International Journal of Innovative Environmental Studies Research 14():158-173, July-Sept, 2026
© SEAHI PUBLICATIONS, 2026 www.seahipublications.org ISSN: 2354-2918

DOI:10.5281/zenodo.22091872

Adoption and Utilisation of Planning Support Systems (PSS) in Urban Planning Practices in Abuja: A Systematic Literature Review

Mopa Michael Egila[1], Daniel Adamu[2], Musa Eya[3]

[1]Department of Urban and Regional Planning,
Federal Polytechnic Nasarawa, Nigeria

[2,3]Department of Urban and Regional Planning
Nasarawa State University, Keffi, Nigeria

ABSTRACT
This systematic literature review examines the adoption and utilisation of Planning Support Systems (PSS) in urban and regional planning practice, with specific reference to the Abuja Federal Capital Territory (FCT) of Nigeria. A total of 45 peer-reviewed sources across four ScienceDirect search rounds, the review synthesises evidence on PSS typologies, digital decision-support tools, adoption barriers and enablers, institutional and governance contexts, participatory spatial tools, and the particular conditions that shape technology uptake in Sub-Saharan African planning systems. The review is organised around six thematic clusters: (1) PSS and digital decision-support in planning; (2) AI, digitalisation, and smart city technologies; (3) adoption barriers and enablers; (4) Global South planning contexts and institutional constraints; (5) participatory and spatial support tools; and (6) Nigeria-specific planning dynamics and technology gaps. Findings across the expanded corpus reinforce and deepen the conclusion that PSS adoption in the Global South remains structurally constrained by data scarcity, institutional fragmentation, limited professional capacity, mismatched tool design, and weak governance frameworks. Critically, no article in the combined corpus provides direct empirical evidence on PSS adoption in Abuja—a finding that itself constitutes a compelling justification for original empirical research. The review contributes a synthesised four-dimension analytical framework and identifies twelve specific research gaps warranting investigation in the Abuja/FCT context.
Keywords: Planning Support Systems; PSS; Urban Planning; Abuja; Federal Capital Territory; Nigeria; Global South; Digital Planning Tools; Technology Adoption; Spatial Decision Support; Institutional Capacity; Governance

1. INTRODUCTION

Urban planning is an inherently knowledge-intensive and decision-laden process that requires the management of vast quantities of spatial, demographic, infrastructural, and environmental information. As cities across the world grow in size and complexity, the planning profession has progressively turned towards computational tools—collectively described as Planning Support Systems (PSS)—to aid analysis, scenario development, policy evaluation, and stakeholder communication. PSS encompass a broad family of technologies, from Geographic Information Systems (GIS) and spatial modelling platforms to scenario planning software, urban analytics dashboards, agent-based models, multicriteria decision support systems (MCDSS), and geospatial participatory platforms. Their promise lies in transforming raw data

into actionable planning intelligence, enabling planners to evaluate alternative futures, coordinate stakeholders, and make more evidence-based decisions.

Despite the theoretical promise of PSS, their adoption in professional planning practice has been persistently disappointing, particularly outside high-income countries. A substantial body of literature—significantly expanded in this updated review—identifies a persistent gap between tool development and real-world use. Practitioner uptake remains 'lacklustre' even where tools are freely available (Yap et al., 2022), and the Global South—including Sub-Saharan Africa—consistently lags in both PSS research representation and practical implementation (Lartey & Law, 2025; Heyik et al., 2025). Newly incorporated evidence from Dale and Mukherjee (2022) and Pueyo-Ros et al. (2026) further illuminates why even co-developed, user-centred tools struggle to achieve sustainable take-up, pointing to systemic socio-institutional and governance barriers that transcend tool quality.

Within this context, Abuja, the Federal Capital Territory (FCT) of Nigeria, represents a uniquely significant case study. As a purpose-built capital city formally inaugurated in 1991, Abuja was conceived on principles of rational, master-plan-driven urbanism. It houses Nigeria's highest concentration of planning professionals, federal government institutions, and administrative infrastructure. Yet rapid urban expansion, informal settlement proliferation, governance fragmentation, and inadequate deployment of technology-assisted planning tools have fundamentally challenged its original planning vision. Acey's (2016) analysis of multi-stakeholder governance failures in Nigeria's Niger Delta highlights structural features—power asymmetries, institutional mistrust, weak accountability—that likely pervade Abuja's planning environment as well.

