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*Article*

# Urban Green Space for High-Density Contexts: A Quality-Based Performance Study of Whitworth Park

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**Abstract:** Rapid urbanisation and escalating climate pressures have intensified the demand for high-quality urban green spaces, particularly in high-density contexts where land availability for new green infrastructure is severely constrained. This study investigates the influence of spatial quality and functional layout on the usage patterns of Whitworth Park, a public park situated in a densely built urban area of Manchester, United Kingdom. Adopting a mixed-methods approach, the research integrates on-site observations, spatial zoning analysis, quantitative usage statistics, activity-type recording, dwell-time measurement, and environmental quality assessment to evaluate the park's actual performance. Findings reveal pronounced temporal, typological, and spatial variations in park usage: the afternoon emerged as the peak usage period, whereas evening visitation was comparatively lower. The Children's Play Area and the Exercise/Fitness Zone attracted the highest number of users, while the Open Peripheral Lawn Area recorded notably lower utilisation, suggesting that well-configured facility layouts are more effective in attracting visitors and encouraging prolonged stays. Additionally, areas featuring shaded seating significantly extended dwell times, underscoring the critical role of environmental comfort in shaping user experience; by contrast, the park's main traffic corridors primarily served a transit function. Entrance analysis further indicated that the east entrance on Oxford Road, benefiting from superior connectivity with surrounding urban roads, functioned as the principal access point. Drawing on these findings, the study recommends upgrading paving and shading infrastructure in accordance with Sustainable Drainage Systems (SuDS) principles and introducing small-scale garden spaces with shaded seating within adjacent communities. Through targeted spatial interventions that enhance the quality of existing parks, this research offers practical strategies for cities confronting limited land resources, growing climate challenges, and inequitable distribution of green infrastructure.

**Keywords:** urban green space; green infrastructure; park utilisation; spatial quality; climate-resilient design

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## 1. Introduction

### *1.1. Research Background*

Urban green spaces contribute to urban livability and environmental resilience [1]. In high-density urban areas, opportunities for expanding green space are limited. As urbanization progresses, developable land becomes increasingly scarce, and existing green spaces must serve a broader range of functional and social needs. Consequently, the spatial quality of parks has emerged as a key determinant of residents' engagement with public green spaces.

Whitworth Park, situated in the Moss Side area south of Manchester's city center, exemplifies these dynamics. It is surrounded by high-density residential neighborhoods, university campuses, and cultural institutions. Pedestrian flows vary markedly across locations and times of day, and activity patterns differ among user groups [2]. These variations reflect the strong influence of spatial accessibility, environmental conditions, and functional design on actual park usage.

Manchester's maritime climate significantly shapes park use. Frequent rainfall and rapid weather fluctuations constrain the duration, scope, and frequency of outdoor activities, thereby affecting how long people stay in parks, what they do there, and how often they visit. Seasonal variation further modulates overall park usage across the year. Accordingly, green infrastructure design must proactively address climatic constraints [1]. These considerations form the foundational context for this study.

### *1.2. Research Objective*

This study aims to analyze how spatial quality and functional configuration influence the usage of Whitworth Park, and to offer design insights for urban parks operating within limited land and spatial resources [3].

### *1.3. Research Question*

To what extent do the existing spatial environment and functional configuration of Whitworth Park influence user activity patterns, spatial choices, and overall park usage?

How can the quality and functionality of the green infrastructure in Whitworth Park be enhanced to improve climate resilience, ensure long-term usability, and generate transferable insights for other high-density urban parks?

### *1.4. Significance of the Research*

The significance of this study lies in bridging park quality assessment with practical design implementation. Current research on urban green spaces frequently emphasizes supply levels and spatial accessibility, yet these metrics inadequately capture real-world park usage patterns [2]. By examining Whitworth Park as a case study, this research investigates how spatial quality and functional configuration influence user behaviors and activity patterns, thereby offering concrete, evidence-informed guidance for optimizing urban park design and management.

### *1.5. Research Area*

Whitworth Park is an 18-acre public park located approximately 1 mile south of Manchester City Centre, at the southern end of the Oxford Road Corridor—a densely populated zone hosting major academic institutions, healthcare facilities, and residential communities. It functions as a vital green space within one of the city's most populous and socially diverse neighborhoods.

