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Research Article

An Operational Assessment Index for Inclusivity in Urban Public Open Spaces

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DOI: <https://doi.org/10.66408/abc2.2026.42>

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Received: 02/02/2026
Revised: 25/03/2026
Accepted: 27/03/2026
Published: 30/03/2026

Volume: 2026
Issue: 03
Pages: 15-34

Abstract

Inclusivity in urban public open spaces (UPOS) has emerged as a central concern within the discourse on social sustainability. Despite this growing attention, inclusivity remains conceptually unsettled and practically fragmented. Existing scholarship offers rich insights into access, publicness, spatial justice, and lived experience; however, these concerns are frequently examined in isolation or translated into assessment frameworks that privilege physical form over relational, perceptual, and behavioural processes. This study undertakes a theoretical and conceptual investigation into how inclusivity in UPOS can be coherently structured and translated into an assessment framework without reducing its socio-spatial complexity. The research adopts an interpretive, literature-based approach, combining thematic synthesis across interdisciplinary scholarship with a comparative review of established empirical indices addressing liveability, equity, and social sustainability. Koberg and Bagnall's morphological framework is used as a conceptual scaffold, enabling systematic examination of relationships between physical engagement, perception, and affective response. The analysis produces a multidimensional conceptual model structured around four operational domains: physical, behavioural, perceptual, and functional, and four interrelated dimensions of inclusivity: accessibility, sense of place, conviviality, and resilience. Inclusivity is thereby repositioned as a socio-spatial condition produced through the interaction of spatial form, social practice, symbolic meaning, and governance, rather than as a fixed or purely design-led outcome. By clarifying the conceptual structure of inclusivity, this paper contributes a theoretically grounded foundation for future assessment, design, and policy-orientated research, while remaining attentive to the contextual, relational, and negotiated nature of public space.

Keywords: Conviviality; Inclusivity; Lived experiences; Socio-spatial theory, Spatial justice, Urban public open spaces (UOPS)

Highlights

- Inclusivity in UPOS is a relational socio-spatial condition produced through everyday practice and negotiation.
- Morphological structuring permits systematic integration of theory without diminishing conceptual complexity.
- Inclusive public space design requires alignment between spatial form, governance, and lived experience.

1 Introduction

Public open spaces are vital components of the urban built environment. They shape how people move through, occupy and interact with others within shared urban environments on a daily basis. Streets, squares, parks and plazas are primary arenas for public networking, facilitating chance encounters, public participation and the negotiation of difference in everyday settings (Varna and Tiesdell, 2010). These spaces support cultural expression and democratic engagement while providing platforms for informal interactions, protests, and leisure. Consequently, urban public open spaces are essential for urban well-being and social sustainability in a diverse contemporary setting. Contemporary cities are characterised by increasing social, cultural and demographic diversity driven by migration, economic restructuring and changing patterns of urban living. This transformation has amplified the need for inclusivity as a core value of the urban public open space (UPOS). In this research, UPOS is understood through its capacity to support diverse uses, users and forms of engagement. Public spaces are therefore required to accommodate difference while remaining legible, usable, and meaningful across disparate user groups.

Conventionally physical accessibility has served as the central component of inclusivity. However, this concept requires reframing within the contemporary societal parameters (Agyeman, 2007). Addressing universal access and barrier-free design is vital, but the frameworks must also account for how people use, perceive and shape these spaces through everyday activity. Research across urban design and public space scholarship demonstrates that exclusion arises through subtle mechanisms such as social norms, perceptions of belonging, symbolic boundaries and uneven power relations rather than an overt physical barrier (Lofland, 1973, Sennett, 2021). As a result, spaces that meet formal accessibility criteria may still fail to be inclusive if they limit participation or sense of attachment for specific users. This realisation has led to an extension of the notion of inclusivity to address broader conditions such as social accessibility, identity, sense of place, and sense of attachment, enhancing the experiential quality alongside physical accessibility.

Contemporary debates on the design of UPOS increasingly recognise that inclusivity is closely related to spatial justice and the right to differ. Lefebvre's notion of the 'right to the city' shifts focus from pure access towards an emphasis on the right to participate in its production and transformation (Lefebvre, 1992). Public open spaces are therefore understood as evolving socio-spatial constructs shaped through design decisions and patterns of use informed by everyday experiences, memories and identities. Inclusivity in these shared negotiated environments involves recognising differences and supporting varied forms of participation, use and appropriation. This broader scope of inclusivity is reflected in user-centred forms of urban design that emphasise lived experience, participation and responsiveness to contextual governance (Francis et al., 2012, Low & Iveson, 2019). This also aligns with contemporary policy agendas that foreground inclusive and sustainable development, including the United Nations Sustainable Development Goals, specifically Goal 11. This goal emphasises the importance of inclusive, safe, resilient, and sustainable cities (United Nations [UN], 2015). However, while such agendas articulate goals at the city scale, their implementation depends on how inclusivity is translated into the design, evaluation, and management of individual public spaces within the built environment.

The gap between the conceptual understanding and practical evaluation of inclusivity in public open spaces remains a key challenge. Moreover, existing indices and assessment frameworks measure physical attributes of the space with limited insights into social and behavioural dynamics, perceptual experience and the evolving meaning of place (Leach et al., 2016, MacFeely, 2020). Scholars across architecture, urban studies, geography and behavioural studies have noted the need for assessment tools that capture lived experience, social interaction and temporal change, recognising public space as a dynamic socio-spatial process rather than a static design outcome (Soja, 2003; Carmona, 2021). Addressing this requires a structured approach capable of organising diverse theoretical perspectives while remaining adaptable to different urban contexts. The framework devised integrates physical,

functional, behavioural and perceptual domains to operationalise a balanced framework for assessing inclusivity.

This study responds to the need to reframe inclusivity in relation to pluralistic urban coexistence. This gap is addressed by investigating the research question: "How can inclusivity in urban public open spaces be coherently conceptualised and operationalised to support robust evaluation and design decision-making?" Focusing on city centre public spaces, the research seeks to reconceptualise inclusivity as a multidimensional order shaped through access, experience, interaction and adaptability over time. Rather than treating inclusivity as a fixed attribute, the study understands it as an ongoing socio-spatial process produced through the relationship between spatial form, social behaviour, perception and governance.

The primary aim of the study is to develop a comprehensive and operational framework for assessing inclusivity in UPOS. This is achieved through the development of the Inclusivity Index for Urban Public Open Spaces (IUPOS), a structured tool designed to bridge theory and practice. The index integrates insights from urban sociology, environmental psychology, spatial theory and design research, organising them through a grounded and systematic methodological approach. Koberg and Bagnall's morphological framework provides the structural basis for translating conceptual complexity into coherent domains, dimensions and indicators (Koberg & Bagnall, 1974).

The wider study makes two key contributions. First, it advances theoretical understanding by synthesising fragmented literature on public space, inclusivity and spatial justice into a unified socio-spatial framework. Second, it offers a practical and adaptable assessment tool that enables planners, designers and policymakers to evaluate inclusivity in a way that reflects both objective conditions and subjective experiences. This paper is the theoretical link between conceptualisation and development of the operational toolkit for inclusivity, supporting more informed, equitable and context-sensitive approaches to the design and governance of urban public open spaces.

