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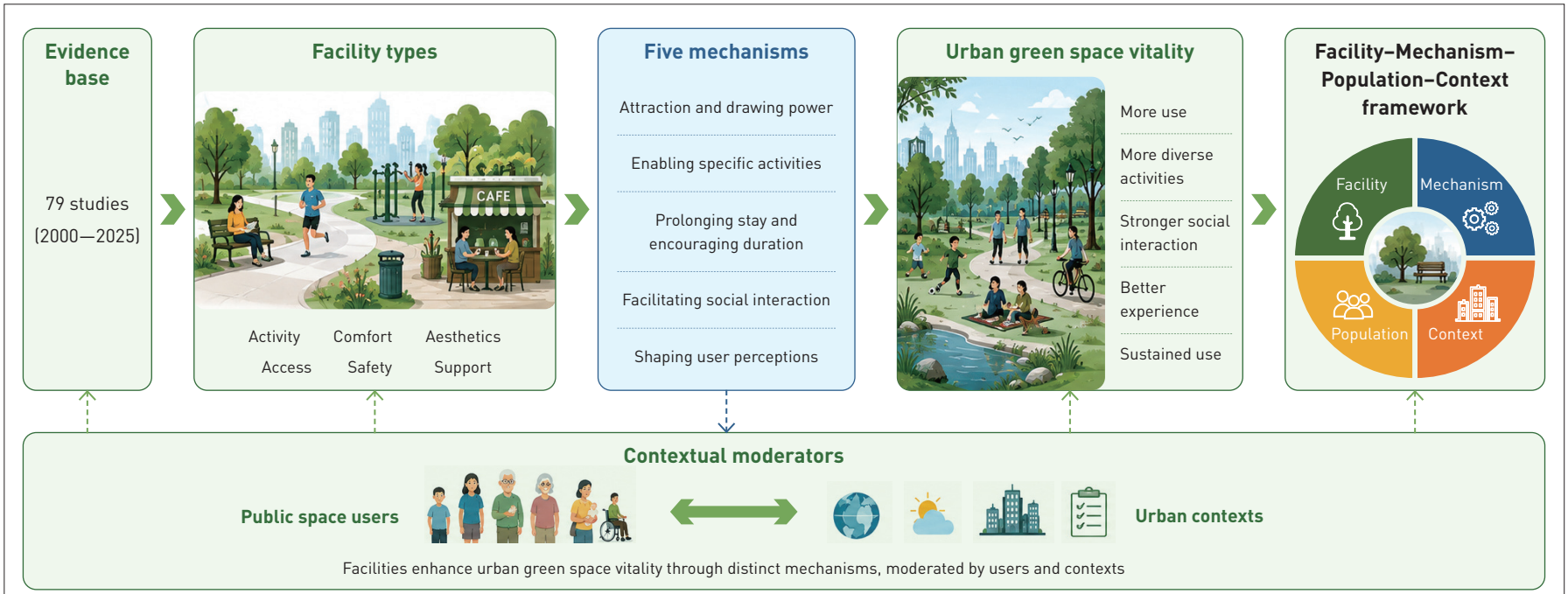
A Scoping Review of the Role of Facilities in Enhancing Urban Green Space Vitality

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GRAPHICAL ABSTRACT



ABSTRACT

Urban green space vitality—the intensity and diversity of human activities—is crucial for delivering public health benefits. While the provision of facilities is widely acknowledged as a key determinant of urban green space vitality, the empirical evidence remains fragmented, obscuring a coherent understanding of how and under what conditions these features influence use. This scoping review systematically maps and synthesises this body of evidence to clarify the functional typology, operative mechanisms, and contextual moderators linking facilities to urban green space vitality. Following the PRISMA Extension for Scoping Reviews (PRISMA-ScR) guidelines, we analyzed 79 empirical studies identified from 8,748 screened records across four databases between 2000 and 2025. The review synthesizes a functional typology of facilities, spanning activity-enabling facility, facility for comfort and socialization, aesthetic and natural feature, and supporting and access infrastructure. It further elucidates five key mechanisms through which facilities influence vitality: attraction and drawing power, enabling specific activities, prolonging stay and encouraging duration, facilitating social interaction, and shaping user perceptions. The findings reveal that facility impact

is not universal but is moderated by population heterogeneity and geographical context, a relationship integrated into the proposed Facility–Mechanism–Population–Context (FMPC) framework. While substantial evidence confirms facilities as central to urban green space success, the field is constrained by a reliance on cross-sectional designs and significant geographical biases. Critical knowledge gaps are identified, including a need for robust causal evidence, fine-grained spatial analysis, and focused research on under-represented populations and regions in the Global South. This review provides a foundational resource for future research, evidence-based design, and equitable policy aimed at maximising the health and social value of urban green spaces.

KEYWORDS

Urban Green Space; Spatial Vitality; Public Space Design; Facility; Amenity; Use Pattern; Scoping Review

HIGHLIGHTS

- Facilities are pivotal, modifiable drivers of urban green space vitality
- A novel functional typology categorizes urban green space facilities
- Five key mechanisms link facilities to multi-dimensional vitality
- The Facility–Mechanism–Population–Context framework reveals how facilities impact vitality
- Evidence gaps include causality, spatial configuration, and equity

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1 Introduction

Urban green spaces (UGS)—including parks, gardens, greenways, and natural corridors—are widely recognised as vital components of sustainable and liveable cities. They contribute significantly to human health and well-being through multiple pathways, such as harm reduction (e.g., mitigating air and noise pollution), facilitating psychological restoration from mental fatigue, and encouraging physical activity and social cohesion[1–4]. The Millennium Ecosystem Assessment[5] categorized these benefits as essential supporting, regulating, provisioning, and cultural services, underpinning the critical role of UGS in urban ecosystems.

Critically, the health and social benefits associated with UGS are not automatic outcomes of mere proximity to nature. They are co-produced through active use and living experience within these spaces[1]. This behavioral dimension of human–environment interaction is encapsulated in the concept of "vitality"[6]. Within urban studies and landscape architecture, vitality refers to the intensity and diversity of human activity occurring within a public space, serving as a key indicator of its success and utility[6–7]. The concept has been increasingly operationalized in empirical research. For instance, Jieyuan Zhu et al. define urban park vitality as "the liveliness that attracts urban residents to use the recreational services sustainably due to the richness of the park landscape, diversity of functions, and accessibility of the park."[7] Their composite vitality index integrates objective behavioral metrics (e.g., visiting intensity derived from sensor data or direct observation) with subjective perceptual measures (e.g., recreational satisfaction), offering a spatially explicit method for assessing UGS performance that moves beyond simplistic usage counts[7].

Building upon this foundation, this review conceptualizes UGS vitality through a multi-dimensional framework that extends earlier definitions to more fully capture the complexity of human–environment interactions[7]. This comprehensive understanding encompasses five interconnected dimensions: 1) behavioral intensity: the sheer volume and frequency of use; 2) activity diversity: the range of different pursuits supported, from active recreation to passive relaxation; 3) social interaction: the extent to which the space facilitates encounters and communication among users; 4) perceptual quality: users' subjective experiences, including satisfaction, sense of safety, and aesthetic appreciation; and 5) temporal dynamics: variations in use patterns across different times of day, days of the week, and seasons[8–9]. Such multi-dimensional approaches underscore the importance of understanding the drivers of UGS vitality to fully release their public health potential and justify public investment. Nevertheless, it remains unclear how these distinct dimensions are collectively stimulated by the specific, modifiable physical attributes of green spaces—particularly facilities and amenities.