Established in 1890 and currently under the stewardship of the University of Manchester, Whitworth Park is bordered by Denmark Road to the north, Moss Lane East to the south, and Oxford Road to the east. The Whitworth Art Gallery is situated within the park grounds, and the site lies adjacent to the primary campuses of both the University of Manchester and Manchester Metropolitan University [4] (As shown in Figure 1).


**Figure 1.** The Whitworth Park Research Area

## 2. Literature Review

Green infrastructure (GI) has become an important concept in contemporary urban planning, widely applied to address ecological, social, and climate-related challenges associated with urban intensification. It is defined as a planning network comprising natural, semi-natural, and artificial green spaces capable of delivering diverse ecosystem services at the urban scale. In high-density urban environments, land constraints make the expansion of new parks particularly challenging [5]. Consequently, research emphasis has gradually shifted from quantifying green space area toward evaluating green space quality—specifically, how existing parks can better serve surrounding residents through thoughtful design, spatial arrangement, and adaptive management. Within this framework, spatial quality and functional configuration have emerged as critical determinants of park effectiveness.

The physical environmental quality of green infrastructure directly influences both its ecological performance and user experience. Canopy coverage, for instance, plays a key role in moderating park microclimate. Empirical evidence indicates that higher canopy coverage can reduce physiological equivalent temperature (PET) by up to 11°C, thereby extending the duration of thermally comfortable outdoor conditions [6]. Similarly, the condition of walkways, extent of vegetation coverage, and quality of seating environments collectively shape users' dwell time and activity patterns within parks. When environmental quality is suboptimal, parks are often used merely as transit corridors rather than destinations for rest or social interaction, diminishing their intended ecological and community functions. Thus, environmental quality constitutes a foundational prerequisite for the effective implementation of green infrastructure.

Beyond environmental quality, green infrastructure contributes significantly to urban climate adaptation and long-term sustainability. Well-designed green infrastructure supports flood mitigation, alleviates urban heat effects, and fosters biodiversity conservation. Permeable pavement systems, for example, have been shown to reduce surface runoff by up to 80%, demonstrating particular utility in cities with high rainfall frequency. Sustainability in this context extends beyond ecological benefits to encompass functional continuity—ensuring green spaces remain accessible, usable, and

responsive to public needs across varying seasons and weather conditions, and accommodating diverse user groups.

Functional layout of park facilities also plays a decisive role in shaping usage behavior. Research examining community parks has found that the number and diversity of on-site facilities exert a stronger influence on residents' participation in physical activity than either park size or proximity. Walkways, in particular, demonstrate pronounced impact on movement and engagement. Further analysis reveals that specific facility types—including walkways, seating, shelter structures, and designated activity zones—systematically affect both user demographics and activity typologies [4]. Observations on seating placement, provision of shade, and spatial integration indicate that such design elements strongly influence whether individuals pause, linger, interact, or simply pass through. Ultimately, park utilization is less dependent on spatial scale and more contingent upon whether facility configurations align with actual usage requirements. This perspective informs the analysis of Whittow Park and helps explain observed variations in usage intensity across its distinct spatial zones.

## 3. Methodology

### *3.1. Research Method*

This study employs a mixed-methods approach integrating qualitative and quantitative techniques to obtain comprehensive data. Spatial data analysis is combined with on-site observation to simultaneously examine park usage patterns and users' lived experiences, enabling an assessment of how spatial characteristics of urban green infrastructure influence human activity behaviors and overall park utilization [7].

### *3.2. Data Collection*

This study adopts the case study method as its primary research approach, enabling in-depth exploration of specific phenomena through analysis of contextual background, implementation processes, and outcomes of decision-making. Whitworth Park was selected as the research object and treated as a representative example of urban green space within a high-density residential community. The study further employs inductive analysis, deriving insights into the relationship between physical environmental characteristics and park usage from systematic on-site observations. Facility conditions and user behaviors were recorded to examine how spatial quality and functional layout influence patterns of park utilization [8].

### *3.3. Fieldwork Systematic Observation*

Field investigations were conducted on both weekdays and weekends, with three standardized observation periods: morning (08:00–10:00), afternoon (14:00–16:00), and evening (17:00–19:00), to examine temporal variations in park usage patterns [9].

