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AI-Assisted Inclusive Architecture and Neighbourhood Planning in Emerging Nigerian Cities Through Human-in-the-Loop Frameworks

Tajudeen O. Ajayi[1*], Oluwafunmilayo A. Akinniyi[2] & Olabisi O. Adeyemi[3]
[1]Department of Architectural Technology, The Federal Polytechnic, Ado-Ekiti, Nigeria
[2]Department of Architecture, Elizade University, Ilara-Mokin, Nigeria
[3]Department of Urban & Regional Planning, The Federal Polytechnic, Ado-Ekiti, Nigeria

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ABSTRACT

Review Article

Emerging Nigerian cities are expanding through formal estates, peripheral subdivisions, informal neighbourhoods and road-led corridors that can separate households from jobs, schools, healthcare, affordable transport and usable public space. This critical structured narrative review examines how AI-assisted and related computational methods can support inclusive architectural design and neighbourhood planning through an explicitly architecture-planning lens, while distinguishing AI-specific methods from conventional GIS, network analysis and scenario modelling. The evidence base comprises 48 substantive peer-reviewed journal articles, two peer-reviewed review-methodology papers and 15 institutional, statutory and policy documents. The synthesis indicates that AI-specific methods can augment prediction, classification, clustering and pattern recognition. In contrast, GIS, network analysis and scenario modelling provide complementary support for accessibility mapping, service-gap diagnosis, housing-location assessment and mobility analysis. Their usefulness depends on representative data, local validation, community knowledge and professional interpretation. The proposed framework centres on urban and regional planning and architecture as complementary professional lenses while recognising additional transport, infrastructure, accessibility, community-engagement and data/AI expertise where required. An iterative human-in-the-loop framework links inclusive data and community knowledge to digital/GIS and AI-assisted analytics, planning interpretation, architectural design translation, joint validation, neighbourhood monitoring and feedback, under cross-cutting governance safeguards. The framework proposes that digital and AI-assisted interventions be evaluated through disaggregated indicators of accessibility, spatial quality, housing inclusion and liveability rather than technological novelty alone.

Keywords: Artificial Intelligence, GIS, Inclusive Neighbourhoods, Neighbourhood Planning, Mobility Equity, Universal Design, Nigeria.

**Corresponding author:* Tajudeen O. Ajayi
Department of Architectural Technology, The Federal Polytechnic, Ado-Ekiti, Nigeria

Introduction

For this review, inclusive neighbourhood planning concerns the equitable ability of residents across income groups, ages, abilities, genders and locations to obtain and use housing, employment, education, healthcare, mobility, public space and essential services without avoidable physical, spatial or economic exclusion. Inclusion is therefore both spatial and distributive because urban form affects where opportunities, services and environmental burdens occur and who can practically reach and use them (Lucas, 2012; Pereira et al., 2017; United Nations, 2017). In this review, 'emerging Nigerian cities' is used descriptively for secondary and intermediate urban centres experiencing substantial spatial expansion, peri-urban development and infrastructure or service pressures; it is not presented as an official statutory classification, and the cities discussed are not assumed to be empirically equivalent (Aliyu & Amadu, 2017; Fox et al., 2018).

Housing inclusion cannot be separated from location, connectivity and everyday access. A structurally adequate dwelling may still impose substantial travel-time or transport-cost burdens where employment, schools, health facilities, markets and public transport are distant, while formal housing estates can remain exclusionary where pedestrian networks, drainage, infrastructure and essential services are inadequate (Geurs & van Wee, 2004; Handy & Niemeier, 1997; Ibem, 2013; Ibem & Aduwo, 2013; Páez et al., 2012). Housing inclusion is therefore interpreted through both the quality and usability of the dwelling and residents' practical access to urban opportunities.

This perspective aligns with Sustainable Development Goal 11 and the New Urban Agenda, which connect adequate housing, accessible transport, participatory planning, public space and equitable access to inclusive and sustainable urban development. The World Health Organization's age-friendly city framework similarly treats outdoor spaces, transportation, housing and community services as interconnected dimensions of liveability (United Nations, 2015, 2017; World Health Organization, 2007). These frameworks reinforce the need to evaluate neighbourhood performance by asking not only what is provided, but who can access, use and benefit from it.

AI and related computational methods are increasingly relevant because contemporary cities generate spatial and behavioural information from satellite imagery, street networks, land records, transport systems, planning applications, sensors and public feedback. AI-specific techniques can extract patterns, classifications or predictions from such data, whereas GIS, conventional network analysis and scenario modelling provide complementary non-AI analytical functions (Batty et al., 2012; Kitchin, 2014; Sanchez et al., 2023; Zheng et al., 2014). These distinctions matter because incomplete datasets, opaque assumptions and unequal representation can reproduce exclusion where informal settlements, informal mobility, disability-related barriers and locally significant travel or service patterns are omitted (Floridi et al., 2018; Mittelstadt et al., 2016; United Nations Department of Economic and Social Affairs, 2016; Yigitcanlar, Desouza, et al., 2020). AI should therefore be used as transparent and reviewable decision support rather than as an autonomous planning or architectural authority.

For analytical clarity, architecture and urban and regional planning are treated as the two principal professional lenses of the review. In Nigeria, architectural practice is regulated by the Architects Registration Council of Nigeria (ARCON) under the Architects (Registration, Etc.) Act, Cap. A19, Laws of the Federation of Nigeria 2004, while town planning is regulated by the Town Planners Registration Council of Nigeria (TOPREC) under the Town Planners (Registration, Etc.) Act, Cap. T7, Laws of the Federation of Nigeria 2004. Urban and regional planning provides the spatial-equity, land-use, mobility, infrastructure, development-control and participatory perspective, while architecture translates these conditions into inclusive housing, universal access, public-realm quality, climate-responsive form and buildable neighbourhood environments. This analytical focus does not imply a two-profession delivery process: transport planners and engineers, infrastructure specialists, accessibility/disability experts, community representatives and data/AI specialists may also be required for implementation and validation. AI is consequently treated as shared decision support rather than a substitute for statutory or professional judgement, with community validation, transparency and human oversight retained (Architects (Registration, Etc.) Act, 2004; Organisation for Economic Co-operation and Development [OECD], 2024; Town Planners (Registration, Etc.) Act, 2004; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2021).

Against this background, three questions guide the review: (1) which AI-assisted and computational methods can support inclusive neighbourhood analysis in emerging Nigerian cities; (2) how can planning evidence be translated into inclusive architectural and public-realm decisions; and (3) what professional, participatory, data and governance safeguards are required for responsible implementation? The central concern is therefore not whether AI can produce more urban data, but whether appropriately selected analytical methods can be translated through planning and architectural judgement into neighbourhood environments that are more accessible, inclusive, usable and responsive to diverse urban populations.

Review Design and Analytical Procedure

This paper adopts a critical structured narrative review to synthesise heterogeneous conceptual, empirical, methodological and policy evidence across AI, urban and regional planning, architecture, housing accessibility, mobility equity, liveability and AI governance. A narrative approach is appropriate where related fields use different study designs and outcome measures that cannot be meaningfully pooled, while a structured search, explicit inclusion logic and thematic appraisal improve transparency (Grant & Booth, 2009; Green et al., 2006). The review does not claim PRISMA-compliant systematic-review reporting or meta-analysis.