Among the myriad factors influencing UGS vitality (e.g., location, accessibility, safety, aesthetic quality), the provision

of facilities plays a particularly foundational and modifiable role. In this review, the term "facility" broadly encompasses the tangible, human-made attributes that support a wide range of recreational and sedentary behaviors—from larger, activity-specific infrastructure (e.g., sports pitches, fitness equipment) to smaller, comfort-oriented features (e.g., benches, lighting, public toilets)[10]. It is now clear that the presence of vegetation alone is insufficient to guarantee use. Rather, it is the integration of high-quality green space with well-designed, well-maintained facilities that create opportunities for diverse activities, from vigorous exercise to passive socializing and relaxation, which collectively underpin spatial vitality[11–12]. This is especially true in community-level green spaces, where integration into daily life is most pronounced[13–14].

The theoretical link between facilities and vitality can be effectively framed, and systematically analysed, through the lens of affordance theory[15]. This theory shifts the focus from inert environmental properties to the perceived opportunities for action (affordances) that an environment offers an individual. Crucially for this review, affordance theory actively shapes our analytical structure. Rather than merely inventorying physical objects, we utilize the concept of affordances to categorize facilities based on their functional purpose in supporting urban vitality, such as enabling specific activities (e.g., a sports pitch affording team games) and providing comfort (e.g., a bench affording resting and socialising). This functional perspective directly informs the development of our facility typology. Furthermore, affordance theory posits that an environment's potential is only actualized when the physical features align with the capabilities, needs, and cultural norms of specific users. This relational perspective forms the theoretical bedrock of our proposed Facility–Mechanism–Population–Context (FMPC) framework. It conceptualizes that the affordances provided by facilities (the mechanisms) are not absolute; rather, they must interact with specific demographic profiles (populations) and geographical settings (contexts) to successfully generate observable and multi-dimensional vitality. Despite the conceptual clarity of this theoretical expectation, the empirical evidence mapping exactly how these affordances operate in diverse urban settings remains dispersed, necessitating a unified scoping review.

For the FMPC framework, substantial empirical evidence demonstrated the role of facilities in enhancing UGS vitality through several interconnected mechanisms. Facility density and diversity are consistently identified as significant predictors of park use and vitality metrics[16]. Seminal work by Andrew T. Kaczynski et al. demonstrated that each additional physical activity facility in a neighborhood park was associated with a significant increase in the odds of the park being used for physical activity, an effect independent of overall park size[16]. Similarly, Zhu et al. found that higher facility density was directly linked to elevated composite vitality scores[7].

For the population in FMPC framework, facilities function to attract users and prolong their engagement. A series of natural experiments and intervention studies have shown that park improvements—such as installing walking tracks, outdoor gyms, and improved seating—consistently lead to significant increases in visitor numbers and time spent in moderate-to-vigorous physical activity[17–19]. Furthermore, and of critical importance, facilities facilitate social interaction, a key dimension of vitality often overlooked in purely physical activity-focused research. Spatial behavior mapping reveals that stationary activities like resting, people-watching, and socializing strongly cluster around specific amenities such as benches, picnic areas, and shaded nodes[8], a long-term pattern observed in foundational studies of public life. This pattern is echoed in studies focusing on specific demographic groups: for older adults and children, the presence of seating, shade, toilets, and play equipment is frequently cited as a critical determinant for encouraging prolonged use and fostering social interactions[20–24]. Moreover, differentiated preferences for specific facilities—such as sports fields among active adolescent boys, and playgrounds or well-maintained landscaped areas among families and less active subgroups—further illustrate how tailored and inclusive provision can enhance visitation and activity participation across a diverse user base[25].

Under the FMPC framework, despite the accumulating evidence, significant methodological and conceptual gaps persist, hindering the formation of a coherent and generalizable evidence base. These gaps exist at multiple levels. Firstly, a prominent issue is the reliance in many larger-scale studies on macro-level or "green-blind" metrics (e.g., GIS-derived Normalized Difference Vegetation Index [NDVI] measures of greenness), which fail to capture the presence, quality, configuration, or functionality of specific facilities[26]. Concurrently, the field has been constrained by a historical reliance on self-reported physical activity data and audit tools that possess a distinct "physical activity bias," thereby overlooking the value of facilities that support restorative experiences, mental well-being, and passive socialization[27–28]. Consequently, there remains a scarcity of fine-grained, place-based behavioral research that meticulously and empirically links specific design features to observable health-promoting behaviors.

This gap is underscored by limited transferability of context-

specific evidence. Although recent studies increasingly use behavioral mapping and other observational methods to examine how facilities shape social activities in green spaces; the relative contribution of facility provision, vegetation structure; and spatial configuration remains unevenly tested across settings. This conceptual and methodological gap is further compounded by a general neglect of temporal dynamics. Emerging evidence suggests that the attractiveness and use of different facilities vary considerably with seasonal changes, time of day, and microclimatic conditions, yet few studies systematically incorporate these temporal factors into their research design or analysis[8–9]. These interconnected gaps collectively hinder the formation of a coherent and generalisable evidence base, underscoring the necessity for a scoping review to integrate extant findings and pinpoint priorities for future research.

While a substantial body of review literature has explored the broader determinants of urban park use, physical activity, and green space quality, these prior syntheses have predominantly focused on macro-level environmental metrics. Existing reviews frequently investigate factors such as vegetation density (e.g., NDVI), general accessibility, and holistic aesthetic appeal, or concentrate primarily on health outcomes. However, there remains a notable scarcity of review studies that explicitly isolate and systematically synthesize the distinct, functional contributions of human-made facilities. Consequently, it remains unclear how specific types of built infrastructure, ranging from sports courts to basic comfort amenities, differentially drive the multi-dimensional vitality of green spaces across various contexts. By exclusively targeting the functional role of facilities, this scoping review distinctively addresses this gap, providing a focused evidence synthesis that differentiates itself from broader environmental or purely health-oriented reviews.

To map the extant literature, this scoping review clarifies key concepts, identifies the breadth and nature of research activity, and pinpoints knowledge gaps, rather than appraising the effectiveness of interventions[29]. A central objective of this review is to integrate evidence on facilities supporting both dynamic activities (e.g., sports) and those enabling static activities (e.g., socializing, rest), thereby providing a more holistic understanding of UGS vitality. The review seeks to answer the following research questions:

1) What types of facilities are investigated in the extant literature, and how are they categorized and defined?

2) Through what proposed or evidenced mechanisms do these facilities influence UGS vitality, as measured by the intensity and diversity of human activity?

3) What are the methodological characteristics (e.g., research design, measures of vitality and facilities) of existing studies, and what key knowledge gaps and future research priorities remain?

2 Methodology

This scoping review was conducted following the established methodological framework proposed by Hilary Arksey and Lisa O'Malley, as well as subsequent enhancements from the Joanna Briggs Institute (JBI) guidance[30]. The review adheres to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) checklist[31].

2.1 Search Strategy

A search was executed across four electronic databases: Web of Science (WoS), Scopus, PubMed, and ScienceDirect. The aim was to identify relevant peer-reviewed journal articles published in English or Chinese between 1st January 2000 and 31st December 2025. An initial limited search informed the identification of relevant keywords and index terms present in the titles, mesabstracts, and subject headings of pivotal papers (Table 1). The final search strategy integrated three core conceptual blocks: 1) UGS; 2) vitality-related outcomes; 3) facilities and amenities.

2.2 Literature Selection Process

The literature selection process followed the PRISMA-ScR flow diagram and involved two stages of screening to systematically reduce the initial 6,220 unique records to the final 79 included studies[7–8,16,18–19,25,27,29,32–102] (Fig. 1).

1) Title and abstract screening. Two independent reviewers screened titles and abstracts against the exclusion criteria. The primary reasons for exclusion were that the studies focused solely on ecological or microclimatic outcomes without behavioral data, investigated rural or wilderness settings rather than urban environments, or clearly lacked a focus on human-made facilities as analytical variables.

