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Rethinking pocket parks as relational infrastructure for urban micro-renewal: Spatial legibility, social inclusion, and adaptive governance in historic urban districts

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Abstract

Pocket parks are now crucial tactics for enhancing access to green space and urban micro-renewal in densely inhabited, historically layered urban districts. However, their presence does not necessarily result in meaningful use, indicating that social life cannot be ensured by physical provision alone. This study explores how perceptual experience, cultural meaning, spatial legibility, and governance conditions relate to how pocket parks are used on a daily basis. Ten pocket parks across three historic urban settings (Taiyuan and Xi'an in China, and George Town in Penang, Malaysia) were examined through a qualitative multiple-case study. Semi-structured interviews with 21 participants, document analysis, and field observations were used to gather data. The findings suggest that entry visibility, circulation clarity, environmental comfort, cultural recognition, and adaptive management are associated with user engagement. Lower levels of daily use were observed in parks that had sufficient amenities but ambiguous spatial signals, poor contextual connections, or limited management support. The findings further suggest that spatial design, user behavior, cultural interpretation, and institutional responses interact in shaping how pocket parks function as relational public infrastructures. This study develops a relational framework for pocket-park performance centered on perceptual spatial justice, cultural negotiation, and institutional flexibility, offering a more comprehensive understanding of how small urban green spaces may contribute to inclusive and socially meaningful urban renewal.

Keywords: Pocket parks; Urban micro-renewal; Spatial legibility; Environmental psychology; Social inclusion; Historic urban districts

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1. Introduction

The struggle between urban growth and the availability of accessible green space in densely populated areas has intensified with rapid urbanization (Tu *et al.*, 2021). This dilemma has prompted China to shift from large-scale rebuilding toward micro-renewal initiatives that prioritize adaptive reuse of existing urban spaces, environmental quality, and spatial enhancement (He & Li, 2024). In this regard, aging metropolitan areas often lack useful, accessible green spaces that support daily activities, social contact, and

overall well-being (Wen *et al.*, 2020).

Due to their dense development, aging infrastructure, and intricate spatial arrangements, historic urban districts are now crucial locations for urban micro-renewal (Wang & Wu, 2025; Ye *et al.*, 2021). Pocket parks are one of the many interventions that have gained popularity as small-scale public areas that can improve local liveability and repurpose residual land (Chu *et al.*, 2025). However, physical provision alone cannot account for their performance. People's perceptions, interpretations, and experiences of these locations appear to shape how they are used and valued.

Pocket parks are frequently promoted as urban green infrastructure solutions that can support recreational activities and environmental quality (Rosso *et al.*, 2022; Wu & Sharudin, 2025). Despite fulfilling planning standards and offering basic facilities, many are underutilized (Dong *et al.*, 2023; Shu *et al.*, 2022). This disparity implies that meaningful use is not always correlated with physical accessibility. According to environmental psychology studies, people's interaction with public space is impacted by perceived safety, comfort, emotional attachment, and legibility in addition to objective circumstances (Kaplan & Kaplan, 1989).

From the standpoint of spatial cognition, people's recognition and navigation of urban environments are influenced by environmental cues such as border definition, circulation clarity, and entry visibility (Lynch, 2013). These perceptual elements can have a significant impact on whether visitors feel welcome to enter and stay in pocket parks, which have constrained space and frequently complex surrounding urban settings. Similarly, whether a space is viewed as welcoming and significant is influenced by emotional and symbolic factors, such as perceived safety, maintenance quality, cultural familiarity, and social presence (Espitia *et al.*, 2025; Gehl, 2012).

Even though pocket park research has grown significantly, a large portion of the literature still concentrates on quantitative and physical variables such as park size, service radius, accessibility, and facility availability. The ways that everyday use, cultural significance, and perceptual experience influence pocket park performance have received relatively less attention, especially in historic urban areas where institutional, cultural, and geographical factors are intricately linked.

To address this gap, this study examines how governance conditions, cultural recognition, emotional safety, and spatial legibility affect how pocket parks are used in historic urban areas. Ten pocket parks in three historic metropolitan settings, Taiyuan and Xi'an in China and George Town in Penang, Malaysia, were the subject of this qualitative multiple-case research. Semi-structured interviews with 21 stakeholders, document analysis, and field observations were used to gather data. In the larger framework of urban micro-renewal, the study seeks to provide a fuller understanding of how small urban green spaces are viewed, utilized, and maintained.

Accordingly, this study addresses the following research questions:

- RQ1: How do site location and entrance visibility affect spatial intelligibility and user engagement in pocket parks in historic city areas?
- RQ2: What perceptual and functional landscape criteria enable pocket parks to operate as shared urban landscapes in historic city contexts?
- RQ3: How do emotional safety, situational readability, and cultural cues influence communicative diversity and social interaction in pocket parks?

2. Literature review

2.1. Pocket parks and urban micro–green infrastructure

Pocket parks have emerged as an important strategy for expanding urban green infrastructure in densely developed areas where large parks are difficult to establish. These small public spaces, often ranging from a few hundred to several thousand square meters, can provide accessible recreational opportunities and contribute to neighborhood environmental quality. Studies have shown that pocket parks may support physical activity, enhance local biodiversity, and improve psychological well-being by providing nearby contact with nature (Bazrafshan *et al.*, 2021; Patria *et al.*, 2025).

In recent years, scholars have increasingly examined the role of pocket parks within broader urban sustainability agendas. Research highlights that micro-scale green spaces can enhance urban resilience, mitigate heat island effects, and strengthen community interaction (Bajwoluk & Langer, 2023; Monty, 2022). In compact cities, pocket parks are often considered effective tools for increasing green space accessibility and improving environmental equity at the neighborhood level (Rigolon & Németh, 2020).

Recent studies have further emphasized the role of pocket parks as flexible elements within urban regeneration strategies, especially in historic districts where spatial constraints limit large-scale redevelopment. These spaces are increasingly understood not only as ecological resources but also as social infrastructures that support everyday public life and community interaction (Heydari *et al.*, 2022).

However, the performance of pocket parks varies significantly across urban contexts. While some become vibrant community spaces, others remain underused despite similar physical characteristics (Rigolon & Németh, 2020). This variation suggests that additional factors beyond physical design may influence how pocket parks function in practice.

2.2. Spatial legibility and environmental perception in urban public space

Spatial legibility refers to how easily people can understand and navigate an environment. Originally developed in urban design theory, spatial legibility describes the extent to which individuals can recognize, organize, and mentally represent environmental structures (Lynch, 2013). Environments that are visually coherent and cognitively understandable allow individuals to orient themselves more easily and feel more confident in navigating unfamiliar spaces.

In small urban parks, spatial legibility can influence how easily users recognize entrances, identify circulation paths, and interpret the intended functions of different areas. Research in environmental psychology suggests that environments characterized by clear spatial structure and recognizable landmarks tend to promote higher levels of user engagement and longer stays (Kaplan & Kaplan, 1989).

Recent urban design studies have also highlighted the importance of perceptual cues, such as entrance visibility, boundary definition, and path continuity, in shaping how small public spaces are cognitively interpreted. In micro-scale environments such as pocket parks, where spatial dimensions are limited, even minor differences in layout or visual accessibility may significantly affect users' willingness to enter and explore a space (Kaplan & Kaplan, 1989; Lynch, 2013).

These findings indicate that spatial legibility may be particularly important in the design and evaluation of pocket parks in dense and spatially complex urban settings. Drawing on the legibility tradition, this study therefore considers path clarity, boundary coherence, access logic, directional connectivity, and surveillance visibility as related but analytically distinguishable spatial conditions.

2.3. Emotional safety and user experience in public green spaces

Beyond spatial structure, users' emotional responses to public spaces also influence patterns of engagement. Emotional safety refers to the subjective sense of comfort, security, belonging, and social acceptance that individuals experience within an environment. When users perceive a space as emotionally safe, they are more likely to remain in the environment, interact with others, and participate in social activities.

Research on urban public spaces has consistently shown that perceived safety is shaped by multiple environmental factors, including visibility, lighting conditions, surrounding land uses, and the presence of other users (Espitia *et al.*, 2025; Gehl, 2012). Spaces that appear isolated, poorly maintained, or visually enclosed may generate feelings of discomfort, discouraging prolonged use.

Recent scholarship emphasizes that emotional safety in small urban parks is closely related to environmental cues that signal care, openness, and social legitimacy. Elements such as clear sight lines, active edges, visible maintenance, and culturally familiar design features can contribute to a sense of comfort and belonging among users (Espitia *et al.*, 2025; Gehl, 2012).

In historic urban districts, where spatial environments are often heterogeneous and socially diverse, emotional safety may play a particularly important role in determining whether pocket parks are perceived as inclusive community spaces. Emotional safety is not considered a psychological construct that can be measured directly in this study. Rather, it is analyzed using observable and discussable characteristics including emotional belonging, facility comfort, security perception, surveillance visibility, and maintenance condition.

2.4. User engagement in micro public spaces

User engagement in public spaces reflects the extent to which people actively use, inhabit, and socially interact within an environment. In the context of pocket parks, engagement can be observed through patterns of entry, duration of stay, diversity of activities, and levels of social interaction. In this study, user engagement is understood not simply as physical presence but as the outcome of continuous interaction between spatial affordances, individual perception, and social conditions.

Previous studies have often evaluated pocket park performance through quantitative indicators such as service radius, green space coverage, and facility provision. While these measures are important for planning purposes, they may not fully capture how users experience and interpret these spaces in everyday life (Rigolon & Németh, 2020).

Despite these theoretical developments, a large portion of the literature on pocket parks continues to emphasize quantitative and physical indicators such as facility availability, green space ratios, and service radius. Although valuable, this approach often overlooks

how spatial legibility, emotional safety, and perceptual interpretation influence patterns of user engagement in micro public spaces.

Understanding these perceptual and behavioral dimensions is therefore essential for explaining why some pocket parks become socially vibrant while others remain underused despite similar physical characteristics (Heydari *et al.*, 2022)

2.5. Analytical framework

The literature reviewed above indicates that pocket-park performance cannot be adequately understood through a single physical, behavioral, or social dimension. Drawing on the perspectives discussed above, this study synthesizes these perspectives into a literature-derived analytical framework comprising 19 parameters (P1–P19). The parameters cover spatial legibility and accessibility, functional and environmental conditions, cultural recognition, social interaction, user experience, and management adaptability. Together, they provide a structured basis for examining how different characteristics of pocket parks relate to patterns of use and user experience.

The 19 parameters were developed through a synthesis of established perspectives rather than adopted from a single theoretical model. Spatial parameters concerning path clarity, boundary coherence, access, and connectivity draw primarily on the literature on spatial legibility and urban perception (Lynch, 1964), while parameters concerning visibility, security, functionality, and usability are informed by research on natural surveillance, human-scale public life, and public-space design (Jacobs, 1961; Matan & Newman, 2016; Mehta, 2014). Parameters related to cultural recognition and emotional belonging are informed by research on place attachment, cultural continuity, and heritage contexts (Labuz, 2019). Social inclusion and cross-group interaction are informed by research on participation and inclusive public space (Madanipour, 2018), while regulatory adaptability draws on perspectives concerning flexible urban spaces and adaptive governance (Stevens, 2020).