Scopus and Web of Science served as the principal bibliographic databases, with Google Scholar used for supplementary discovery and targeted searches conducted in ScienceDirect, SpringerLink, Taylor & Francis Online, ACM Digital Library, MDPI-hosted journals and relevant institutional repositories. The final search was updated in June 2026. The peer-reviewed analytical window was bounded at 1997-2025 to preserve a complete calendar-year corpus; the 2026 update was used to capture late-indexed 2025 records and update policy or institutional material. Search concepts were organised into thematic blocks covering AI/data-driven analysis, urban and neighbourhood planning, accessibility and mobility equity, housing inclusion, liveability, inclusive/universal design, responsible AI, Nigeria, emerging cities and the Global South. A reproducible search framework is provided in Supplementary Table S1.

The evidence base comprises 50 peer-reviewed journal articles and 15 institutional, statutory and policy documents. Forty-eight journal articles form the substantive analytical corpus, while Grant and Booth (2009) and Green et al. (2006) support the review methodology. Included analytical articles were required to have direct relevance to inclusive cities, housing, accessibility, mobility, AI-assisted planning or governance and to provide a traceable conceptual, empirical or methodological contribution. Purely technical AI papers without urban-planning relevance, smart-city publications without inclusion or governance content, duplicates, non-scholarly opinion pieces and studies whose context or evidence did not support the review themes were excluded. Historical record-level retrieval counts were not available in the retained search log and are therefore not retrospectively estimated.

For each substantive study, the extraction matrix recorded author/year, geographic context, urban scale, study design or evidence type, population or data source where reported, analytical method, AI-specific or conventional computational technique, inclusion dimension, principal contribution, limitation and transferability to emerging Nigerian cities. Sources were qualitatively appraised for methodological transparency, appropriateness of study design, data provenance, validation quality, contextual relevance, treatment of equity and inclusion, and transferability to Nigerian secondary-city conditions. These criteria informed evidential weighting rather than a numerical risk-of-bias score.

Thematic synthesis was organised around six components: digital, GIS and AI-assisted urban analytics; inclusive mobility; housing accessibility; liveability; responsible AI and data governance; and professional integration. Table 1 defines the analytical scope, while Table 2 makes the 48-study analytical corpus and its transferability limitations explicit.

Table 1. Review logic and thematic scope

Review component	Scope applied in the article	Analytical contribution
Digital, GIS and AI-assisted urban analytics	GIS and network analysis; machine learning; remote-sensing classification; scenario modelling; dashboards; urban computing.	Distinguishes conventional spatial/computational methods from AI-specific prediction, classification, clustering and pattern-recognition functions.
Inclusive mobility	Walking; formal and informal public transport; last-mile access; safety; travel time and travel burden.	Connects mobility evidence to spatial equity, social exclusion and access to opportunities.
Housing accessibility	Housing location; affordability; tenure; service proximity; transport burden; universal design.	Frames housing as both spatial access and usable built form.
Liveability	Health; public space; comfort; safety; environmental quality; opportunity access; subjective wellbeing.	Links neighbourhood form and service distribution to quality-of-life outcomes.
Responsible AI and data governance	Data provenance; representation; privacy; bias; transparency; accountability; human oversight; review and challenge mechanisms.	Establishes safeguards for consequential planning and architectural decisions.
Professional integration	Urban and Regional Planning and Architecture interpretation of digital/GIS and AI-assisted evidence.	Converts analytics into statutory planning, architectural design, participatory and implementation decisions.

Note: Authors' methodological synthesis. The narrative-review approach is informed by Grant and Booth (2009) and Green et al. (2006); the thematic structure derives from the retained accessibility, housing, liveability, AI-planning and governance literature.

Table 2. Characteristics and critical appraisal of the 48-study analytical corpus

Study	Context/scale	Evidence type	Contribution to synthesis	Critical limitation/transferability
Alcorn & Karner (2021).	Lagos, Nigeria; transport system	Formal-informal transit integration	Shows why accessibility analysis must represent both formal and informal mobility.	Highly relevant to Nigerian mobility; Lagos evidence should not be assumed to represent secondary-city networks.
Aliyu & Amadu (2017).	Nigeria; urbanisation and health	Contextual review/analysis	Links rapid urbanisation to infrastructure and health pressures.	National context is useful but does not evaluate AI or neighbourhood-scale interventions.
Allam & Dhunny (2019).	International; smart cities	Conceptual/review	Frames big data and AI as urban decision-support resources.	Broad smart-city evidence; inclusion outcomes require separate local validation.
Batty et al. (2012).	International; city systems	Conceptual urban-computing synthesis	Establishes data-rich analysis of complex urban systems.	Predates current generative/ML practice and is not Nigeria-specific.
Bibri & Krogstie (2017).	International; smart sustainable cities	Interdisciplinary literature review	Connects smart-city technologies with sustainability and integrated urban systems.	Technology-oriented synthesis; distributive inclusion is not its primary outcome.
Boeing (2017)	International; street networks	Methods/software paper	Provides reproducible open-source acquisition and analysis of street networks.	Formal digital street data may omit informal paths, seasonal barriers and local safety conditions.
Braimoh & Onishi (2007).	Lagos, Nigeria; land-use change	Spatial empirical analysis	Demonstrates spatial drivers of urban land-use change in a Nigerian metropolis.	Older Lagos evidence; transfer to smaller cities requires updated local data.
Brussel et al. (2019).	International; transport indicators	Indicator critique	Shows that transport 'access' indicators can miss actual accessibility and equity.	Methodological relevance is high, but local thresholds and data remain context-dependent.
Cervero & Golub (2007).	Global South/international; informal transport	Review	Establishes informal transport as a substantive part of urban mobility systems.	Global synthesis; Nigerian route structures and user conditions require local mapping.
Cervero & Kockelman (1997).	Built environment and travel	Empirical built-environment study	Links density, diversity and design with travel demand.	Seminal but older and context-specific; not an inclusion or Nigerian study.
Chan & Adabre (2019).	Affordable/sustainable housing	Critical housing study	Links housing sustainability and affordability criteria.	Housing-level evidence; spatial accessibility and Nigerian transferability require additional analysis.
Cugurullo (2020)	Smart cities; AI governance	Critical conceptual analysis	Warns against urban AI autonomy and unexamined automation.	Governance relevance is strong but does not empirically test neighbourhood outcomes.