2 Conceptualising Inclusivity as a Socio-Spatial Condition

Inclusivity within urban public open spaces (UPOS) is framed as a dynamic, socio-spatial process produced through everyday practices and lived experiences rather than mere physical provision. Drawing upon Lefebvre's seminal discourse of 'the right to the city', UPOS is understood as socially produced and subject to ongoing negotiations, where transformation on account of participation and use is central to inclusivity (Lefebvre, 1992). This is further nuanced by Soja's conceptualisation of spatial justice, which highlights how inclusivity is compromised by the asymmetric power relations inherent in urban governance and spatial organisation (Soja, 2003). Moreover, Massey's relational ontology positions UPOS as open, dynamic, and constituted through multiple, coexisting trajectories (Massey, 2005). Collectively, these theoretical lenses establish inclusivity as a relational phenomenon shaped through the interaction of spatial forms, human behaviour, perception and urban governance. This theoretical premise underpins the conceptual structure of the assessment framework.

Inclusivity in UPOS is understood as a complex socio-spatial condition rather than a property of space. As sites where social norms, identity and power relations are negotiated, UPOS require an approach that extends beyond access and openness. This section synthesises key conceptual, socio-spatial and philosophical perspectives to structure inclusivity as a relational and lived process, providing a coherent theoretical foundation for the assessment framework developed in this study.

2.1 The Socio-Spatial Perspective and the Everyday Urban Experience

Urban public open spaces are lived and contested environments where social meaning is continuously produced. While early scholarship highlighted the role of UPOS in fostering civic culture and encounters between strangers, critical perspectives reveal that inclusion within the context of an emerging diverse population base is shaped by social norms, power dynamics and cultural expectancy (Blackman et al.,

2003). Thus, mere presence in the UPOS does not necessarily equate to participation or recognition, particularly for groups outside the dominant norms.

These lines of inquiry have been articulated through debates on the public sphere. Habermas framed UPOS as a normative arena for democratic discourse, positioning it as central to public participation and legitimacy. However, his model has been critiqued for assuming conditions of equality, while access to spaces has been historically structured around gender, class, race, and cultural norms (Thompson, 2002, Garnham, 2007). Fraser extended this critique by introducing the concept of counter-publics, arguing that multiple overlapping public spheres emerge in response to exclusion from dominant arenas of expression, participation and appropriation (Fraser, 2024). These perspectives reframe inclusivity by emphasising the ongoing negotiation in the contested space through participation and appropriation.

Everyday interaction reveals how social negotiations unfold in public space settings amongst strangers navigating shared norms and behavioural expectations (Lofland, 1973). Sennett similarly observes how an overdesigned and rigid environment can hinder opportunities for encounters and adaptations, reducing the capacity of the UPOS to support pluralist urban life (Sennett, 2018). This critique of UPOS aligns with Jacobs' attention to human-scale streets and Shaftoe's emphasis on conviviality. Conviviality offers a complementary lens focusing on everyday lived experiences that emerge on account of comfort, diversity and human-scale environments (Jacobs, 1961, Shaftoe, 2012). Through the lens of conviviality, inclusivity is characterised by the capacity of the UPOS to sustain varied forms of occupants, interactions, and uses over time.

These democratic and interactional concerns are subsequently reshaped in spatial terms. The 'right to the city' further reframes inclusivity through its emphasis on participation and appropriation. Lefebvre conceptualised space as socially produced through everyday practices and lived experiences rather than as a static physical container. Lefebvre's ideas underpin later work by geographers such as David Harvey and Edward Soja, who provide a strong theoretical foundation for understanding public space as a lived, contested, and political environment. Harvey argued that urban space networks are collectively shaped through democratic engagement (Harvey, 2000). Similarly, Soja highlights how spatial arrangements directly influence a user's opportunities, perception and social interactions (Soja, 2003). Collectively, these studies emphasise that public spaces that appear neutral may still produce exclusion through subtle spatial cues and governance practices (Francis et al., 2012).

2.2 Meaning, Perception and the Production of Inclusive Space

Building on the socio-political perspectives of inclusivity established in 2.1, this section examines how these conditions are experienced, interpreted and reproduced through everyday interactions with the UPOS. The experience, perception, interpretation and meaning of public space are shaped through socio-spatial relations.

Lefebvre's spatial triad: conceived, perceived and lived, emphasises that inclusivity is strongly expressed through lived experience, where memory, emotion and everyday values shape attachment and belonging (Lefebvre, 1992). Public spaces that resonate with these lived experiences are more likely to foster recognition and a genuine sense of place. Insights from environmental psychology extend this by identifying experiential dimensions relevant to inclusivity. Research into place attachment and identity demonstrates how emotional ties develop through repeated, incidental interactions and cultural meanings (Low and Altman, 1992, Proshansky et al., 2014). These connections influence perceptions of belonging and place, shaping whether individuals feel included within these shared environments (Arefi, 1999, Di Masso et al., 2019). Through this lens, inclusivity depends on how well the spatial form aligns with lived experience, moving beyond a focus on physical design delivery alone (Salama, & Wiedmann, 2013).

Lived experiences inform how the UPOS is perceived and evaluated over time. Perception mediates this relationship by translating past experiences into judgements of safety and comfort influenced by spatial

cues such as visibility, legibility and social presence (Jacobs, 1961, Newman, 2015). Behavioural responses are closely linked to perception, with practices of appropriation and personalisation contributing towards a feeling of place and ownership (Hall, 1974, Karimnia & Haas, 2020). Public spaces that accommodate the progression from experience to perception to action through flexibility and tolerance of diverse practices are more likely to promote and nurture an inclusive engagement.

Over time, changes in use, users and social context reshape how UPOS are perceived and used. UPOS that evolve through daily rhythms and social changes can better accommodate the shifting patterns of use, users and identity (Wunderlich, 2008). Massey's relational understanding of space stresses that places are continually produced through interaction across time and scale, allowing multiple meanings and trajectories to coexist (Massey, 2005). Inclusivity therefore depends on the capacity of UPOS to remain responsive and adaptable over time.

This study adopts an interpretive and relational philosophical position that recognises inclusivity as socially constructed and context dependent. Drawing on spatial justice and critical urban theory, UPOS is understood as contested and negotiated, shaped through governance, perception and everyday practice (Soja, 2003, Harvey, 2000). This position informs the development of an assessment framework that highlights lived experience alongside spatial analysis, providing a coherent foundation for operationalising inclusivity in the UPOS. The study recognises inclusivity as a relational and context-dependent process and thus uses research strategies that capture both conceptual complexity and experiential nuances. The following section outlines the methodological design adopted to translate theoretical insights into a structured operational assessment framework.

2.3 Knowledge Gaps and Research Opportunities

The literature on urban public space offers extensive insights into aspects of spatial justice, accessibility, publicness, and everyday interactions. However, inclusivity as a holistic construct remains difficult to evaluate systematically because the key aspects, such as access, sense of attachment, adaptability, perception and governance, are all frequently examined in isolation and for different typologies of public spaces. This fragmentation limits the development of a coherent and transferable assessment of UPOS for design decision-making.