The qualitative component of the research emphasizes the subjective and experiential dimensions of Whitworth Park through structured field assessments extending beyond quantitative user counts. This includes a systematic audit of physical environmental quality—specifically sidewalk width, pavement integrity, and path permeability—to evaluate how built infrastructure supports or constrains movement. Visual transparency and perceived safety constitute a central focus: observers identified potential blind spots and assessed lighting coverage to determine environmental security across diverse user groups [10]. Environmental variables—including weather conditions and luminous quality—were documented to capture how atmospheric and physical attributes collectively shape user experience. During each observation period, the number of users was recorded to map spatial and temporal usage density. Users were categorized by age group—children, students or young adults, adults, and older adults—and the use of assistive devices (e.g., wheelchairs, strollers) was noted to evaluate accessibility. Duration of stay was classified into intervals (e.g., 0–5 minutes, 15–30 minutes, 45–60 minutes) to analyze temporal engagement patterns. On-site activities were systematically coded into five categories: Active (A), Passive (P), Social (S), Transit (T), and Dog Walking (D).

Additionally, structured on-site observations were employed to assess environmental quality and user experience. Observed parameters included sidewalk width, road surface condition, and walkway permeability, enabling analysis of how facility characteristics influence pedestrian access and park usability. Potential visual obstructions and lighting adequacy were documented to evaluate safety perceptions among different user groups. Environmental contextual factors—such as ambient weather and lighting conditions—were also recorded to explore their influence on park atmosphere and subsequent usage behavior.

## 4. Discussion

Based on field observations, Whitworth Park has a total of 9 entrances (Figure 2). Among them, 5 entrances are located on the east side of the park, close to Oxford Road. There are two entrances on each side of Denmark Road and Moss Lane East, respectively, distributed along the north and south boundaries of the park. Since Manchester College is located on the west side of the park, no entrance is established on that side.


**Figure 2.** Entrance Location Inside the Whitworth Park

Whitworth Park was divided into several functional areas in the study for observation and recording purposes, including the Children's Play Area and Exercise Zone, and the Primary Circulation Corridor (the walking and cycling path) (Figure 3). Field observations revealed that there were 27 benches in the park, most of which were concentrated around the central roundabout (Figure 4). There is a shaded rest area on the east side, an open lawn area in the southwest, and a cluster of children's play facilities, fitness and exercise spaces in the northwest.

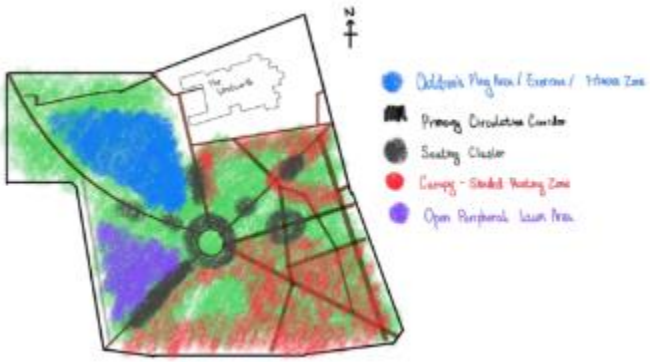


**Figure 3.** Different Activity Zones' Location in the Whitworth Park


**Figure 4.** Bench Location Inside the Whitworth Park

Observation data shows that the usage of Whitworth Park varies significantly on different dates and time periods. Behavioral observations recorded a total of 221 valid users entering the park. The average stay time was approximately 24.9 minutes, indicating that the park not only serves as a passage but is also used for longer periods of leisure and social activities (Table 4.1).

From the perspective of time distribution, the afternoon is the period with the highest usage frequency. Whether it is a working day or a weekend, 60 users were recorded in the afternoon (Table 1). This indicates that the afternoon is usually the peak period for park activities, possibly related to more favorable weather conditions, increased free time, and the park's function as a social and leisure venue after school or work hours (Figures 5 and 6) (As shown in Figure 5, 6).