Echendu (2023)	Nigeria; planning participation	Empirical professional-perspective study	Supports public participation as a legitimacy condition in Nigerian planning.	Direct Nigerian relevance; professional perceptions do not substitute resident outcome evaluation.
Echendu & Okafor (2021)	Africa; smart-city technology	Critical/conceptual study	Situates smart-city technology within African urbanisation pressures.	Broad African framing; specific AI effects and neighbourhood outcomes are not established.
Ewing & Cervero (2010).	International; travel/built environment	Meta-analysis	Synthesises relationships between built environment and travel.	Strong aggregate evidence but largely outside Nigeria and not focused on AI.
Floridi et al. (2018).	International; AI ethics	Normative ethics framework	Provides principles for beneficence, non-maleficence, autonomy, justice and explicability.	Normative rather than planning-specific; requires translation into local governance procedures.
Fox et al. (2018).	Nigeria; urban transition	Empirical urbanisation analysis	Establishes continuing Nigerian urban growth and transformation.	National/urban-system evidence rather than neighbourhood intervention evaluation.
Frank et al. (2010).	Neighbourhood walkability	Index-development empirical study	Demonstrates measurable walkability constructs tied to built form.	Indicator structure is useful; weights and thresholds require Nigerian calibration.
Gan et al. (2017).	Affordable housing; stakeholders	Stakeholder study	Identifies sustainability considerations in affordable housing delivery.	Not Nigeria-specific and not primarily accessibility-focused.
Gandy (2006)	Metropolitan Lagos, Nigeria	Critical urban-infrastructure analysis	Documents infrastructure and planning deficits relevant to inclusion.	Older metropolitan case; should not be treated as representative of all emerging cities.
Geurs & van Wee (2004).	Accessibility planning	Review/methodological synthesis	Establishes accessibility as interaction among land use, transport, time and individuals.	Foundational but not AI-specific; metric choice remains normative and context-dependent.
Giles-Corti et al. (2016).	International; planning and health	Evidence synthesis	Links city planning, built form and population health.	Strong cross-sector evidence; secondary-city Nigerian applicability requires local measurement.
Handy & Niemeier (1997).	Accessibility measurement	Methodological review	Clarifies conceptual and measurement choices in accessibility analysis.	Seminal and non-Nigerian; data requirements can exceed local availability.
He et al. (2024)	International; AI in urban design/planning	Systematic review	Maps emerging technologies and AI applications in urban design and planning.	Technological breadth is high; direct Nigerian evidence remains limited.
Ibem (2011)	Lagos region, Nigeria; public housing	Housing-policy empirical study	Provides Nigerian evidence on public/private housing provision context.	Useful delivery context but does not test accessibility analytics or AI.

Ibem (2013)	Ogun State, Nigeria; public housing	Empirical service-accessibility study	Shows service/facility accessibility matters to public-housing residents.	Highly relevant Nigerian housing evidence; limited geographic scope and no AI component.
Ibem & Aduwo (2013).	Ogun State, Nigeria; public housing	Residential-satisfaction empirical study	Links neighbourhood/service conditions with residential satisfaction.	Direct Nigerian evidence but limited to sampled public-housing settings.
Isalou et al. (2014).	Qom, Iran; housing/transport	Empirical affordability-index test	Demonstrates combined housing-and-transport affordability assessment.	Developing-world relevance, but thresholds, travel modes and markets differ from Nigeria.
Kandt & Batty (2021).	International; urban analytics	Conceptual/review	Frames long-run use of big data and urban analytics in policy.	Highlights analytical potential more than distributive outcome validation.
Kenyon et al. (2002).	Transport and social exclusion	Conceptual/empirical discussion	Connects mobility constraints with participation and social exclusion.	Useful equity framing; virtual-mobility emphasis may not transfer directly to Nigerian neighbourhood access.
Kitchin (2014)	Smart urbanism	Critical conceptual analysis	Questions real-time, data-driven urbanism and associated governance assumptions.	Not Nigeria-specific; valuable mainly for critical interpretation of data-driven claims.
Lucas (2012)	Transport and social exclusion	Review	Synthesises exclusion mechanisms and transport disadvantage.	Strong conceptual relevance; operational indicators require local adaptation.
Mittelstadt et al. (2016).	Algorithmic ethics	Systematic conceptual mapping	Identifies ethical concerns around opacity, bias, responsibility and evidence.	General algorithmic ethics; planning-specific governance must be operationalised locally.
Mouratidis (2021)	Urban planning and quality of life	Literature review	Maps pathways linking built environment and subjective wellbeing.	Provides liveability framing but not Nigeria-specific or AI-specific.
Páez et al. (2012).	Accessibility indicators	Methodological study	Distinguishes positive and normative accessibility measurement choices.	Highly relevant to transparent indicator design; local policy objectives determine acceptable metrics.
Papa & Bertolini (2015).	European metropolitan areas	Accessibility/TOD empirical analysis	Links accessibility and transit-oriented development.	Methodological relevance is transferable, but formal-transit context differs from Nigerian mixed systems.
Papa et al. (2016).	European planning practice	Review of accessibility instruments	Shows how accessibility tools enter planning practice.	Implementation lessons are useful, but institutional context differs from Nigeria.
Pereira et al. (2017).	Transport equity	Conceptual/review	Provides distributive-justice framework for transport accessibility.	Strong equity basis; requires locally defined population groups and opportunity sets.

Sallis et al. (2016).	International; planning policy and health	Evidence-to-policy synthesis	Connects planning evidence to healthy and sustainable city policy.	Broad policy evidence; causal effects at Nigerian neighbourhood scale require local studies.
Sanchez et al. (2023).	Urban planning and AI	Review/prospective analysis	Identifies AI opportunities and professional implications in planning.	Directly relevant to AI framing but largely international and not outcome-evaluated in Nigerian cities.
Silva et al. (2018).	International; smart cities	Literature review	Maps smart-city architectures, components and implementation challenges.	Technology/system focus; inclusion and Nigerian transferability are indirect.
Silva et al. (2017).	Planning practice	Empirical/practice-oriented accessibility study	Addresses implementation gap between accessibility tools and planning practice.	Useful institutional lesson; European setting limits direct transfer.
Southworth (2005)	Walkable-city design	Design synthesis	Defines spatial qualities supporting walkability.	Foundational architectural relevance; climate, informal use and maintenance conditions require Nigerian adaptation.
Stevenson et al. (2016).	International; land use/transport/health	Scenario modelling study	Estimates health benefits of compact urban development.	Supports integrated land-use/transport reasoning, but model assumptions are not Nigerian.
te Brömmelstroet et al. (2016)	European planning practice	Experiential workshop/method study	Shows strengths and weaknesses of accessibility instruments in professional use.	Practice insight is valuable; institutional and data contexts differ from Nigeria.
Yigitcanlar, Desouza, et al. (2020).	Smart cities; AI	Systematic review	Balances potential contributions of AI with risks in smarter cities.	Broad review; direct evidence of inclusive outcomes remains limited.
Yigitcanlar, Kankanamge, et al. (2020).	Australia; planning/AI perceptions	Empirical perception study	Shows how AI-related urban-planning concepts are understood and used by practitioners.	Professional-perception evidence from Australia; limited direct transfer to Nigerian institutions.
Zheng et al. (2014).	International; urban computing	Conceptual/methodological survey	Defines urban computing methods for integrating heterogeneous city data.	Foundational computational evidence; inclusion, ethics and Nigerian validation require separate treatment.

Note: The table distinguishes direct Nigerian evidence, transferable international or Global-South evidence, and methodological or conceptual evidence. Appraisal is qualitative and does not represent a numerical risk-of-bias score. International findings inform method selection and hypothesis generation; Nigerian recommendations remain conditional on local data, field verification and institutional context.

Inclusive Neighbourhood Accessibility and Liveability

Inclusive neighbourhood planning coordinates land use, housing, mobility, public space and services so that different groups can reach and use opportunities without avoidable exclusion. It is spatial. After all, it examines where homes, schools, clinics, markets, transport stops, and public facilities are located, and distributive because it asks how benefits and burdens are distributed and which groups face barriers to participation. These barriers can be physical, economic, social or institutional. Streets without continuous pedestrian routes, accessible crossings or adequate drainage can restrict independent movement, particularly for persons with disabilities and other users facing mobility barriers (United Nations Department of Economic and Social Affairs, 2016; World Bank, 2022).