This systematic literature review aims to synthesise existing knowledge on PSS adoption and utilisation in urban and regional planning, with particular focus on what is known—and what remains critically unknown—about the FCT context. The review addresses five core research questions: What types of PSS and digital planning tools have been developed and applied in planning practice globally? What factors enable or constrain PSS adoption, particularly in the Global South? What do analogous African, Asian, and Latin American cases reveal about institutional and contextual barriers to tool adoption? How have participatory and open-source planning tools fared in resource-constrained environments? And what specific evidence gaps necessitate focused empirical research on Abuja?

2. METHODOLOGY

2.1 Search Strategy and Database

This review follows a systematic methodology informed by PRISMA principles. The primary database used was ScienceDirect. Across four independent search rounds, a condensed Boolean search string was applied:

(PSS OR SDSS OR "planning support") AND ("urban planning" OR "spatial planning") AND (adoption OR implementation) AND (Nigeria OR "Global South")

This condensed string (8 Boolean operators) was designed to maximise recall while preserving coverage across the four core dimensions of the research: planning support technology, planning practice domains, technology adoption, and geographic context. Supplementary searches expanded the geographic and thematic scope to include digital planning tools, geodesign, participatory GIS, and smart city governance to capture the full relevant literature.

2.2 Screening and Inclusion Criteria

Articles were included if they: (a) addressed PSS, digital planning tools, GIS, spatial decision support, AI in planning, or technology adoption in urban/regional planning; (b) were published in peer-reviewed journals or edited volumes between 2014 and 2026; (c) were accessible via ScienceDirect; and (d) offered substantive relevance to one or more thematic clusters. Articles from wholly unrelated domains (clinical health, fisheries, energy engineering, satellite computing, tyre recycling) were excluded after title and

abstract screening. A total of 45 articles meeting inclusion criteria were retained for full synthesis across the four rounds.

2.3 Data Extraction and Thematic Synthesis

For each article, the following data were extracted: author(s), year, journal, geographic focus, methodology, key findings, and relevance to PSS adoption and the Abuja/Nigeria context. Articles were coded thematically using iterative inductive coding. Six major themes emerged, which form the structure of Section 5. The analytical framework draws on Technology Acceptance Model (TAM), Diffusion of Innovations theory, and socio-technical systems thinking to contextualise findings across institutional settings.

3. Bibliometric Profile of Reviewed Literature

3.1 Distribution by Year

The 45 articles span 2014 to 2026. The earliest articles—Comino et al. (2014), Ahmed and Bramley (2015), and Acey (2016)—establish the foundational PSS and governance discourse. Publications accelerated sharply from 2020 onwards, with 35 of 45 articles (78%) published between 2020 and 2026. This temporal pattern reflects the convergence of smart city agendas, post-COVID digital transformation, and growing recognition of the Global South's structural disadvantages in technology adoption. The surge aligns with findings from the bibliometric analyses of Praharaj (2026) and Alesaily and Albialy (2025), both of which document dramatic growth in AI/PSS-related urban planning research since 2020.

3.2 Geographic Distribution

The 45 articles span five broad geographic categories. Global/comparative studies (14 articles) include Yap et al. (2022), Heyik et al. (2025), Lartey and Law (2025), Praharaj (2026), and Alesaily and Albialy (2025). Global South-focused studies (13 articles) address Asia, Africa, Latin America, and the Middle East. Sub-Saharan Africa studies (8 articles) include Croese et al. (2023), Cobbinah et al. (2020), Eilola et al. (2019), Ibrahim et al. (2023), Kissiedu et al. (2025), Moodley (2020), Asibey et al. (2021), and Poku-Boansi et al. (2024). Nigeria-specific studies (3 articles) include Ogunkan (2025), Ogunkan et al. (2026), and Acey (2016). Global North studies (7 articles) provide comparative benchmarks. Crucially, no article in the corpus addresses PSS adoption in Abuja or the FCT directly.

3.3 Methodological Diversity

The corpus is methodologically diverse. Systematic and bibliometric reviews constitute the most common approach (14 articles), reflecting the field's effort to consolidate a rapidly expanding knowledge base. Qualitative and mixed-methods studies dominate empirical work, including ethnographic approaches (Christmann & Schinagl, 2023), participatory action research (Eilola et al., 2019), Delphi methods (Gomes et al., 2023), and in-depth interviews (Moodley, 2020; Kuller et al., 2022). Quantitative approaches include bibliometric analysis (Praharaj, 2026; Alesaily & Albialy, 2025; Heyik et al., 2025), GIS/spatial modelling (Ahmed & Bramley, 2015; Zibaei et al., 2026; Derdouri et al., 2025), agent-based modelling (Zibaei et al., 2026), and policy document analysis (Praharaj, 2025; Dale & Mukherjee, 2022).