2) Full-text review. During this phase, 120 studies were excluded for specific, documented reasons: facilities were present but not treated as a core analytical variable; the study lacked objective or quantifiable behavioral measures of UGS vitality; the publication was non-empirical, such as a commentary, review, or purely theoretical essay; and the research focused exclusively on single-function playgrounds without addressing broader, general-purpose park amenities. Discrepancies at both screening stages were successfully resolved through consensus discussion or consultation with a third reviewer.

Table 1: Search keywords by database

Database	Search keywords
WoS	((urban OR city OR metropolitan OR "urban area*") AND ("green space*" OR greenspace* OR park* OR "public park*" OR "urban park*" OR "open space" OR "green infrastructure") AND (vitality* OR vibrancy* OR liveliness OR "public life" OR use* OR visit* OR utilization OR attendance OR "physical activity" OR recreation*) AND (facility* OR amenity* OR equipment OR infrastructure OR playground* OR "fitness equipment" OR "sports court" OR bench* OR "service level"))
Scopus	(urban OR city OR metropolitan OR "urban area*") AND ("green space*" OR greenspace* OR park* OR "public park*" OR "urban park*" OR "open space") AND (vitality* OR vibrancy* OR liveliness OR "public life" OR use* OR visit* OR utilization OR attendance OR "physical activity" OR recreation*) AND (facility* OR amenity* OR equipment OR infrastructure OR playground* OR "fitness equipment" OR "sports court" OR bench*)
PubMed	(((urban OR city OR metropolitan) AND ("green space" OR "green spaces" OR greenspace OR park OR parks OR "public park" OR "urban park") AND (vitality OR vibrancy OR liveliness OR "public life" OR use OR uses OR usage OR visitation OR attendance OR "physical activity" OR recreation)) AND (facilities OR amenity OR amenities OR equipment OR infrastructure OR playground OR "fitness equipment" OR "sports court" OR bench OR benches))
ScienceDirect	Title, abstract or author-specified keywords: ("green space" OR park OR "urban park") AND (vitality OR use OR "physical activity" OR visit) AND (facilities OR amenities)

NOTE
Quotation marks denote exact phrase matching (e.g., "green space"), whereas unquoted terms are treated as individual keywords; the asterisk (*) is a truncation symbol for variant endings. Search syntax variations across databases account for differences in quotation mark usage.

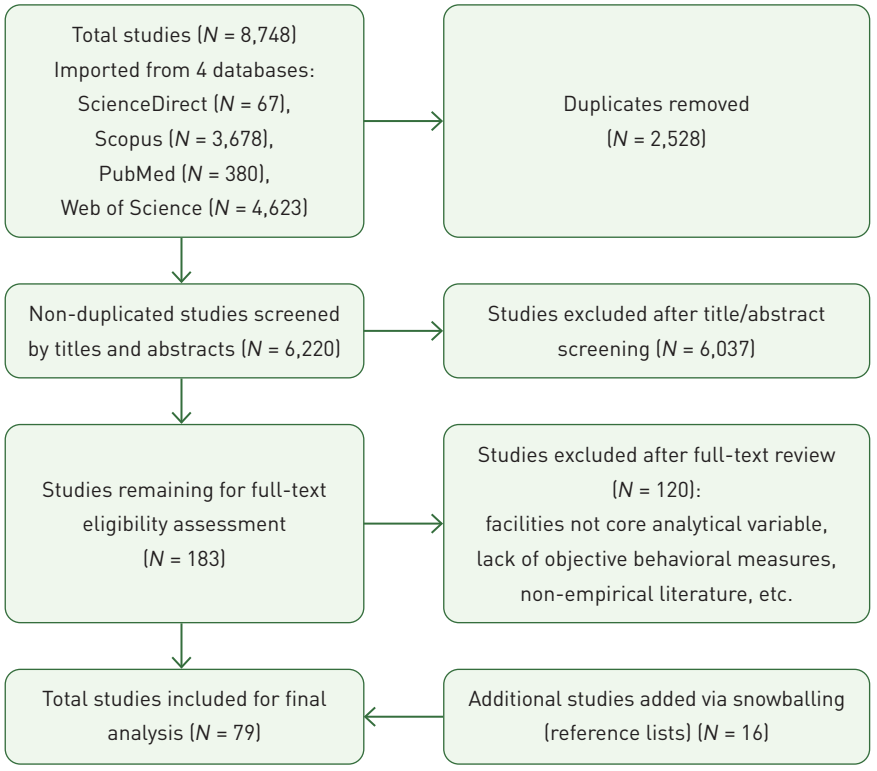


Fig. 1 Screening and inclusion process.

3) Inclusion. Eligibility for inclusion was determined using criteria structured according to the PECO framework (Population, Exposure, Comparator, Outcome). Studies were included if they primarily investigated the role of human-made facilities as core analytical variables influencing metrics of UGS vitality, involved primary empirical research set in urban green spaces, and provided explicit empirical insights into the mechanisms linking facilities to use.

2.3 Data Extraction and Synthesis

A data extraction form was developed and piloted by the research team. For each included study, we extracted: 1) bibliographic and contextual data, including title, authors, year, country or region, and UGS type; 2) research design and data sources, including sample size, observation or survey instruments, and spatial or digital datasets; 3) facility variables, including the type, quality, location, density, diversity, and management of facilities or amenities; 4) vitality measures, including visitation, activity intensity, activity diversity, social interaction, perceptual quality, and temporal patterns; and 5) explanatory claims made by the original authors about how facilities affected use. In addition, data extraction was performed by one reviewer and verified by a second reviewer to ensure accuracy and consistency. Any discrepancies identified during verification were resolved through consensus discussion. To preserve traceability, each extracted claim was retained with its study identifier, facility type, vitality outcome, and supporting quotation or paraphrased finding before

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being assigned a code.

To address the second research question, we used a transparent thematic synthesis procedure rather than deriving the mechanisms solely from narrative interpretation. First, empirical findings and author explanations were segmented into claim units, each linking a facility or a facility condition to an observed or reported vitality outcome. Second, these claim units were coded using action-oriented labels such as "draws users from outside the neighborhood," "supports group gathering," and "improves perceived safety." Third, similar codes were grouped into descriptive themes according to the behavioral or experiential function represented by the evidence. Finally, guided by affordance theory and iterative discussion within the research team, these descriptive themes were consolidated into five analytical mechanisms.

The synthesis was considered complete when the codes and descriptive themes showed a consistent pattern across the extracted evidence and could be linked through an explicit analytical chain to the proposed mechanism. In other words, each mechanism was grounded in study-level findings and was not introduced solely on the basis of theoretical interpretation. The extraction matrix provided the audit trail linking the original findings to the initial codes, descriptive themes, and final mechanisms.

Table 2 provides an illustrative audit trail from extracted evidence to the codes, descriptive themes, and the final five mechanisms. The table is not intended to quantify the frequency of mechanisms; rather, it demonstrates how individual study-level observations were synthesized into the analytical categories used in the findings.

