

From urban park concepts to performance: A critical narrative review of Socio-Ecological design and quality

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ARTICLE INFO	ABSTRACT
<i>Article history:</i> Received June 20, 2026 Received in revised form July 20, 2026 Accepted August 17, 2026 Available online September 01, 2026 <i>Keywords:</i> Park quality Performance indicators Place-keeping Socio-ecological design Urban Park *Corresponding author: Nur Intan Mangunsong Department of Architecture, Faculty of Civil Engineering and Planning, Universitas Trisakti, Indonesia Email: nurintan@trisakti.ac.id	Urban Park concepts are frequently articulated in terms of spatial composition, amenities, landscape character, or distinctive visual identity; however, their substantive value ultimately depends on the socio-ecological outcomes that can be demonstrated and evaluated. This critical narrative review examines how architectural and landscape design intentions can be systematically converted into evidence concerning biodiversity, hydrological regulation, thermal comfort, equitable accessibility, lived experience, cultural significance, and long-term stewardship. A structured literature search and an explicit evidence hierarchy were used to integrate recent scholarship addressing green infrastructure, ecosystem services, nature-based solutions, environmental justice, park quality, walking behavior, and governance. The synthesis establishes four interrelated performance tests: ecological functionality, equitable availability, experiential affordance, and place-keeping capacity. Recent empirical evidence indicates that the mere provision of parks does not necessarily ensure high-quality environments, that characteristics at the route level can substantially influence patterns of use, and that decision-support instruments can make priorities more explicit only when their criteria and weighting procedures are transparent. The proposed concept-to-performance framework consequently connects individual design claims with their underlying mechanisms, measurable indicators, responsible actors, and post-occupancy monitoring procedures. Its principal contribution is the integration of ecological, distributive, experiential, and governance-based evidence into a single auditable sequence for design evaluation. The framework is intended to support concept assessment, planning approval, public participation, and adaptive management rather than function as a universal scoring system.

Introduction

Urban parks can no longer be adequately understood as isolated amenities whose primary purpose is to provide scenic relief within increasingly dense urban environments. Within contemporary conservation and urban-planning discourse, parks are progressively conceptualized as components of green infrastructure, as providers of multiple ecosystem services, and as spatial settings in which biodiversity, human well-being, and social justice converge. Consequently, multifunctionality should be understood as a social-ecological planning challenge rather than merely as an inventory of recreational facilities or landscape features (Hansen and Pauleit 2014). The principles associated with nature-based solutions further emphasize that interventions should operate systemically, respond to their specific contexts, promote inclusion, and generate positive outcomes for biodiversity (Kabisch, Frantzeskaki, and Hansen 2022). At the same time, co-benefit frameworks require environmental, socio-cultural, and economic consequences to be examined collectively rather than treated as separate considerations (Raymond et al. 2017). More recent perspectives based on social-ecological-technological systems reinforce this position by demonstrating that ecological processes, infrastructure, technological systems, institutions, and patterns of human use interact to determine whether urban ecosystem services are actually delivered (McPhearson et al. 2022).

The principal unresolved issue is therefore one of evaluation. A compelling conceptual drawing may communicate a persuasive spatial vision, but it cannot by itself demonstrate whether a proposed park will perform its intended ecological functions, distribute its benefits equitably, facilitate meaningful forms of use, or maintain its effectiveness throughout long-term operation and management. Existing approaches address different portions of this performance chain. Resilience theory, for example, emphasizes adaptive systems and safe-to-fail approaches (Ahern 2011), whereas multifunctional green-infrastructure planning positions parks as landscapes that provide services while operating as components of broader urban networks (Lovell and Taylor 2013). Accessibility research generally examines proximity and opportunities for access; investigations of park quality and

human behavior consider facilities, perceptions, and patterns of use; and governance-oriented studies focus on stewardship and management. Nevertheless, these bodies of scholarship are seldom connected systematically from an initial design proposition to measurable outcomes and clearly identified responsible actors. As a result, design-review processes may place disproportionate emphasis on visual appearance, total area, or spatial distance while giving insufficient attention to causal mechanisms, distributional effects, lived experience, and long-term maintenance.

Recent empirical evidence demonstrates why this evaluative gap is consequential. A multidimensional assessment encompassing 100 parks in Chengdu employed six dimensions and 27 indicators and revealed substantial differences in park quality even in locations where park provision was already present (Zhang et al. 2024). Similarly, a pathway-level investigation undertaken at Cautin Park in Chile documented 7,018 walkers across 39 road segments and identified relationships between design characteristics, spatial legibility, and walking behavior (Paydar, Kamani Fard, and Gárate Navarrete 2023). Evidence from natural experiments further indicates that park renewal can influence visitation, physical activity, and social interaction, although the magnitude and direction of these outcomes differ among user groups and contextual conditions (Poppe et al. 2023). Research focused on equity likewise demonstrates that nominal or formal access does not necessarily translate into comparable levels of exposure or service provision across populations (Chen et al. 2022; Z. Li et al. 2023). Collectively, these findings point to the need for an evaluative framework capable of connecting design concepts with ecological, social, experiential, and institutional evidence that can be independently examined and audited. The scholarly significance of this review derives from its effort to integrate these otherwise fragmented traditions of assessment. Its distinctive contribution is an audit-oriented concept-to-performance chain that simultaneously identifies four critical components: (i) the mechanism through which a proposed design intervention is expected to generate its intended effect, (ii) indicators capable of assessing ecological performance and user experience, (iii) distributional considerations concerning which populations benefit and which may be excluded, and (iv) stewardship

responsibilities together with triggers for adaptive management. Rather than reducing these considerations to a single benchmark or composite numerical score, the framework retains potential trade-offs and exposes its underlying assumptions to subsequent testing. In this respect, it is intended to complement not replace established principles of nature-based solutions, social-ecological-technological systems models, accessibility metrics, and multi-criteria decision-support tools.