The 19 parameters establish a consistent lens through which observations, interview accounts, and documentary evidence can be examined across cases. Although the analytical categories were defined before the empirical analysis, the specific patterns, recurrence, and contextual meanings identified within these categories were derived from the empirical material. This approach provided analytical consistency while allowing differences across cases and contexts to emerge from the data.

The resulting framework connects the literature review with the empirical investigation by bringing together spatial, functional, environmental, cultural, social, experiential, and governance dimensions of pocket-park use. It was subsequently applied to the observation, interview, and documentary data to examine how these dimensions were manifested across the selected cases.

2.6. Research gap

Although existing studies have provided valuable insights into the ecological, spatial, and social functions of pocket parks, relatively limited research has examined how perceptual spatial factors, emotional experience, and cultural interpretation jointly shape user engagement in small urban green spaces. In particular, there remains a need for empirical research that integrates spatial analysis, behavioral observation, stakeholder perspectives, and contextual interpretation to better understand how people interact with pocket parks in complex historic urban environments.

The limited integration of these dimensions under a single, practical analytical framework is another gap. Previous research frequently examines governance, social interaction, accessibility, environmental quality, and cultural significance independently. There is a dearth of empirical research that unifies these dimensions while preserving significant boundaries between the broader notions used to understand them and the observable conditions employed in analysis.

This study addresses this gap by investigating how spatial legibility, emotional safety, perceptual cues, and cultural recognition relate to user engagement across the parks represented in the final analytical observation dataset, comprising nine formally selected comparative cases and one retained pilot observation site, located in Taiyuan and Xi'an, China, and George Town, Penang, Malaysia. Through a qualitative multiple-case study involving field observations, semi-structured interviews with 21 participants, and document analysis, the research provides a more comprehensive understanding of the spatial, behavioral, cultural, and governance patterns associated with pocket-park use. Furthermore, the study situates these findings within broader discussions of context-sensitive urban renewal and organic renewal theory (Kunyuan & Hellquist, 2014; J. Liu *et al.*, 2023; Zhou, 2012).

3. Methodology

In order to integrate ideas from environmental psychology, spatial cognition, and urban regeneration, this study used a qualitative multiple-case study approach, with the final analytical dataset comprising 10 observed pocket parks across three cities.

3.1. Research design

This study used a qualitative multiple-case study design. The study aims to gain a comprehensive understanding of how users encounter, interpret, and engage with pocket parks across various urban and cultural contexts.

Three historic urban settings, George Town in Penang, Malaysia, and Taiyuan and Xi'an in China, were used for the empirical study. The observational program comprised nine formally selected comparative cases, with Wenying Park in Taiyuan initially used as a pilot observation site and subsequently retained in the final analytical dataset. Wenying Park was first chosen as a pilot observation site to test the observation routine, improve recording techniques, and assess the viability of the field instruments. The pilot observation was used to assess the operability of the spatial scanning process, the feasibility of the observation protocol, and the clarity of the behavioral categories. Only minor methodological changes were needed after the pilot research, including reducing the observation interval from 10 minutes to 5 minutes and refining the spatial zoning procedure. The pilot observations were retained in the final qualitative analysis because the observation framework remained the same throughout the investigation, and the resulting records satisfied the coding requirements and provided usable empirical evidence. Thus, the final analytical observation dataset included 10 parks: nine formally selected comparative cases and the retained pilot observation site.

Three complementary qualitative techniques were used to collect data: semi-structured interviews, systematic field observation, and document analysis. Spatial features, behavioral patterns, environmental conditions, and the use of public spaces were all recorded through field observations. Twenty-one stakeholders participated in semi-structured interviews to share their firsthand insights on the planning, design, management, and daily use of pocket parks. In order to comprehend the institutional framework shaping pocket park development, document analysis examined planning policies, urban renewal initiatives, and landscape design guidelines.

A coding framework of 19 analytical parameters served as a guide for the qualitative content analysis used to examine all qualitative data. These parameters functioned as analytical classifications for arranging and contrasting data from observations, interviews, and written materials. The parameters were derived from the literature reviewed before the empirical analysis and were used as a deductive analytical framework rather than as independent variables or predetermined findings. The use of multiple qualitative data sources supported methodological triangulation by allowing observations, participant accounts, and documentary evidence to be compared and contextualized within the same analytical framework.

3.2. Study areas and case selection

This study used a purposive case-selection approach to examine how pocket parks operate in various historic urban settings. The study sought information-rich instances that might demonstrate a variety of regional features, behavioral patterns, and governance situations rather than trying to achieve statistical representativeness. Because it allows the selection of examples that are most pertinent to the study aims and capable of producing rich contextual information, purposive sampling is often recommended for qualitative research (Patton *et al.*, 2015).

Three historical urban locations, Taiyuan (Shanxi province, China), Xi'an (Shaanxi province, China), and George Town (Penang, Malaysia), representing various cultural, planning, and urban development contexts, were used for fieldwork. These cities were chosen due to their unique histories, urban morphologies, and planning strategies, as well as their active promotion of pocket park development. Their distinctions offered a suitable comparative framework for analyzing how user engagement, emotional safety, and spatial legibility are expressed in various sociocultural and governance contexts.

For this study, a pocket park refers to a small-scale public green or open space embedded in the existing urban fabric and intended to provide everyday opportunities for informal recreation, social interaction, rest, or neighborhood use. The cases were not selected solely on the basis of physical size; public accessibility, integration within established urban areas, and everyday public-space function were also considered.

The selection of study sites followed five principles (Table 1).

Nine pocket parks were formally selected as comparative cases, with three parks from each city. The selection aimed to capture variation in morphology, adjacency, user activity, and management context. Wenying Park was selected separately as the pilot observation site before the formal comparative sample was established. Although it was not one of the nine formally selected comparative cases, its pilot observation records were retained because they generated usable and codable evidence under the same analytical framework.

Wenying Park was observed during the pilot phase before the formal observation protocol was finalized. The pilot was used to assess the feasibility and clarity of the observation procedure and resulted in two procedural

Table 1. Sampling criteria across methods

Criterion category	Sampling criteria	Rationale for inclusion	Analytical alignment
Parameter relevance	Sites, stakeholders, and documents were selected when they provided evidence relevant to one or more dimensions of the 19-parameter framework, with preference given to sources offering evidence across several parameters.	To ensure that the selected material could contribute directly to the research questions and analytical framework.	Supports systematic examination of spatial, functional, environmental, cultural, social, experiential, and governance dimensions.
Spatial and contextual variation	Cases were selected to reflect differences in spatial form, surrounding urban conditions, and local context.	To capture variation in how pocket parks are embedded within established urban environments.	Supports cross-case comparison of spatial and contextual conditions.
Cross-method reach	Preference was given to cases for which observation, interview, and documentary evidence could be obtained.	To enable comparison across different forms of qualitative evidence.	Supports methodological triangulation.
Operational feasibility	Cases were selected where repeated observation, participant access, and relevant documentation were feasible.	To support consistent data collection across the study period.	Supports completeness and comparability of case evidence.
Cross-city balance	Three formal cases were selected from each city.	To maintain a balanced comparative structure across the three urban settings.	Supports comparison of common and context-specific patterns.

refinements: the observation interval was reduced from 10 minutes to 5 minutes, and the spatial zoning procedure was refined. These refinements were subsequently applied to the nine formally selected comparative cases. The refinements concerned the field-recording procedure, while the 19 analytical parameters remained unchanged.

A standard qualitative observation technique was used to conduct observations at the 10 parks included in the final analytical observation dataset. For the nine formally selected cases, observations were conducted during two observation rounds, while Wenying Park was observed once during the pilot phase. The difference in the number of observation rounds reflects its distinct pilot status rather than an attempt to treat it as an equivalent formal comparative case. In order to record variations in user behavior, activity patterns, and spatial utilization, each park was inspected during the scheduled observation periods at different times of the day. To improve comparability across locations, the formal observations used the refined 5-minute observation interval, spatial zoning procedure, and analytical framework. The Wenying pilot records were retained because the observations contained codable evidence relevant to the same 19 analytical parameters and could therefore contribute to the broader analytical dataset. However, Wenying Park was treated as supplementary analytical evidence rather than as an equivalent formal case in cross-case comparison.

Additionally, methodological triangulation was supported by comparing evidence obtained through the different data-collection methods rather than by the selection strategy alone. All of the parks that were visited were then evaluated through pertinent planning documents and policy materials and discussed during stakeholder interviews. This allowed the study to interpret documented data, participant interpretations, and behavioral observations within the same analytical framework using 19 literature-derived parameters. To strengthen contextual interpretation and traceability, the study incorporated several types of qualitative evidence rather than treating each approach separately. The features of every study location used in the investigation are provided in **Table A1**.

3.3. Data collection

A single qualitative framework that included document analysis, interviews, and observation was used to coordinate data collection. To ensure conceptual coherence and enable methodological triangulation, all three approaches were guided by the same 19 analytical parameters. The empirical evidence's cross-method comparability and contextual interpretability were supported by this integrated strategy.

3.3.1. Systematic observation

The locations of the 10 pocket parks included in the final analytical observation dataset are shown in Figure 1. This dataset comprises nine formally selected comparative cases and Wenying Park, which was initially used as the pilot observation site and subsequently retained for analysis.

Observation sessions were conducted across all 10 cases included in the final analytical dataset during predefined



Figure 1. Location of the 10 pocket parks included in the final analytical observation dataset in (A–C) George Town, (D–F) Xi'an, and (G–J) Taiyuan. Source: Maps by authors

weekday time windows. However, the 10 parks did not all undergo the same observation sequence: Wenying Park was initially observed as a pilot site, and its observation data were subsequently retained for the final analysis, whereas the nine formally selected comparative cases were subsequently observed in two formal rounds. The resulting observation records are summarized in Table 2.

Two sets of observation sessions were conducted across the nine formally selected comparative cases in Xi'an, Taiyuan, and George Town during predetermined weekday time frames to ensure temporal comparability across the cases.

Activity sequencing and movement trajectories; duration and frequency of space occupation by user groups; spatial preferences in relation to micro-features such as shade, elevation, or edge conditions; interaction forms, such as solitary use, intergenerational groups, and informal clusters; and perceived affordances or constraints, as inferred from behavioral patterns, were among the key interpretive axes. Although these parameters were pre-structured into the field methodology, they were applied flexibly to account for variations in context and circumstance across the cases. We were able to reconstruct behavioral patterns and spatial activity distributions without using Global Positioning System or automated tracing methods by adding zone-based activity maps and hand-drawn movement sketches to the observational notes.

3.3.2. Semi-structured interviews

Semi-structured interviews, as opposed to structured interviews, offer sufficient flexibility to examine participants' experiences while maintaining uniformity across interviews by using a standard interview guide (Kvale & Brinkmann, 2015).

Participants with hands-on experience in pocket parks, urban public spaces, and historic urban regeneration were selected using a purposive sampling technique. A pilot interview was conducted to improve the interview guide, and the pilot participant was retained in the final analysis because only minor changes were made to the interview guide. In total, twenty-one individuals participated in the interviews, including the pilot participant.