Another limitation is the dominance of physical accessibility as a mode of evaluating inclusivity in the UPOS. Barrier-free design is an essential output of such assessments, but that does not necessarily capture how inclusion is shaped through perception, memory, social norms and governance. As a result, spaces that are physically accessible may remain socially unwelcoming or culturally exclusionary. Similarly, scholarship that focuses on experience, attachment, conviviality, and identity often remains descriptive, producing rich conceptual insights that are difficult to translate into systematic and equivalent evaluative tools (Salama, & Azzali, 2015). The other empirical tools, like the existing indices, tend to follow similar hierarchical structures of domains, dimensions, and indicators but prioritise measurable physical attributes and provide limited engagement with behavioural dynamics, perceptual experience, and socio-cultural meaning. This fragmentation hinders the ability of planners and designers to fully and holistically identify subtle forms of exclusion and to address participation, recognition, and attachment alongside access.

These conceptual and practical gaps need to be addressed at the scale of human interaction. Narrow interpretations of inclusivity under-recognise its complex, relational character and limit the development of tools capable of supporting evidence-informed design. Addressing these limitations requires a framework that integrates diverse theoretical perspectives into a clear structure while remaining operationally practical for urban practitioners.

2.4 Proposed Conceptual Model

To address the complex nature of inclusivity and the gap discussed in section 2.3, the study adopts Koberg and Bagnall's morphological framework as a structuring device capable of organising diverse

theoretical insights into a coherent conceptual model (Koberg, & Bagnall, 1974). Morphological analysis provides a non-linear way of structuring multidimensional relationships through their intersections rather than as discrete categories, making it well suited to conceptualising inclusivity as a socio-spatial process and supporting its translation into an operational framework.

Koberg’s axes are interpreted for the context of urban public open space as physical (psychomotor), behavioural and affective dimensions. The psychomotor axis (Y-axis) relates to physical engagement with space, including movement, form and spatial configuration, while the behavioural axis (X-axis) captures how people act and interact within public environments. The affective axis (Z-axis) relates to meaning, reflecting how spaces are understood and experienced through everyday use.

The framework is structured through both individual axes and their intersections. The composite axes (XY, YZ, XZ) represent relationships between physical, behavioural, and affective dimensions, as illustrated in Figure 1. These intersections allow spatial configuration, patterns of use, and meaning to be examined together.

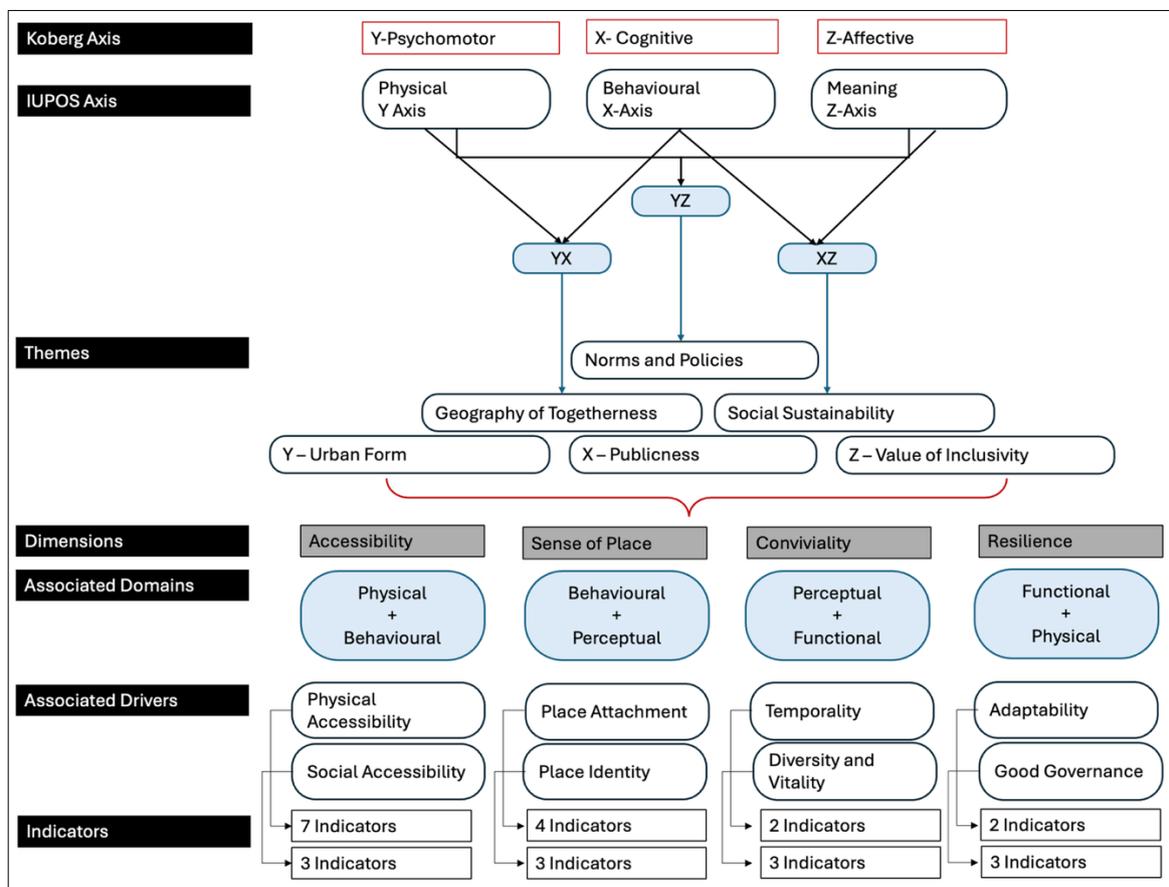


Figure 1. Mapping Koberg’s morphological axes to the current study (Source: Authors).

Domains are derived directly from the axis configuration. The psychomotor axis defines the physical domain, and the behavioural axis defines the behavioural domain. The affective axis gives rise to two domains, perceptual and functional, separating experience from use. The framework therefore comprises four domains: physical, behavioural, perceptual, and functional.

Inclusivity is examined through four dimensions: accessibility, sense of place, conviviality, and resilience. These dimensions are derived from the synthesis of the literature and reflect recurring concerns across disciplines. They operate across domains rather than mapping onto a single domain, allowing inclusivity to be examined through interactions between spatial conditions, social practices, and lived experience.

The conceptual model defines how inclusivity is structured prior to measurement. Domains establish the analytical structure, and dimensions define the areas of inquiry. Subsequent stages introduce drivers, indicators, and variables, translating this structure into an operational index.

2.5 Thematic Synthesis of Inclusivity Across the Existing Literature

The conceptual model was developed through thematic synthesis of literature drawn from urban design, sociology, environmental psychology, and planning. Selected texts were systematically encoded using NVivo to support consistent identification, comparison, and consolidation of recurring concepts across disciplines. Coding in NVivo was conducted iteratively, with concepts refined through systematic comparison across sources to identify overlaps, consolidate related ideas, and clarify thematic boundaries.

Six themes, derived from Koberg and Bagnall's framework, were used as organising categories. Concepts generated through NVivo coding were grouped within these themes. This step ensured that the synthesis was structured in line with the analytical framework described in Section 2.4 rather than emerging as an unstructured aggregation of concepts.

The themes were examined across both the individual axes and their intersections. Themes aligned with the psychomotor axis focus on accessibility, connectivity, and legibility. Behavioural themes capture patterns of activity, encounter, and interaction. Themes associated with the affective axis address perception, publicness, and symbolic meaning. Examining themes across the composite axes (XY, YZ, XZ) highlights how spatial configuration, patterns of use, and meaning are linked. This step establishes that inclusivity cannot be explained within a single domain but emerges through their interaction.