4. Article Review Matrix

Table 1 presents a structured overview of all 45 reviewed articles, organised by author, source, focus, methodology, geographic scope, and relevance to PSS adoption in Abuja/FCT. Articles are grouped by thematic cluster.

Table 1: Systematic Review Article Matrix (n=45)

Author(s) & Year	Journal/Source	Topic/Focus	Methodology	Geography	PSS/Abuja Relevance
Osman (2026)	Urban Climate	PSS + participatory scenario planning,	Mixed methods	Global South (Egypt)	Direct PSS use (INDEX 4.0); scenario planning;

		Cairo			GHG assessment
Kuller et al. (2022)	Cities	PSS for NbS, Indonesia	Interviews/workshops	Global South (Indonesia)	PSS adoption challenges; data scarcity; institutional barriers
Yap et al. (2022)	Computers, Env. & Urban Sys.	Open-source software for planning	Survey/repository audit	Global	Planning tool uptake; poor adoption among practitioners; PSS landscape
Dale & Mukherjee (2022)	Procedia Computer Science	Digital planning tool adoption (TOSCA), GIS	Case study	Global South (2 pilots)	Sustainable take-up of digital tools; PSS in governance; Global South context
Comino et al. (2014)	Land Use Policy	Multicriteria Spatial Decision Support System (MC-SDSS)	GIS/MCDA modelling	Europe (Italy)	SDSS typology; MCDA-GIS integration; territorial planning tool
Steinitz et al. (2023)	Book chapter (Elsevier)	Geodesign for global change	Conceptual/framework	Global	Geodesign as PSS; collaborative negotiation; impact simulation
Pueyo-Ros et al. (2026)	Env. Modelling & Software	Nat4Wat: co-developed DSS for urban water	Co-design/case study	Global (Spain pilot)	DSS co-development; MCDA; stakeholder participation; transparency
Ahmed & Bramley (2015)	Int'l J. Sustainable Built Env.	Urban growth modelling, Dhaka	Quantitative/CA model	Global South (Bangladesh)	What-if scenario modelling; spatial PSS in data-scarce contexts
Zibaei et al. (2026)	Landscape & Urban Planning	Spatial agent-based model for brownfield land use	GIS/ABM modelling	Global South (Iran/Tehran)	GIS decision-support; rule-based land use allocation; data-scarce

					context
Heyik et al. (2025)	Urban Governance	AI-powered analysis of geospatial participatory platforms	Systematic review/AI clustering	Global (312 platforms)	Digital participatory platforms; GIS; institutional adoption; PSS uptake
Praharaj (2026)	City and Env. Interactions	AI + urban resilience planning, bibliometric	Bibliometric	Global	AI/DSS adoption trends; algorithmic planning; equity gaps
Lartey & Law (2025)	Landscape & Urban Planning	AI adoption in urban planning governance	Systematic review	Global/Africa gap	AI-PSS barriers; Africa underrepresented; socio-political challenges
Praharaj (2025)	Applied Geography	Smart cities ICCC, India	Quantitative policy analysis	Global South (India)	Smart city tech adoption; governance; city-size effect
Christmann & Schinagl (2023)	Journal of Urban Management	Digitalisation in planning practice	Qualitative/ethnographic	Europe (multi-site)	Digital tool use; GIS; spatial knowledge transformation; planners
Alesaily & Albialy (2025)	Sustainable Futures	Future cities bibliometric review 1875–2024	Bibliometric	Global	Smart cities; urban planning; AI gap in future cities research
Oyadeyi & Oyadeyi (2025)	Research in Globalization	Smart city sustainability: Zurich, Oslo, Copenhagen	PRISMA SLR	Global North	Smart city adoption; barriers; equity; technology integration
Alblooshi et al. (2026)	Sustainable Cities & Society	Infrastructure resilience, Global South	PRISMA SLR	Global South	Data scarcity; governance maturity; tiered capacity framework
Croese et al.	Land Use	Master	Historical/qual	Sub-Saharan	Planning