Mobility describes movement, whereas accessibility describes the ability to reach valued destinations. Accessibility incorporates land use, transport options, travel time, travel cost, safety and the distribution of opportunities, making it more directly relevant to inclusion than road capacity or vehicle movement alone (Geurs & van Wee, 2004; Handy & Niemeier, 1997; Páez et al., 2012). In Nigerian urban contexts, practical accessibility depends on combinations of walking, formal public transport and informal or shared transport; road provision alone therefore does not adequately represent access conditions (Alcorn & Karner, 2021; Cervero & Golub, 2007).

Housing accessibility similarly extends beyond dwelling supply. It concerns households' ability to obtain and sustain housing that is safe, affordable, tenure-secure and spatially connected to employment, schools, health facilities, markets, public transport and open space. Housing research shows that location, infrastructure, transport cost and neighbourhood services shape affordability, service access and residential satisfaction (Chan & Adabre, 2019; Ibem, 2013; Ibem & Aduwo, 2013; Isalou et al., 2014). Within the architecture-planning lens, housing accessibility is therefore treated as a spatial-planning concern that must also be translated into universal access, usable dwellings and public-realm design.

Liveability literature links neighbourhood form with health, safety, comfort, opportunity, social participation, environmental quality and subjective wellbeing. Density, diversity, street design, walkability, public space, service access and access to nature can influence mobility behaviour and quality-of-life outcomes (Cervero & Kockelman, 1997; Ewing & Cervero, 2010; Frank et al., 2010; Giles-Corti et al., 2016; Mouratidis, 2021; Southworth, 2005). Nigerian urban evidence adds dispersed growth, drainage deficits, traffic conflict, unserviced layouts, infrastructure constraints and weak development control to this context (Aliyu & Amadu, 2017; Echendu & Okafor, 2021; Fox et al., 2018; Gandy, 2006).

The reviewed evidence has complementary implications for Urban and Regional Planning and Architecture. Planning literature addresses the distribution of opportunities, mobility systems, infrastructure, statutory controls and participatory priorities; inclusive-design and housing evidence addresses how those spatial conditions are translated into usable housing, streets, public realm and universal access (Geurs & van Wee, 2004; Ibem, 2013; Pereira et al., 2017; United Nations Department of Economic and Social Affairs, 2016). Inclusive performance therefore depends on alignment between location decisions and physical design.

Evidence Synthesis on Digital Analytics, Accessibility, Housing and Liveability

Across urban-computing and planning-support literature, conventional spatial analysis, urban computing and AI-specific methods provide different but complementary capabilities. GIS and network models support spatial representation, service-area and accessibility calculations; conventional scenario modelling compares alternatives; and AI may add classification, prediction, clustering and pattern recognition where suitable training and validation data exist (Allam & Dhunny, 2019; Batty et al., 2012; Kandt & Batty, 2021; Kitchin, 2014; Sanchez et al., 2023; Zheng et al., 2014). Treating these methods as interchangeable obscures their different assumptions, data requirements and validation needs.

The same literature identifies a persistent tension between analytical efficiency and distributive accountability. AI can increase processing capacity, but incomplete datasets, opaque assumptions and unequal institutional power can reproduce exclusion or present value-laden decisions as technically objective (Cugurullo, 2020; Floridi et al., 2018; Mittelstadt et al., 2016; Yigitcanlar, Desouza, et al., 2020; Yigitcanlar, Kankanamge, et al., 2020). Digital outputs are therefore treated as decision support requiring planning interpretation, architectural translation, community validation and governance review.

Accessibility and transport-equity studies converge on measuring the ability to reach opportunities rather than infrastructure quantity alone, while access outcomes vary by income, gender, age, ability and residential location (Brussel et al., 2019; Geurs & van Wee, 2004; Handy & Niemeier, 1997; Kenyon et al., 2002; Lucas, 2012; Páez et al., 2012; Pereira et al., 2017). Nigerian and comparable evidence on informal transport further indicates that formal and informal mobility networks should be analysed as a connected system (Alcorn & Karner, 2021; Cervero & Golub, 2007).

GIS- and network-based accessibility analysis can integrate travel-time, facility-location and demographic information. At the same time, AI may supplement these analyses through prediction, classification or clustering where the decision problem and data justify its use. Remote-sensing data can supplement spatial analysis where locally validated. Planning-support research shows that such tools are most useful when they are understandable, institutionally embedded and contextually verified (Papa & Bertolini, 2015; Papa et al., 2016; Silva et al., 2017; te Brömmelstroet et al., 2016). Open-source network methods expand analytical capacity, yet incomplete representation of informal paths, transport routes, seasonal flooding and safety conditions remains a transferability limitation requiring field and community verification (Alcorn & Karner, 2021; Boeing, 2017; Echendu, 2023).

Housing accessibility literature further shows that affordability cannot be separated from location, transport cost, infrastructure and service access (Chan & Adabre, 2019; Gan et al., 2017; Isalou et al., 2014). Nigerian public-housing studies indicate that access to services and facilities affects residential satisfaction and housing-scheme performance (Ibem, 2011, 2013; Ibem & Aduwo, 2013). Housing that is inexpensive in purchase or rental terms may therefore remain spatially exclusionary where travel costs and poor access to employment, education, healthcare, markets or public transport create substantial household burdens.

Land use, infrastructure, transport, environmental risk, service proximity and household resources can be analysed jointly when assessing candidate housing areas (Geurs & van Wee, 2004; Ibem, 2013; Isalou et al., 2014; Papa et al., 2016). For planning, this supports site selection, development control and infrastructure sequencing; for architecture, the same evidence informs layout, universal access, public realm, safety, ventilation and communal-space decisions. Computationally derived suitability scores - whether generated through GIS, multi-criteria methods or AI-assisted models - should therefore be treated as decision-support inputs requiring transparent weighting, professional interpretation and contextual validation rather than final planning outcomes.

Liveability evidence links neighbourhood form, mobility, housing, public space, environmental quality and social infrastructure with physical activity, exposure, safety and subjective wellbeing (Cervero & Kockelman, 1997; Ewing & Cervero, 2010; Giles-Corti et al., 2016; Mouratidis, 2021; Sallis et al., 2016; Stevenson et al., 2016). Digital dashboards, spatial indicators, street audits and public-feedback analysis can support liveability assessment, but legitimate use requires participation and professional interpretation rather than numerical optimisation alone (Echendu, 2023; Floridi et al., 2018; Yigitcanlar, Desouza, et al., 2020).

Digital, GIS and AI-Assisted Spatial-Equity and Accessibility Analytics

Digital and AI-assisted methods are most useful when linked to clearly defined neighbourhood decisions such as identifying access gaps, comparing housing locations, testing land-use and mobility alternatives, or monitoring service and liveability outcomes. Method selection should follow the decision problem rather than the availability of a tool labelled AI. Accessibility theory keeps the analytical focus on residents' ability to reach opportunities, while governance, field verification and professional judgement determine whether computational outputs are sufficiently reliable for consequential decisions (Batty et al., 2012; Geurs & van Wee, 2004; Lucas, 2012; Pereira et al., 2017; Sanchez et al., 2023; Zheng et al., 2014).