Urban planning, landscape architecture, architecture, cultural heritage, environmental management, municipal administration, property management, community organizations, and long-term park users were among the various backgrounds represented among the participants. This diversity offered viewpoints on how pocket parks should be planned, designed, managed, and used on a daily basis.

Open-ended questions about spatial accessibility, landscape quality, user behavior, social interaction, cultural identity, environmental conditions, maintenance, and governance were included in the interview guide. In order to facilitate context-specific discussion, participants were given pictures and background information about the chosen pocket parks before each interview.

Tencent Meeting (VooV Meeting, Tencent, China) was used to conduct Mandarin Chinese interviews between February and July 2025. With the participants' permission, each interview (45–75 minutes) was audio-recorded and then verbatim transcribed.

Table 3 summarises the characteristics of the 21 interview participants, including the pilot participant. Participant identifiers (E1–E21) are researcher-assigned codes and do not represent participants' real names or initials. Professional roles and years of experience are reported for contextual purposes, and the combination of these characteristics was reviewed to ensure that individual participants could not be identified. No personally identifiable information is reported in the table.

Table 2. Observation schedule of the pocket parks

City	Pocket park	Observation phase	Date	Observation time
Taiyuan	Wenying	Pilot test	Dec 2024	09: 00-10: 00; 13: 00-14: 00; 19: 00-20: 00
Xi'an	Yongningmen, Yuxiangmen, Changlemen	Round 1	Feb 2025	09: 00–10: 00; 13: 00–14: 00; 19: 00–20: 00
		Round 2	Apr 2025	09: 00–10: 00; 13: 00–14: 00; 19: 00–20: 00
Taiyuan	Qiyi, Jiefang Road, Chengfang East Street	Round 1	Feb 2025	09: 00–10: 00; 13: 00–14: 00; 19: 00–20: 00
		Round 2	Apr 2025	09: 00–10: 00; 13: 00–14: 00; 19: 00–20: 00
George Town (Penang)	Sia Boey, Armenian Park, G+P Pocket Park	Round 1	Mar 2025	09: 00–10: 00; 13: 00–14: 00; 19: 00–20: 00
		Round 2	Jul 2025	09: 00–10: 00; 13: 00–14: 00; 19: 00–20: 00

Table 3. Characteristics of the 21 interview participants

Participant code	Years of experience	Title	Variable domain(s)
E1	11	Interior designer and landscape designer	Spatial design, aesthetic quality
E2	9	Landscape planner	Accessibility, green infrastructure
E3	32	Researcher of Chinese traditional gardens	Cultural value, aesthetic integration
E4	23	Urban park researcher	Spatial functionality, social use
E5	11	Architect and landscape designer	Infrastructure, maintenance
E6	11	Business manager	Commercial influence, user behavior
E7	39	Tourism planner	Cultural heritage, community engagement
E8	20	Regional development specialist	Accessibility, resource allocation
E9	37	Urban planner	Transport, connectivity
E10	40	Land planner	Land redevelopment, shared green space
E11	14	Property manager	Facility maintenance, user experience
E12	37	Environmental monitoring specialist	Ecological evaluation, environmental benefits
E13	6	Independent landscape designer	Public space practice, heritage urban contexts
E14	39	Urban renewal specialist	Urban regeneration, public space revitalization
E15	8	Real estate agent	Real estate impact, neighborhood perception
E16	12	Community staff	Community services, public facility use
E17	40	Civil engineer	Technical infrastructure, safety
E18	33	Senior park visitor	Elderly accessibility, social comfort
E19	10	Young park visitor, organization	Youth interaction, recreational needs
E20	39	Professor of Urban Planning and Geography	Urban restructuring, post-industrial redevelopment
E21	12	Lecturer in Urban Planning	Urban planning, public-space development

3.3.3. Document analysis

By offering institutional and policy viewpoints on pocket park development and management, document analysis supplemented the field observations and interviews (Bowen, 2009). Documents directly pertaining to pocket park development and urban regeneration in the three research locations were collected using a purposive sampling technique.

Planning reports, urban renewal strategies, design guidelines, heritage conservation documents, environmental reports, statistical publications, official government announcements from China and Malaysia, and national and local policy documents were all included in the document bundle. Publicly accessible documents from governmental organizations and planning bodies were given precedence (Table 4).

Documents were included when they provided information directly relevant to pocket-park development, urban renewal, public-space planning, heritage conservation, environmental management, or governance. They were examined in relation to the 19 analytical parameters and used primarily to contextualize observed conditions and participant accounts, rather than to provide independent measures of park performance.

3.4. Data analysis

The 19-parameter analytical framework developed for this study served as a guide for the qualitative content analysis used to examine the data. The framework offered a shared foundation for analyzing data from field observations, semi-structured interviews, and documentary sources rather than developing themes inductively. The 19 parameters were established from the literature before the empirical analysis and were therefore used as predetermined analytical categories. They were not treated as independent variables, nor were they assumed to represent findings in advance.

Before being coded against one or more of the predetermined parameters, observation records, interview transcripts, and documents were first separated into relevant analytical units. To ensure consistent interpretation across the three datasets while preserving the unique features of each approach, operational indicators were created for

Table 4. Typology of documents used in the analysis

Document type	Issuing authority	Scale
National policy directives	State Council; Ministry of Housing and Urban–Rural Development	National (China)
Provincial regulations & guidelines	Shaanxi DOHURD; Shanxi DOHURD	Provincial (China)
Municipal spatial plans & design manuals	Xi'an Municipal Government; Taiyuan Municipal Government; Penang Island City Council	Municipal
Urban renewal frameworks & redevelopment guidelines	Local Planning Departments; Special Project Offices	District/Redevelopment zone
Heritage conservation & cultural landscape publications	George Town World Heritage Incorporated	City/Heritage core
Statistical bulletins & data reports	Department of Statistics Malaysia; Municipal Statistics Offices	National/Municipal
Environmental or infrastructure bulletins	Environmental bureaus; Transport agencies	Municipal/District
Official media and government-affiliated press	State–affiliated news outlets	National/Municipal

each parameter. Documents offered policy and planning frameworks, interviews revealed individuals' experiences and viewpoints, and observations recorded behavioral and spatial situations. Table 5 displays the operational definitions for each parameter.

The coding process was deductive. Each analytical unit was examined against the operational definition of the relevant parameter and assigned to one or more parameters, where appropriate. For observations, coding focused on directly recorded spatial and behavioral evidence, including movement patterns, activity distribution, spatial occupation, visibility, access, facilities, maintenance, and interactions. Interview data were coded according to participants' accounts of experience, interpretation, use, and management, while documentary material was coded according to relevant planning, design, cultural, environmental, and governance information. The same parameter could therefore be examined through different types of evidence, while the evidentiary meaning remained specific to its source.

The analytical framework was used to organize and compare evidence rather than to assume that all parameters were equally relevant in every case. Patterns were identified through the recurrence and contextual interpretation of coded evidence within and across cases. This allowed the analysis to distinguish between patterns that appeared consistently across cases and those that were more context-specific.

After coding, methodological triangulation was used to compare the three datasets. To identify regions of convergence, complementarity, and divergence, each source was examined separately prior to cross-comparison. Convergence was identified when different sources provided broadly consistent evidence concerning the same parameter or pattern. Complementarity was identified when different sources provided different but related forms of evidence, while divergence was identified when observations, participant accounts, and documentary evidence did not correspond. This comparison brought together institutional data, stakeholder perspectives, and observed behaviors, with each source considered according to the type of evidence it provided. The triangulated analysis was therefore used to strengthen contextual interpretation and traceability rather than to establish causal relationships or statistical validity.

3.5. Ethical considerations

The study involved observations in publicly accessible spaces and semi-structured interviews with adult stakeholders. No ethics approval number was applicable to this study. All participants gave their informed consent before any data were collected, and participation in the interviews was entirely voluntary. Participants were informed of their right to withdraw at any time. No identifiable information is reported in this study, and personal information was anonymized during transcription, coding, and analysis.

4. Results

The results of the triangulated analysis of field observations, semi-structured interviews, and documents from the 10 pocket parks included in the final analytical dataset and 21 interviewees suggest that the interaction of spatial legibility, behavioral compatibility, and emotional safety was recurrently associated with micro-scale urban green space performance, while the quantity of amenities or adherence to formal planning standards alone did not consistently correspond to higher levels of observed use. The empirical analysis reveals three interconnected domains corresponding to the study's research questions:

Table 5. Coding scheme and parameter synchronization

Parameter	Parameter focus	Operational coding indicator
P1. Path clarity	Readability of circulation routes	References to unclear or obstructed paths, absence or presence of wayfinding cues, or ease of pedestrian navigation
P2. Boundary coherence	Definition and continuity of spatial edges	Descriptions of blurred, permeable, or clearly articulated boundaries between park and surrounding urban fabric
P3. Access logic	Logic of entry and approach	Statements concerning entry placement, access conflicts, or alignment with pedestrian flows
P4. Facility allocation	Distribution of facilities	Mentions of seating, equipment placement, or spatial provision relative to use patterns
P5. Material suitability	Appropriateness of surface and material use	References to paving, vegetation, or material performance affecting comfort or use
P6. Functional density	Intensity and clustering of functions	Descriptions of multiple activities coexisting, efficient zoning, or reduced functional conflict
P7. Cultural reference	Presence of cultural cues	Mentions of symbolic elements, historical references, or cultural markers
P8. Social inclusion	Inclusiveness of user groups	Statements regarding participation of different age or social groups
P9. Directional connectivity	Continuity of movement	References to smooth or disrupted pedestrian connections through or around the park
P10. Surveillance visibility	Visibility and monitoring	Mentions of sightlines, surveillance devices, or visual oversight
P11. Emotional belonging	Sense of attachment	Expressions of comfort, familiarity, or repeated use
P12. Cross-group interaction	Interaction across user groups	Observations or reflections on intergenerational or cross-group encounters
P13. Security feeling	Perceived safety	References to lighting, nighttime confidence, or avoidance behavior
P14. Usability diversity	Variety of usage modes	Descriptions of short- and long-stay use, social and solitary activities
P15. Facility comfort	Physical comfort	Mentions of shading, seating comfort, or thermal conditions
P16. Maintenance condition	Upkeep and cleanliness	References to maintenance quality or deterioration
P17. Environmental coherence	Environmental consistency	Statements on landscape integration or environmental continuity
P18. Regulatory adaptability	Flexibility of management	Mentions of rule adjustment, informal use tolerance, or adaptive governance
P19. Cultural recognition	Recognition of identity	References to local identity, heritage acknowledgment, or cultural visibility

(i) spatial legibility and perceptual access (RQ1); (ii) design coherence within shared landscapes (RQ2); and (iii) communicative diversity and emotional inclusion (RQ3).

These domains help explain why certain parks continue to be socially underutilized despite their physical advantages, while others function as lively civic microspaces. The triangulated evidence suggests that perceptual interpretation and emotional reaction, rather than only spatial provision, appeared repeatedly as factors associated with user engagement across the investigated parks. Because of this, pocket parks serve as relational and perceptual infrastructures where institutional logics, symbolic signals, and cognitive cues shape users' perceptions, entry, and occupancy of space. Table 5 and Tables A2–A5 present the operationalization of the P1–P19 analytical parameters.