Themes associated with the affective axis extend beyond perception to include how space is interpreted and used in practice. This distinction supports the separation of perceptual and functional domains within the framework and reinforces the domain structure derived in Section 2.4. The four dimensions of inclusivity, accessibility, sense of place, conviviality, and resilience are derived from recurring patterns identified through this synthesis. These dimensions operate across domains and provide the conceptual basis for examining inclusivity within the framework.

3 Methodology: Research Strategy

The study adopts a mixed-methods research design to examine inclusivity in urban public open spaces as a socio-spatial condition. This approach responds to the multidimensionality of inclusivity, which encompasses physical form, behaviour, perception, function and governance. Relationships across these dimensions are examined through the integration of qualitative and analytical approaches (Creswell, 2021). The methodological process progresses from conceptualisation to operationalisation, as illustrated in Figure 2 and detailed in Table 1.

The research follows an exploratory, sequential design informed by grounded theory principles. Concepts and categories are developed through systematic engagement with the literature, rather than predefined assumptions (Heath and Cowley, 2004). Koberg and Bagnall's morphological framework is used to organise this process and structure relationships between concepts, while empirical indices are incorporated at a later stage to support operationalisation.

A structured literature review was conducted to establish how inclusivity is conceptualised across disciplines relevant to urban public open spaces. Key databases were searched using targeted keywords related to inclusivity, public space, spatial justice, place attachment, and social sustainability. Screening criteria ensured relevance and academic rigour. Bibliometric tools and snowball sampling were used to identify relevant, significant, and frequently cited works (Kaufman et al., 2021).

The review identified recurring concerns relating to access, patterns of use, perception, and social interaction and identified a limitation in existing assessment approaches, which prioritise physical

accessibility over experiential and social dimensions (Mor Barak & Daya, 2013, Vohra et al., 2015). This limitation required an analytical approach capable of examining inclusivity across interacting domains rather than within a single domain.

Content analysis was conducted to organise the literature into four lines of inquiry: use and users, safety and comfort, temporality, and infrastructure. These lines of inquiry were derived by grouping concepts in the literature according to whether they addressed patterns of use, conditions of safety and comfort, changes over time, or the physical provision of space and facilities. These distinctions were consistently observed across sources, supporting their use as organising categories. Within each line of inquiry, aspects of inclusivity were identified and grouped as components. These components represent recurring concerns across the literature and provide an intermediate level of organisation between individual concepts and broader dimensions. The components were synthesised into four dimensions of inclusivity: accessibility, sense of place, conviviality, and resilience. The dimensions capture distinct but interrelated aspects of inclusivity and operate across the domains defined in Section 2.4.

Koberg and Bagnall's morphological framework was then used to structure the conceptual material (Koberg & Bagnall, 1974). Six themes derived from the framework were adopted as organising categories. NVivo was used to code the literature and generate concepts grounded in the source material. Concepts were iteratively compared, consolidated, and assigned to the themes to ensure analytical consistency (Braun & Clarke, 2006, Vaismoradi et al., 2016). The themes provided the analytical structure for organising concepts generated through NVivo coding and for aligning these concepts with the morphological axes, supporting the derivation of domains.

The analysis incorporated theoretical models identified in the literature, building on this structured alignment between themes and domains. For each theme, two models were selected based on conceptual alignment with the issues captured within that theme. The models were examined to identify conditions, relationships, and mechanisms through which inclusivity is produced and constrained within each thematic area.

The identified mechanisms were compared across models and synthesised into eight drivers. Drivers represent recurring conditions that influence inclusivity across domains and provide a link between conceptual dimensions and their operationalisation. They define how inclusivity operates within the framework and guide the selection of indicators.

Conceptual and thematic outputs were integrated by examining how identified drivers operate across domains, specifically in relation to spatial form, interaction, perception, and governance (Table 1). This established cross-domain relationships within the framework and structured the transition from conceptual development to operationalisation. Figure 2 illustrates the methodological progression described above, linking literature review, content analysis, thematic structuring, and theoretical integration to the development of an operational framework.

The final stage focused on converting the conceptual framework into a measurable assessment tool. A targeted review of existing empirical indices addressing liveability, equity, social sustainability, and resilience (e.g., ARUP, Project for Public Spaces, UN-Habitat, Place Standard) was conducted to identify relevant indicators and methodological approaches. These indices address themes such as liveability, equity, social sustainability, and well-being across multiple spatial scales. Despite variations in terminology, most indices share a hierarchical structure comprising domains, dimensions, indicators and measurable variables.

Candidate indicators were derived from these indices and assessed against criteria of conceptual relevance, measurability, and applicability to urban public open spaces. This process resulted in an initial pool of 407 indicators, which was refined through a structured multi-criteria evaluation process involving iterative screening, consolidation of overlapping indicators, and removal of those lacking direct observability or contextual relevance. In addition, variability within variables and correlation across indicators were examined to ensure a set of indicators that was both comprehensive and non-

redundant, resulting in a final set of 32 indicators. These indicators were further operationalised through 118 variables to enable systematic observation and comparison across diverse sites.

These variables were implemented through a combination of structured observation protocols and perception-based assessment tools to enable consistent data collection. Indicator-level variables were first normalised to a common scale to ensure comparability across measures. These normalised values were aggregated to produce indicator scores, which were subsequently combined to generate domain-level indices. A uniform weighting structure was applied across indicators, assigning equal weight to each component within the aggregation process. This hierarchical aggregation enabled the translation of observational and perception-based inputs into comparable domain scores used in the analysis.