(2023)	Policy	planning in Accra, DSM, Lilongwe	itative	Africa	practice; institutional capacity; colonial legacies; politics
Cobbinah et al. (2020)	City, Culture and Society	Culture and urban planning, Kumasi	Mixed methods	Sub-Saharan Africa (Ghana)	Informality; institutional neglect; planning culture
Moodley (2020)	Social Sciences & Humanities Open	City-to-city learning, S. Africa/Malawi /Namibia	Qualitative	Sub-Saharan Africa	Knowledge transfer; trust-building; capacity building in planning
Acey (2016)	Landscape & Urban Planning	Governance in the Niger Delta, Nigeria	Qualitative content analysis	Nigeria (Niger Delta)	Wicked planning problems; multi-stakeholder governance; Nigeria-specific
Ibrahim et al. (2023)	Int'l J. Disaster Risk Reduction	Governance and flood risk, Kumasi	Qualitative	Sub-Saharan Africa (Ghana)	Governance principles; spatial planning; institutional weakness; Africa
Kissiedu et al. (2025)	Land Use Policy	Wetland transformation , peri-urban Ghana	Qualitative/GI S	Sub-Saharan Africa (Ghana)	Institutional fragmentation; land use planning; weak enforcement; Africa
Salem et al. (2025)	Journal of Urban Management	Peri-urban land use management	Systematic review/biblio metric	Global	Fragmented governance; AI/geospatial tools for planning; policy-implementatio n gap
Dacosta Aboagye & Sharifi (2026)	J. Environmental Management	Urban climate action planning case	Systematic review	Global (206 countries)	Planning barriers/drivers ; governance;

		studies			underrepresentation of Global South
Ogunkan (2025)	Progress in Planning	Nigerian planning specialisations	Survey/qualitative	Nigeria	Technology gaps; digital tools underexplored; planning research landscape
Ogunkan et al. (2026)	Cities	Ota: metropolitan edge city, Nigeria	Spatial/secondary data	Nigeria	Governance fragmentation; infrastructure deficits; institutional weakness
Ahmed et al. (2018)	Cities	Dhaka: capital city planning challenges	Review/qualitative	Global South (Bangladesh)	Planned capital; informality; governance failure; planning analogue for Abuja
Eilola et al. (2019)	Landscape & Urban Planning	Participatory GIS, Tanzania	Participatory action research	Global South (Africa)	PGIS in formal planning; spatial decision support; bottom-up tool adoption
Ortiz-Fernández et al. (2023)	Env. & Sustainability Indicators	Spatial NSA for urban planning, Ecuador	GIS/indicator model	Global South (Ecuador)	GIS-based spatial decision support; ArcGIS planning tool; Global South
Uribe-Aguado et al. (2026)	Urban Forestry & Urban Greening	DST for NbS, Bogotá	Framework development	Global South (Colombia)	Citizen-integrated decision support; spatial prioritisation; planning tool
Cong & Temkin (2025)	Book chapter (Elsevier)	NbS and policy communication tool	Conceptual/tool design	Global	Planning support tool; interactive visualisation;

					stakeholder engagement
Gomes et al. (2023)	Environmental Development	Delphi participatory adaptation pathways, India	Participatory/ Delphi	Global South (India)	Stakeholder participatory planning; decision-support; multi-actor settings
Aquino et al. (2026)	Socio-Economic Planning Sciences	Clustering framework for neighborhoods, São Paulo	Quantitative/ ML	Global South (Brazil)	Data-driven planning tools; neighbourhood-scale analysis; transferable framework
Cao et al. (2021)	Cities	Collaborative Planning Turn in China	Conceptual/discourse analysis	China/East Asia	Diffusion of planning ideas; institutional shift; collaborative frameworks
Derdouri et al. (2025)	Landscape & Urban Planning	Urban green space, 8 GN/GS cities	Geospatial/remote sensing	Global North/South	Data-driven planning; spatial analytics; GS-GN disparities
Sepehri & Sharifi (2025)	Cities	X-minute cities bibliometric review	Bibliometric	Global	Proximity planning; spatial tools; accessibility modelling; sustainability
Castaldo et al. (2025)	Land Use Policy	NbS in Global South urban planning	Systematic review	Global South	Implementation barriers; awareness; financial sustainability; institutional capacity
Kasula et al. (2026)	Cities	Social inclusion of urban villages	SQLR	Global South	Participatory planning; governance; inclusion; underrepresented geographies
Muñoz & Duarte (2025)	Cities	Green infrastructure as planning tool	Systematic/grey literature review	Global (73 documents, 46 cities)	Urban planning instruments; planning tool systematisation