**Table 1.** Utilisation by Observation Period

| Indicators | Users N | Mean duration (min) | Total Duration Midpoint (min) |
|---|---|---|---|
| Weekday Morning | 30 | 26.83 | 805 |
| Weekday Afternoon | 60 | 26.92 | 1615 |
| Weekday Evening | 23 | 20.22 | 465 |
| Weekend Morning | 27 | 21.39 | 577.5 |
| Weekend Afternoon | 60 | 26.04 | 1562.5 |
| Weekend Evening | 21 | 22.50 | 472.5 |
| Total | 221 | 24.88 | 0 |

**Figure 5.** User Activities in Whitworth Park on a Weekday Afternoon

**Figure 6.** User Activity in Whitworth Park on a Weekend Afternoon

The number of users in the morning is relatively low. On weekdays, it is 30 people, and on weekends, it is 27 people (Table 1). This phenomenon indicates that during this period, the main activities are walking, jogging, commuting, and light leisure activities. The number of users is the lowest in the evening, with 23 people on weekdays and 21 people on weekends. The decrease in usage may be related to factors such as reduced lighting conditions, decreased sense of security, lower temperatures, and restrictions on the use of some facilities during the evening (As shown in Figure 7, 8).

**Figure 7.** User Activities in Whitworth Park on a Weekday Morning

**Figure 8.** User Activities in Whitworth Park on a Weekday Evening

The data demonstrate that Whitworth Park is mainly used as a recreational space in the afternoon. In the morning and evening, it provides for lower-intensity, more transient uses. The consistency between weekday and weekend afternoon figures also suggests that the park serves local residents and visitors in a relatively balanced manner (As shown in Figure 9, 10).

**Figure 9.** Light Conditions in Whitworth Park on a Weekday Evening

**Figure 10.** Light Conditions in Whitworth Park on a Weekend Afternoon

On weekday mornings, about 36.7% of users were active, while passive use increased to 45% in the afternoon, when users preferred sitting, resting, socialising, or relaxing (Table 2) (Figure 11). On weekday evenings, over 91% of users engaged in movement activities like walking, jogging, or commuting, showing the park mainly functions as a transit route at this time. Weekend mornings had more active use, including walking, exercise, or family activities (Figure 12). Weekend afternoons show a balance between active and passive uses.

**Table 2.** Activity Profile in Different Observation Periods

| Indicators | A - Active N | A - Active Percent | P - Passive N | P - Passive Percent | T - Transit N | T - Transit Percent | S - Social N | S - Social Percent | D - Dog Walking N | D - Dog Walking Percent | Total N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Weekday Morning | 11 | 36.67% | 4 | 13.33% | 6 | 20.00% | 5 | 16.67% | 4 | 13.33% | 30 |
| Weekday Afternoon | 21 | 35.00% | 27 | 45.00% | 2 | 3.33% | 0 | 0.00% | 2 | 3.33% | 60 |
| Weekday Evening | 10 | 43.48% | 7 | 30.43% | 4 | 17.39% | 0 | 0.00% | 2 | 8.70% | 23 |
| Weekend | 14 | 51.85% | 2 | 7.41% | 4 | 14.81% | 2 | 7.41% | 5 | 18.52% | 27 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Morning Weekend Afternoon | 26 | 43.33% | 15 | 25.00% | 6 | 10.00% | 8 | 13.33% | 0 | 0.00% | 60 |
| Weekend Evening | 7 | 33.33% | 10 | 47.62% | 4 | 19.05% | 0 | 0.00% | 0 | 0.00% | 21 |
| Total | 89 | 40.27% | 65 | 29.41% | 26 | 11.76% | 15 | 6.79% | 13 | 5.88% | 221 |

**Figure 11.** User Activities in Whitworth Park on a Weekend Afternoon

**Figure 12.** User Activities in Whitworth Park on a Weekend Morning

Table 3 shows that the Children's Play Area and Exercise Zone had the highest usage rate, accounting for 30.77%, with a cumulative stay time of 2,047.5 minutes [11, 12]. This indicates that these facilities are highly attractive to users. The usage rate of the main circular passage was also relatively high, reaching 24.43%, reflecting the important position of Whitworth Park in urban walking and the connection network. However, compared to the number of users, the total stay time in this area was significantly shorter, suggesting that the majority of users in this space mainly engaged in passing through.