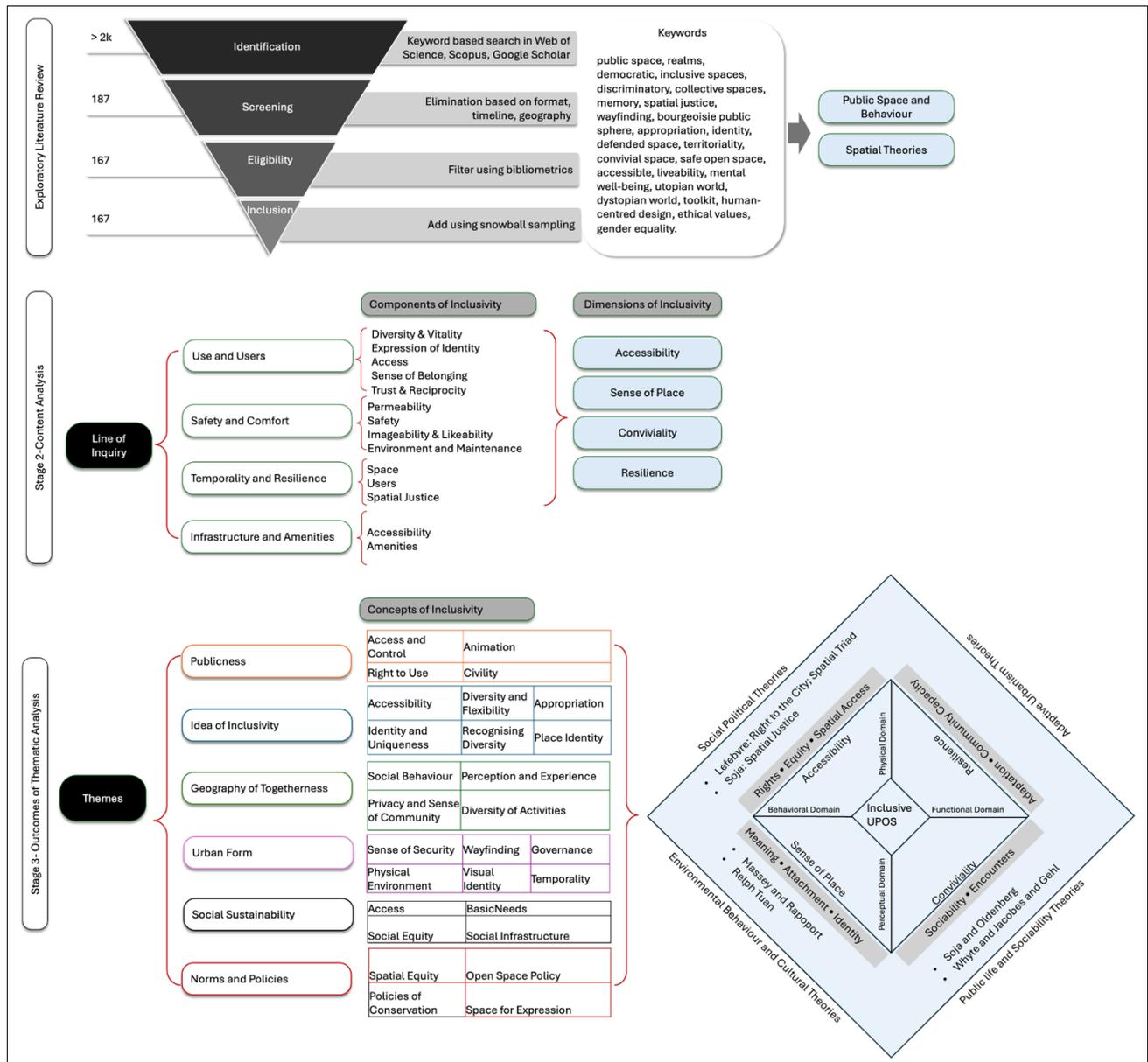


Figure 2. Development of the inclusivity framework through literature analysis, thematic analysis and conceptual framing (Source: Authors).

The resulting Inclusivity Index for Urban Public Open Spaces (IUPOS) is structured through domains, dimensions, drivers, indicators, and variables. Domains define the structure of analysis, dimensions define areas of inquiry, drivers define mechanisms, and indicators and variables enable measurement. The index integrates three components: a measurable model defining structure and relationships, a

measured model enabling systematic assessment, and a data collection and analysis model supporting triangulation between spatial conditions and lived experience.

Methodological decisions throughout the research were guided by the need to balance conceptual depth with applicability, as summarised in Table 1. Qualitative methods enabled the examination of perception, behaviour, and lived experience, while the hierarchical organisation of domains, dimensions, and indicators supports transparency and comparability in assessment (Creswell, 2021, Creswell & Poth, 2016, Bergman, 2008).

Validation of the framework was undertaken through application across selected sites in the UK. The framework was first applied in Glasgow to assess the relevance and robustness of domains, drivers, and indicators. This stage tested feasibility and informed initial refinement of indicators and assessment methods. It was subsequently applied in Newcastle to examine its applicability in a comparable post-industrial context. Structured site observations and perception-based assessment tools were used to examine how indicators operate across these contexts and to assess the functioning of the framework. Domain scores generated through the normalised and uniformly weighted aggregation procedure enabled comparison across sites characterised by varying degrees of regeneration, use, and user profiles.

Table 1. Development and validation process of the IUPOS framework (Source: Authors).

Stage	Process	Method	Outcome
Conceptual Model	Theoretical Framework Development	Literature synthesis	Define inclusivity conceptually and for measurement
		Historical literature review	Identifies key inclusivity dimensions
		Thematic analysis	Validates dimensions and drivers within an analytical framework for measurement
		Comparative empirical index analysis	Establishes candidate indicator pool
Operational Model	Indicator identification	Compilation of indicators from existing empirical indices on similar measurements	Establishes candidate indicators.
	Indicator refinement	Multi-criteria decision method	Reduces indicators based on relevance and measurability
	Toolkit development	Integration of observation and perception-based assessment	Prepares toolkit for field implementation
	Empirical validation	Site studies in UPOS in Glasgow	Tests feasibility and refines indicators and assessment methods
	Framework refinement	Iterative review of the framework in Newcastle	Finalises the operational IUPOS framework
Final IUPOS Index	Finalised framework	Consolidation of validated domains, drivers, indicators and variables	Produces the finalised toolkit for operationalisation

The following section builds on this methodological foundation by detailing how Koberg’s morphological framework structures the analysis and supports the transition from theory to assessment.

4 Results

4.1 Inclusivity Framework Structure Derived from Literature Synthesis

The literature, thematic, and conceptual synthesis outlined in Section 3 result in a structured assessment framework linking domains, dimensions, and drivers (Table 2). Four operational domains emerge as the primary analytical categories for assessment: physical, behavioural, perceptual, and functional. These domains are analytically distinct but interdependent, reflecting the way inclusivity is produced through overlapping socio-spatial processes rather than isolated attributes.

Across these domains, four interrelated dimensions of inclusivity are specified: accessibility, sense of place, conviviality, and resilience. Each dimension is assessed across two domains through paired drivers, ensuring that inclusivity is evaluated through both material conditions and lived experience. In total, eight drivers structure the framework, providing the bridge between conceptual constructs and assessable indicators. Indicators within each driver are further specified through measurable variables that form the operational units of the index and support a systematic site-based assessment.

Table 2. Structure of the IUPOS assessment framework (Source: Authors).

Hierarchical Category	Role within the Framework	Example Components
Domains	Analytical categories structuring assessment	Physical, Behavioural, Perceptual, Functional
Dimensions	Conceptual values derived from literature	Accessibility, Sense of Place, Conviviality, Resilience
Drivers	Mechanisms linking theory to measurement	Physical Accessibility, Social Accessibility, Place Attachment, Place Identity
Indicators	Observable attributes representing drivers	Activity Diversity, Legibility
Variables	Measurable attributes used in field assessment	

4.2 Operational Structure of the IUPOS Index Assessment

To transform the conceptual framework into an operational assessment tool, the Inclusivity Index for Urban Public Open Spaces organises domains, dimensions, drivers, indicators and variables into a structured site assessment process. Indicators are operationalised through three types of data: observable spatial attributes, behavioural patterns, and user perception measures collected during field assessment. Each indicator is then specified through a defined set of measurable variables and associated data collection methods, enabling systematic and replicable assessment across sites. Researcher-led walking tour assessments (WTA) document physical conditions such as accessibility, legibility and infrastructure provision, while behavioural mapping (BMT) records patterns of activity and social interaction. These observations are complemented by perception-based tools such as the Emotion Elicitation Tool (EET), which captures users' experiences of safety, comfort, identity and place attachment. The integration of these methods enables triangulation between spatial observation, behavioural patterns and user perception, supporting the consistency of the assessment as detailed in Table 3. The resulting dataset enables each site to be evaluated across the domains of the framework and produces a structured inclusivity profile highlighting spatial conditions that enable or restrain inclusive use of urban public open spaces.