Accordingly, this review pursues three primary objectives. First, it seeks to clarify the contemporary meaning of an urban park design concept. Second, it synthesizes the available evidence into four interconnected performance tests: ecological functionality, equitable availability, experiential affordance, and place-keeping capacity. Third, it proposes a framework through which early-stage design narratives can be connected to post-occupancy monitoring and performance evaluation. In accordance with these objectives, the review addresses three research questions: RQ1: Which dimensions should be incorporated into a contemporary urban park concept-to-performance framework? RQ2: How can these dimensions be translated into observable indicators and evidence? RQ3: Which governance and monitoring conditions are required to sustain performance and equity over time?

Methods

This research adopted a critical narrative review methodology because its primary aim was to achieve interpretive integration across heterogeneous conceptual, empirical, and practice-oriented bodies of literature rather than to statistically aggregate effect sizes. The review brought together scholarship concerning green infrastructure, ecosystem services, nature-based solutions, park quality, accessibility, biodiversity, environmental justice, lived experience, and governance. The principal decisions governing the search strategy, source selection, evidence weighting, and synthesis process are summarized in [table 1](#). Peer-reviewed conceptual and review studies were used to establish the theoretical boundaries of the inquiry, whereas empirical investigations of park quality, accessibility, biodiversity, and patterns of use provided the

principal evidence base for the proposed framework. Official guidance documents were consulted to clarify expectations concerning implementation, while agency and project-based sources were restricted to the interpretation of built-case narratives rather than being treated as direct evidence of performance.

Four conceptually defined search blocks were used to identify publications dated from 2022 to 2026: “urban park quality assessment performance”; “urban green space equity accessibility”; “urban park ecosystem services biodiversity”; and “urban park walking design quality use.” The first 100 relevance-ranked records retrieved from each conceptual block were exported, producing an initial dataset of 400 records. Following deduplication based on DOI and normalized title, the dataset was reduced to 351 unique records. Subsequent screening of titles and metadata identified 98 potentially relevant records. After assessments of relevance, source quality, and DOI verification, 15 recent peer-reviewed articles were selected and incorporated into the 50-source base manuscript, resulting in a final analytical corpus of 65 sources.

Studies were considered eligible when they investigated urban parks or comparable public urban green spaces and provided evidence relevant to at least one of the four performance dimensions established by this review. The update placed particular emphasis on English-language journal articles and review studies published from 2022 onward. Nevertheless, earlier publications were retained when they provided foundational theoretical concepts, validated assessment instruments, official standards, or landmark evidence whose removal would have weakened the conceptual provenance of the framework. Records were excluded when they were duplicates, concerned subjects unrelated to urban green space despite superficial keyword overlap, were narrowly technical without meaningful relevance to design, or lacked verifiable bibliographic identities. Practice-oriented websites were deliberately excluded as evidence for claims concerning actual performance.

The search terminology was intentionally broad because relevant concepts are expressed differently across landscape architecture, urban ecology, public health, environmental justice, and urban planning. The terms “urban park” and “urban green space” defined the principal spatial object, while quality, performance, ecosystem services, biodiversity, equity, accessibility,

walking, design, and use represented the principal outcome and mechanism dimensions. Within each concept block, retrieved records were ranked according to relevance before the first 100 records were subjected to screening. Backward citation tracing was subsequently conducted for retained review articles and landmark empirical studies. This procedure served two purposes: identifying foundational publications published before 2022 and verifying the intellectual origins of concepts such as multifunctionality, environmental preference, green justice, and place-keeping. Crossref metadata were also checked against author names, publication year, article title, journal, volume or article number, and DOI information. Sources were not incorporated when their bibliographic metadata could not be reconciled or when they merely duplicated an argument already supported by a stronger or more directly relevant study.

For data charting, every retained publication was systematically documented according to publication type, geographical setting, park or green-space typology, analytical scale, research design, population or ecological receptor, performance outcome, indicator, principal finding, and stated limitation. Information concerning distributional equity, cultural fit, governance, maintenance, displacement risk, and post-occupancy monitoring was recorded separately. This separation was necessary to prevent social and institutional conditions from being subsumed within an overly broad category of “benefits.” Although an individual study could contribute evidence to more than one performance dimension, each application of that study within the synthesis was required to correspond to the specific result it supported rather than merely to its general subject matter. Quantitative findings were cross-checked against their original methodological context including sample characteristics, measurement units, spatial scale, and analytical method before being retained as quantitative anchors in [table 4](#).

The appraisal of evidence was calibrated according to the type of publication under consideration. Empirical studies were assessed in terms of sampling transparency or spatial coverage, clearly defined variables and outcomes, appropriateness of analytical methods, and explicit recognition of uncertainty. Review studies were evaluated according to their stated scope, search or synthesis procedures, and the degree of correspondence between the evidence

they included and the conclusions they advanced. Conceptual publications were used to establish and define theoretical constructs but were not treated as evidence for the magnitude of effects. Official standards and guidance were used to establish normative or implementation criteria, whereas project websites were limited to descriptive contextual information. Because the evidence base comprised heterogeneous research designs, the review did not impose a single numerical quality score across all sources. Instead, individual claims were calibrated to the strongest evidence available, while contradictory or context-dependent findings were retained as limitations rather than being averaged into an artificial consensus.

