighborhood parks emerge as the most exclusionary environments for women. This finding is especially significant because neighborhood parks function as everyday spaces rather than occasional destinations. Gender exclusion at this scale reflects routine spatial inequality, shaped by limited activity diversity, poor visibility, and male-dominated sports infrastructure. The assumption that proximity ensures inclusivity is therefore empirically challenged.

Table 5 Parameter-wise Activity Mapping Analysis across Park Hierarchies

S. No	Parameter	Regional Park	District Park	Neighborhood Park	Key Inference
1	<i>Individual Attributes</i>	Marked gender differentiation in activity types; males dominate high-intensity uses, while females are more visible in passive and caregiving roles	Unequal participation; male dominance in active zones, with female presence largely confined to social and child-related activities	Clear gender-based participation patterns; males dominate mobile and fitness-related activities, while females are engaged in walking, seating, and caregiving, especially in low-intensity spaces	Gender significantly influences activity type, intensity, and duration across all park hierarchies
2	<i>Connectivity</i>	Higher overall usage during weekends; increased female presence corresponds with higher crowd density and perceived safety	Walking is the dominant mode; female participation increases during weekends due to improved accessibility and social presence	Female participation peaks during early morning and evening periods; accessibility and social familiarity influence usage patterns	Temporal accessibility and social presence are critical determinants of female's engagement
3	<i>Park Attributes</i>	Large-scale parks with diverse attractions; sports facilities remain male-dominated, while informal seating supports female presence	Spatial typologies encourage segregation; shaded areas and seating zones are more inclusive, while sports zones remain male-centric	Passive spaces and shaded seating areas support female participation; infrastructure remains largely male-oriented in active zones	Comfort-oriented and passive infrastructures are more effective in enabling gender-inclusive use
4	<i>Activity</i>	Active uses are predominantly male-driven; females participate more in low-intensity and group-based activities	Activity intensity drives gender clustering; men dominate active zones, while women engage in social and passive activities	Active recreation remains male-dominated; passive and low-intensity uses show relatively higher female participation	Zoning and activity intensity act as structural barriers influencing gender balance

5	Perception Attributes	Comfort, aesthetics, and safety perceptions influence female participation; passive and nature-based areas are preferred	Women tend to avoid isolated zones; perceived safety and visibility strongly shape spatial behavior	Increased female presence during socially active periods indicates reliance on crowd presence for safety; comfort and familiarity enhance engagement	Perceived safety and comfort are key determinants of women's spatial behavior and park usage
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Temporal analysis further highlights the conditional nature of female's engagement with urban green spaces. Female participation increases markedly during evenings and weekends, when social presence is higher and perceived safety improves. Morning hours—particularly on weekdays—remain predominantly male spaces, reflecting unequal leisure time distribution and persistent safety concerns. These observations align with broader literature emphasizing that women's use of public space is often negotiated through time-based and group-based strategies rather than autonomous choice [9],[15][9], [15][9],[15].

Methodologically, the study demonstrates the value of activity mapping as a behavior-based evaluative tool. By documenting who uses which space, for what activity, and at what time, activity mapping reveals micro-level inequalities that are overlooked by access-based or perception-only approaches. The emphasis on selective usage patterns—rather than overall attendance—emerges as a critical insight for assessing gender sensitivity in public spaces [18],[20][18], [20][18],[20].

From a planning perspective, the findings underscore the limitations of gender-neutral design approaches. Parks that meet quantitative standards of provision may still reproduce gendered exclusion when their internal organization prioritizes competitive, male-coded activities. Achieving gender equity in urban green spaces therefore requires a shift from neutral provision to gender-sensitive planning, grounded in empirical evidence of everyday spatial behavior.

In conclusion, this study contributes to urban planning discourse by providing data-driven, context-specific insights into gendered use of urban green spaces in an Indian city. By linking spatial design, activity structure, and temporal accessibility to observed gender disparities, the research offers a robust foundation for rethinking how urban green spaces can support equitable, confident, and independent use by all genders.

7. FUTURE SCOPE OF RESEARCH

While this study provides robust empirical insights into gendered use of urban green spaces, several avenues remain open for further research. First, future studies should integrate user perception surveys and qualitative interviews alongside activity mapping to capture subjective dimensions such as fear, comfort, and belonging. Combining behavioral and perceptual data would enable a more holistic understanding of gendered spatial experiences.

Second, GIS-based spatial analysis can be employed to correlate activity patterns with physical attributes such as lighting coverage, visibility corridors, pathway connectivity, and land-use context. Such integration would support predictive modeling of gender-inclusive design outcomes.

Third, longitudinal studies are needed to assess how gendered use patterns evolve over time, particularly in response to design interventions or policy changes. Seasonal variation, weather conditions, and life-cycle changes should also be examined to strengthen temporal understanding.

Fourth, comparative research across multiple Indian cities and settlement types—including smaller towns, informal settlements, and peri-urban areas—would enhance generalizability and reveal how class, density, and governance intersect with gender in shaping public space use.

Finally, future work should focus on institutionalizing gender-responsive indicators within statutory planning frameworks, development control regulations, and park design guidelines. Translating empirical findings into measurable standards—such as minimum visibility ratios, mixed-use activity thresholds, and time-based accessibility benchmarks—can ensure that gender equity becomes a core planning objective rather than an aspirational ideal.

CONFLICT OF INTERESTS

None.

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