4.1. Overview of the results

The findings suggest that spatial intelligibility, functional adaptability, and socio-cultural responsiveness were recurrently associated with the observed performance of pocket parks in historic urban districts, rather than individual design elements alone. Data from the 10 parks in the final analytical dataset and interviews with 21 participants indicate that the ways in which people view, understand, and utilize these areas in daily urban life appeared to be closely associated with how pocket parks functioned.

The results can be categorized into three interconnected themes that correspond to the research questions, according to triangulated data from field observations, stakeholder interviews, and documentary analysis. RQ1 asks how circulation, entry visibility, site placement, and perceptual accessibility were associated with user

engagement. Pocket parks, as shared urban landscapes, are supported by perceptual and functional landscape characteristics, which RQ2 examines. RQ3 investigates the ways in which cultural readability, emotional safety, and adaptive governance were related to social interaction and communicative diversity.

Additionally, areas of convergence and divergence between the three evidence sources are shown using the triangulated analysis. Interviews offer stakeholder viewpoints on design and administration, field observations record routine spatial practices, and documentation analysis reveals planning goals and governance priorities. These sources were examined separately before being compared, allowing similarities and differences in the evidence to be identified. These results collectively imply that pocket parks operate as dynamic socio-spatial settings that are shaped by the interplay of institutional framework, user behavior, and spatial arrangement.

In general, effective pocket parks were distinguished by aligning spatial organization, landscape design, and users' daily experiences rather than just the supply of amenities. This pattern was observed across evidence sources, although the emphasis placed on particular conditions varied between cases.

4.2. Spatial intelligibility, entrance visibility, and user engagement (RQ1)

The results pertaining to RQ1 demonstrate that users' recognition, approach, and interpretation of pocket parks in intricate urban environments were closely associated with observed patterns of use in historic urban districts. Park use was influenced by a variety of factors, including site position, entry visibility, circulation logic, and perceptual clarity, rather than just physical accessibility.

Pocket parks with obvious entrances, logical circulation, and distinct spatial interfaces were more easily identified as public spaces and integrated into regular pedestrian movement, according to triangulated data. Unclear borders, disjointed circulation, and hidden entrances were repeatedly observed or reported as conditions associated with spontaneous use and decreased spatial intelligibility.

Accordingly, the findings are organized into three interrelated themes: (i) site accessibility and entrance recognition, (ii) circulation, visibility, and perceived safety, and (iii) spatial configuration and behavioral engagement.

4.2.1. Site accessibility and entrance recognition

Users' identification of pocket parks as publicly accessible areas appears to be influenced by site accessibility and entry recognition (Figure 2). This was examined through observations of entrance visibility, surrounding pedestrian approaches, boundary conditions, and the continuity of movement around the sites.

Users appeared to rely more on spatial continuity and identifiable access routes than on formal entrances in old urban districts, where small streets, irregular plots, and varied land uses produce fragmented urban environments. Hidden entrances or unclear thresholds reduced perceived accessibility, while parks with visually connected approaches and defined limits were easier to identify and enter. Planning documents highlighted pedestrian connectedness, permeable boundaries, and integration with existing street networks, while stakeholders observed that gradual integration with surrounding areas was more beneficial than isolated or heavily contained layouts.

The three sources of evidence converged on the relevance of access and spatial continuity, but addressed these conditions from different perspectives. Field observations recorded entrance and movement patterns, interviews described users' and stakeholders' perceptions of access, and planning documents emphasized connectivity and integration with surrounding streets.

Together, these findings suggest that path clarity (P1), boundary coherence (P2), and access logic (P3) collectively support spatial intelligibility by enabling users to recognize pocket parks as open, accessible, and socially legitimate public spaces. Directional connectivity (P9) further relates these conditions to pedestrian continuity through and around the parks.

4.2.2. Spatial configuration and behavioral engagement

How space arrangement facilitates daily use is the last dimension. User involvement is influenced not only by physical access but also by how well various activities and user groups can coexist in the space (Figure 3).

Field investigations revealed that parks that encouraged a combination of strolling, relaxing, and casual social interaction were more likely to maintain activity levels throughout the day. However, rather than just adding more facilities, this diversity was accomplished through appropriate spatial layouts. The necessity of adaptable design that takes into account the various habits and expectations of inhabitants, commuters, older persons, and children was also highlighted by interviewees. This viewpoint was supported by documentary evidence that promoted multipurpose, flexible public places that could accommodate evolving community demands.

These results collectively imply that the behavioral result of coherent spatial organization is usability diversity



Figure 2. Examples of circulation logic and spatial legibility. (A–J) Representative site photographs illustrating P1 (path clarity), P2 (boundary coherence), P3 (access logic), and P9 (directional connectivity), covering entrance legibility, boundary articulation, access interference, and pedestrian continuity. Source: Photos by the authors (2025)

(P14). Field observations further recorded differences in activity type, duration, user group, and spatial location, providing direct evidence of how functional arrangements were associated with patterns of use. Pocket parks are easier to integrate into regular urban activities when accessibility, circulation, and visibility are well integrated.

Overall, the results for RQ1 show that accessibility, circulation, visibility, and behavioral adaptation were closely related to spatial intelligibility. User engagement is an ongoing process in which users interpret spatial cues, evaluate usability, and decide whether to enter, stay, and use the place, rather than relying only on physical access. The findings therefore connect P1–P3 and P9 with P6 and P14, showing how spatial conditions were reflected in observed patterns of occupation and movement.

4.2.3. Circulation, visibility, and perceived safety

The ease with which people can navigate and understand the area appears to influence whether pocket parks continue to be used after initial awareness. Functional organization, directional clarity, and felt safety are closely associated with circulation quality (Figure 4).

According to field studies, uneven patterns of use were frequently caused by fragmented circulation and unclear internal paths, with certain regions drawing focused activity while others remained underutilized. In a similar vein, stakeholder interviews highlighted how circulation serves as a behavioral framework, assisting users instinctively decide where to move, relax, or engage. For both orientation and perceived security, visibility between activity areas was also deemed crucial.



Figure 3. Examples of functional intensity and behavioral layering. (A–K) Photo evidence for P6 (functional density) and P14 (usability diversity), showing spatial subdivision, time-sensitive zoning, demographic differentiation, and accessibility constraints. Source: Photos by the authors (2025)

These conclusions were supported by documentary evidence that emphasized clear spatial organization, wide sightlines, and effective circulation as important factors for pocket parks in old urban areas. Perceived safety (P13) was more closely linked to environmental openness, predictable movement, and the presence of regular users across all three data sources than it was to formal surveillance. This does not suggest that formal surveillance was irrelevant; rather, the evidence placed greater emphasis on everyday visibility, openness, and predictable activity patterns when describing perceived safety. These results imply that people's comfort levels when using and occupying pocket parks are influenced by circulation, visibility, and perceived safety.

4.3. Perceptual and functional landscape criteria for shared urban landscapes (RQ2)

The results show that functional provision, environmental conditions, user comfort, and cultural context are more frequently represented in the available evidence in determining how well pocket parks function as shared urban landscapes than the number of amenities. Parks



Figure 4. Examples of nighttime legibility and perceived safety. (A–H) Examples of P10 (surveillance visibility) and P13 (security feeling), highlighting illumination patterns, visual blind spots, accessible-infrastructure gaps, and their impacts on evening use. Source: Photos by the authors (2025)

with higher levels of user engagement showed a tighter alignment between landscape design and daily use. Rather than operating as stand-alone design elements, facilities, materials, maintenance, and cultural components worked best when they adjusted to local environmental conditions and users' everyday routines.

The findings are organized into three interrelated themes: (i) amenity allocation, material performance, and environmental coherence; (ii) comfort, maintenance, and long-term usability; and (iii) cultural embedding and symbolic recognition.

4.3.1. Amenity allocation, material performance, and environmental coherence

The performance of pocket parks as shared landscapes is closely associated with facility allocation, material selection, and environmental integration (Figure 5). Field observations revealed that rigid design often led to conflicts between activities, while coordinated arrangements of seating, walkways, vegetation, and activity spaces supported more continuous and varied use.

Interviewees also stressed that, rather than imitating the amenities of larger parks, facilities should be tailored to local user demands, area features, and daily behavioral patterns. This viewpoint was supported by documentary evidence, which advocated for integrated landscape planning that incorporates ecological infrastructure, accessible materials, climate adaptation, functional facilities, and heritage-sensitive design. P4 (amenity allocation), P5 (material suitability), and P17 (environmental coherence) were consistently identified as complementary rather than independent design considerations across the three data sources, suggesting that pocket parks were more often described as integrated landscape settings than as collections of discrete facilities.

The convergence was particularly evident in relation to facility placement and environmental conditions, while emphasis differed by source: observations focused on spatial arrangements and use, interviews on suitability for local users, and documents on planning and design expectations.

4.3.2. Comfort, maintenance, and long-term usability

Comfort and upkeep are strongly linked to the long-term use of pocket parks (Figure 6).