**Table 3.** Utilisation by Spatial or Functional Zone

| Indicators | Users N | Users Percent | Total Duration Midpoint (min) | Percent of the user-minutes | Mean duration (min) |
|---|---|---|---|---|---|
| Children's Play Area/Exercise / Fitness Zone | 68 | 30.77% | 2047.5 | 37.24% | 30.11 |
| Primary Circulation Corridor (main walking/cycling path) (Transit users/commuters) | 54 | 24.43% | 800 | 14.55% | 14.81 |

| | | | | | |
|---|---|---|---|---|---|
| Seating Cluster | 37 | 16.74% | 1125 | 20.46% | 30.41 |
| Canopy-Shaded Resting Zone | 34 | 15.38% | 905 | 16.46% | 26.62 |
| Open Peripheral Lawn Area | 28 | 12.67% | 620 | 11.28% | 22.14 |
| TOTAL | 221 | 100% | 5497.5 | 100.00% | 24.88 |

Compared to other open spaces, the duration of stay in these two types of areas is significantly longer. Specifically, 16.74% of the users spent time in the seating area, with an average duration of 30.41 minutes; 15.38% of the users chose the shaded rest area, with an average stay time of 26.62 minutes. From the records, the usage of these spaces is not particularly concentrated, but the duration of stay is relatively higher, indicating that basic comfort conditions do have an impact on stay behavior.

The Open Peripheral Lawn Areas have the lowest usage rate, at only 12.67%. The usage of children's play areas and fitness zones is 30.77%, with an average stay time of approximately 30.11 minutes. It proves that spaces with more defined functions and a wider variety of activities are attractive to users. Such areas offer diverse activity options and create conditions for social interaction, thus being more sustainable in use. In contrast, although the peripheral lawns provide a large open green space, due to the lack of facility support, their actual usage is more often low-frequency or short-term activities [13].

The spatial structure of Whitworth Park serves both the functions of transportation and leisure. The Primary Circulation Corridor is mainly used for short-term transit activities. Shaded seating and recreational zones improve the microclimate conditions to some extent, reducing the discomfort caused by exposure to adverse weather, enabling the park to maintain a certain level of usability even in hotter or more variable weather conditions [14].

Oxford Road is the main entry point into the park, accounting for approximately 64% (Table 4). This side connects to sidewalks, bus stops, the university, and shops, so the flow of people is naturally concentrated [15]. In contrast, the north entrance on Denmark Road and the east entrance on Moss Lane East have much less usage, at 19.46% and 16.29% respectively, basically remaining as occasional entries and exits. Overall, most people enter the park from this side on Oxford Road, and the usage in the afternoon is also significantly higher (Table 5).

Based on the distribution, the differences are quite clear. The entrances close to the main roads, schools, and transportation hubs have always had relatively stable traffic flow; while the entrances located at the edge of the park, whether on weekdays or on weekends, have a significantly lower usage frequency [16]. This distribution causes the traffic flow to mainly concentrate on a few main entrances (As shown in Table 4, 5).

**Table 4.** Entrance Profile

| Indicators | Users N | Users Percent |
|---|---|---|
| Entrance beyond Oxford Road (EAST) | 142 | 64.25% |
| Entrance beyond Denmark Road (NORTH) | 43 | 19.46% |
| Entrance beyond Moss Lane East (SOUTH) | 36 | 16.29% |
| TOTAL | 221 | 100.00% |

**Table 5.** Entrance Profile in Different Observation Periods

| Indicators | Entrance beyond Oxford Road (EAST) N | EAST Percent | Entrance beyond Denmark Road (NORTH) N | NORTH Percent | Entrance beyond Moss Lane East (SOUTH) N | SOUTH Percent | Total N |
|---|---|---|---|---|---|---|---|
| Weekday Morning | 18 | 60.00% | 12 | 40.00% | 0 | 0.00% | 30 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Weekday Afternoon | 42 | 70.00% | 8 | 13.33% | 10 | 16.67% | 60 |
| Weekday Evening | 13 | 56.52% | 2 | 8.70% | 8 | 34.78% | 23 |
| Weekend Morning | 14 | 51.85% | 13 | 48.15% | 0 | 0.00% | 27 |
| Weekend Afternoon | 41 | 68.33% | 8 | 13.33% | 11 | 18.33% | 60 |
| Weekend Evening | 14 | 66.67% | 0 | 0.00% | 7 | 33.33% | 21 |
| Overall | 142 | 64.25% | 43 | 19.46% | 36 | 16.29% | 221 |

Some sections have less than ideal traffic conditions, mainly due to uneven road surfaces and localized water accumulation. While this is not a major issue in good weather, rain makes these areas difficult to navigate and requires detours. This will increase inconvenience for wheelchair users, stroller pushers, or people with mobility issues (As shown in Figure 13).