Table 2: Traceable example of coding and synthesis from study-level evidence to analytical mechanisms

Extracted evidence	Examples	Facility/facility condition	Vitality outcome	Code	Descriptive theme	Mechanism
Unique, high-quality, or diverse facilities are associated with higher visitation and destination value	Refs. [32,52,68,72,79,96]	Water bodies, Wi-Fi, diverse sports, and recreational facilities	Higher visitation; visitor numbers	Draw users to the park	Destination pull	Attraction and drawing power
Sports courts, fields, walking loops, playgrounds, and outdoor fitness equipment supported moderate-to-vigorous physical activity (MVPA) and structured activities	Refs. [40,56,59,62,71,78, 80,83,87,90,93]	Activity-specific infrastructure	Activity participation; MVPA	Enables structured exercise or play	Direct activity support	Enabling specific activities
Benches, shade, picnic tables, toilets, food outlets, maintenance, and cleanliness were linked to longer visits and repeated use	Refs. [38,41,51,53,86,89, 92–93]	Comfort and service amenities	Duration of stay; repeat visitation	Allow users to remain on-site	Comfort and convenience	Prolonging stay and encouraging duration
Seating clusters, picnic areas, pavilions, events, markets, stages, and sports courts created opportunities for conversation and group congregation	Refs. [50,60,64,97]	Sociable and programmable facilities	Social interaction; group gathering	Creates a setting for encounter	Social opportunity	Facilitating social interaction
Maintenance, lighting, sightlines, facility quality, cleanliness, accessibility, and restorative qualities shaped perceived safety, satisfaction, and willingness to use parks	Refs. [25,35,41,46,55, 66,69,95]	Safety, maintenance, and quality cues	Perceptual quality; use intention	Improves perceived safety or satisfaction	Perceptual mediation	Shaping user perceptions

3 Results

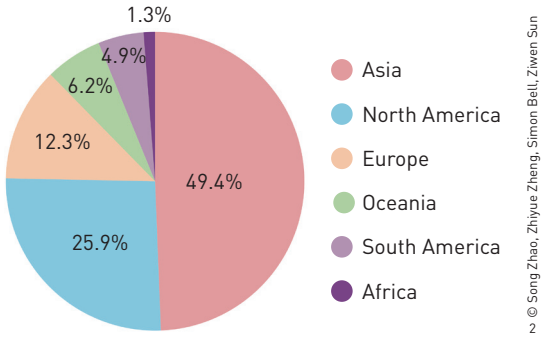
3.1 Literature Characteristics

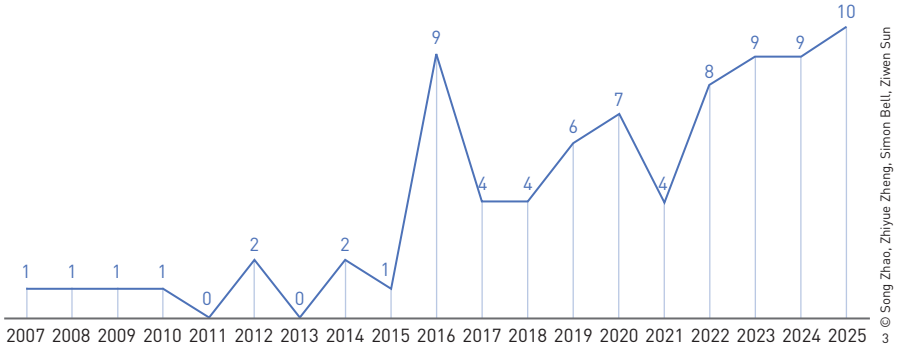
3.1.1. Geographic and Temporal Distribution

The geographic distribution of the included literature reveals a pronounced concentration of research activity in specific regions. As summarized in Fig. 2, the geographic distribution indicates a significant bias, with the evidence base skewed towards Asia and North America—regions predominantly classified as high- or middle-income economies by the World Bank[103]. This geographical skew is likely attributable to several intersecting socio-economic and methodological factors.

Firstly, the rapid urbanization and high-density living conditions prevalent in many Asian and North American metropolises have amplified both public and academic scrutiny regarding the scarcity of green spaces, effectively positioning UGS vitality as a critical public health and urban planning priority. Consequently, these regions often benefit from more substantial research funding directed towards urban sustainability. Secondly, the recent methodological shift towards utilizing "big data," such as mobile phone location tracking, social media check-ins, and smart city sensor networks, is highly dependent on advanced digital infrastructure. This infrastructure is disproportionately concentrated and accessible in these high- and middle-income nations[52,68]. While this concentration yields rich, large-scale datasets, it significantly limits the generalizability of current findings to low-income contexts and the Global South. In these under-represented regions, differing cultural norms, distinct climatic conditions, and varying capacities for facility maintenance may fundamentally alter the mechanisms through which built-up features influence UGS vitality[38,51,64].

The temporal span of the literature, from 2007 to 2025, shows a highly uneven output (Fig. 3). A marked surge in publications occurred from 2016 onwards, with 89.9% of studies (N = 71) published in this latter period. This trend, peaking in 2023 and 2024, reflects rapidly growing scholarly interest in the role of facilities in UGS vitality over the past decade.





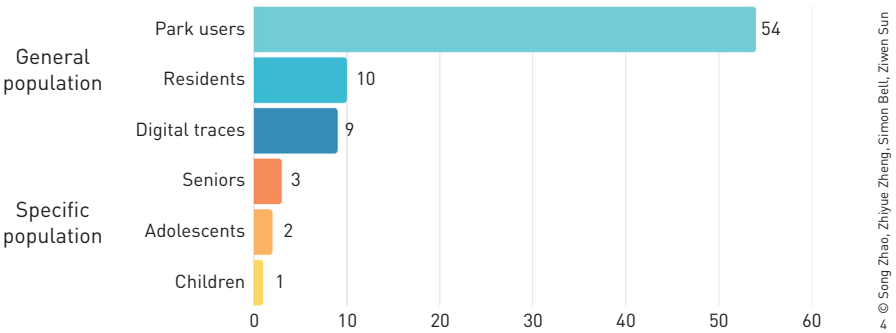


Fig. 2 Geographic distribution of included studies.

Fig. 3 Annual publication distribution of included studies.

Fig. 4 Classification of study populations of the included studies.

3.1.2 Study Populations

Analysis of study populations reveals a clear distinction between general and specific user groups (Fig. 4). The vast majority of studies (N = 73) examined general populations, typically referring to undifferentiated "park users" or nearby "residents." A growing subset of these studies used aggregated digital data, such as social media check-ins and mobile phone data, as proxies for park users or population characteristics, enabling analysis at larger spatial scales. In contrast, only a small number of studies (N = 6) focused on specific population groups, including older adults, adolescents, and children. Age definitions varied across the primary studies, but generally followed WHO-based categories, with children defined as 0–12 years, adolescents as 10–19 years, and older adults as 60 years and above.

Despite the limited number of population-specific studies, they reported differences in the types of facilities associated with use and vitality outcomes across age groups. For older adults, the evidence primarily concerned comfort and accessibility amenities. Well-maintained seating with backrests, shaded resting areas, and accessible public toilets were associated with longer visitation duration and social interaction[36,44,48,69]. Studies of adolescents, in contrast, emphasized activity-enabling infrastructure, particularly facilities supporting vigorous physical activity and

peer socialization. Dedicated sports facilities, including basketball courts and skate parks, as well as unprogrammed open spaces, were associated with physical activities and opportunities for independent group gathering[25,40]. For children, the provision, safety, and variety of play equipment were associated with MVPA[66]. Some studies also reported the role of complementary parental amenities, with playgrounds located alongside seating, clear sightlines, and shelter being associated with longer family-based visits. Overall, the population-specific evidence indicates variation in facility-related needs and use patterns across age groups, though the relatively small number of such studies limits the breadth of evidence available for comparison.

3.1.3 Overview of Study Designs and Data Collection Methods

The methodological approaches employed across the literature are summarized in Table 3. The field is dominated by cross-sectional study designs (*N* = 58, 73.4%), which provide valuable snapshots of associations but limit causal inference regarding the impact of facilities. A notable trend within this category is the increasing use of big data for analyzing spatiotemporal visitation patterns. Case studies (*N* = 11, 13.9%) often employ mixed-methods approaches. By contrast, designs capable of providing stronger causal evidence—such as natural experiments, longitudinal studies, and controlled experiments—were collectively scarce, representing less than 15% of the evidence base. This reliance on cross-sectional data presents a significant constraint for establishing causality and understanding temporal dynamics.