To strengthen claim-to-source traceability, the synthesis matrix was examined in two complementary directions. The first, a source-to-framework assessment, identified the mechanisms, indicators, trade-offs, and contextual qualifications supported by each publication. The second, a framework-to-source assessment, examined whether every proposed design question and indicative metric had an evidentiary foundation and whether contradictory or limiting findings had been overlooked. Convergence was recognized only when conceptually compatible studies using different methodological designs supported the same relationship. Conversely, disagreement was interpreted as evidence of contextual dependence rather than being resolved through vote counting. The four performance tests were retained because they appeared repeatedly across disciplinary perspectives while remaining sufficiently differentiated for practical design review. Ecological functionality addresses biophysical mechanisms; equitable availability focuses on distribution and barriers; experiential affordance addresses perception and observed use; and place-keeping capacity encompasses finance, governance, maintenance, and adaptation. The resulting framework was subsequently compared with established approaches to identify areas of overlap, distinctive contributions, and appropriate boundaries before the practical implications were formulated.

The synthesis itself was undertaken in three stages. First, claims and indicators were deductively classified under the four performance categories: ecological functionality, equitable availability, experiential affordance, and place-keeping capacity. Second, inductive coding was

used to identify mechanisms that crossed these categories, together with trade-offs, affected populations, monitoring requirements, and responsible actors. Third, the evidence was examined comparatively across conceptual frameworks, review studies, empirical assessments, and decision-support research. Quantitative findings were retained as contextual anchors rather than statistically pooled because the underlying studies differed substantially in research design, spatial units, populations, and outcome measures. Consequently, every proposed component of the framework was required to have an explicit mechanism and

support from at least one empirical study, review article, or standards-based source.

Although this protocol enhances transparency, it does not constitute an exhaustive review. Relevance-ranked sampling may fail to capture less-visible studies, while the emphasis on English-language publications limits the geographical representation of the evidence base. In addition, the proposed framework has not yet undergone prospective validation across different park typologies or governance settings. These limitations are therefore treated as priorities for future comparative research and post-occupancy evaluation.

Table 1. Review design and evidence hierarchy

Review element	Operational decision	Bias-control function
Review purpose	Critical narrative synthesis; no effect-size pooling	Aligns the review methodology with heterogeneous conceptual, empirical, and practice-oriented evidence
Discovery and verification	OpenAlex discovery; Crossref metadata and DOI verification; search updated 8 September 2026	Makes the update route and verification source explicit
Concept blocks	Park quality/performance; equity/accessibility; ecosystem services/biodiversity; walking/design/use	Ensures coverage of all four dimensions of the proposed framework rather than concentrating on a single thematic domain
Retrieval and deduplication	400 relevance-ranked records exported; 351 unique after DOI/title deduplication	Documents the size of the candidate evidence pool and how duplicate records were handled
Eligibility	Urban parks or comparable public urban green spaces; evidence relevant to design, performance, equity, use, or stewardship	Prevents inclusion based solely on keyword correspondence
Time horizon	2022–2026 prioritized for the update; older sources retained only when foundational or standards-based	Balances contemporary evidence with preservation of conceptual provenance
Screening outcome	98 records passed title/metadata relevance screening; 15 verified recent articles added; final corpus n = 65	Transparently reports selection outcomes without suggesting that the review is exhaustive or systematic in scope
Evidence hierarchy	Highest weight: peer-reviewed reviews and empirical studies; moderate: official guidance; descriptive only: project websites	Distinguishes evidence demonstrating outcomes from sources describing implementation or project narratives
Synthesis	Deductive and inductive coding into four tests, mechanisms, indicators, trade-offs, monitoring needs, and responsible actors	Establishes traceability between the literature and the individual components of the proposed framework

Results and discussion

The findings are structured to maintain direct correspondence between the research questions and the resulting analytical sections. Sections 1–4 address RQ1 by defining the four dimensions of performance. Sections 5–6 address RQ2 by comparing established approaches and converting the four dimensions into measurable indicators and quantitative anchors. Section 7 addresses RQ3 by establishing the governance, monitoring,

and implementation conditions required to sustain performance over time.

Defining the urban park concept

Within professional design practice, the term *park concept* commonly refers to a visual theme, spatial composition, or narrative of landscape identity. From the perspectives of conservation and ecosystem-service planning, however, such a definition is inadequate. A contemporary urban park concept should instead articulate how the proposed landscape is expected to operate as a

social-ecological system and should identify the hydrological, vegetative, habitat, mobility, cultural, and governance mechanisms through which the park is expected to generate benefits for its users and surrounding communities. This interpretation is consistent with guidance that connects physical improvement with community engagement and long-term management (WHO 2017), as well as with nature-based-solution principles emphasizing systemic design, biodiversity enhancement, inclusion, and adaptive governance (IUCN 2020; Kabisch, Frantzeskaki, and Hansen 2022).

Accordingly, a design concept should not be understood merely as a visual representation of a proposed park. Rather, it constitutes a testable hypothesis that a particular spatial and ecological configuration will generate specified benefits under realistic social, climatic, and institutional conditions. For example, a concept that claims to enhance flood resilience should explicitly identify the mechanisms of water storage and infiltration together with appropriate performance metrics. Similarly, a proposal emphasizing inclusive access should identify the populations intended to benefit and the barriers that may remain. A biodiversity-oriented concept should establish habitat objectives, management regimes, and monitoring responsibilities. Framing the concept in this manner transforms a general design aspiration into a sequence of causal propositions that can be examined both before construction and through post-occupancy evaluation.

This distinction is particularly important because urban ecosystem services emerge from interactions among biophysical processes, built infrastructure, technologies, institutions, and patterns of social use. Foundational research established urban parks as providers of locally important services, including air filtration, microclimate regulation, noise reduction, drainage, and recreation (Bolund and Hunhammar 1999). The social-ecological-technological systems perspective subsequently makes these interactions more explicit (McPhearson et al. 2022), while recent empirical research demonstrates that naturalness, ecological functioning, and the degree of imperviousness can influence the services delivered by urban green infrastructure (Hanna, Bruno, and Comín 2023).