The length of time visitors stayed in the parks was found

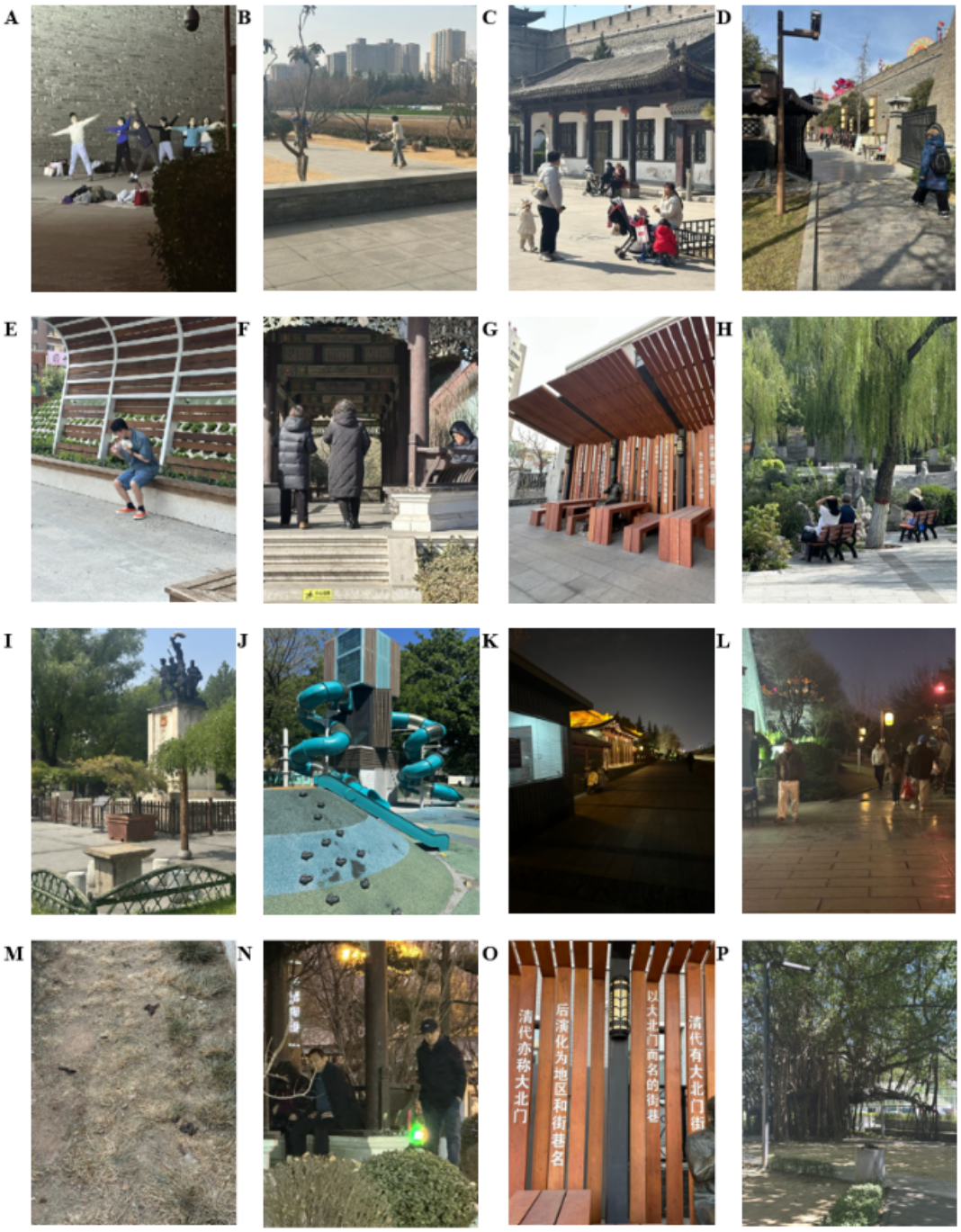


Figure 5. Examples of facility logic and environmental integration. (A–P) Interplay between P4 (facility allocation) and P17 (environmental coherence): functional zoning, shade-aligned seating, lighting/planting coherence, and environmental buffers that stabilize everyday use. Source: Photos by the authors (2025)



Figure 6. Examples of material comfort and maintenance logic. (A–K) Illustrations of P5 (material suitability), P15 (facility comfort), and P16 (maintenance condition): wayfinding/signage clarity, shelter and shade performance, seating ergonomics, and upkeep effects on usability. Source: Photos by the authors (2025)

to be influenced by seating quality, shade, spatial openness, and facility condition, according to field observations.

In a similar vein, interviewees defined comfort as a blend of accessibility for users with various needs, psychological ease, and physical convenience. Maintenance was considered equally vital in all interviews, with users' willingness to use communal places being negatively affected by deteriorating amenities, dwindling greenery, and unclean conditions.

These findings were corroborated by documentary evidence, which highlighted regular inspections, maintenance duties, and long-term management as crucial elements of park governance. Together, P15 (facility comfort) and P16 (maintenance condition) suggest that long-term usability is closely related to ongoing management that maintains welcoming and comfortable surroundings, in addition to design excellence. The evidence therefore indicates that comfort and maintenance were repeatedly connected with visitors' willingness to stay and use the parks over time.

4.3.3. Cultural embedding and symbolic recognition

The importance of pocket parks as shared landscapes

in historic urban districts is strengthened by cultural embedding (Figure 7).

Field observations revealed that when incorporated into daily spatial experiences, locally identifiable materials, historical allusions, and context-sensitive landscape elements were associated with users' feeling of place. Interviewees also highlighted that, as opposed to surface-level historical imitation, cultural expression should arise through spatial organization, materials, plants, and communal activities.

Documentary evidence supported this viewpoint by showing that encouraging historical continuity, heritage compatibility, and the incorporation of local identity into public space design can strengthen these connections. Users' emotional connection to place was consistently influenced by P7 (symbolic location) and P19 (cultural recognition) across the three datasets, indicating that cultural significance works best when incorporated into daily life rather than being viewed as ornamental design.

The results for RQ2 show that functional provision, environmental responsiveness, user comfort, and cultural meaning integrate to create shared landscape performance. Pocket parks in historic districts were observed as shared urban landscapes that combined cohesive landscape design with comfortable everyday use and locally significant spatial identities, rather than being defined primarily by the quantity of facilities. Across the three sources, cultural recognition was expressed differently: observations focused on visible spatial and material cues, interviews emphasized meanings and local identity, and documents generally framed cultural continuity through planning and heritage objectives.

4.4. Communicative diversity and emotional inclusion (RQ3)

The results show that emotional safety, cultural familiarity, adaptive governance, and physical accessibility were associated with differences in communicative variety in pocket parks. Pocket parks serve as social interfaces where people manage shared space through daily routines and casual interactions (Figure 8).

In contrast to fragmented layouts, poor social cues, or strict governance, which were linked to less social engagement, parks that encouraged various patterns of use were typified by inclusive spatial arrangements, familiar cultural cues, and responsive management.



Figure 7. Examples of symbolic location and cultural recognition. (A–G) Cases of P7 (symbolic location) and P19 (cultural recognition), including cultural display interfaces, heritage-context alignment, and moments of dialogic cultural activation. Source: Photos by the authors (2025)



Figure 8. Examples of social integration and adaptive coexistence. (A–H) Scenes reflecting P8 (social inclusion), P11 (emotional belonging), P12 (cross-group interaction), and P18 (regulatory adaptability): habitual group territories, cross-group encounters, soft governance, and encroachment/negotiation dynamics. Source: Photos by the authors (2025)

The findings are organized into three interrelated themes: (i) inclusive interfaces and interactional opportunities, (ii) emotional belonging and affective anchoring, and (iii) regulatory adaptability and governance support.

4.4.1. Inclusive interfaces and interactional opportunities

Social inclusion hinges on whether spatial arrangements allow various users to share space pleasantly rather than just providing physical access. Flexible seating, overlapping circulation, and multipurpose activity areas facilitated the coexistence of various user groups, according to field observations.

Interviewees also stressed that inclusive pocket parks should use shared activity areas, transitional spaces, and context-sensitive layouts to support both active and passive forms of involvement. Documentary evidence supported these conclusions by highlighting barrier-free access, intergenerational use, community involvement, and multipurpose public spaces.

Together, P8 (social inclusion) and P12 (cross-group interaction) suggest that communicative diversity is strengthened when spatial conditions encourage everyday encounters without requiring direct interaction. The observations were particularly useful in showing that inclusion could occur through shared occupation of space even when users did not directly interact, while interviews and documents provided contextual explanations for the importance of such arrangements.

4.4.2. Emotional belonging and affective anchoring

Users' emotional attachment to pocket parks is strengthened through frequent use and cultural familiarity. According to field observations, regularly visited parks were linked to daily routines, favorite spots, and well-known activity patterns.

Instead of designing generic green spaces, interviewees emphasized the significance of reflecting local identity through materials, landscape character, and community activities. The importance of pocket parks in preserving community identity, collective memory, and cultural continuity was further highlighted by documentary evidence.

Across the three data sources, P11 (emotional belonging) reflects the transition from physical use to emotional attachment, although each source captured a

different aspect of this relationship. Observations recorded repeated occupation and familiar activity patterns, interviews described perceptions of familiarity and identity, and documents provided the broader cultural and planning context. This suggests that parks become socially embedded when they are recognized as familiar parts of everyday community life.

4.4.3. Regulatory adaptability and governance support

Adaptive governance also shapes communicative variety. According to field observations, regular park use was frequently associated with users' collaborative negotiation and informal adaptations. While documentation evidence emphasized community involvement, routine maintenance, integrated roles, and responsive governance as important management concepts, interviewees preferred flexible management over excessive control or inadequate oversight.

Together, these findings indicate that P18 (regulatory adaptability) was associated with the capacity of pocket parks to accommodate diverse forms of use while maintaining spatial quality. The evidence did not indicate that flexibility meant the absence of rules; rather, it pointed to adjustments in management practices in response to everyday patterns of use and local conditions.

The results for RQ3 show that inclusive spatial arrangements, emotional belonging, and adaptive governance were closely related to producing communicative variety. Social interaction arises when people feel at ease, understand local meanings, and are able to engage in regular park activities within encouraging institutional frameworks, rather than only from physical openness.

4.5. Cross-method synthesis: Pocket parks as relational infrastructures

Pocket park performance cannot be described using individual design elements alone. Rather, spatial organization, landscape experience, human behavior, and government were interrelated in the evidence examined in this study and were associated with usability and social vitality.

A recurring pattern was found in all three research questions. Accessible locations, obvious entrances, cohesive limits, and constant circulation were all necessary for RQ1's spatial intelligibility, which was associated with users' awareness of and inclination to visit pocket parks. Rather than relying solely on the number of facilities, shared landscape performance for RQ2 was influenced by the integration of functional provision with environmental comfort, material compatibility, and cultural context. For RQ3, possibilities for daily engagement, emotional safety, cultural familiarity, and adaptive management were associated with communicative diversity and social inclusion.

Every data source offered a different viewpoint. Planning concepts and institutional expectations were mirrored in documentation analysis; stakeholder interviews clarified design aims and management issues; and field observations recorded actual patterns of mobility, occupation, and daily use. When taken as a whole, these sources provided complementary evidence: observations showed what occurred in the spaces, interviews provided accounts of experiences and interpretations, and documents situated these patterns within planning and governance contexts. Areas of convergence strengthened the interpretation of recurring patterns, while differences between sources were retained as part of the case context rather than treated as errors.

Overall, the results imply that pocket parks function as relational infrastructures, with close connections among institutional support, social practice, cultural significance, and physical shape. Pocket parks were more likely to develop into vibrant neighborhood areas when functional adaptability, emotional comfort, spatial intelligibility, and governance responsiveness were present together in the observed and reported evidence. Parks may continue to be physically accessible but socially underutilized when these components are not well aligned.

5. Discussion

The results indicate that the effectiveness of pocket parks was more closely associated with the alignment of spatial intelligibility, functional organization, cultural recognition, and adaptive management than with the availability of physical facilities. When taken as a whole, these elements were associated with how people perceive a park as open to the public, know how to utilize it, feel at ease staying there, and integrate it into their daily routines.

Three complementary viewpoints (perceptual spatial justice, cultural negotiation, and institutional flexibility) are used to interpret these findings and explain how spatial, experiential, cultural, and governance conditions are connected. Rather than being adopted as three pre-existing components of the analytical framework, these viewpoints were developed through the interpretation and synthesis of the empirical findings in relation to existing scholarship.

5.1. Discussion of the results

This study demonstrates how users' perceptions,

interpretations, and appropriations of pocket parks in historic urban districts are associated with their observed performance alongside their physical layout. Pocket parks are being promoted as local green infrastructure through urban renewal strategies, but the results suggest that the interaction between spatial arrangement and everyday experience is closely associated with their observed performance. This finding extends a predominantly physical understanding of pocket-park performance by showing that accessibility and usability are also experienced and interpreted by users.

The results of RQ1 highlight a distinction between physical access and perceived accessibility. Uncertain entrances, disjointed circulation, and poor spatial definition were associated with lower inclination to enter and utilize the area, even in well-positioned parks. Entrance visibility and spatial intelligibility appear important for supporting daily use in historic neighborhoods, where small public spaces are frequently obscured by thick urban form and uneven street networks. Thus, physical proximity alone does not necessarily correspond to experienced accessibility. The finding supports the view that accessibility in small urban spaces has both spatial and perceptual dimensions.