3.2 Facility Typologies in UGS Vitality Research

Analysis of the literature revealed a heterogeneous array of studied features. To synthesize these findings and address the first research question, facilities were categorized into varied typologies by function (Table 4), which most directly aligns with the mechanisms through which they influence vitality[16,73].

These typologies move beyond simple inventories to group facilities by their primary function in enabling activity, providing comfort, enhancing aesthetics, or facilitating access. It is important to note that a single facility can serve multiple functions. The relative importance of different typologies is also contingent upon user groups and cultural contexts.

3.3 Mechanisms Linking Facilities to UGS Vitality

As described in Table 2, the five mechanisms are the analytical output consolidated through affordance-informed interpretation. Table 5 therefore presents not a pre-existing framework imposed on the evidence, but a synthesis derived from the data extraction table.

Table 3: Frequency distribution of primary study designs of the included literature (*N* = 78)

Primary study design	Number of studies (percentage)	Description and methodological characteristics	Examples
Cross-sectional study	58 (73.4%)	Observational studies analyzing data from a population or a set of cases at a single time point; a significant methodological trend within this category is the use of big data (e.g., mobile location data, social media) as the primary data source; furthermore, a number of studies adopted a mixed-methods approach, integrating qualitative insights with quantitative data to enrich the analysis	Refs. [39,71]
Case study	11 (13.9%)	In-depth, contextual investigations of a single park or a small number of parks; this design typically combines environmental audits, behavioral observations, and interviews to provide a holistic understanding of a specific context	Refs. [8,89]
Natural experiment	7 (8.9%)	Studies that leverage a real-world intervention (e.g., park refurbishment) to evaluate impact, employ a pre-post and/or control group design to infer causality, and often use systematic observational tools and cost-data collection	Refs. [27,58]
Experimental/quasi-experimental study	3 (3.8%)	Designs involving researcher-led manipulation, such as choice-based conjoint tasks and virtual reality simulations, to test causal pathways or specific user preferences	Ref. [25]
Longitudinal study	2 (2.5%)	Research involving data collection at multiple time points to analyze changes in park use and vitality over an extended period	Ref. [75]

Table 4: Facility typologies in the included literature

Typology	Sub-typology	Specific facility	Examples
Activity-enabling facility	Structured and vigorous activity	Sports court (basketball, tennis, badminton); sports field (soccer, baseball); swimming pool; skate park; outdoor fitness equipment (fitness zones); gym	Refs. [39,80]
	Random and recreational activity	Playground (swing, slide, climbing structure); multifunctional lawn/open grass area; walking/cycling path or loop; jogging trail; splash pad	Refs. [27,40,83]
Facility for comfort and socialization	Seating and sheltered space	Bench (with/without backrest); picnic table; pavilion; pergola; shelter; seat wall	Refs. [41,82,97]
	Basic service and sustenance	Public toilet; drinking fountain; food and beverage outlet (café, kiosk); litter bin; lighting	Refs. [40,86]
Aesthetic and natural feature	Cultivated and ornamental	Flower bed; ornamental vegetation; sculpture and public art; decorative water feature; architectural ornament	Refs. [88–89,95]
	Natural landscape and ecosystem	Tree canopy and shaded area; woodland; water body; lawn; habitat for wildlife	Refs. [65,74]
Supporting and access infrastructure	Access and wayfinding	Park entrance and gate; signage; path network (connectivity, width, paving); car parking; proximity to public transit	Refs. [44,62–63]
	Safety and maintenance	General upkeep and cleanliness; graffiti and vandalism removal; security facility (CCTV); open sightlines and visibility of park spaces from surrounding areas	Refs. [25,41]

Table 5: Evidenced mechanisms linking facilities to UGS vitality

Mechanism	Definition	Evidence from the literature	Examples
Attraction and drawing power	The capacity of a facility to act as a destination, drawing users to the UGS and increasing overall visits	Unique or high-quality facilities (e.g., water bodies, Wi-Fi, diverse sports facilities) are associated with higher visitation rates, as measured by social media data and direct observation	Refs. [34,68,72,79]
		The installation of fitness zones attracts new users and increases park visitation, particularly in densely populated areas with limited existing facilities	Ref. [58]
		Parks with a greater diversity and area of facilities attract significantly more visitors, acting as destinations within the urban fabric	Refs. [32,43,79]
Enabling specific activities	The provision of physical infrastructure that directly supports particular forms of use	Dedicated sports courts and fields facilitate structured, vigorous activities like basketball and football	Refs. [40,54,78,80]
		Walking loops and jogging trails are strongly associated with MVPA across all age groups, particularly seniors	Refs. [56,62,71,87]
		Playgrounds with a greater variety of play elements support significantly more use and MVPA among children	Ref. [71]
		Outdoor fitness equipment enables strength and aerobic training, significantly increasing MVPA among users	Refs. [59,67,90]

(Continued)

Table 5: Evidenced mechanisms linking facilities to UGS vitality (Continued)

Mechanism	Definition	Evidence from the literature	Examples
Prolonging stay and encouraging duration	Facilities that enhance comfort and convenience, supporting longer visits and cumulative activities	Benches, shaded areas, picnic tables, and toilets allow users to remain on-site for extended periods, facilitating rest and social gatherings	Refs. [36,38,51,89,92]
		The presence of commercial facilities (e.g., food and beverage outlets) integrates longer, sedentary social visits into UGS experience	Refs. [86,93]
		Good maintenance and cleanliness are positively associated with longer durations of stay and repeated visitation	Refs. [41,53]
Facilitating social interaction	The creation of spatial and programmatic opportunities for social encounters, both planned and spontaneous	Clusters of seating, picnic areas, and pavilions provide settings for conversation and group gatherings	Refs. [64,97]
		Programmatic facilities (e.g., community events, markets, performance stages) create structured opportunities for social engagement and foster place attachment	Ref. [50]
		Sports court spaces are particularly conducive to fostering both the congregation of crowds and deeper engagement among users	Ref. [60]
Shaping user perceptions	Facilities influence psychological perceptions (e.g., safety, aesthetics), which mediate the decision to visit and the quality of UGS experience	Good maintenance, lighting, and clear sightlines improve perceived safety, lowering a key barrier to use	Refs. [25,35,69]
		High-quality facilities and a clean environment enhance overall park satisfaction, which indirectly supports more frequent and diverse use	Refs. [41,95]
		The provision and quality of facilities improve perceptions of accessibility, excitement, and restorative quality, which are more proximal drivers of use than the physical features themselves	Refs. [46,55]

Addressing the second research question, the analysis identified five predominant, often interrelated, mechanisms through which facilities influence UGS vitality.

The strength of evidence supporting these mechanisms varies. The mechanisms of enabling specific activities are supported by substantial cross-sectional and quasi-experimental evidence. In contrast, the indirect pathway of shaping user perceptions is primarily supported by cross-sectional surveys employing mediation models, indicating a need for more causal research[45]. Critically, these mechanisms are not mutually exclusive; a well-designed facility, such as a scenic walking loop with seating, can activate multiple mechanisms[83], simultaneously creating a synergistic effect on overall vitality[33,44,70,73].

3.4 Methodological Approaches, Gaps, and Future Research

This section summarizes the descriptive methodological characteristics of the reviewed literature, addressing the third research question by examining how evidence on facilities and UGS vitality has been gathered, measured, and analyzed.

3.4.1 Research Design, Data Collection, and the Conceptualization of Vitality

Table 6 characterizes the three data collection methods adopted among the included literature, each with distinct strengths and limitations. Direct observation provides high-validity behavioral data but is often resource-intensive. Surveys and self-reports are invaluable for capturing perceptions and motivations but are susceptible to recall bias[19,47–48,78]. The rise of emerging digital methods (e.g., mobile phone data, social media analysis, computer vision) enables unprecedented spatiotemporal analysis at scale, yet these approaches often lack qualitative depth and raise ethical considerations regarding representativeness and privacy.