Variables are logged using standardised observational and perception-based scales to ensure consistency across sites. Each indicator is operationalised through measurable variables linked to specific assessment methods, ensuring consistency between data collection and evaluation. Variable scores are first normalised to a common scale to ensure comparability across measures. Scores are then aggregated hierarchically from variables to indicators, and from indicators to driver and domain levels, using a uniform weighting structure in which each component contributes equally. Domain scores are synthesised to produce a site-level inclusivity profile, enabling comparative evaluation across urban contexts. This approach supports transparency and comparability while avoiding disproportionate influence from any single variable.

Table 3. Illustrative measurement structure of the IUPOS tool (Source: Authors).

Domain	Driver	Indicator	Variable	Method Implemented	Description of Measurement
Physical	Accessibility	Accessibility	Presence and quality of pedestrian pathways	Walking Tour Assessment (WTA)	Structured site observation using standardised scale to assess physical access conditions
Physical	Connectivity	Connectivity	Access to public transport	Walking Tour Assessment (WTA)	Observation of transport links and spatial integration within site context
Behavioural	Social Interaction	Social Spaces	Presence of group interaction	Behavioural Mapping Tool (BMT)	Systematic recording of user activities and interaction patterns across time
Behavioural	Diversity and Vitality	Diversity of Users	Variation in age and gender of users	Behavioural Mapping Tool (BMT)	Observation and classification of user groups present within the space
Perceptual	Place Identity	Cultural Marker	Presence of culturally significant elements	Emotion Elicitation Tool (EET)	User-based perception data capturing identity and meaning associated with the space
Perceptual	Comfort and Safety	Perceived Safety	User perception of safety and visibility	Emotion Elicitation Tool (EET)	Survey-based responses using structured perception scales
Functional	Adaptability	Flexibility of Form	Ability of space to support multiple uses	Behavioural Mapping + Observation	Assessment of temporal variation and adaptability through repeated site visits
Functional	Governance	Maintenance	Cleanliness and upkeep of space	Walking Tour Assessment (WTA)	Observational scoring of maintenance conditions and infrastructure quality

4.3 Dimensions, Domains, and Drivers of Inclusivity

The index domains have been conceptually derived and aligned to Koberg and Bagnall’s morphological axes; however, they perform distinct roles within the study. Koberg’s psychomotor, cognitive, and affective axes function as a conceptual skeleton, guiding the thematic alignment and synthesis of theories during analysis. The index domains, by contrast, are operational categories designed to organise measurement through defined drivers, indicators, and variables, as seen in Figure 1. This deliberate alignment allows relational and experiential theories to inform the assessment structure while retaining the conceptual distinctions of the source theories. By maintaining this distinction, the framework preserves theoretical detail while ensuring clarity and usability in applied urban contexts.

Across the theoretical models reviewed, emphasis varies considerably. Some highlight physical configuration and movement, others focus on behaviour and encounter, while others feature meaning, perception, governance, or temporality. A key finding of the synthesis is that these perspectives rarely converge within a single operational structure, limiting their usefulness for systematic assessment on site.

The assessment framework developed here addresses this limitation by consolidating physical, behavioural, perceptual, and functional domains into a unified model. This provides a structured framework for assessing inclusivity as a relational condition shaped by interaction between form, experience, and governance rather than as a collection of isolated attributes.

4.4 Working Definition of Inclusivity in UPOS

As an outcome of the synthesis, inclusivity in urban public open spaces is defined as a socio-spatial value reflecting how users access, experience, interpret, and engage with shared environments.

“Inclusivity is a value attached to public spaces that respects and recognises the positive experiences of users. It upholds the right to difference and the right to access and use urban public spaces.”

Positive experiences function as an umbrella term capturing the socio-spatial conditions addressed by the framework, including access, participation, attachment, identity, conviviality, and adaptability. The IUPOS Index operationalises this definition through dimensions, drivers, indicators, and measurable variables. Inclusivity is thus treated as an ongoing socio-spatial condition shaped by interaction, perception, and governance, rather than a fixed outcome of design provision. The definition anchors the framework and guides the specification of its components.

4.5 Index Validation and Site Application

The IUPOS Index was validated through implementation across thirteen urban sites in Glasgow and Newcastle to test its applicability and robustness. The purpose of this site application is to demonstrate the operational feasibility, comparative sensitivity, and practical applicability of the framework, rather than to present a full empirical validation dataset. A detailed empirical application of the framework for the Glasgow case study is presented in (Pansare, & Salama, 2023) while the present study extends the application across sites in Glasgow and Newcastle. Accordingly, the results presented here focus on domain-level outputs and comparative patterns across sites to illustrate the functioning of the index.

This dual-city application covered six Glasgow locations and seven Newcastle sites, including three city centre and four residential neighbourhood environments. This cross-sectional approach confirmed the tool's scalability and its diagnostic sensitivity across different urban environments. Comparative domain-level results are presented in Figure 3, where site conditions are shown alongside domain scores and inclusivity profiles. The photographic panels demonstrate spatial characteristics and patterns of use, while the table and radar chart provide a structured comparison across accessibility, sense of place, conviviality and resilience.

Implementation followed a structured, time-based sampling of four visits per site; these visits covered weekday, weekend, morning, and afternoon sessions to capture temporal variations in usage and social vitality. This protocol allowed the framework to remain sensitive to the shifting rhythms of the urban environment. Data triangulation was achieved through a multi-tool approach. Walking tour assessments documented physical attributes such as universal access and legibility, whilst behavioural mapping recorded social interactions and spatial occupancy. These researcher-led observations were corroborated by user perceptions gathered through an Emotion Eliciting Tool. Domain scores presented in Figures 3 and 4 were derived using the normalised and uniformly weighted aggregation procedure described in Section 4.2, enabling systematic comparison across sites.



Figure 3. Comparative inclusivity profile for three sites in Newcastle upon Tyne (Source: Authors).

The results indicate a trade-off between functional connectivity and social engagement, as seen in Figures 3 and 4. City centre sites generally scored higher in physical accessibility and diversity of activities but lack strong place attachment. In Newcastle, Bigg Market demonstrated peak connectivity but scored poorly in place appreciation due to a lack of active frontages. Conversely, Grey’s Monument excelled in place identity and temporality, driven by its culturally significant landmarks and robust year-round event programming. Neighbourhood sites exhibited a contrasting performance profile, surpassing central sites in maintenance and social accessibility whilst struggling with universal design. The Jesmond High Street site revealed high community cohesion and social interaction, yet the site recorded poor universal access scores due to an absence of ramps and limitations posed by the street layout. These patterns are reflected in Figure 3, where the radar chart highlights variation in domain performance across sites and supports comparison between city centre and neighbourhood contexts.

By triangulating spatial audits with behavioural mapping and user perception data, the implementation established that physical provision alone does not guarantee inclusivity. The Newcastle and Glasgow results demonstrate the operational applicability of the IUPOS Index as a structured tool for identifying site-specific barriers. This confirms that inclusive urban space is a relational product of design, governance, and lived experience rather than a fixed architectural outcome.