**Figure 13.** Pavement Condition in the Whitworth Park

The park has some directional signs, mainly concentrated at the entrance and key intersections, to indicate directions, routes, and opening hours. For first-time visitors, these signs are the primary reference point; otherwise, it is easy to get lost at some forks in the road (As shown in Figure 14, 15, 16, 17).


**Figure 14.** Park Identity Signage Along Oxford Road


**Figure 15.** Operational Time Regulation Signage at Whitworth Park Entrance

**Figure 16.** Controlled Access Gate and Night-Time Closure Notice Near Whitworth Art Gallery

**Figure 17.** Spatial Information and Educational Signage within Whitworth Park

## 5. Intervention

Based on the field observation results, this paper proposes two improvement measures to address certain deficiencies in the spatial quality and functional configuration of Whitworth Park. Each measure specifies the approximate location, implementation scope, management approach, and estimated cost, and is contextualized within existing UK funding and management frameworks. Although user preference data were not

collected in this study, the recommendations are grounded in observed usage patterns and supported by relevant research findings. While lighting conditions influence evening park use, observations indicate consistently low nighttime attendance—typically fewer than twenty-five individuals per visit—suggesting that limitations extend beyond illumination alone and reflect broader issues related to daytime usability, comfort, and accessibility [17]. Consequently, priority should be placed on enhancing convenience, comfort, and equitable access during daylight hours.

*5.1. Permeable Paving Upgrade and Shaded Circulation Along the Primary Circulation Corridor*

The Primary Circulation Corridor, covering approximately 2,000 square meters, exhibits signs of pavement deterioration and localized water accumulation (Figure 14). During rainfall events, these conditions impair pedestrian accessibility and pose practical challenges for elderly individuals, wheelchair users, and caregivers with strollers [18]. To address these issues, the corridor is proposed for upgrading to a resin-based permeable pavement aligned with Sustainable Drainage Systems (SuDS) principles. Additionally, three bioswales will be installed in topographically low-lying zones. These SuDS components collectively serve to attenuate surface runoff velocity, provide temporary rainwater storage, and promote natural infiltration—functions particularly suited to Manchester's high-rainfall climate.

To enhance microclimatic comfort across seasonal variations, 12 to 15 medium-sized deciduous trees—each with an estimated crown diameter of 15 meters—will be planted along both sides of the corridor. Their canopy structure is expected to deliver effective summer shading while permitting adequate solar penetration during winter months. Based on current UK market pricing for SuDS-compliant resin pavement (£100–£130 per square meter), the initial construction investment is projected at £215,000–£275,000. Tree planting costs are estimated at £3,600–£4,500, assuming £300 per tree. With an anticipated service life of approximately 15 years, the corresponding average annual expenditure falls within £14,500–£18,500. Implementation may be coordinated jointly by the University of Manchester and Manchester City Council, leveraging public funding mechanisms such as the National Lottery Heritage Fund; prior precedent exists, including a £39,700 allocation to Whitworth Park in 2011 (As shown in Figure 18).