Concurrently, the operationalization of UGS vitality has evolved from rudimentary metrics of use intensity (e.g., visitor counts)

Table 6: Summary of methodological approaches in UGS vitality

Method	Example tool/technique	Strengths	Limitations	Examples
Direct observation	SOPARC, MOHAWk, behavioral mapping, gate counts	Objective, quantifiable data on behavior and demographics; high validity for observed activities	Resource-intensive; limits spatial and temporal scope; potential observer bias	Refs. [49,77,80]
Survey and self-report	Questionnaire, interview, Likert scale	Captures perception, preference, motivation, and satisfaction; essential for understanding "why" behind use	Subject to recall, social desirability, and self-report biases; may not reflect actual behaviors	Refs. [16,88]
Emerging digital and geospatial method	Drone remote sensing; social media data; mobile phone data; CCTV and computer vision (AI-based video analysis)	Enables large-scale, high-frequency, and fine-grained spatiotemporal analysis; often cost-effective at scale	Raises ethical and privacy concerns; potential user representativeness bias; lacks rich qualitative context	Refs. [34,43,94]

NOTE
SOPARC stands for System for Observing Play and Recreation in Communities; MOHAWk stands for Method for Observing pHysical Activity and Wellbeing.

towards more sophisticated, multi-dimensional constructs (Table 7). The most robust studies integrate behavioral metrics with perceptual qualities (e.g., satisfaction, sense of place), thereby capturing both the quantitative and qualitative dimensions of how spaces are used and experienced.

3.4.2 Analytical Techniques: From Descriptive to Predictive Modeling

The analytical approaches employed in the literature reflect a progression from foundational methods to sophisticated techniques capable of modeling complex relationships and, in some cases, inferring causality. A substantial number of studies relied primarily on descriptive statistics and basic inferential tests (e.g., chi-square, *t*-tests, ANOVA) to summarize usage patterns and test bivariate associations between facility provision and vitality indicators[41,57]. While valuable for identifying broad trends and differences between user groups or park types, these methods are inherently limited in their ability to control for confounding variables.

A significant proportion of studies advanced to multivariate regression techniques to isolate the effect of specific facilities while controlling for contextual factors such as park size, location, and user demographics. Commonly used models included linear regression[88–89], logistic regression[37], and negative binomial regression for count data[80,83]. To account for nested data structures (e.g., individuals within parks, observations within park subspaces), multilevel modeling was effectively employed in several studies[41,76,78].

A distinct and growing subset of research incorporated spatial and configurational analysis to move beyond treating the park as a homogeneous unit. Techniques such as Geographical Detectors

Table 7: Conceptualization and measurement of UGS vitality

Dimension	Typical indicators	Common measurement methods	Examples
Use intensity	Visitor counts; density; frequency/duration of visit	SOPARC; drone counts; survey; mobile data	Refs. [16,43]
Activity diversity	Variety of activity types; Shannon-Wiener Index	Direct observation; behavior mapping; survey	Refs. [54,76]
Social interaction	Group size; conversational engagement; shared activities	MOHAWk; survey; Bayesian Belief Network analysis	Ref. [94]
Perceptual quality	Satisfaction; sense of place; emotional response	Likert scale; sentiment analysis (NLP); qualitative interview	Refs. [85,88]
Temporal dynamics	Seasonal/diurnal variation; consistency of use	Repeated observation; mobile data time-series; heat map	Refs. [34,77]

and Multiscale Geographically Weighted Regression (MGWR) were applied to reveal the spatially heterogeneous influence of facilities on vitality, demonstrating how the same amenity can have varying effects in different parts of a city[32,34,96]. Furthermore, Space Syntax analysis was utilized to quantitatively assess how the internal configuration of pathways and the placement of facilities influence pedestrian movement flows and co-presence within parks[44,63,79].

The most methodologically sophisticated studies employed advanced techniques to explore causality and prediction. These included three main approaches. 1) Structural equation modeling (SEM) was used to test complex, mediated pathways, such as the chain from environmental features through satisfaction and usage behavior to health outcomes[95], and the role of psychological factors as mediators between physical facilities and park use[46]. 2) Machine learning algorithms, such as Random Forest, were applied to identify non-linear relationships and determine the relative importance of multiple environmental attributes in predicting physical activity characteristics[39]. 3) Bayesian Belief Networks (BBN) were utilized to model probabilistic causal networks, providing a nuanced understanding of how different spatial types (e.g., fitness areas, courts) influence social interaction via distinct pathways of factors[75].

This evolution from descriptive and associative methods towards predictive, spatially explicit, and causal modeling signifies a maturing field seeking a deeper, more mechanistic understanding of how facilities generate UGS vitality. Nevertheless, the application of these advanced techniques remains relatively scarce compared with the more widespread use of descriptive and standard inferential methods.

3.5 Knowledge Gaps and Future Research Priorities

Building on the descriptive results presented in Tables 3–6 and Fig. 2, the review identifies five knowledge gaps that constrain cumulative understanding of how facilities shape UGS vitality. These gaps are presented here as findings of the scoping review rather than as interpretive discussion.

1) Establishing causality in facility-vitality dynamics. The overwhelming reliance on cross-sectional designs (73.4% of included studies) represents the most significant constraint for asserting that facilities cause changes in vitality. While these studies robustly demonstrate association, they cannot account for self-selection bias or establish temporal precedence. Future research must prioritize longitudinal studies that track changes in use patterns following specific facility interventions. Furthermore, the field would greatly benefit from more natural experiments and quasi-experimental designs that capitalize on planned park renovations, using pre-post measurements with control sites to robustly isolate the causal impact of facility provision, quality, and configuration on multi-dimensional vitality metrics.

2) Spatial analysis of inter park configuration. The prevalent "park-as-a-whole" analytical unit obscures the micro-scale dynamics of how facility layout drives behaviors. Vitality is not uniformly distributed but clusters around specific features and their spatial relationships[44,84]. Future studies should employ behavioral mapping integrated with spatial analysis techniques such as Space Syntax or GIS-based configurational analysis to investigate how the proximity, connectivity, and visibility of different facility types (e.g., the relationship between seating areas and playgrounds, the accessibility of a sports court from a main path) co-produce observed patterns of activity intensity and diversity. This shift is crucial for moving from knowing which facilities matter to understanding how their spatial arrangement influences vitality.

3) Addressing critical contextual and population under-representation. The pronounced geographical bias—heavily skewed towards East Asian and North American contexts—severely limits the generalizability of findings and undermines the equity goals of urban planning. The FMPC framework explicitly posits context as a critical moderator, yet the evidence base lacks the diversity to test. There is an urgent need for primary research in under-represented regions, particularly in the Global South and low-income countries, where cultural norms, climatic conditions, and maintenance regimes may fundamentally alter the facility–vitality relationship. Concurrently, the near-exclusive focus on "general populations" obscures the needs of specific demographic groups. Targeted research is required to understand the distinct facility preferences and barriers faced by adolescents, older adults, people with disabilities, and culturally and linguistically diverse communities, ensuring that UGS design promotes inclusivity.

4) Integrated multi-dimensional vitality and multi-method approaches. The conceptual evolution of vitality towards a multi-dimensional construct (encompassing behavioral intensity, activity diversity, social interaction, perceptual quality, and temporal dynamics) has outpaced its consistent operationalization in empirical studies. Many studies still rely on single-dimensional proxies (e.g., visitor counts). Future research should champion mixed-methods designs that systematically integrate different data streams. For instance, combining the macro-scale spatiotemporal patterns revealed by big data (e.g., mobile phone data) with the micro-scale behavioral insights from direct observation and the explanatory depth of qualitative interviews can bridge the gap

between what patterns occur and why they emerge, providing a holistic understanding of how facilities contribute to both the quantity and quality of park use.