Evidence domains in the concept-to-performance chain

Ecological functionality

Ecological functionality is the first test. An urban park concept should demonstrate how soil, water, vegetation, topography, habitat, and urban form are spatially configured to generate identifiable ecosystem services. Nature-based solutions are most effective when they are integrated into planning processes, developed through stakeholder co-production, and evaluated in relation to multiple benefits and potential trade-offs (Frantzeskaki 2019; Kabisch, Frantzeskaki, and Hansen 2022). Without clearly articulated mechanisms and governance arrangements, however, the concept may become too broad or ambiguous to support meaningful evaluation (Nesshöver et al. 2017). Empirical assessments further indicate that the degree of naturalness and ecological functioning, rather than the mere presence of green cover, influences service provision (Hanna, Bruno, and Comín 2023). Similarly, habitat quality and varying degrees of wildness affect the spatial distribution of urban biodiversity (Aznarez et al. 2022).

The evidence concerning human health introduces an additional pathway through which ecological performance can be translated into human outcomes. Urban natural environments may contribute to well-being through several interconnected mechanisms, including stress reduction, increased physical activity, social interaction, improved air quality, and mitigation of heat exposure (van den Bosch and Ode Sang 2017; Twohig-Bennett and Jones 2018). These pathways should be articulated separately rather than reducing green exposure to a single undifferentiated variable (Markevych et al. 2017). Global evidence also indicates that the cooling benefits generated by urban green spaces can be substantial while remaining unevenly distributed across urban areas (Y. Li et al. 2024). Greening strategies oriented toward biodiversity may likewise contribute to health outcomes, although their effects depend on intervention type, level of exposure, and study quality (Spotswood et al. 2025). Design claims should therefore specify the ecological mechanism involved, the population or ecological receptor affected, the expected outcome, and the indicator through which that outcome will be monitored.

Equitable availability and quality

Equity represents the second performance test. Measures of distance to a park or area of green space per capita are insufficient for determining whether residents can actually reach, enter, use, and benefit from that space. Inequality can manifest through differences in quantity, quality, proximity, transportation access, safety, programming, and cultural fit (Rigolon 2016). Furthermore, apparently adequate provision at the city scale can conceal significant disparities between individual neighborhoods (Kabisch and Haase 2014). Exposure to urban green space also differs across and within the Global North and Global South (Chen et al. 2022), while observed outcomes are influenced by spatial delineation, population demand, ethnicity, and contextual conditions (Z. Li et al. 2023; Wolf and Waitt 2023). Improvements to parks may additionally reproduce environmental injustice or contribute to green gentrification when appropriate safeguards are absent (Wolch, Byrne, and Newell 2014; Anguelovski et al. 2022).

Figures 1–3 demonstrate why the provision of access must be accompanied by adequate quality. In Chengdu, 100 urban parks located across five central districts were evaluated according to six dimensions and 27 indicators, revealing substantial differences in both overall quality scores and the availability of individual quality attributes among locations (Zhang et al. 2024). Figure 1 identifies the spatial locations of the parks included in the assessment, figure 2 depicts the spatial disparities in park-quality scores, and figure 3 illustrates differences in the distribution of quality elements among districts. The implication for architectural and landscape design review is therefore straightforward: conventional proximity-based accessibility measures should be assessed together with systematic evaluations of park quality and its spatial distribution. Without such a combined assessment, low-quality parks may be treated as equivalent providers of public benefits to substantially higher-quality parks, thereby obscuring meaningful differences in environmental performance and user experience.

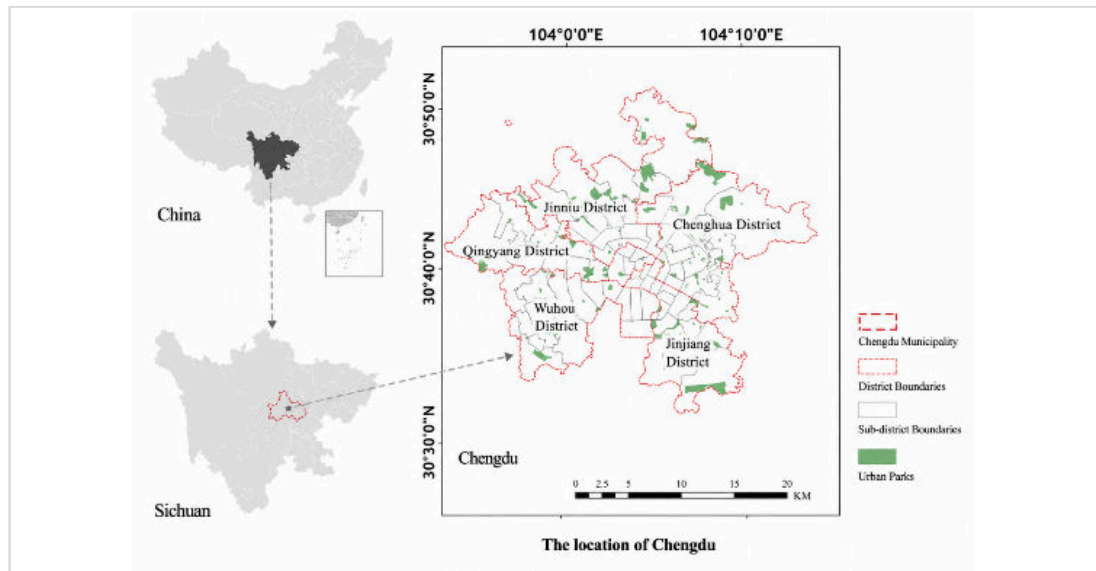


Figure 1. Spatial distribution of urban parks in central Chengdu
Source: adapted from Zhang et al. (2024).