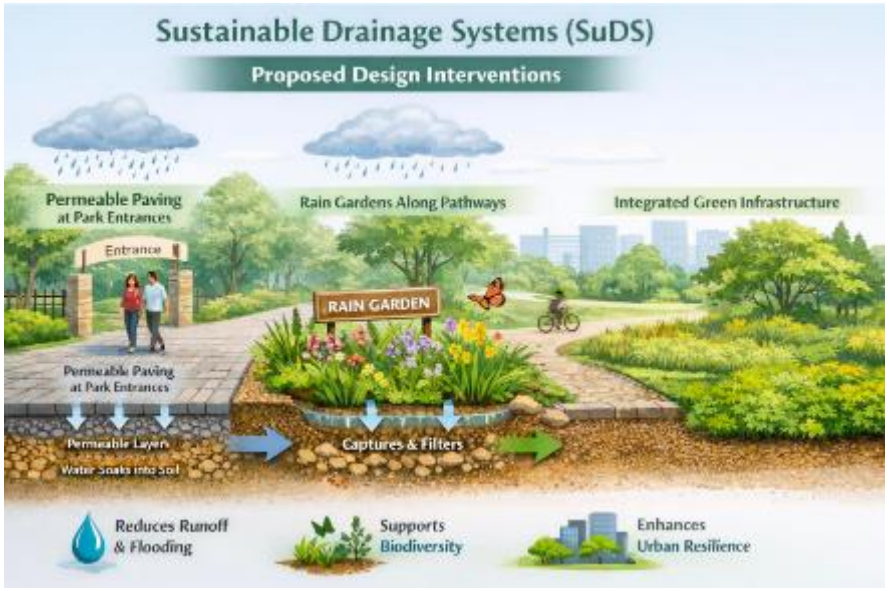


**Figure 18.** The Sustainable Drainage Systems (SuDS)

*5.2. Pocket Community Garden and Hybrid Sheltered-and-Shaded Seating on the Open Peripheral Lawn*

The Open Peripheral Lawn has the lowest utilization rate, at only 12.67%, while the Children's Play and Exercise Zone reaches 30.77% (Table 3). This pattern aligns with

findings from prior research on public open space usage. A community garden is proposed for the southwest side of the lawn, covering approximately 300 square meters, complemented by tree-lined benches and pavilions—design choices informed by empirical observations on seating configuration and user dwell time.

Comparable community garden initiatives have been established in multiple locations across Manchester, including Castlefield, Crowcroft Park Orchard, and Levenshulme. These projects received funding support through municipal neighborhood improvement programs. Preliminary cost estimates for the proposed garden range from £19,000 to £31,000, with pavilion construction accounting for £4,000 to £6,000. Over a five-year operational horizon, the average annual cost falls between £4,300 and £6,700. Funding may be secured via community development grants and dedicated horticultural subsidy schemes. Daily coordination would be undertaken by the Friends of Whitworth Park, with technical input from the University's Sustainable Development Team and oversight by the municipal park management authority.

A phased implementation strategy is recommended: initiating with small-scale, low-cost pilot activities to assess actual usage patterns and community engagement levels; subsequent phases would proceed only upon demonstration of positive uptake and sustained participation. This approach mitigates initial financial exposure and strengthens the case for continued investment (As shown in Figure 19).