5) Investing the interplay between facilities, management, and programming. The current evidence base is predominantly focused on physical infrastructure. However, a facility's impact on vitality is mediated by its management and the activities it accommodates. Critical gaps remain in understanding how maintenance regimes, public programming (e.g., organized sports, fitness classes, markets), and perceived safety interact with physical features to sustain long-term vitality. Future efforts should systematically investigate how these "soft" factors activate the affordances of "hard" infrastructure, particularly how programming can attract diverse user groups and extend temporal vitality into evenings and off-peak seasons.

4 Discussion

4.1 Synthesis of Key Findings and Theoretical Integration

This section interprets the three layers of evidence—descriptive patterns in the reviewed studies, mechanisms derived from thematic synthesis, and knowledge gaps identified from the evidence map—together, asking what they imply for theory, future research, and landscape architecture practice.

The central theoretical contribution of this study is to translate affordance theory into an empirically grounded facility-vitality model: instead of being passive objects within green space, facilities operate as actionable affordances that can attract users, enable activities, sustain duration, support social interaction, and shape perceptions. This interpretation addresses critiques of "green-blind" metrics that treat UGS as undifferentiated greenness while overlooking the functional qualities through which people actually use park environments[26].

The FMPC framework (Fig. 5) integrates these mechanisms with the moderating roles of user diversity and geographical context. Its value lies in making the facility-vitality relationship conditional rather than universal: the same facility may produce different vitality outcomes depending on the population served, the cultural and climatic setting, and the management regime. The FMPC framework therefore moves the field beyond listing correlates of park use towards a testable model of how built features, behavioral pathways, users, and contexts jointly co-produce multi-dimensional vitality.

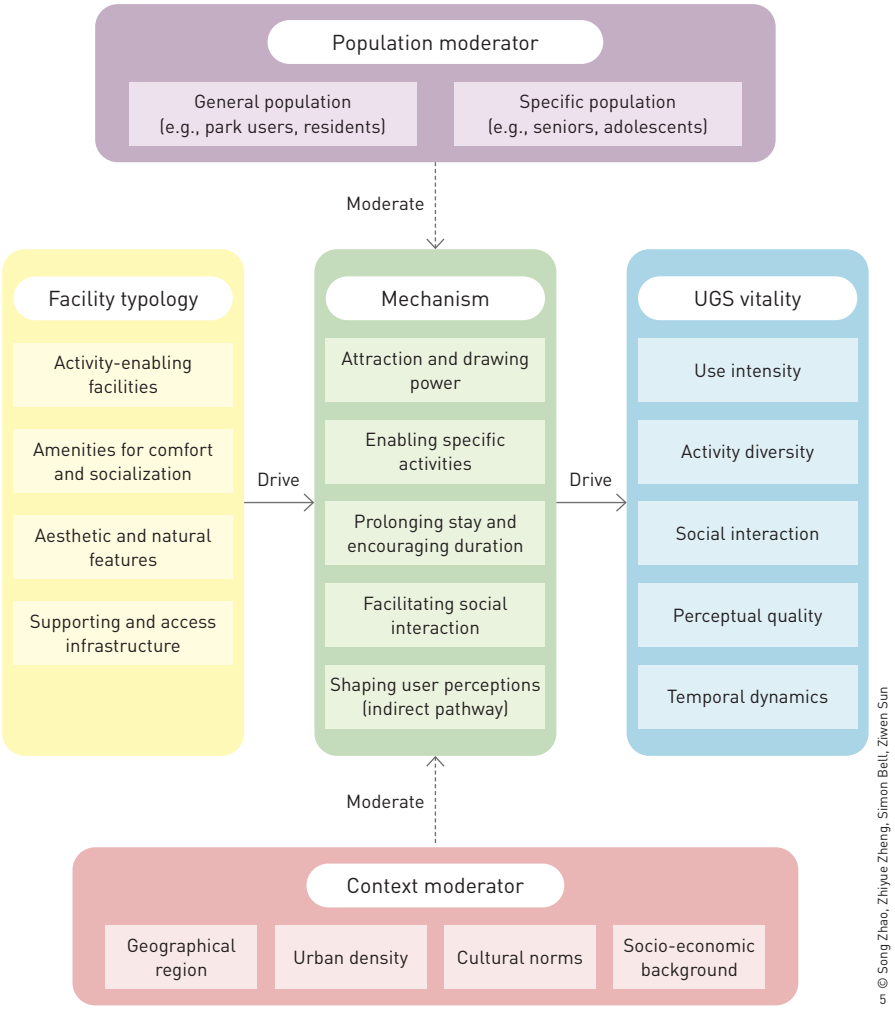


Fig. 5 The FMPC framework for UGS vitality.

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4.2 Interpretation of Findings Within the FMPC Framework

4.2.1 Interplay of Facilities and Mechanisms

The review reveals that high-performing facilities often activate multiple mechanisms synergistically—a phenomenon that echoes William H. Whyte's observations on the social life of small urban spaces[104]. For instance, a well-maintained, shaded walking path not only enables walking and running but may also attract visitors due to its aesthetic quality, prolong stays through strategically placed benches, and facilitate social interaction among walkers. This synergy underscores that the whole impact of a well-designed UGS is greater than the sum of its parts, reinforcing the holistic design principles advocated by landscape architects[6]. However, the strength of evidence supporting these mechanisms varies considerably. While the mechanism of enabling specific activities is strongly supported by quasi-experimental and spatial analysis studies[17–18], the indirect pathway of shaping user oerceptions relies predominantly on cross-sectional surveys employing mediation models[41,46]. This reliance on snapshot data represents a significant methodological constraint for asserting causality, a limitation previously highlighted by Louise Poppe et al.[27] and the very

limitation that the FMPC framework seeks to address by calling for more longitudinal and experimental designs.

4.2.2 The Critical Role of Population Heterogeneity and Context

The pronounced skew in the literature towards general population studies fundamentally limits the field's contribution to equitable planning, a concern raised by Jennifer R. Wolch et al. in their seminal work on environmental justice[105]. The FMPC framework posits that the facility–mechanism relationship is not universal[47,54,91]. For example, the presence of seating and toilets is a critical determinant for older adults' visitation duration[24], whereas adolescents demonstrate distinct preferences for sports facilities and skate parks[25].

Similarly, the significant geographical bias—heavily weighted towards urban contexts in East Asia and North America—underscores the context-dependent nature of UGS vitality, a point emphasized by Christine Haaland and C. Konijnendijk van den Bosch in their review of green-space planning under densification[106]. In some settings, basic amenities like sanitation and security are essential prerequisites for use[107], whereas in others, aesthetic refinement or high-end recreational facilities may be more salient drivers[7]. This necessitates context-sensitive, evidence-informed policies over the universal application of design standards derived from a narrow set of cultural and economic contexts.

4.3 Interpreting the Gap Structure and the Path Forward

The gap structure identified above indicates that the field is methodologically productive but uneven. The expansion of digital traces, spatial analytics, and predictive modeling has increased the scale and granularity of evidence, yet the dominance of cross-sectional designs means that much of the literature still explains where vitality is associated with facilities rather than how facility interventions change vitality over time.

This imbalance matters because each method illuminates only part of the FMPC framework. Big data can reveal large-scale visitation patterns, but it often remains blind to motivations, perceived comfort, social interaction quality, and the everyday constraints experienced by under-represented groups. Conversely, observation and qualitative methods can reveal behavioral and experiential mechanisms, but are often spatially and temporally limited. Treating these methods as complementary rather than competing is therefore essential for moving from descriptive association to explanatory evidence.