The RQ2 findings suggest that the coordination of amenities, environmental conditions, upkeep, and cultural context was consistently represented in the evidence on landscape quality. Stronger park performance was observed only when functional features supported comfortable, long-term use and adapted to local activity patterns. Similarly, when local allusions were incorporated into daily spatial experiences rather than being added as decorative elements, cultural recognition appeared to be reinforced. This suggests that landscape quality is not simply a matter of how many facilities are provided, but also of how physical elements fit with environmental conditions, everyday practices, and the cultural setting.

The RQ3 findings further indicate that physical openness is not the only factor associated with communicative diversity. Through adaptable daily usage patterns, users were able to share space, identify familiar cultural cues, and feel emotionally at ease, all of which appeared to support social contact. These findings emphasize how important adaptive governance and emotional safety appear to be in maintaining inclusive public areas. The finding also extends the discussion of inclusion beyond physical access by considering whether different users can occupy and share space comfortably within everyday routines.

Overall, the results point to a relational outcome for pocket park performance. Emotional and cultural ties were associated with attachment and social interaction, functional and perceptual coherence was associated with daily use, and spatial intelligibility was associated with recognition and access. Taken together, these patterns help explain why some pocket parks become vibrant neighborhood areas while others remain geographically accessible but socially underutilized. Rather than identifying a single condition as responsible for park performance, the findings indicate that these dimensions are interrelated and become meaningful through their interaction with everyday use and local context.

5.2. A relational framework of pocket park performance

Instead of viewing pocket parks as static landscape products, this study views them as dynamic socio-spatial assemblages. Spatial configuration, user perception, cultural meanings, daily behaviors, and institutional governance interact to affect their performance.

This interpretation is informed by established discussions of spatial justice, everyday heritage and place-making, cultural meaning and place attachment, and flexible public-space use (Franck & Stevens, 2006; Madanipour *et al.*, 2022; Mosler, 2019; Tan *et al.*, 2018). However, these perspectives are not treated as a ready-made model for the present study. Instead, they provide theoretical points of reference for interpreting patterns identified across the empirical material. On this basis, the study develops three interrelated mechanisms (perceptual spatial justice, cultural negotiation, and institutional flexibility) that together constitute the relational model proposed here.

This viewpoint is especially pertinent to historic urban areas, where complex conditions for micro public spaces are created with fragmented urban forms, layered cultural contexts, and varied patterns of use. The ways in which spaces are viewed, appropriated, and controlled in such environments may contribute to differences in the outcomes of comparable design interventions. The findings therefore suggest that the performance of a pocket park cannot be understood independently of the social and institutional context in which it is used.

The findings identify three interrelated mechanisms that underpin pocket park performance. The way that entrances, circulation, and spatial organization affect recognition and access is explained using perceptual spatial justice. Functional-cultural coherence emphasizes how local identity, upkeep, amenities, and environmental conditions work together to support daily use. The importance of emotional safety, cultural familiarity, and adaptive management in maintaining a variety of occupations is emphasized by cultural negotiation and institutional flexibility. These mechanisms are not

presented as independent variables or as separate causal pathways. They represent three complementary interpretive mechanisms identified through the cross-case synthesis of the observations, interviews, and documentary evidence.

The first mechanism concerns whether users can recognize, approach, and understand the pocket park as an accessible public resource. The second concerns how cultural references and everyday practices acquire meaning through use and interpretation. The third concerns how management arrangements respond to changing patterns of occupation while maintaining basic conditions of safety, accessibility, and upkeep. The three mechanisms are therefore connected rather than strictly sequential: perceptual access provides conditions for engagement, engagement creates opportunities for cultural interpretation and social use, and adaptive management can support or constrain these processes over time.

These dynamics imply that rather than being isolated green areas, pocket parks serve as relational infrastructures. Their observed performance is related to the alignment of human behavior, governance methods, and spatial conditions, in addition to physical provision. Pocket parks may function as vibrant community spaces that support social inclusion, belonging, and engagement when these connections are sustained over time. Spaces may be physically accessible but socially underutilized when these relationships are weak or poorly aligned.

This framework builds on traditional assessments that mostly rely on physical metrics such as facility availability, size, and accessibility distance. It does not replace physical assessment; rather, it places physical conditions within a broader relational interpretation in which perception, cultural meaning, everyday appropriation, and institutional response are considered together (Figure 9).

5.2.1. Perceptual spatial justice

Conventional methods of spatial justice focus on the distribution and accessibility of public green spaces, using metrics such as service coverage and distance. Research on spatial justice has emphasized that justice has an inherent spatial dimension and involves questions of distribution, inclusion, and the relationship between social processes and spatial arrangements (Madanipour *et al.*, 2022). However, this study indicates that meaningful access is not ensured through physical availability alone, especially in historic urban neighborhoods, where users' awareness and involvement may be limited by complicated spatial patterns.

By highlighting its perceptual aspect, this study extends this discussion by considering accessibility as an experienced spatial condition rather than only a geographical relationship. Spatial legibility shapes accessibility as an experience and a geographical situation. Pocket parks are easier for people to comprehend, approach, and use as acceptable public locations when they have clear entrances, logical circulation, and obvious activity areas.

The findings therefore suggest that perceptual access should be considered alongside physical proximity when examining spatial equity at the micro-scale. A park may be present within a neighborhood and remain formally

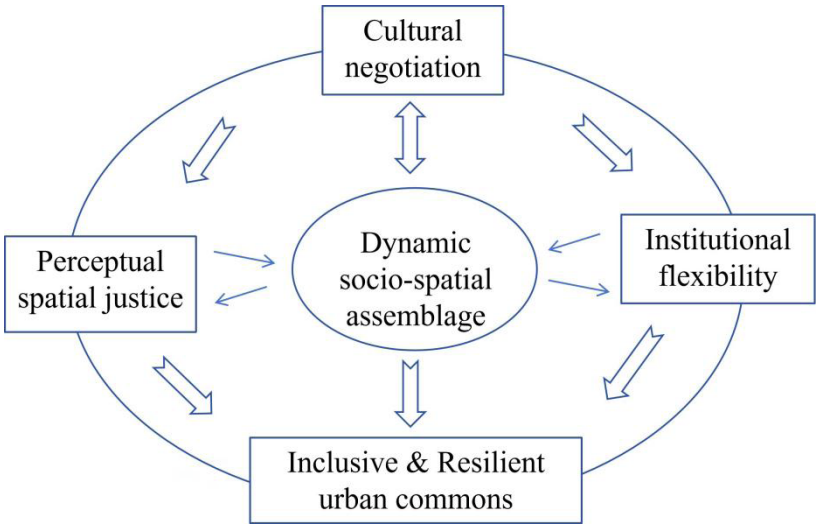


Figure 9. Relational framework of pocket-park performance as dynamic socio-spatial assemblages in historic urban districts. Source: Diagram by the authors.

open to the public, yet unclear entrances, fragmented circulation, or weak spatial cues may reduce its integration into everyday movement. In this sense, perceptual spatial justice concerns not only where green space is located, but also how readily people can recognize, approach, and understand it as a public resource.

This interpretation is particularly relevant to historic urban districts, where irregular street networks, mixed land uses, inherited spatial boundaries, and visually constrained entrances can affect how small public spaces are encountered. The empirical findings do not suggest that physical accessibility is unimportant. Rather, they indicate that physical access and perceptual accessibility need to be considered together when examining how pocket parks become part of everyday urban life.

Perceptual spatial justice is therefore used in this study as a conceptual extension of spatial-justice thinking at the micro-scale. It does not claim that perceptual accessibility replaces distributive measures; instead, it draws attention to a dimension of access that may remain overlooked when assessment is limited to location, distance, or service coverage.

Perceptual spatial justice thus emphasizes the necessity of assessing micro public places in a way that goes beyond distributional metrics. Environments that are not only physically accessible but also cognitively and experientially accessible are necessary for equitable regeneration in historic urban situations.

5.2.2. Cultural negotiation

Although perceptual accessibility clarifies how people identify and enter pocket parks, it falls short of explaining how these areas acquire social significance. Users constantly interpret how spaces should be used and whether they represent local lifestyles, in addition to physical access. Pocket parks are consequently seen in this study as locations of cultural negotiation, where everyday activities, physical layouts, and symbolic meanings interplay.

This interpretation is informed by research showing that heritage and historic urban environments can acquire meaning through everyday place-making and through the relationship between people, cultural references, and the urban landscape (Mosler, 2019). Research in George Town and Melaka has likewise shown that person–place bonding, sense of place, and community relationships are relevant to the sustainability of intangible cultural heritage (Tan *et al.*, 2018).

Instead of directly influencing behavior, design features such as seating, planting, materials, and cultural allusions offer cues that help users negotiate shared use and form bonds with the location. As a result, the value of a pocket park appears to be more closely related to how well its cultural aspects align with local customs and shared experiences than to their mere presence.

This interpretation also helps explain the distinction between cultural presence and cultural recognition. A historical reference, material, or landscape element may be physically present without becoming meaningful to everyday users. The findings suggest that cultural recognition is more closely associated with the way such elements are encountered, interpreted, and incorporated into ordinary activities. This is consistent with research showing that landscape elements can communicate cultural expectations and become meaningful through recognisability and consistency with local traditions or social norms (Li & Nassauer, 2020).

Therefore, rather than merely representing heritage, cultural meaning is created through everyday interaction. In addition to serving as green areas, pocket parks in historic urban areas serve as regular cultural landscapes where shared experiences, social connections, and local identities are perpetuated.

According to this viewpoint, culturally sensitive design should prioritize environments that encourage engagement, familiarity, and everyday appropriation while maintaining clear symbols. The role of cultural negotiation may also vary across historic urban contexts because local identities, heritage practices, and patterns of community use are not uniform. The cross-context evidence in this study therefore supports attention to local interpretation rather than the application of a single cultural design formula.

Cultural negotiation therefore represents the second mechanism in the proposed model. It explains how cultural references become socially meaningful through everyday encounter, interpretation, and use, rather than assuming that cultural meaning is automatically produced by the presence of heritage-related elements.

5.2.3. Institutional flexibility: from static management to adaptive stewardship

Pocket parks' long-term viability is closely related to how governance systems adapt to shifting requirements, even as perceptual accessibility and cultural negotiation shape how users identify and appropriate them. Institutional flexibility is defined in this study as the ability to strike a balance between adaptive management and regulatory control.

This interpretation is informed by research on flexible public-space use, particularly the concept of "loose

space," which highlights how urban residents appropriate public spaces in ways that may extend beyond their originally intended uses (Franck & Stevens, 2006). In the present study, this perspective is extended from spatial appropriation to the management conditions that allow or constrain changing patterns of everyday use.

The findings do not support treating pocket parks as finished design products whose performance is largely shaped at the construction stage. Everyday use, maintenance procedures, and interactions between institutions, communities, and users all contribute to the evolution of their social value. Even well-designed environments may eventually become outdated if they are not continuously adjusted and maintained.