4.6 Application, Adaptability, and Positioning

The IUPOS Index is designed to be adaptable across different urban contexts and scales across the European and American contexts. While the core structure of domains, dimensions, and drivers remains consistent, indicators can be calibrated to reflect local spatial conditions, governance arrangements, and cultural context. This adaptability supports comparative analysis while acknowledging that inclusivity is shaped through context-specific socio-spatial dynamics.

Application of the framework across multiple post-industrial urban contexts enabled refinement of drivers and indicators and established the value of integrating behavioural and perceptual dimensions alongside spatial analysis. These studies revealed patterns of inclusion and exclusion not readily captured through conventional access-based assessment tools.

The IUPOS Index provides a structured method for assessing inclusivity as a socio-spatial condition, integrating spatial, behavioural, and perceptual dimensions within a single framework. By integrating relational theory with an operational assessment structure, it bridges the gap between conceptual research and practical evaluation. Its emphasis on lived experience, interaction, and adaptability responds directly to limitations identified in existing empirical frameworks, particularly their prioritisation of physical accessibility over social and perceptual dimensions.

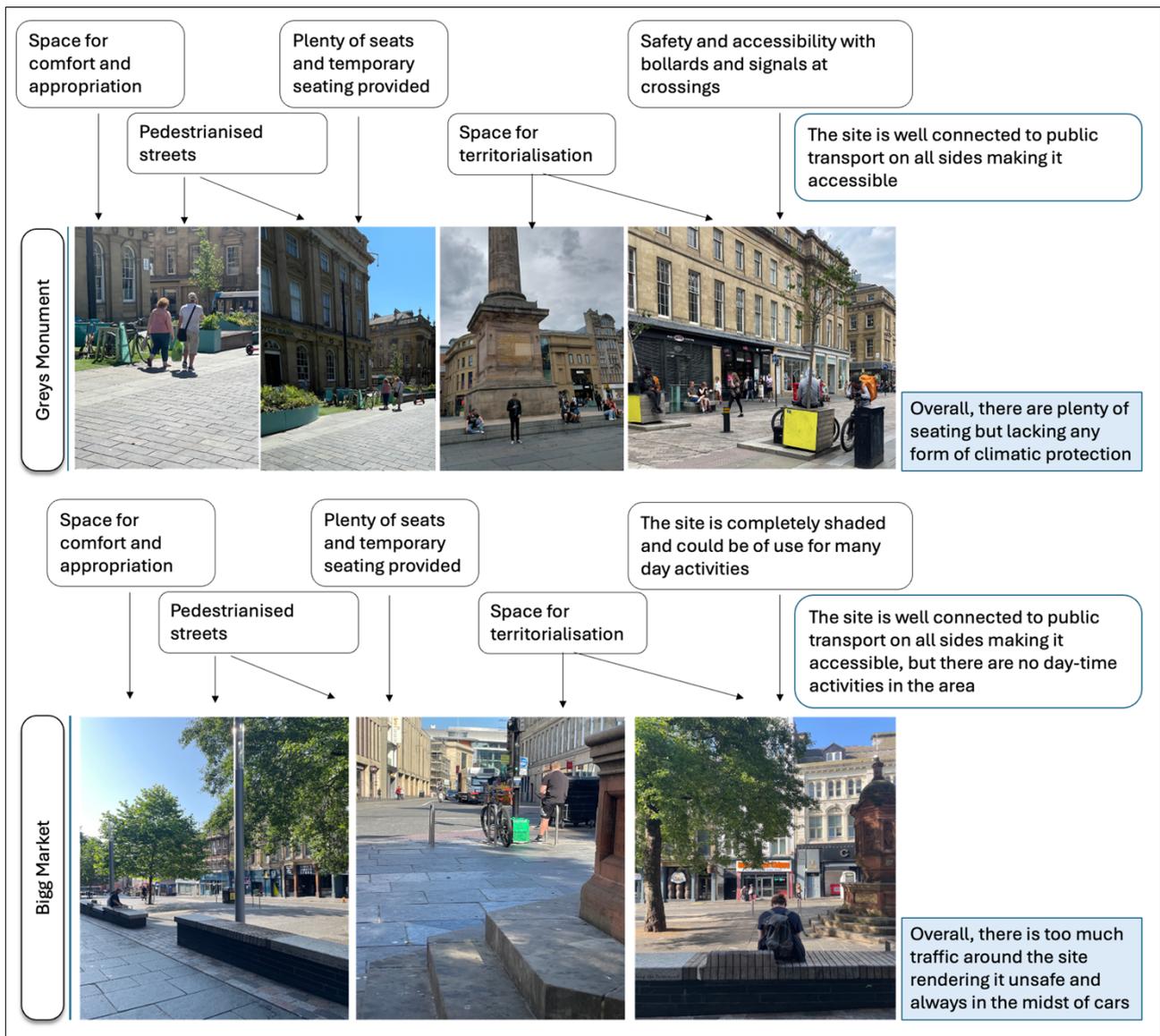


Figure 4. Illustrated example of UPOS in Newcastle city centre (Source: Authors).

5 Discussion, Contribution, and Future Research Directions

This study contributes to debates on urban public open spaces (UPOS) by reframing inclusivity as a multidimensional process grounded in socio-spatial, behavioural theories and operational practices rather than a condition achieved through physical access or design provision alone. Theoretically synthesising insights from spatial justice, environmental psychology, urban sociology, and design theory, the study responds to a persistent fragmentation in the literature, where access, experience, meaning, interaction, and governance are frequently addressed in isolation. The framework developed here demonstrates how these different strands can be integrated into one coherent structure capable of supporting both conceptual clarity and empirical assessment. This contribution is strengthened through the operationalisation of inclusivity into domains, drivers, indicators, and measurable variables, enabling systematic evaluation rather than purely conceptual interpretation.

A central theoretical contribution lies in the use of Koberg and Bagnall’s morphological framework as a classifying and structuring device for managing multidimensional conceptual complexity. The application of Koberg and Bagnall’s framework reframes inclusivity beyond checklist-based approaches with discrete attributes by enabling relational alignment between physical, behavioural, perceptual, and functional domains. This approach allows established spatial theories, including Lefebvre’s

conception of socially produced space and Soja's articulation of spatial justice, to inform assessment without losing their critical complexity. Inclusivity is framed as an outcome of interaction, perception, and governance, rather than embedded solely in spatial form.

Practically, the study contributes towards the development of the Inclusivity Index for Urban Public Open Spaces (IUPOS) as a structured assessment framework that responds directly to limitations identified in existing theories and empirical indices. The IUPOS framework integrates behavioural and perceptual domains alongside spatial analysis. Its hierarchical structure of domains, dimensions, drivers, and indicators provides transparency and adaptability, enabling systematic evaluation while remaining grounded in lived experience and local context. The framework is further supported by a clearly defined measurement process in which variables are recorded using standardised observational and perception-based scales and aggregated to produce comparable domain-level scores. These outputs enable direct comparison across sites, as demonstrated through the comparative table and radar chart presented in the results section.