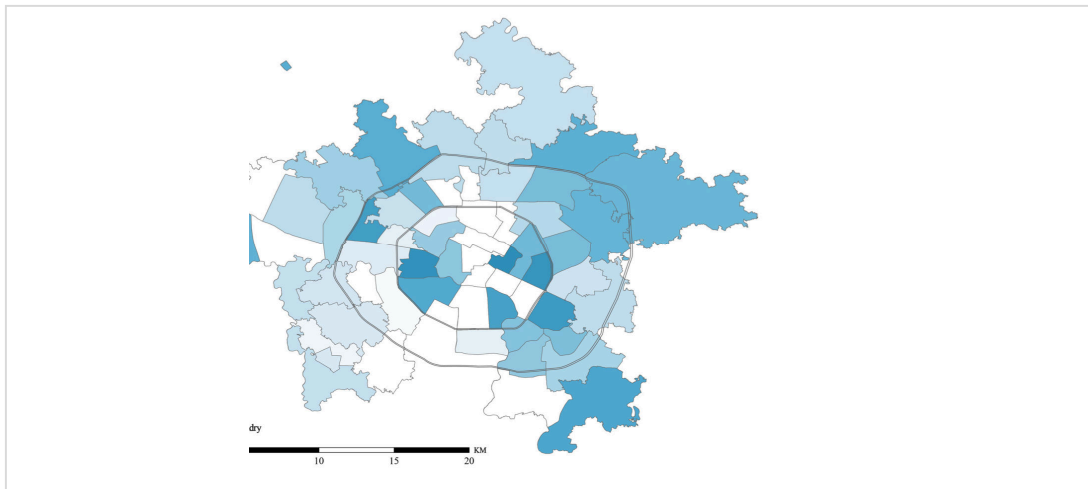


Figure 2. Spatial distribution of park-quality scores in Chengdu
Source: adapted from Zhang et al. (2024)

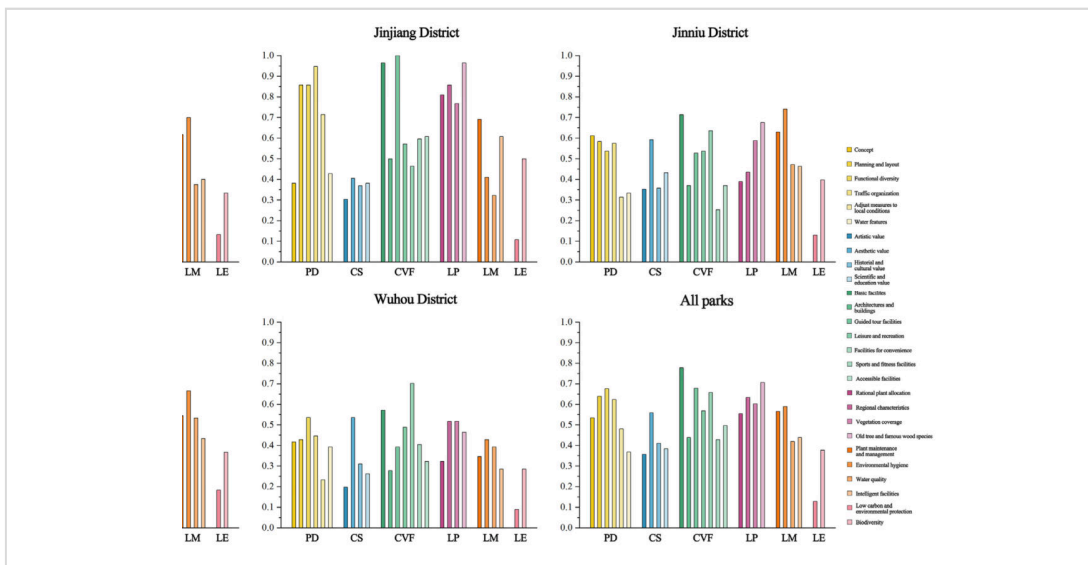


Figure 3. Proportion of existing quality elements across parks and districts
Source: adapted from Zhang et al. (2024)

Social cohesion and social inclusion cannot be adequately represented by the mere presence of a green polygon on a spatial map. Parks are more likely to strengthen social cohesion when they are perceived as safe, welcoming, appropriately programmed, culturally meaningful, and responsive to the needs and expectations of diverse groups of users (Jennings and Bamkole 2019). Patterns of green-space use likewise differ according to socioeconomic conditions, policy environments, geographic regions, and types of green spaces (Kleinschroth et al. 2024). Accordingly, table 3 incorporates network accessibility, environmental quality, safety,

affordability, cultural appropriateness, and protection against displacement as interconnected considerations. These variables should be defined and addressed from the concept-development stage rather than introduced only after a park has been designed or constructed.

Experiential affordance and lived use

The third evaluation concerns experiential affordance, namely, the extent to which spatial and environmental characteristics enable individuals to perceive, approach, enter, navigate, occupy, interact within, and ultimately enjoy an urban park. Existing reviews and empirical

investigations indicate that facilities, aesthetic qualities, perceptions of safety, maintenance conditions, programming, park size, and local contextual characteristics can influence park use and physical activity (Kaczynski, Potwarka, and Saelens 2008; Cohen et al. 2010; McCormack et al. 2010). Nevertheless, these relationships are not uniform across all populations. For older adults, for instance, accessible pedestrian routes, adequate seating, toilets, shade, safety, and opportunities for social interaction can be particularly important determinants of park use and satisfaction (Van Puyvelde et al. 2023). Evidence from a natural experiment in Belgium further demonstrated that park renewal can modify patterns of use, physical activity, and social interaction, reinforcing the importance of post-occupancy evidence for determining whether intended design outcomes are actually achieved after implementation (Poppe et al. 2023).