The active role of governance in place-making is highlighted by institutional flexibility. Users' perceptions of pocket parks as dependable and well-maintained public areas are influenced by maintenance, responsibility distribution, community involvement, and feedback systems. Effective administration, however, requires balancing law and order with a variety of daily occupations.

The findings indicate that adaptive stewardship should not be understood as the removal of regulation. Rather, it concerns the capacity of management arrangements to respond to changing patterns of use while maintaining basic standards of safety, maintenance, and accessibility. This distinction is important because excessive control may restrict informal and diverse uses, whereas limited management may affect the quality and usability of the space.

This viewpoint is especially crucial in older urban areas because pocket parks have strong linkages to the neighborhood and evolving social norms. The ability of institutions to preserve, modify, and support these areas over time is as important to their sustainability as the quality of their design. The governance conditions surrounding pocket parks may also differ between urban contexts, suggesting that adaptive stewardship needs to be considered in relation to local administrative arrangements, community roles, and management practices rather than treated as a uniform model.

Institutional flexibility therefore constitutes the third mechanism in the proposed model. It connects the longer-term management of pocket parks with changing patterns of spatial occupation and everyday social use.

5.2.4. Integrated interpretation

An integrated account of how pocket parks in historic urban areas develop into socially significant spaces is offered through perceptual spatial fairness, cultural negotiation, and institutional flexibility. These aspects show how spaces are acknowledged, understood, and maintained over time through interconnected processes.

Perceptual spatial justice helps users access and understand pocket parks; cultural negotiation clarifies how meanings and daily practices are shaped; and institutional flexibility supports the long-term adaptation of these spaces. Together, these mechanisms help explain how physical accessibility may develop into everyday use, how everyday use may become culturally meaningful, and how management practices can support or constrain these processes over time.

According to this viewpoint, the performance of a pocket park cannot be attributed solely to particular design elements or physical amenities. Rather, it arises from the interplay of human perception, social practices, cultural identity, geographical form, and governance processes.

The proposed framework therefore shifts the analytical focus from isolated design attributes toward the relationships among spatial conditions, user experience, cultural interpretation, and institutional response. Importantly, the three mechanisms should not be read as a fixed sequence or universal formula. Their relative expression may vary according to the physical, cultural, and institutional conditions of a particular urban context.

This study builds on previous methods that highlight quantifiable characteristics such as size, accessibility, or facility quantity by conceptualizing pocket parks as dynamic socio-spatial assemblages. It emphasizes how continuous processes of recognition, usage, negotiation, and maintenance create the value of micro public places. Therefore, pocket parks serve as relational infrastructures that link urban form, communal memory, and daily social life in historic urban neighborhoods rather than just being green areas.

Taken together, these relationships constitute the relational model developed in this study. The model proposes that pocket-park performance is better understood as an ongoing outcome of interaction among perceptual access, cultural negotiation, and institutional flexibility, rather than as a fixed property of the physical site.

5.3. Implications

By offering insights into the planning, design, and administration of pocket parks in historic urban environments, the study's ramifications go beyond the individual cases examined in Xi'an, Taiyuan, and George Town. The study emphasizes how physical configuration, user perception, cultural meaning, and governance

practices interact to define micro public space performance rather than providing fixed architectural answers.

Theoretically, by considering these areas as relational infrastructures rather than static landscape forms, this work extends the discussion of pocket-park performance beyond physical provision. The proposed relational model contributes an integrated interpretation of how perceptual access, cultural negotiation, and institutional flexibility are connected within everyday pocket-park use. The results demonstrate that usability and accessibility are influenced by users' perceptions, interpretations, and interactions with the environment in addition to physical features. This viewpoint broadens the scope of current assessments that mostly focus on quantifiable characteristics such as size, service coverage, and facility availability.

For planning and policy, the results indicate that experiential aspects such as entrance visibility, circulation clarity, environmental quality, cultural significance, and maintenance conditions should be included in pocket-park assessments for planners and policymakers. The proposed framework further suggests that spatial design, cultural considerations, and management conditions should not be assessed entirely as separate concerns, because their interaction may affect how a pocket park is experienced and used.

For design practice, the findings suggest that pocket-park performance is more closely related to spatial coherence than to the mere addition of amenities. Clear entrances, readable circulation, appropriate activity layouts, context-sensitive items, and adaptable spaces that accommodate a variety of daily activities are important factors to take into account.

Pocket parks can serve as neighborhood infrastructure at the local level, supporting social connection, local attachment, and casual engagement. Their long-term value is closely related to community involvement, ongoing management, and design quality. This suggests that design and management decisions should be considered together, rather than treating construction and subsequent stewardship as separate stages.

Methodologically, this study highlights the importance of integrating stakeholder interviews, field observation, and documentary analysis to investigate the intricate link between everyday experience and spatial design. The 19-parameter framework provided a consistent analytical structure across the three sources, while the subsequent cross-case synthesis allowed broader relational patterns to be identified from the empirical material. This distinction between literature-derived analytical parameters and the relational model developed through empirical interpretation strengthens the connection between the study's methodology and its theoretical contribution.

5.4. Limitations

Initially, the final analytical dataset comprised 10 pocket parks in Xi'an, Taiyuan, and George Town, including nine formally selected comparative cases and Wenying Park, which was initially used as the pilot observation site and subsequently retained for analysis. Although the cases offer detailed insights into the social and spatial dynamics affecting pocket park performance, more comparative research is needed to examine whether these findings are also observed in various institutional, cultural, and climatic contexts.

Second, the interpretation of behavioral patterns and user experiences required researcher discretion, even if the inclusion of various data sources strengthened analytical dependability. The use of structured analytical parameters and comparison across observations, interviews, and documents helped maintain consistency, but it could not eliminate interpretive judgment. To further validate the associations found, future studies could use quantitative methods such as behavioral tracking, spatial analysis, and larger-scale surveys.

Further information about how user behaviors and spatial functions evolve may be obtained from longitudinal research. The observation periods in this study captured selected weekday time windows rather than continuous use across all seasons and times of day, limiting the extent to which longer-term or seasonal changes can be assessed.

Lastly, the spatial, perceptual, social, and governance aspects of pocket-park performance were the main focus of this study. To better understand long-term pocket-park sustainability, future research should examine institutional issues such as funding arrangements, management systems, and community involvement. These factors were considered through documentary and interview evidence but were not examined as independent institutional variables.

5.5. Future research directions

Future research could examine whether the spatial, perceptual, and governance mechanisms identified in this study remain applicable across different urban, cultural, and institutional contexts through comparative studies (C. Liu *et al.*, 2025; Wartmann *et al.*, 2021). Longitudinal research is also needed to capture how seasonal change, evolving community needs, and management practices may influence pocket park performance over time (Abdelhamid & Elfakharany, 2020; Song *et al.*, 2022; Ma *et al.*, 2023).

Further studies should explore how design decisions, including amenity provision, material selection, environmental integration, maintenance, and governance, relate to the long-term usability of pocket parks (Faridtehrani, 2025; Hassan Murtadha, 2024; Kiss *et al.*, 2022). In addition, digital tools, such as user feedback platforms and real-time monitoring, may support more adaptive management and evidence-based planning (Xu *et al.*, 2024; Zhang *et al.*, 2023).

Finally, future research could adopt behavioral and perceptual approaches, including cognitive mapping, behavioral tracking, and user-centered evaluation, to better understand how emotional safety, cultural familiarity, and perceived inclusiveness relate to everyday engagement with pocket parks (Alders, 2024; Khaleghımoghaddam, 2024).

6. Conclusion

This study investigated how spatial, cultural, and governance elements associate with daily use and social value through semi-structured interviews, field observations, and documentation analysis. The findings suggest that pocket-park performance is related not to any single physical or managerial attribute, but to the interaction among spatial conditions, user experiences, cultural meanings, and governance practices.

The results suggest that the integration of spatial legibility, functional coherence, cultural significance, and adaptive management supports effective pocket parks. While emotional safety and responsive governance appear to support social engagement and long-term vitality, clear entrances, readable circulation, suitable amenities, environmental comfort, and locally meaningful design are associated with daily use. On the other hand, if design goals are not linked to user perceptions, behaviors, and local contexts, parks may continue to be underutilized.

The relational model developed in this study provides a more comprehensive understanding of how micro public spaces are identified, experienced, and maintained in historic urban environments by combining perceptual spatial justice, cultural negotiation, and institutional flexibility. Rather than treating these dimensions as independent factors, the model conceptualizes pocket parks as dynamic socio-spatial assemblages in which spatial conditions, everyday practices, cultural interpretation, and institutional response are interconnected. This constitutes the study's main theoretical contribution.

Practically, the results indicate that pocket park planning should account for long-term stewardship, cultural responsiveness, and perceptual accessibility, in addition to provision-based characteristics. The findings also suggest that design and management should be considered together, particularly in historic urban districts where inherited spatial conditions, local cultural meanings, and changing patterns of use may affect how pocket parks are experienced. The findings suggest that better coordination among spatial design, daily use, and governance may contribute to more inclusive, resilient, and people-centered communities as historic areas continue to undergo urban renewal.

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Conflict of interest

The authors declare they have no competing interests.

Author contributions

Conceptualization: Dong Han, Mohd Jaki Mamat
Formal analysis: Dong Han, Mohd Jaki Mamat
Investigation: Dong Han, Mohd Jaki Mamat
Methodology: Dong Han, Mohd Jaki Mamat
Writing–original draft: Dong Han
Writing–review & editing: Dong Han, Mohd Jaki Mamat

Ethics approval and consent to participate

The participants were all adults and their participation was voluntary. Informed consent was obtained from all participants before the interviews. Participants were informed that they could withdraw at any time, and personal information was anonymized during transcription, coding, and analysis.

Consent for publication

Verbal informed consent for the publication of anonymized interview data was obtained from all participants.

Availability of data

The data generated and analyzed during this study are not publicly available due to participant confidentiality and ethical considerations. Relevant supporting information is provided in the manuscript and the supplementary file.