Table 3. Digital, GIS and AI-assisted applications for inclusive neighbourhood planning and architectural design

Application	Method class	Planning use	Inclusion benefit	Architecture output	Key caution	Validation need
Accessibility mapping	GIS/network analysis	Estimate walking, public-transport and travel-time access to schools, clinics, markets, jobs and parks.	Identifies underserved areas and service gaps.	Facility-location brief, street-improvement priorities and inclusive housing-site criteria.	Formal network data may omit informal paths, transport, flooding and local barriers.	Field verification, community mapping and locally defined travel-time criteria.
Housing-location suitability	GIS/multi-criteria decision support; AI optional	Compare sites using infrastructure, hazards, service access, transport, affordability and land-use compatibility.	Can identify locations where travel burden may undermine effective affordability.	Neighbourhood-layout brief, housing prototype parameters and development-control checklist.	Weights can conceal normative choices; land price and road access are insufficient alone.	Transparent weighting, sensitivity testing and planning review.

Mobility demand and network analysis	Network/scenario modelling; ML where justified	Analyse trip patterns, congestion, public-transport demand and peak-period stress.	Can reveal travel and access burdens affecting low-income households, non-car users and mobility-vulnerable groups.	Pedestrian-priority corridors, street sections and safer-school-route proposals.	Digital traces may underrepresent poorer, older or offline residents.	Household/mobility surveys and representation checks.
Computer-vision street audit	Machine learning/computer vision	Detect sidewalks, crossings, lighting, obstructions, greenery and road condition from imagery.	Supports universal access and safer movement.	Public-realm retrofit, accessibility detail and maintenance priorities.	Privacy, image bias and recognition error can distort results.	Field audit, error assessment and privacy safeguards.
Participatory digital dashboard	Digital platform; NLP/AI text classification optional	Organise complaints, map priorities and compare scenarios.	Allows lived experience to influence decisions when participation is broad.	Community-validated planning and design brief.	Digital-only participation can exclude residents with low connectivity or literacy.	Offline/face-to-face channels, representation audit and transparent classification.
Housing-transport affordability screening	GIS/statistical or multi-criteria analysis	Relate income, housing cost, transport cost, location and infrastructure to household burden.	Highlights affordability burdens and spatial-exclusion risks.	Integrated housing-location and affordability responses.	Thresholds and income data can be sensitive or context-dependent.	Locally justified thresholds, privacy protection and subgroup analysis.
Infrastructure sequencing	GIS/scenario and multi-criteria support	Prioritise roads, drainage, water, sanitation and facilities by service deficits, risk and growth pattern.	Supports evidence-informed prioritisation toward identified deficits.	Phased neighbourhood infrastructure and coordinated site-development brief.	Scores cannot replace budgets, statutory priorities or public-interest judgement.	Budget alignment, agency review, community validation and monitoring.

Source: Authors' synthesis based on accessibility and transport-equity evidence (Geurs & van Wee, 2004; Lucas, 2012; Pereira et al., 2017), housing-accessibility and affordability research (Chan & Adabre, 2019; Ibem, 2013; Isalou et al., 2014), urban analytics (Boeing, 2017; Kandt & Batty, 2021; Sanchez et al., 2023), and responsible-AI literature (Floridi et al., 2018; OECD, 2024; UNESCO, 2021).

Note: The applications are decision-support functions rather than autonomous determinants of inclusive outcomes. GIS/network analysis, scenario modelling and multi-criteria methods are not treated as AI unless learning-based or other AI-specific techniques are actually used.

Architectural and Planning Translation of Digital Evidence

Accessibility and service-gap evidence acquires implementation meaning through professional interpretation. Planning-support and accessibility research assigns land-use, mobility, infrastructure, statutory and participation questions to planning processes. In contrast, inclusive-design and housing research requires those conditions to be translated into usable housing, streets, public spaces, universal access and climate-responsive form (Geurs & van Wee, 2004; Ibem, 2013; Pereira et al., 2017; Sanchez et al., 2023; United Nations Department of Economic and Social Affairs, 2016).

Neither spatial location nor architectural quality is sufficient by itself. A neighbourhood with favourable travel-time indicators can remain exclusionary where streets, entrances or public spaces are inaccessible, while a well-designed dwelling can remain socially inaccessible when essential services and affordable transport are distant (Ibem, 2013; Isalou et al., 2014; Lucas, 2012; Pereira et al., 2017). Inclusive performance therefore depends on alignment between planning location decisions and architectural design from site selection through occupation and post-occupancy learning.

Within this two-lens framework, planning interpretation identifies who is underserved, which opportunities are inaccessible, where infrastructure deficits occur and which statutory or participatory priorities govern intervention. Architectural translation then converts those findings into spatial responses such as accessible dwelling layouts, continuous pedestrian interfaces, safe street edges, shaded public realm, legible entrances, climate-responsive form and maintainable neighbourhood facilities. Computational outputs remain evidence to be interpreted, not design instructions.

Iterative Human-in-the-Loop Architecture -Planning Framework

Figure 1 organises the reviewed evidence into an iterative human-in-the-loop framework for inclusive neighbourhood planning and design. Stage 1 combines population and housing information, land-use records, street and service networks, housing locations, public facilities, transport routes and environmental-risk data with community knowledge from participatory mapping, field observation and local mobility experience. Community evidence is treated as an analytical input rather than an after-the-fact consultation because Nigerian planning research identifies participation as important to the legitimacy of planning decisions (Echendu, 2023).

Stage 2 distinguishes digital and AI-assisted methods. GIS and network analysis support accessibility and service-area assessment, conventional scenario modelling tests alternatives, and AI-specific techniques such as machine learning, clustering and image classification can support prediction or pattern detection where suitable data and validation are available (Boeing, 2017; Sanchez et al., 2023; Zheng et al., 2014).

Stages 3 and 4 represent the two principal professional lenses. Urban and Regional Planning interprets spatial equity, land use, mobility, infrastructure sequencing, development control, policy alignment and participation; Architecture translates those conditions into inclusive housing layouts, universal-access strategies, street-edge and public-realm design, climate-responsive built form and context-sensitive neighbourhood identity (Geurs & van Wee, 2004; Ibem, 2013; Pereira et al., 2017; United Nations Department of Economic and Social Affairs, 2016).

Stage 5 requires joint professional and community validation before consequential recommendations are implemented. Stage 6 evaluates three substantive outcome domains: mobility and service accessibility, housing inclusion and spatial quality, and neighbourhood liveability. Monitoring and post-occupancy evidence then feed back to the data, planning and architectural-design stages. Data provenance, representation, privacy, bias assessment, transparency, professional accountability, human oversight and mechanisms for review or challenge operate as cross-cutting safeguards throughout rather than as an outcome.