Evidence concerning walking further clarifies this relationship. Characteristics such as

attractiveness, park size, and proximity can influence recreational walking behavior (Giles-Corti et al. 2005; Sugiyama et al. 2010), whereas imageability, enclosure, human scale, transparency, complexity, and coherence contribute to perceptions of walkability (Ewing and Handy 2009). Additional perceptual characteristics, including legibility, mystery, visual accessibility, and perceived danger, can influence environmental preferences (Herzog and Kropscott 2004), extending foundational theoretical perspectives concerning environmental preference and urban legibility (Kaplan and Kaplan 1989; Lynch 1960). These associations should not be interpreted as universally linear relationships because their effects can vary according to user characteristics, the purpose of an activity, temporal conditions, and the connectivity of the surrounding urban environment. Spatial access metrics should therefore be complemented by perceptual, experiential, and behavioral evidence when evaluating the performance of an urban park.

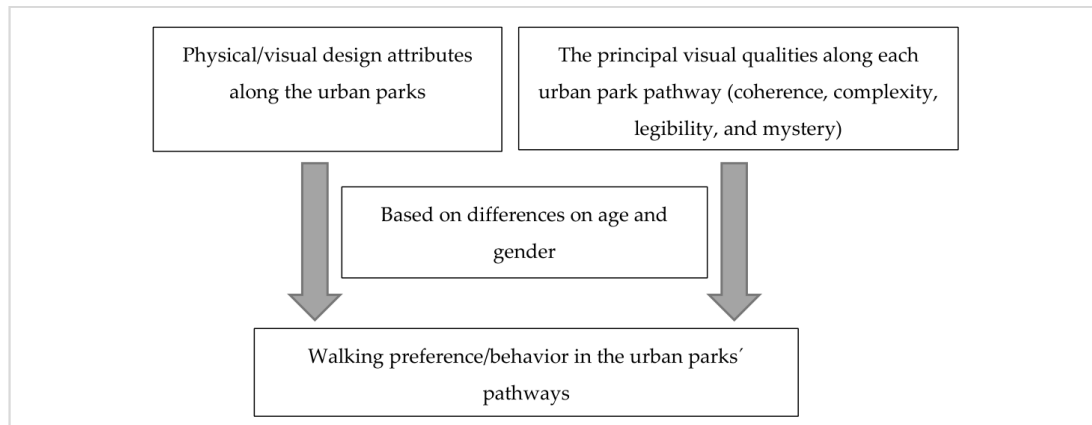


Figure 4. Conceptual framework linking pathway attributes, visual qualities, age and gender differences, and walking

Source: adapted from Paydar, Kamani Fard, and Gárate Navarrete (2023)

Figure 4 synthesizes the experiential rationale that should be incorporated into the conceptualization of an urban park. It demonstrates that physical and visual characteristics, perceived environmental qualities, and differences associated with age and gender can mediate walking preferences and behavioral responses. Figure 5 subsequently translates this conceptual relationship into observed evidence from Cautin Park, where 7,018 pedestrians were recorded across 39 path

segments. This route-level analytical approach demonstrates the value of post-occupancy monitoring for identifying the particular path segments, visual characteristics, and activity-related connections that encourage or constrain park use. Such evidence is more informative for design evaluation than simply determining whether a park is generally popular, because it reveals how specific spatial conditions influence actual patterns of movement and occupation.

Hamilton 2012; Anguelovski et al. 2019). Research on post-industrial regeneration similarly demonstrates that governance arrangements influence which populations ultimately receive and retain the economic, environmental, and social value generated through ecological restoration (De Sousa 2014). Comparative evidence from European and North American cities further confirms that urban greening may occur alongside exclusionary real-estate transformation, potentially transferring the benefits of environmental improvement toward higher-income populations (Anguelovski et al. 2022). Designers, planners, and public agencies should consequently integrate ecological enhancement with affordable access, community-benefit mechanisms, tenure-sensitive monitoring, and explicit anti-displacement measures so that improvements in environmental quality do not unintentionally intensify social exclusion.

Comparison with existing frameworks and the concept-to-performance model

Existing frameworks offer important analytical perspectives, although each provides only a partial lens through which urban park performance can be examined. Nature-based-solution principles establish systemic, inclusive, and ecologically positive qualities for interventions; the social-ecological-technological systems framework explains interactions among interconnected urban processes; the 3–30–300 rule provides memorable benchmarks concerning environmental exposure, neighborhood greenness, and proximity; multi-criteria and park-quality assessment tools translate broad objectives into operational indicators; and ecosystem-service modeling supports spatial prioritization and decision-making (Kabisch, Frantzeskaki, and Hansen 2022; McPhearson et al. 2022; Konijnendijk 2023; Lourdes et al. 2022; M. Liu 2024; Zhang et al. 2024; Jin 2025). Table 2 compares the principal strengths of these established approaches and identifies the specific boundary that the proposed review seeks to address.