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Appendix

Table A1. List of pocket parks observed

No.	Name	Location	Area/Observed zone	Principal data collected
O1	Wenying park	Yingze district, Taiyuan, China	Selected observation zones within a historic urban park	Pilot observation record; site photos; field notes; movement, seating use, shade, maintenance, and safety-related behavior
O2	Yuxiangmen pocket park	Yuxiangmen area, Xi'an City Wall west-gate area, Xi'an, China	Small public open-space zone near the historic gate	Structured observation; site photos; entrance visibility, boundary condition, path clarity, short stays, and wall-edge use
O3	Yongningmen pocket park	Yongningmen area, Xi'an City Wall south-gate area, Xi'an, China	Small public open-space zone near the historic gate	Structured observation; site photos; access logic, visitor movement, nightscape use, staying behavior, and spatial compression
O4	Qiyi pocket park	Qiyi area, historic urban area of Taiyuan, China	Small public open-space site in an historic-city renewal context	Structured observation; site photos; user grouping, facility use, vegetation condition, maintenance, safety, and governance-related use patterns
O5	Jiefang Road pocket park	Jiefang Road corridor, Taiyuan, China	Roadside/Linear public open-space observation zone	Structured observation; site photos; pedestrian flow, route connection, facility conflicts, road-edge use, and comfort conditions
O6	Chengfang East Street pocket park	Chengfang East Street, Taiyuan, China	Small street-edge public open-space site	Structured observation; site photos; compact spatial use, cultural display area, activity clustering, maintenance, and spatial constraints
O7	Sia Boey	Prangin Canal/Sia Boey area, George Town, Penang, Malaysia	Public open-space portion within a heritage redevelopment area	Structured observation; site photos; family and child use, planting, visibility, cultural setting, movement, and everyday public use
O8	G+P pocket park	George Town historic urban core, Penang, Malaysia	Small public open-space site within the historic urban fabric	Structured observation; site photos; shaded use, lawn condition, generational use, edge activation, and informal staying behavior
O9	Armenian park	Armenian Street/Acheh Street area, George Town, Penang, Malaysia	Small public open-space site within the heritage core	Structured observation; site photos; cultural recognition, tourist-local overlap, lighting, group interaction, and shared-use behavior
O10	Changlemen pocket park	Changlemen area, Xi'an City Wall east-gate area, Xi'an, China	Small public open-space zone near the historic gate	Structured observation; site photos; cultural display, access condition, use diversity, interaction, maintenance, and coexistence patterns

Table A2. Parameter framework for pocket park design and management

Parameter code	Parameter name	Description	Practical application
P1	Path clarity	Ease of navigation along paths and circulation routes.	Clear, simple-to-follow paths that enhance natural pedestrian flows have two advantages: fewer detours and higher involvement.
P2	Boundary coherence	Visual and symbolic continuity of park boundaries.	When boundaries are clearly established, visitors are more likely to view the park as a cohesive, safe, and accessible space.
P3	Access logic	Logical placement of entrances and exits.	Entrances should be visible and aligned with pedestrian desire lines to boost usage.
P4	Facility allocation	Strategic distribution of park amenities and activity zones.	Correctly positioned facilities increase user satisfaction and reduce conflict between activities.
P5	Material suitability	Appropriateness of materials for comfort, safety, and durability.	Resilience, comfort, and visual coherence are enhanced through context-sensitive materials.
P6	Functional density	Intensity and layering of different uses within the park.	An appropriate density supports a variety of activities without creating crowding or conflict.

(*Cont'd...*)

Table A2. (*Continued*)

Parameter code	Parameter name	Description	Practical application
P7	Symbolic location	Placement of cultural or narrative elements.	Carefully positioned symbols enhance cultural identification, narrative, and emotional attachment.
P8	Social inclusion	Opportunities for all demographic groups to engage in the park.	Designing for a variety of age groups and social backgrounds encourages intergenerational involvement.
P9	Directional connectivity	Integration of park paths with surrounding street networks.	Increase connectivity and visitors by ensuring simple access from multiple perspectives.
P10	Surveillance visibility	Visibility and sightlines for informal surveillance.	Enhance the sense of security and encourage longer, more frequent park visits.
P11	Emotional belonging	Users' sense of attachment and ownership.	Enhance long-term engagement and foster a shared urban identity.
P12	Cross-group interaction	Facilitation of encounters among different user groups.	Strengthen social ties and increase community resilience.
P13	Security feeling	Perceived safety within the park.	Clear boundaries, adequate illumination, and visibility improve comfort and usage.
P14	Usability diversity	Flexibility of spaces for multiple uses.	Support a variety of activities and allow programming to evolve.
P15	Facility comfort	Physical comfort of benches, shelters, and other amenities.	Increase consumer satisfaction, encourage staying, and make return visits easier.
P16	Maintenance condition	State of upkeep, cleanliness, and repair.	Well-maintained parks see frequent use, show care, and build trust.
P17	Environmental coherence	Integration with microclimate, natural features, and landscape design.	Both ecological value and human comfort are enhanced through climate-sensitive construction, greenery, and shade.
P18	Regulatory adaptability	Flexibility of governance and management policies.	Participatory management and adaptive rules promote long-term responsiveness.
P19	Cultural recognition	Acknowledgment of local history, heritage, and community identity.	Strengthen emotional ties, encourage social engagement, and support cultural continuity.

Table A3. Parameter-coded observation excerpts

Source ID	Raw text excerpt	Analytical memo	Parameter code	Parameter name
Changlemen pocket park, Xi'an city	The park achieves efficient utilization within the limited space through reasonable functional zoning.	This text represents an empirical reflection aligned with the parameter of functional density.	P6	Functional density
Changlemen pocket park, Xi'an city	The spatial planning is reasonable and adaptable to multi-level usage requirements.	This text represents an empirical reflection aligned with the parameter of functional density.	P6	Functional density
Changlemen pocket park, Xi'an City	Middle-aged people mainly use the square area and the walkway area. They engage in various activities but interact less.	This excerpt implies perceived safety and spatial comfort, supporting the parameter of safety assurance.	P14	Usability diversity
Changlemen pocket park, Xi'an city	The significant flow of people at night reflects a strong sense of security and environmental appeal.	This aligns with the parameter of perceived safety.	P13	Security feeling
Yuxiangmen pocket park, Xi'an city	Its geographical location contributes to the openness and accessibility of the park's boundaries, distinguishing it from more enclosed community parks.	This segment describes edge conditions and integration, related to spatial enclosure and continuity.	P2	Boundary coherence

(*Cont'd...*)

Table A3. (*Continued*)

Source ID	Raw text excerpt	Analytical memo	Parameter code	Parameter name
Yuxiangmen pocket park, Xi'an city	Yuxiangmen pocket park not only serves local residents but also becomes part of the city's daily walking, cycling, and tourism routes.	The text discusses entry points or directional flow, linking directly to the parameter of accessibility structure.	P3	Access logic
Yuxiangmen pocket park, Xi'an city	The footpaths and green belts form transitional spaces, improving walking flow.	This text represents an empirical reflection aligned with the parameter of directional connectivity.	P9	Directional connectivity
Yuxiangmen pocket park, Xi'an city	Middle-aged and young visitors mainly stay for a short time. During the day, they mainly rest; at night, they mostly engage in relaxing activities such as walking and photography.	This text represents an empirical reflection aligned with the parameter of usability diversity.	P14	Usability diversity
Yuxiangmen pocket park, Xi'an city	Imbalanced night lighting: Light intensity in some areas is relatively low, which affects the sense of security at night. It is recommended to optimize the light source layout.	This text represents an empirical reflection aligned with the parameter of security feeling.	P13	Security feeling
Yuxiangmen pocket park, Xi'an city	It is mainly concentrated in the pavilion and fitness area, with the highest usage rate in the morning.	This text represents an empirical reflection aligned with the parameter of functional density.	P6	Functional density
Yuxiangmen pocket park, Xi'an city	During the midday break, people take a short break with relatively low communication density, mainly for individual rest or small-scale exchanges.	This text represents an empirical reflection aligned with the parameter of usability diversity.	P14	Usability diversity
Yuxiangmen pocket park, Xi'an city	Some visitors park their electric bikes at the entrance, affecting the walking experience.	This excerpt reflects navigational ambiguity or pathway confusion, supporting the parameter of clear pedestrian logic.	P1	Path clarity

Table A4. Parameter-coded interviewees' quotations

Source ID	Raw text excerpt	Analytical memo	Parameter code	Parameter name
E1	1. What is your opinion on the functional zoning design of Changle Gate pocket park?	Zones such as fitness, plaza, pavilion, and exhibition are functionally independent, reducing user conflict.	P6	Functional density
E1	3. Given frequent nighttime usage, does the lighting system meet safety and comfort needs?	Main pathways are evenly lit, and both plaza and fitness zones have adequate illumination.	P13	Security feeling
E1	3. Given frequent nighttime usage, does the lighting system meet safety and comfort needs?	Lighting blind spots exist, posing potential security risks.	P10	Surveillance visibility
E1	4. The plaza space is open 24 hours; how efficient is this in actual use?	Hard-surfaced plaza enables adaptive and extended use.	P6	Functional density
E1	6. Is the distribution of benches and trash bins reasonable?	Orientation and spacing of benches enhance switchability between social and private modes.	P14	Usability diversity
E1	1. The design layout helps organize user flows and program clusters.	Spatial configuration reinforces behavioral segmentation and minimizes crowding.	P3	Access logic
E1	2. In what ways do current surveillance features affect usage confidence?	Visual access is limited at night, affecting passive surveillance.	P10	Surveillance visibility

(*Cont'd...*)

Table A4. (*Continued*)

Source ID	Raw text excerpt	Analytical memo	Parameter code	Parameter name
E1	4. Do you think the openness of the plaza invites misuse or enables flexibility?	Full openness offers multifunctional use but lacks situational containment.	P2	Boundary coherence
E1	5. What improvements are needed in comfort amenities like shading or resting space?	The lack of sunshade reduces comfort during midday use.	P15	Facility comfort
E1	6. Do you find the signage and directional cues intuitive and useful?	Directional signs are limited, with occasional confusion in entry logic.	P1	Path clarity
E2	7. Does the design accommodate users of different ages and needs?	Facilities meet basic needs but lack universal design for all demographics.	P08	Social inclusion
E2	8. Are there observed challenges in managing or regulating spontaneous use?	Inconsistent usage norms pose challenges for routine governance.	P18	Regulatory adaptability

Table A5. Parameter-coded documents excerpts

Source ID	Raw text excerpt	Analytical memo	Parameter code	Parameter name
D1	The master plan proposed to preserve the linear axis of the mountain–water–city pattern in regional planning.	Illustrates regional ecological logic aligning with spatial coherence.	P3	Access logic
D1	The policy document emphasized the necessity of road connectivity to heritage pockets.	Reflects infrastructural focus on access logic between nodes.	P1	Path clarity
D1	Green spaces are integrated with public transport hubs to improve recreational access.	Indicates intermodal synergy enhancing landscape connectivity.	P3	Access logic
D1	The report described shared benches and multi-use infrastructure for social inclusion.	Supports inclusivity through universal infrastructure design.	P8	Social inclusion
D1	Air quality enhancement was proposed through vegetation corridors along arterial roads.	Demonstrates ecosystem services tied to environmental comfort.	P17	Environmental coherence
D2	Policies advocated spatial equity by creating small green areas in underused spaces.	Aligns with equitable distribution of public landscape resources.	P8	Social inclusion
D2	Accessibility mapping shows 300 m radius service areas covering most urban nodes.	Provides empirical support for park reachability analysis.	P3	Access logic
D2	Governance recommendation includes multi-stakeholder participation in park design.	Represents participatory planning as governance strategy.	P18	Regulatory adaptability
D2	Integration with historic zoning is emphasized to preserve site-specific narratives.	Shows regulatory alignment with cultural landscape identity.	P19	Cultural recognition
D2	Soft paving materials are prioritized to reduce stormwater runoff.	Links material strategy to ecological permeability.	P5	Material suitability
D2	Signage system is designed to be bilingual, with universal graphic standards.	Improves cognitive accessibility through standard signage.	P8	Social inclusion
D2	Proposed lighting standards follow visibility, comfort, and security benchmarks.	Promotes safety through formal lighting norms in design codes.	P10	Surveillance visibility