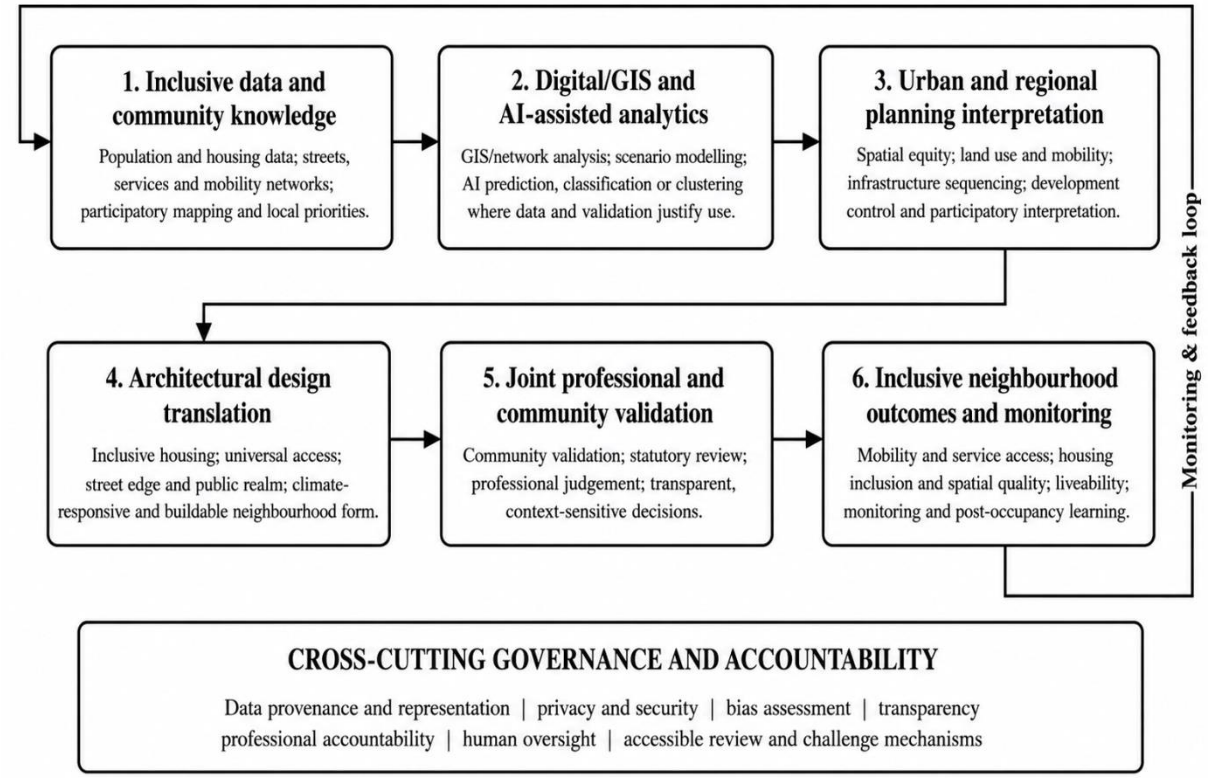

Figure 1. Proposed iterative human-in-the-loop architecture-planning framework integrating community knowledge, spatial analysis and AI-assisted decision support for inclusive neighbourhoods.

Note: Authors' conceptual synthesis based on Batty et al. (2012), Zheng et al. (2014), Sanchez et al. (2023), Geurs and van Wee (2004), Pereira et al. (2017), Echendu (2023), Ibem (2013), Floridi et al. (2018), Mittelstadt et al. (2016), OECD (2024, 2025), UNESCO (2021), the Nigeria Data Protection Act (2023), the Architects (Registration, Etc.) Act (2004), and the Town Planners (Registration, Etc.) Act (2004).

Table 4. Architecture and planning responsibilities in digitally and AI-assisted inclusive neighbourhood delivery

Professional role	Digital/AI-assisted contribution	Professional judgement retained
Urban and Regional Planning	Interprets accessibility maps, spatial-equity diagnosis, land-use/mobility integration, infrastructure priorities, development-control evidence and policy dashboards.	Defines public-interest objectives, interprets distributive effects, manages participation and aligns evidence with statutory plans.
Architecture	Uses digital evidence to refine housing layouts, universal access, street edges, public spaces, shading, safety, service coordination and neighbourhood identity.	Retains professional judgement on dignity, cultural fit, spatial quality, climate response, buildability, maintainability and liveability beyond numerical indicators.
Joint architecture-planning team	Develops integrated briefs, development-control checklists, monitoring indicators and documented decisions.	Records assumptions, ethical data use, community validation, trade-offs and context-sensitive decisions in support of professional accountability.

Source: Authors' synthesis based on Nigerian professional-regulatory frameworks, planning-participation evidence, AI-supported planning literature and responsible-AI guidance (Architects (Registration, Etc.) Act, 2004; Echendu, 2023; OECD, 2024, 2025; Sanchez et al., 2023; Town Planners (Registration, Etc.) Act, 2004; UNESCO, 2021).

Note: The table identifies the principal professional lenses examined in this review rather than the complete implementation team. Delivery may additionally require transport and infrastructure specialists, accessibility/disability expertise, community representatives, data/AI specialists and relevant public agencies according to the intervention.

Application to Emerging Nigerian Cities

The framework is proposed for testing in secondary and intermediate Nigerian cities experiencing rapid spatial expansion, peripheral subdivision, informal settlement growth and infrastructure or accessibility pressures (Aliyu & Amadu, 2017; Echendu & Okafor, 2021; Fox et al., 2018; Gandy, 2006; United Nations Human Settlements Programme, 2022, 2024). Cities such as Ado-Ekiti, Akure, Osogbo, Abeokuta, Ilorin, Minna, Makurdi, Uyo, Owerri and Enugu are illustrative potential settings rather than a sampled or empirically homogeneous group; no comparative claim is made among them.

In these settings, GIS/network-based accessibility profiles, supplemented where justified by AI-assisted prediction or classification, can compare access to schools, clinics, markets, public transport and other services and test alternative facility-location, transport-link, drainage or housing-expansion scenarios (Boeing, 2017; Geurs & van Wee, 2004; Sanchez et al., 2023). The World Bank's Nigerian urban liveability and mobility analysis further supports integrated consideration of service access, infrastructure and urban management (World Bank, 2025).

Ado-Ekiti is presented solely as an illustrative application scenario rather than an empirical case study. A future pilot could integrate housing-growth areas, schools and health facilities, markets, pedestrian and drainage conditions, informal transport nodes, public-space needs and universal-access audits. Planning interpretation would address land use, accessibility and infrastructure sequencing, while architectural translation would develop housing, street-edge, public-realm and universal-design responses, followed by community validation (Boeing, 2017; Echendu, 2023; Geurs & van Wee, 2004; Ibem, 2013).

Inclusive-mobility analysis should include walking, informal transport, safety, seasonal access and disability-related barriers rather than treating formal road networks as complete representations of movement (Alcorn & Karner, 2021; Cervero & Golub, 2007; Lucas, 2012). Housing-site analysis should likewise combine affordability, service access, residential satisfaction, participation and universal-design considerations (Echendu, 2023; Ibem, 2013; Ibem & Aduwo, 2013; United Nations Department of Economic and Social Affairs, 2016).

Governance, Ethical and Data Risks

AI-assisted neighbourhood planning carries governance, ethical and data risks where datasets underrepresent informal settlements or digitally excluded populations, models conceal normative assumptions, personal location data are inadequately protected, or digital systems reinforce existing power imbalances (Cugurullo, 2020; Floridi et al., 2018; Mittelstadt et al., 2016; Yigitcanlar, Desouza, et al., 2020; Yigitcanlar, Kankanamge, et al., 2020). These risks are especially important in accessibility analysis because omission of care trips, disability barriers, informal mobility, unregistered settlements or seasonal constraints can change who appears to be served by a planning option.