Table 2. Comparison of established approaches and the proposed framework

Approach	Primary strength	Boundary for design review	Relation to this review
Nature-based-solution principles	Systemic, inclusive, biodiversity-positive intervention principles	Broad principles do not, by themselves, connect every park-related claim to specific indicators and accountable actors	Provides normative criteria for ecological functionality and governance
Social-ecological-technological systems	Explains interactions among ecology, infrastructure, technology, institutions, and people	Functions primarily as analytical systems model rather than as a concise stage-gate tool for design review	Supplies the causal-system logic behind the performance chain
3–30–300 rule	Memorable canopy, neighbourhood greenness, and proximity benchmarks	Individual thresholds cannot adequately represent quality, lived experience, trade-offs, or long-term stewardship	Used as a compatible benchmark, not as a sufficient score
Park-quality and multi-criteria tools	Operational indicators, scoring, weighting, and spatial comparison	Results can depend strongly on selected criteria, data quality, analytical scale, weighting procedures, and stakeholder legitimacy	Supplies measurable anchors while requiring transparent weights and equity checks
Proposed concept-to-performance framework	Links claims, mechanisms, distribution, experience, indicators, actors, and monitoring	Requires prospective validation across different park types and governance contexts	Integrates four evidence domains into an auditable design-to-stewardship chain

The proposed framework should not be interpreted as a universal scoring system intended to assign a single standardized value to every urban park. Its principal original contribution is procedural. It requires every significant design claim to identify a plausible causal mechanism, the population or ecological receptor affected by

that mechanism, observable indicators through which the expected outcome can be evaluated, the actors responsible for implementation or oversight, and an appropriate monitoring response. In this respect, the framework extends landscape-ecology design theory, which conceptualizes design as a means of testing and

communicating ecological patterns and relationships (Nassauer and Opdam 2008), as well as green-infrastructure planning, which conceptualizes relationships between landscapes and communities through interconnected

networks (Benedict and McMahon 2006). Table 3 operationalizes these requirements across four interconnected performance domains: ecological functionality, equitable availability, experiential affordance, and place-keeping capacity.

Table 3. Concept-to-performance framework for urban park design review

Performance test	Design question	Indicative metrics	Common failure mode
Ecological functionality	How do water, soil, vegetation, habitat, and microclimate produce ecosystem services?	Canopy cover; native/species diversity; infiltration; shade; habitat connectivity; water quality	Decorative greening is introduced without demonstrable ecological mechanisms
Equitable availability	Who can reach, enter, afford, understand, and feel welcome in the park?	Network access; barrier-free routes; toilets/seating; safety; cultural fit; distribution of quality	Park area is counted while differences in quality and patterns of exclusion are overlooked
Experiential affordance	Which spatial qualities convert access into regular use and attachment?	Legibility; pathway width; activity-zone connectivity; tranquility; visual interest; observed use	Amenities are listed without empirical evidence demonstrating their effects on behavior or perception
Place-keeping capacity	Who maintains funds, monitors, and adapts the park over time?	Maintenance standards; stewardship agreements; monitoring schedule; budget; anti-displacement safeguards	The design process effectively ends on opening day, followed by gradual decline resulting from inadequate maintenance

Note: Table 3 converts design claims into auditable performance tests

Quantitative anchors from recent park-quality and use studies

Table 4 presents quantitative anchors intended to support the narrative synthesis rather than constitute a formal meta-analysis. The Chengdu investigation evaluated 100 parks using 27 indicators, 13,589 images, and a 65-point assessment scale (Zhang et al. 2024). The Cautin Park investigation recorded 7,018 walkers across 39 path segments (Paydar, Kamani Fard, and Gárate Navarrete 2023). In addition, decision-support research demonstrates how expert weighting and multi-criteria approaches can provide structured methods for formalizing judgments under conditions of uncertainty, although requirements concerning data availability, sensitivity to analytical scale, and methodological transparency must be explicitly recognized (M. Liu 2024; Jin 2025).

Table 4 distinguishes between aspirational design objectives and empirical evidence that can

be used to evaluate whether those objectives have been achieved. In Chengdu, park-quality scores extended from 11.5 to 56.5, demonstrating that nominal provision of urban parks can conceal substantial differences in the level and quality of services actually available to residents. Similarly, pedestrian counts at the route level demonstrate how observed use can function as a measurable performance indicator rather than being treated merely as anecdotal evidence. Figure 6 illustrates both the potential usefulness and the methodological risks of weighted decision-support tools. Criteria and weighting schemes can make priorities more explicit, but they provide meaningful decision support only when their assumptions, stakeholder contributions, weighting procedures, and associated uncertainties are transparently communicated and subjected to critical scrutiny.

Table 4. Quantitative evidence used to anchor the narrative synthesis

Source	Design-evaluation dimension	Quantitative anchor	Implication for concept review
Zhang et al. (2024)	Multidimensional quality	100 urban parks; six dimensions; 27 indicators; 13,589 images; 65-point scale	Urban Park concepts should define measurable quality dimensions rather than relying solely on broad design themes
Zhang et al. (2024)	District and spatial equity	Mean quality scores differed by district; reported range 11.5–56.5 points	Equity assessment should integrate both spatial

			distribution and quality differences (Figures 1–3)
Paydar, Kamani Fard, and Gárate Navarrete (2023)	Lived use and pathways	7018 walkers observed across 39 road segments; Cautin Park area 27.7 ha	Post-occupancy use should be analyzed and mapped at the route scale
Paydar, Kamani Fard, and Gárate Navarrete (2023)	Visual qualities	Legibility was the visual quality significantly correlated with all pedestrian groups	Wayfinding and environmental readability should be incorporated as explicit design-performance variables
M. Liu (2024)	Decision support under uncertainty	Urban Park environmental design evaluated as an MADM problem with fuzzy neutrosophic information	Decision-support methods can structure expert judgment but require careful and transparent
Jin (2025)	Criteria weighting	Six main criteria and 30 subcriteria scored by three experts on a 0–0.9 scale	Weights such as those presented in figure 6 should remain transparent and should be tested through stakeholder engagement