Methodologically, the study demonstrates the value of integrating qualitative synthesis with structured quantitative assessment. Observational analysis, experiential data and spatial evaluation are combined to capture both objective conditions and subjective perceptions, supporting evidence-informed decision-making. The framework enables planners, designers, and policymakers to move beyond judgement of access and exclusion, supporting more nuanced analyses of inclusion, recognition, and participation within public open spaces. By linking qualitative observations with measurable outputs, the IUPOS Index provides a transparent basis for interpretation and reduces reliance on purely descriptive assessment. The IUPOS Index bridges the gap between conceptual theories and practical application, enabling data-driven decision-making.

Several directions for future research arise from this work. While the conceptual framework draws on an international body of literature, its development and testing were undertaken primarily within Western European and North American contexts. Application across different cultural, socio-economic, and governance settings would strengthen its transferability and robustness. In addition, although researcher-led spatial and behavioural audits followed a multi-period protocol, user corroboration was limited to a single period. This reliance on a temporal snapshot restricts the depth of user feedback regarding shifting urban rhythms. Future studies should expand user corroboration to cover multiple temporal sessions; this would ensure that participant-led data mirrors the same temporal breadth as the observational protocol.

Further development of the framework could extend its application to the evaluation of design proposals, enabling assessment not only of existing conditions but also of projected inclusivity outcomes within planning and design processes. In addition, refinement of indicators through participatory and co-produced methods could enhance sensitivity to local meanings, informal practices, and governance dynamics that are not always captured through structured observation.

Together, these contributions establish a foundation for understanding inclusivity as an ongoing socio-spatial condition, rather than a fixed outcome. The following conclusion draws these theoretical, methodological, and operational insights together, reflecting on their significance for research, practice, and the future governance of urban public open spaces.

6 Conclusion: Bridging Theory and Practice for Inclusive Urban Public Spaces

Urban public open spaces are vital to the city as settings where social difference is encountered, negotiated, and made visible in everyday life. In increasingly diverse cities, inclusive design must go beyond basic accessibility. To be truly effective, spaces must foster meaningful interactions and adapt to the fluid, shifting needs of their users. This study responds to that challenge by developing a

multidimensional assessment framework that reconceptualises inclusivity as a socio-spatial process shaped through everyday practice, perception and governance.

To bridge the gap between theory and practice, the study adopts Koberg and Bagnall’s morphological framework to organise inclusivity across physical, behavioural, perceptual, and functional domains. This structured approach enables the integration of complex theoretical insights into a coherent analytical model. It supports conceptual clarity without reducing the relational depth of the urban experience. The resulting Inclusivity Index for Urban Public Open Spaces (IUPOS) functions as an operational prototype, as demonstrated through implementation across thirteen sites in Glasgow and Newcastle. The validation is supported by measurable domain-level outputs, enabling comparison across sites and confirming the practical applicability of the framework.

The empirical validation demonstrates the diagnostic sensitivity of the index, specifically revealing a consistent trade-off between the high functional connectivity of city centre sites, such as Grey’s Monument, and the superior social accessibility and maintenance found in residential neighbourhoods. These differences are evidenced through comparative domain scores and visualised through the radar chart, which highlights variation across accessibility, sense of place, conviviality, and resilience. These findings indicate that the index operates as more than a static audit, functioning as a robust tool for identifying site-specific barriers, such as limitations within the historic street layout.

Through this operational lens, inclusivity is defined as four interrelated dimensions: accessibility, sense of place, conviviality and resilience. Accessibility addresses safe and equitable access for all users regardless of their ability. It also addresses the affordance the site offers for public participation within the site by eradicating social, cultural and economic barriers. Sense of place represents the processes through which attachment, identity, and meaning emerge from everyday use and memory. Conviviality captures the social-relational capacity of public spaces to support informal encounters, co-presence, and negotiated coexistence in conditions of diversity. Resilience operates at a longer temporal horizon, referring to the ability of public spaces to accommodate social, cultural, and environmental change while sustaining inclusive patterns of use over time. Together, these dimensions frame inclusive urban public open spaces as adaptive socio-spatial formations through which difference is negotiated and public life is sustained. The development of the Inclusivity Index for Urban Public Open Spaces (IUPOS) represents a key outcome of the study. The framework is adaptable to context and scalable, as illustrated in Figure 5.

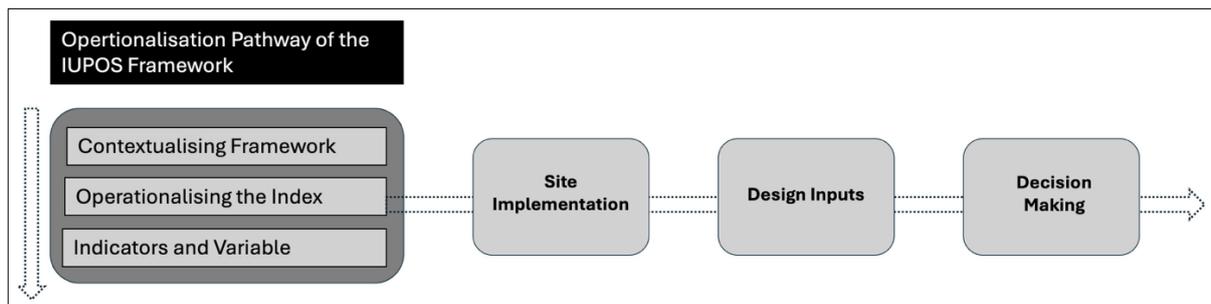


Figure 5. IUPOS Index workflow for implementation (Source: Authors).

The index translates conceptual understanding into an operational assessment tool capable of capturing both objective spatial conditions and subjective lived experience. Its hierarchical organisation supports transparency and adaptability, enabling application across varied urban contexts while remaining grounded in theory. The inclusion of behavioural and perceptual dimensions addresses recognised gaps in existing assessment frameworks, offering a more comprehensive understanding of inclusivity in practice. By integrating measurable indicators and structured scoring, the index strengthens the link between conceptual understanding and empirical evaluation.

Figure 5 situates the IUPOS Index within an applied workflow, illustrating how the framework is operationalised from contextualisation through indicator and variable definition to site implementation and design and planning inputs. The process links site-based data collection to the generation of domain-level outputs, providing a clear pathway from analysis to decision-making. Indicator-level variables are normalised and aggregated, using a consistent weighting structure, to produce domain-level scores. These outputs enable the diagnosis of site-specific strengths and limitations and support targeted interventions across stages of urban development. The evaluation of design proposals represents a direction for future development of the framework.

This study contributes to urban design scholarship by demonstrating how socio-spatial concepts can inform practical evaluation. For practitioners and policymakers, the IUPOS Index translates conceptual understanding into a structured assessment tool capable of capturing both spatial conditions and lived experience. Its hierarchical organisation supports consistent evaluation across sites while remaining responsive to context. Inclusivity in urban public open spaces is not a fixed condition but an ongoing enquiry. As cities continue to evolve, grow and become more diverse and dynamic, such approaches that are reflective, responsive and socially grounded will remain essential to building inclusive, resilient and socially sustainable urban environments.

Ethical Approval Declaration

The study was conducted in accordance with established standards for research integrity and ethics. The authors declare that this research did not involve human participants or animals, and therefore, ethical approval was not required.

Informed Consent Statement

Not Applicable

Funding

This work was supported by the Northumbria University as part of the PGR funding.

Data Availability Statement

The data supporting the findings of this study are available from the author upon reasonable request, subject to ethical and privacy considerations.

Conflicts of Interest

The authors declare no conflict of interest.

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