International AI-governance and urban-AI literature emphasises inclusion, transparency, accountability, human oversight and attention to distributive risks, while algorithmic-ethics scholarship identifies risks of bias where data, assumptions and institutional accountability are weak (Cugurullo, 2020; Floridi et al., 2018; Mittelstadt et al., 2016; OECD, 2024, 2025; UNESCO, 2021). These principles are relevant to planning because AI-assisted decisions can redistribute access to services, transport, public space and housing opportunities.

In Nigeria, the Nigeria Data Protection Act, 2023 provides the binding statutory framework for personal-data processing, while the National Artificial Intelligence Strategy 2025 provides national policy direction for responsible, ethical and inclusive AI development and deployment (Federal Ministry of Communications, Innovation and Digital Economy, 2025; Nigeria Data Protection Act, 2023). Where neighbourhood systems process personal or location data, governance should define lawful purpose, minimisation, access controls, retention, security, responsible data stewards and applicable data-subject rights.

For consequential AI-supported planning decisions, governance documentation should include data provenance, represented and excluded populations, model purpose, assumptions and limitations, update date, validation method, responsible professional reviewers, privacy safeguards, and accessible mechanisms for review or challenge. Records should also identify whether AI-supported recommendations were accepted, modified or rejected and the professional basis for that action (Floridi et al., 2018; OECD, 2024; UNESCO, 2021).

Discussion

The synthesis reinforces the distinction between mobility and accessibility: faster movement does not necessarily improve inclusion when essential opportunities remain distant, unaffordable or physically inaccessible (Geurs & van Wee, 2004; Handy & Niemeier, 1997; Lucas, 2012; Páez et al., 2012; Pereira et al., 2017). Digital and AI-assisted urban analytics can reveal spatial disparities at fine geographic scales, but results remain sensitive to whose journeys, destinations and barriers are represented. Community knowledge and distributive planning judgement are therefore complementary validation sources rather than optional additions.

A second point of convergence is that liveability emerges from the interaction of land-use distribution and built form. Planning decisions influence the location of housing, services and mobility networks, while architectural design shapes how residents experience housing, streets, public space, environmental conditions and universal access (Cervero & Kockelman, 1997; Ewing & Cervero, 2010; Ibem, 2013; Mouratidis, 2021). The proposed framework consequently links spatial-equity diagnosis with physical design translation and monitoring rather than treating them as separate outcomes.

The evidence also reveals recurrent trade-offs. Greater analytical detail can improve identification of service gaps but intensify privacy and data-quality risks; optimisation of travel-time access may conflict with affordability, tenure or community priorities; densification can improve proximity while placing pressure on infrastructure and public space; and digital participation can broaden engagement while excluding residents with limited connectivity or digital literacy. These tensions favour multi-criteria, participatory and professionally interpreted decision-making over single-score optimisation.

Transferability is particularly constrained when models depend on formal street networks, smartphone traces or facility registers that inadequately represent informal paths and transport, care journeys, disability-related barriers, seasonal flooding, unregistered settlements or digitally excluded residents. Urban-analytics and planning-support evidence therefore supports local calibration, field verification and participatory mapping before model outputs are used for consequential neighbourhood decisions (Alcorn & Karner, 2021; Boeing, 2017; Echendu, 2023; Floridi et al., 2018; Sanchez et al., 2023).

Practice and Policy Implications

For practice, neighbourhood accessibility baselines should be established before major housing, transport or public-facility decisions. Such baselines can combine service access, pedestrian conditions, drainage, water, sanitation, public space and transport information, with network analysis verified through field inspection and community evidence (Boeing, 2017; Echendu, 2023; Geurs & van Wee, 2004; Pereira et al., 2017).

Inclusive neighbourhood performance should be monitored through explicitly defined indicators covering service accessibility, pedestrian continuity and safety, combined housing-transport affordability, infrastructure and drainage coverage, public-space access, universal accessibility, participation and resident experience. Wherever feasible and lawful, results should be disaggregated by location and relevant population characteristics so that aggregate improvement does not conceal distributive disadvantage. Table 5 proposes candidate indicators as a testing framework rather than universal standards.

For implementation, pilot-scale digital and AI-assisted applications should use predefined baseline conditions, validation procedures, community participation and outcome measures before wider institutionalisation. In Ado-Ekiti or comparable cities, a pilot could combine housing expansion, public facilities, road and drainage conditions, informal transport nodes and pedestrian-safety evidence with participation by planners, architects, communities, transport users and disability groups (Echendu, 2023; Sanchez et al., 2023; World Bank, 2025).

Professional-capacity implications extend beyond software operation. Continuing professional development for planners and architects should address data quality, model assumptions, spatial analysis, AI ethics, participatory methods, universal design and interpretation of digital evidence. AI governance can also be integrated with development-control and public-procurement procedures through documented assumptions, data sources, update schedules, privacy safeguards, human review and accessible challenge mechanisms (Nigeria Data Protection Act, 2023; OECD, 2024; UNESCO, 2021).

Table 5. Candidate indicators for inclusive neighbourhood monitoring

Outcome domain	Candidate indicator	Operational definition/unit	Primary data source	Spatial scale	Recommended disaggregation	Interpretation/limitation
Service accessibility	Population with practical access to key services	Percentage of residents within a locally specified network travel-time threshold to schools, clinics, markets and public transport.	Network data, facility register, field verification, travel survey.	Neighbourhood/census or enumeration unit.	Income, age, disability, gender and peripheral/core location where lawful and feasible.	Thresholds are normative and should be locally justified; formal networks may omit informal routes.
Pedestrian continuity and safety	Continuous usable pedestrian route coverage	Percentage of audited key-route length with continuous, passable and appropriately accessible pedestrian provision; incident/safety observations reported separately.	Street audit, imagery, community mapping, crash/safety records.	Street segment/route.	School children, older persons, persons with disabilities and gender where evidence permits.	Physical presence does not guarantee perceived safety or maintenance quality.

Housing-transport affordability	Combined recurring housing and transport burden	Housing plus routine transport expenditure as a percentage of household income; distribution reported, not only average.	Household survey, rent/housing-cost records, travel expenditure survey.	Household/neighbourhood.	Income group, tenure, household type and location.	Sensitive income data require protection; policy threshold should be locally specified.
Infrastructure and drainage	Essential-service and all-season access coverage	Percentage of households/streets with functional water, sanitation, drainage and all-season access; recurrent failure incidents reported.	Infrastructure records, field audit, maintenance logs, community reports.	Block/neighbourhood.	Peripheral/core location and vulnerable groups where relevant.	Nominal coverage can differ from reliability and service quality.
Public-space access	Access to usable public/open space	Percentage of residents within a locally specified walking-time threshold to safe, usable public space; quality score reported separately.	GIS/network analysis, public-space inventory, field audit, resident survey.	Neighbourhood.	Age, gender, disability and income where feasible.	Proximity alone does not capture quality, safety, comfort or cultural usability.
Universal accessibility	Accessible-route and facility compliance	Percentage of audited priority routes, entrances and facilities meeting applicable accessibility criteria.	Universal-design audit, field measurement, user walk-through.	Facility/route/neighbourhood.	Persons with different mobility, sensory and cognitive access needs.	Checklist compliance should be triangulated with lived-experience evidence.
Participation and accountability	Representation and decision traceability	Participation rate and representation profile across online/offline channels; percentage of major recommendations with documented response and rationale.	Meeting records, digital platform logs, decision register.	Project/neighbourhood.	Gender, age, disability, income/location and digital access where lawful.	Participation quantity does not guarantee influence; quality of response should be documented.
Liveability and resident experience	Resident-reported neighbourhood satisfaction and service reliability	Composite or domain-specific score for access, safety, comfort, public space and service reliability, with instrument and scale reported.	Resident survey, helpdesk/complaint records, post-occupancy evaluation.	Household/neighbourhood.	Income, tenure, age, disability, gender and location where appropriate.	Subjective measures are valuable but should be triangulated with physical and service data.