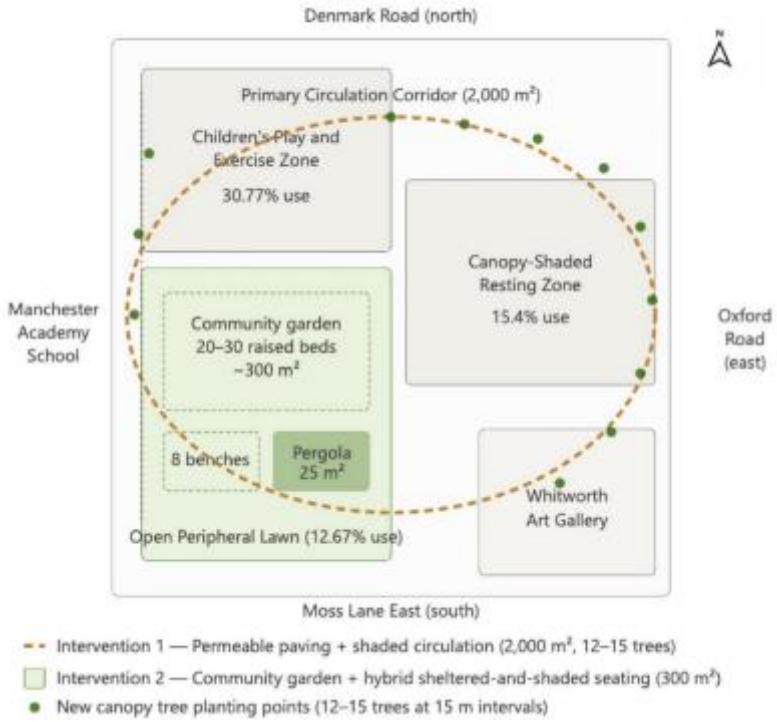


**Figure 19.** Proposed Intervention Locations within Whitworth Park.

## 6. Long-Term Vision & Global Transferability

This study's discussion on long-term sustainability and scalability centers on the method's potential applicability across diverse urban contexts. The geographical setting, climatic characteristics, and planning history of Whitworth Park reflect conditions typical of its local environment. Consequently, the findings cannot be directly generalized to other cities. However, the method offers insight into how spatial quality influences patterns of public use. From this standpoint, its evaluative framework can, in principle, be adapted to other urban green spaces—particularly in cities facing constraints such as limited land availability, constrained budgets, or the need to revitalize aging park infrastructure.

Introducing new public spaces within built-up urban areas typically requires reconfiguring existing land use patterns, which may involve modifying infrastructure layouts or adjusting transportation networks. Such interventions tend to be resource-intensive and operationally complex. In contrast, optimizing existing parks to enhance their functional performance aligns closely with the practical realities of resource-constrained urban environments. This study prioritizes spatial issues that demonstrably affect daily usage—such as inadequate shading reducing dwell time, ambiguous circulation routes hindering accessibility and intuitive navigation, and suboptimal spatial organization diminishing utilization of rest zones. Identifying these factors enables managers to focus improvement efforts on the spatial attributes most critical to user experience.

The approach also holds relevance for certain cities in the Global South. Systematic evidence indicates that green space challenges in these regions encompass not only quantitative deficits but also disparities in access equity—a pattern widely observed across many cities in Africa, Asia, and Latin America. Where land and financial resources are scarce, urban planning must maximize the service capacity of existing green spaces for broader populations. This study provides a pragmatic analytical pathway to pinpoint the spatial barriers most directly impeding the real-world effectiveness of such spaces [19].

The study explicitly acknowledges its contextual boundaries. The urban fabric, climate regime, and planning context of Whitworth Park are highly specific; thus, the design recommendations derived from it are not universally transferable. Nevertheless, empirical observation reveals that the core value of the methodology resides in its analytical logic: first diagnosing patterns of underutilization or functional limitation within the park, then investigating how those patterns relate to physical spatial configurations, and finally formulating context-sensitive enhancement strategies grounded in local conditions [20].

Looking ahead, increasing urban density continues to constrain opportunities for expanding green space through new development. As a result, attention is shifting toward maximizing the utility of existing parks. It has been noted that reconciling high-density urban development with adequate green space provision demands flexible, context-responsive strategies rather than uniform solutions. Within this evolving paradigm, a more pragmatic priority is to systematically assess where current parks fall short in meeting everyday needs—and then implement targeted, phased improvements to strengthen their role in supporting community life [4, 17].

## 7. Conclusion

This study explored the relationship between the spatial environment of Whitworth Park and its actual usage. Using field observations and spatial data analysis, it compared the usage characteristics of different areas within the park.

The observation results show that people tend to use areas with more complete facilities. The usage rates of children's play areas and sports areas are the highest, while open grasslands lacking shade and facilities are used relatively less. Rest areas with shade and seating tend to attract longer stays, indicating that environmental comfort influences the park usage experience. The main corridor primarily serves passage functions, with many users traversing without stopping. Among entrances, the Oxford Road entrance on the east side is the most frequently used, likely due to superior surrounding pedestrian connectivity and public transport access; in contrast, entrances along Denmark Road and Moshi Lane on the east side exhibit lower traffic volumes. The study also identified water accumulation and pavement deterioration on some pathways—conditions that may impede accessibility for elderly individuals, wheelchair users, and caregivers with baby carriages, particularly during rainy weather.

Future improvement measures could prioritize addressing these observable issues: enhancing drainage and accessibility along the main corridor, and upgrading facilities and user appeal in the lawn area. Given constraints on available green space and intensifying urban development pressures, optimizing the functionality and inclusivity of

existing parks represents a more pragmatic strategy than pursuing new construction. Although Whitworth Park possesses distinctive attributes, the observational and analytical approaches applied here may inform park renovation efforts in other high-density urban contexts.

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