Future research should therefore combine stronger causal designs with multi-method triangulation. Longitudinal studies, natural experiments, and quasi-experimental evaluations of facility renovations are needed to test temporal precedence and rule out of self-selction. At the same time, mixed designs that pair GPS or mobile-phone data with behavioral mapping, interviews, or prompted recall can connect macro-scale activity patterns with the micro-scale experiences through which facilities acquire meaning and use value.

4.4 Implications for Research, Policy, and Design

4.4.1 Theoretical Implications

The proposed FMPC framework contributes to theory by specifying facilities as affordance-generating elements embedded in population and contextual conditions. Rather than treating park features as isolated predictors, the framework invites hypotheses about mechanism combinations, threshold effects, and moderated pathways. Future research can use this framework to test, for example, whether comfort amenities amplify the effect of activity-enabling facilities, or whether the same facility type produces different outcomes for adolescents, older adults, and families across climatic or cultural settings.

4.4.2 Implications for Evidence-Based Design and Policy

(1) Design practice and spatial configuration

For landscape architects and planners, the core implication is to design facility systems around intended mechanism profiles rather than around isolated object provision. A park intended to promote everyday physical activity, for example, requires not only sports or walking infrastructure but also the comfort, access, safety, and social affordances that make repeated use plausible across populations and seasons. Three evidence-informed spatial strategies follow from the FMPC framework.

1) Composite design for activity-enabling facilities. To avoid single-use, exclusionary zoning, designers should physcally integrate facilities that cater to different exertion levels and age groups. For example, incorporating tiered spectator seating, shaded resting nodes, or low-intensity walking loops immediately adjacent to high-intensity sports courts or skate parks. This interdependent design supports the vigorous physical activity of adolescents while simultaneously providing comfortable, engaging observation spaces for older adults and peers, thereby fostering intergenerational co-presence.

2) Configurational logic, comfort, and socialization. The layout of comfort amenities critically dictates social interaction. Rather than deploying benches uniformly along pathways in a linear fashion, seating should be clustered in sociopetal configuration

(e.g., L-shaped, U-shaped, face-to-face arrangements) to actively afford conversation and group gathering. Furthermore, these social nodes must be climatically responsive, strategically co-located with tree canopies or architectural shelters to mitigate environmental extremes and prolong visitation durations.

3) Interconnected zoning for vulnerable groups. Equitable design required addressing the logistical barriers faced by specific demographic groups. Planners should establish strong spatial and visual connections between interdependent zones. A primary example is co-locating children's playgrounds with essential supporting infrastructure, such as accessible public toilets, step-free pathways, and comfortable, shaded seating areas that offer unobstructed sightlines for parental or grandparental supervision. This cohesive zoning lowers the threshold for use, ensuring that UGS environments are genuinely inclusive for families and older caregivers.

(2) Public policies

Public investment must recognize that high-quality, basic amenities (e.g., toilets, lighting, seating) and consistent maintenance are not secondary but foundational to vitality. Policies should advocate for targeted investments in underserved neighborhoods and for vulnerable groups to address equity gaps in UGS provision and quality.

(3) Park management

Facility provision alone is insufficient. Park management should integrate physical infrastructure with programming—such as organized events, fitness classes, and markets—to activate spaces and foster community engagement[19,42,45,50,81,84]. Effective, responsive maintenance regimes are equally critical to sustain both the functionality and perceived safety of facilities, without which initial investments quickly fail.

4.5 Limitations

While this scoping review provides a comprehensive mapping of the literature, several limitations should be considered when interpreting its findings. Firstly, the search was restricted to publications in English and Chinese and to the selected bibliographic databases. As a result, relevant evidence published in other languages or in gray literature may have been missed, including government planning reports, design project evaluations, and professional practice documents that are not indexed in the databases searched. This limitation may have reduced the geographical, cultural, and practice-oriented breadth of the evidence base. Secondly, in line with the purpose of a scoping review, the methodological quality of individual studies was not formally appraised. The aim was to map the breadth of evidence rather than to assess the robustness of individual findings. Consequently, the proposed typologies and mechanisms synthesize evidence of varying methodological rigor and should be interpreted as an evidence-mapping framework rather than as an assessment of effect strength.

Finally, the conceptual focus on human-made facilities, while deliberate, may have understated the role of natural features as independent or interacting drivers of vitality. The developed typology is therefore conceptual and may not fully capture the multifaceted and culturally specific characteristics of some facilities.

5 Conclusions

This scoping review consolidates evidence from 79 studies to specify how facilities concretely enhance UGS vitality. The findings demonstrate that vitality is driven not by green space alone, but by the deliberate provision of specific, modifiable infrastructure.

The evidence prioritizes several facility types. Activity-enabling facilities such as sports courts, fitness equipment, and dedicated paths are paramount for boosting physical activity levels and attracting users. Crucially, comfort amenities—particularly seating and toilets—are foundational for prolonging stays and facilitating the social and restorative dimensions of vitality. The positive impact of these features is universally moderated by supporting facilities like adequate lighting and maintenance, which act as critical prerequisites for use. Furthermore, this review clarifies that facilities influence vitality through distinct, synergistic mechanisms—by attracting users, enabling specific activities, prolonging stay, facilitating social interaction, and shaping user perceptions. The effect is highly context-dependent; optimal facility provision must account for population heterogeneity (e.g., the distinct needs of older adults versus adolescents) and geographical context, as highlighted by the significant biases in the current evidence base.

In summary, this review moves beyond generalities to provide a targeted evidence base. The proposed FMPC framework offers a structured model for understanding these dynamics. This review successfully achieves its aim of systematically mapping the field, clarifying key concepts, and identifying critical gaps, thereby establishing a robust foundation for future research and policies and informing investment in the specific facilities that directly enable the diverse human experiences underpinning true vitality.

Competing interests | The authors declare that they have no competing interests.

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城市绿地设施对空间活力影响的范围综述

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摘要

城市绿地活力——即人类活动的强度和丰富程度——是绿地发挥公共健康效益的关键前提。绿地设施虽被认为是影响绿地活力的重要因素，但现有实证研究较为零散，尚未形成关于设施“如何”及在“何种条件”下影响绿地使用的系统认识。针对这一研究空白，本范围综述对相关证据进行了梳理与整合，旨在厘清城市绿地设施的功能类型、作用机制及情境调节因素。依据PRISMA-ScR指南，本文分析了2000—2025年出版的79项实证研究，将设施的功能类型归纳为活动支持型、舒适便利型、审美自然型和辅助支持型4类；并进一步提炼出设施影响活力的5种关键机制，即吸引使用者、支持特定活动、延长停留时间、促进社交互动和塑造使用者感知。研究发现，城市绿地设施的作用受到人群和地理情境异质性的显著影响，这一作用关系最终被整合为本文提出的“设施 – 机制 – 人群 – 情境”框架。尽管大量证据表明设施对绿地服务效能至关重要，但该领域仍普遍为横向研究设计，且未考虑到地域偏差。本文明确指出现有知识的关键短板，包括因果证据和精细空间分析的不足，以及对全球南方地区及弱势人群的关注匮乏。本综述为未来研究、循证设计及旨在最大化城市绿地健康与社会价值的公平政策提供了重要参考。

关键词

城市绿地；空间活力；公共空间设计；设施；便利设施；使用模式；范围综述

文章亮点

- 设施是城市绿地活力重要且可调控的驱动因素
- 创新性地提出城市绿地设施功能分类体系
- 揭示绿地设施影响多维活力的5种关键机制
- “设施 – 机制 – 人群 – 情境”框架揭示了设施对活力的影响
- 指出当前研究在因果推断、空间构型与公平性方面存在欠缺

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