Source: Authors' synthesis based on accessibility and transport-equity evidence (Geurs & van Wee, 2004; Lucas, 2012; Pereira et al., 2017), housing and service-access research (Ibem, 2013; Isalou et al., 2014), walkability and liveability evidence (Frank et al., 2010; Mouratidis, 2021), universal-access guidance (United Nations Department of Economic and Social Affairs, 2016; World Bank, 2022), Nigerian participation evidence (Echendu, 2023), urban liveability evidence (World Bank, 2025), and data-governance requirements (Nigeria Data Protection Act, 2023; OECD, 2024).

Note: The indicators are candidate operational measures, not universal thresholds. Each pilot should state the metric definition, unit, threshold or benchmark where used, data source, spatial scale, population groups represented and known limitations. Disaggregation must comply with privacy and data-protection requirements.

Limitations and Future Research

This review is limited by its structured narrative rather than systematic or meta-analytic design, heterogeneous evidence base and absence of pooled effect estimation. The 48-study analytical corpus combines different geographic contexts, urban scales, technologies and methodological traditions, and no formal numerical risk-of-bias instrument was applied. Historical record-level search-flow counts were not available for retrospective reporting. Much of the accessibility and urban-analytics evidence originates outside Nigeria, while Nigerian secondary-city empirical studies remain limited for several proposed AI functions. In addition, conventional GIS, network-analysis and scenario-modelling evidence can be difficult to separate from genuinely AI-specific effects where studies use broad 'smart' or 'data-driven' terminology. The proposed architecture-planning framework therefore remains conceptual and requires comparative, longitudinal empirical validation before its performance or transferability can be generalised.

Future research should test the framework through comparative multi-neighbourhood pilots combining GIS/network accessibility analysis, clearly identified AI-specific methods where justified, household and mobility surveys, participatory mapping, street and universal-access audits, and post-occupancy evaluation. Baseline or comparison neighbourhoods should be used where feasible to determine whether AI-assisted workflows provide measurable incremental benefits over conventional planning and design processes. Research should also examine data representativeness, model error, participation quality, implementation cost, professional workflow impacts and distribution of benefits across population groups.

Conclusion

The reviewed evidence indicates that AI can augment selected inclusive-neighbourhood tasks such as prediction, classification and pattern detection. At the same time, GIS, accessibility modelling, scenario analysis and other computational methods provide complementary spatial decision support. Their contribution depends on representative data, appropriate method selection, transparent assumptions, local validation, community knowledge and professional interpretation. AI does not replace participation or statutory responsibility; accountable use requires human oversight and mechanisms for review or challenge.

The article contributes a proposed two-lens architecture-planning framework in which Urban and Regional Planning interprets spatial equity, land use, mobility, infrastructure, development control and participation. At the same time, Architecture translates these conditions into inclusive housing, universal access, public realm, climate-responsive form and buildable neighbourhood environments. The model is explicitly iterative: monitored neighbourhood outcomes return to the evidence, planning and design stages, while governance safeguards operate throughout.

The framework proposes that digital and AI-assisted tools ultimately be evaluated through demonstrable and distributively transparent improvements in accessibility, spatial quality, housing inclusion and liveability rather than data volume or technological novelty. Those improvements remain to be established empirically through comparative pilots in Nigerian secondary-city neighbourhoods.

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Supplementary Material

Supplementary Table S1 provides a reproducible framework for future replication or updating of the review. Because the retained manuscript did not contain the original database export or record-level search log, historical retrieval and exclusion counts are not reconstructed.

Supplementary Table S1. Reproducible database-specific search framework for updating the review

Source	Search field/mode	Reproducible search expression	Purpose	Record-count note
Scopus	TITLE-ABS-KEY	("artificial intelligence" OR "machine learning" OR "urban analytics" OR "urban computing") AND ("urban planning" OR "neighbourhood planning" OR "urban design" OR housing) AND (inclus* OR equit* OR accessib* OR liveab* OR "universal design")	Core AI/computational + inclusion literature	Historical retrieval count unavailable; do not retrospectively estimate.
Scopus	TITLE-ABS-KEY	("accessibility planning" OR "mobility equity" OR "transport exclusion" OR walkability OR "informal transport") AND (urban OR neighbourhood OR housing)	Accessibility, mobility and transport-equity evidence	Same note.
Scopus	TITLE-ABS-KEY	("housing accessibility" OR "housing and transport affordability" OR "residential satisfaction" OR "affordable housing") AND (access* OR service* OR neighbourhood OR transport)	Housing-location, affordability and service-access evidence	Same note.
Web of Science	TS=	(("artificial intelligence" OR "machine learning" OR "urban analytics" OR "urban computing") AND ("urban planning" OR "neighbourhood planning" OR "urban design" OR housing) AND (inclus* OR equit* OR accessib* OR liveab*))	Cross-check core analytical literature	Historical retrieval count unavailable; do not retrospectively estimate.
Web of Science	TS=	(("AI ethics" OR "responsible AI" OR "algorithmic ethics" OR "data governance") AND (urban OR planning OR city OR neighbourhood))	Responsible-AI and governance evidence	Same note.
Google Scholar	Supplementary discovery	"artificial intelligence" "urban planning" accessibility inclusion; "mobility equity" neighbourhood planning; "housing accessibility" Nigeria; "public participation" planning Nigeria; "universal design" urban development	Citation chasing, Nigerian/contextual literature and grey-source discovery	Use relevance screening; Scholar hit counts are unstable and should not be treated as precise retrieval totals.
Publisher platforms	Targeted keyword search	Adapt the above concept blocks to ScienceDirect, SpringerLink, Taylor & Francis Online, ACM Digital Library and MDPI-hosted journals.	Locate relevant journal papers not easily surfaced by broad database syntax.	Document platform, date and terms in any future update.
Institutional/legal sources	Targeted title/institution search	Search authoritative sites for SDG 11/New Urban Agenda, accessibility guidance, responsible AI, the Architects (Registration, Etc.) Act, the Town Planners (Registration, Etc.) Act, the Nigeria Data Protection Act, the National Artificial Intelligence Strategy, and Nigerian urban liveability/mobility guidance.	Normative, statutory and policy context	Institutional/statutory sources are supplementary and are not counted within the 48-study analytical corpus.

Note: The peer-reviewed analytical window is 1997-2025. The June 2026 update was used to capture late-indexed 2025 records and update policy/institutional material. The Boolean expressions above operationalise the search concepts documented in the manuscript and provide a reproducible basis for future updates; they should not be presented as verbatim historical queries unless confirmed against the authors' original database search histories.