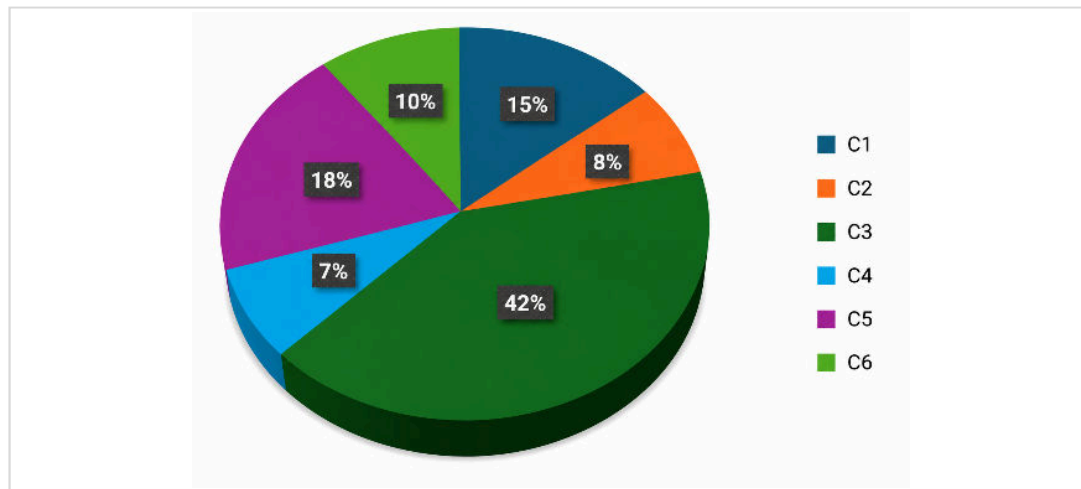


Figure 6. Weights of the main criteria in an urban-park environmental-quality decision model
Source: adapted from [Jin \(2025\)](#)

Critical implications for practice and research

First, ecological claims should explicitly identify causal mechanisms, intended targets, and measurable indicators rather than concentrating primarily on visual appearance. Health-related pathways should establish connections among environmental exposure, physical activity, social interaction, and environmental regulation ([Lee and Maheswaran 2011](#)). Considerations of naturalness, ecological functioning, impervious surface conditions, and unequal distributions of cooling benefits should likewise be incorporated into this analytical logic ([Hanna, Bruno, and Comín 2023](#); [Y. Li et al. 2024](#)).

Second, accessibility standards should be evaluated in combination with standards for quality and spatial distribution. Figures 1–3 and [table 4](#) demonstrate that measurable differences can exist even when nominal park provision is present, while studies of exposure and service

levels reveal inequalities among populations and geographic locations ([Chen et al. 2022](#); [Z. Li et al. 2023](#)). Accordingly, a design review that reports only distance or area may provide an incomplete representation of actual access to meaningful environmental benefits.

Third, lived experience requires direct empirical evidence rather than assumptions derived solely from design intentions. Figures 4–5 and recent empirical studies demonstrate that age-specific preferences and the outcomes of park renewal cannot reliably be inferred from lists of amenities or facilities ([Van Puyvelde et al. 2023](#); [Pope et al. 2023](#)). Post-occupancy evaluation should therefore investigate routes, shade conditions, seating availability, lighting, visual accessibility, and legibility for different categories of users. Such evaluation can determine whether the physical environment

performs as anticipated under actual conditions of use.

Fourth, place-keeping requires explicit financial resources, clearly assigned stewardship responsibilities, systematic monitoring procedures, and adaptive triggers capable of initiating corrective action when performance deteriorates. Evidence concerning management practices, biodiversity monitoring, and the representativeness of digital or survey-derived data should be treated as part of performance evaluation rather than as administrative considerations that occur after design decisions have already been finalized (S. Liu et al. 2024; Egerer et al. 2024).

Fifth, Cheonggyecheon, Bishan–Ang Mo Kio Park, Houtan Park, and Madrid Río demonstrate valuable approaches to urban landscape and park design; however, project narratives alone should not be regarded as definitive evidence of performance unless social, ecological, distributional, and maintenance outcomes have been independently documented and systematically evaluated (table 1). Design precedents can provide useful hypotheses and transferable strategies, but their claimed success should remain subject to empirical verification within their respective institutional, environmental, and social contexts.

Conclusions

In response to RQ1, this review identifies four interrelated dimensions that are necessary for a contemporary concept-to-performance framework for urban parks: ecological functionality, equitable availability, experiential affordance, and place-keeping capacity. In response to RQ2, table 3 translates each of these dimensions into explicit design questions, indicative performance indicators, common failure modes, responsible evidence requirements, and expectations for ongoing monitoring. Table 4 further demonstrates how park quality and actual patterns of use can be quantified through empirical evidence. Collectively, the resulting framework conceptualizes an urban park design not simply as a visual or representational narrative, but as a testable performance hypothesis whose intended outcomes can be examined through observable evidence.

In response to RQ3, the long-term performance of urban parks depends on clearly defined budgets, assigned stewardship responsibilities, inclusive governance arrangements, appropriate monitoring intervals, transparent decision-making criteria, and explicit triggers for adaptive management. The principal contribution of the proposed framework lies in its integration of ecological mechanisms, distributive equity, lived experience, and institutional continuity within a single auditable chain that extends from design conception through implementation, evaluation, management, and adaptation. Nevertheless, the framework has several limitations, including its non-exhaustive narrative search strategy, emphasis on English-language literature, heterogeneity among the available forms of evidence, and the absence of prospective validation. Comparative application across different park typologies, climatic conditions, and governance systems is therefore necessary to examine indicator validity, potential trade-offs, and sensitivity to locally defined priorities before the framework is adopted as a standardized scoring system.

Declaration of generative AI in scientific writing

During the preparation and revision of this manuscript, the authors used ChatGPT for limited language refinement, support in literature searching, and editorial restructuring. All cited sources were independently verified, and the authors retain full responsibility for the conceptual framing, selection of sources, interpretation of evidence, and final content of the manuscript.

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