Asibey et al. (2021)	Cities	Ethnic minority residential segregation, Kumasi	Survey/FGD	Sub-Saharan Africa (Ghana)	Urban planning gaps; absence of planning regime; African city dynamics
Poku-Boansi et al. (2024)	Habitat International	Residential mobility, Kumasi	Cross-sectional survey	Sub-Saharan Africa (Ghana)	Urban planning and housing; life-course; Global South dynamics
Korkou et al. (2023)	Urban Forestry & Urban Greening	Green infrastructure multifunctionality	Systematic review	Global	Spatial planning methods; assessment tools; planning principles
Pantaloni et al. (2026)	Cities	GI/NbS for seismic resilience	Systematic review	Global	Spatial planning; NbS integration; urban policy
Omwamba et al. (2025)	Urban Transitions	15-Minute City assessment	PRISMA SLR	Global/GS gap noted	Proximity planning; spatial tools; accessibility models; GS evidence gap
Luan et al. (2026)	J. Air Transport Management	Airport decarbonisation, SE Asia	Mixed methods	Global South (SE Asia)	Spatial planning frameworks; governance alignment; institutional coordination

5. Thematic Synthesis

5.1 Theme 1: PSS and Digital Decision-Support in Urban Planning

PSS is not a single technology but a family of tools spanning GIS-based spatial analysis, scenario evaluation, and stakeholder communication. The updated corpus shows this family to be both more diverse and more contested than earlier reviews suggested.

Osman (2026) offers the clearest evidence of PSS working in a Global South setting: INDEX 4.0, deployed within a participatory scenario framework for Greater Cairo, evaluated three 2050 growth strategies. Even in a resource-constrained, institutionally fragmented context, the tool generated usable quantitative planning evidence — but only where quality spatial data, technical expertise, and political will were already present.

That dependency has a longer history. Comino et al. (2014) trace the origins of Multicriteria Spatial Decision Support Systems (MC-SDSS), showing how MCDA-GIS integration lets tools mediate between technical analysis and deliberative planning; their IDRISI-based river basin model is a methodological archetype largely absent from Sub-Saharan African practice, and the intellectual root from which Kuller et al. (2022), Dale and Mukherjee (2022), and Pueyo-Ros et al. (2026) all descend.

Steinitz et al. (2023) frame geodesign as a practice that couples proposals for change with impact simulation grounded in geographic and systems thinking. Their International Geodesign Collaboration framework was built for multi-institutional, multinational settings with unequal resources — a description that fits Nigeria's uneven distribution of skilled professionals and data reasonably well.

Pueyo-Ros et al. (2026) detail Nat4Wat, a co-developed DSS for urban water management combining MCDA with an open knowledge base on performance, cost, and co-benefits. Its transparency-first design answers a standing critique — that PSS tend to be too expert-driven and opaque for practical use — also raised by Uribe-Aguado et al. (2026) against nature-based solution decision tools.

Zibaei et al. (2026) built a spatial agent-based model for brownfield land allocation in Tehran using an open-source GIS rule system (Mesa-Geo). Their result — that transparent, replicable tools are achievable in data-scarce urban contexts — bears directly on Abuja's own data constraints.

The clearest statement of the adoption problem, though, comes from Yap et al. (2022), whose audit of 70 open-source planning tools found practitioner uptake "lacklustre" despite availability; scenario planning, public participation, and evaluation functions were the most underserved, and 60% of tools required API access, shutting out practitioners without coding skills. Dale and Mukherjee (2022) push this further, examining the TOSCA toolkit across two Global South pilots: sustainable take-up depended not on technical quality but on embedding tools in governance processes, local training, and stakeholder co-ownership from the start.

5.2 Theme 2: AI, Digitalisation, and Smart City Technologies in Planning

Praharaj's (2026) bibliometric analysis of 3,941 publications (1975–2024) maps a sharp rise in AI integration into urban resilience research over the past decade, concentrated in climate mitigation, infrastructure management, and generative scenario design. But the human, cultural, organisational, and participatory dimensions — including algorithmic bias and governance — remain thin, an equity gap with obvious relevance where transparency is already a live planning issue, as in Abuja.

Lartey and Law (2025) find AI-in-governance research concentrated in Europe, North America, and Asia, with "Africa and Central America underrepresented"; integration with public administration remains minimal. Their call for governance frameworks that balance innovation against ethical and sociopolitical considerations applies squarely to Nigeria.

Alesaily and Albialy's (2025) review of "future cities" literature (1875–2024) sorts the field into four clusters — smart cities and decision-making, urban planning and future development, sustainable development, and city/human studies — and flags a specific absence: little work explicitly links future-cities thinking to AI, despite its growing footprint. Given Abuja's own smart city ambitions, that gap is not abstract.

City size shapes outcomes too. Praharaj (2025), studying India's 100 Smart Cities Mission, finds that platform adoption varies with city size and that governance models tend to hand corporate entities greater control over public affairs, producing new management complications — a dynamic the Nigeria Smart Cities Initiative may reproduce, with Abuja as a likely test case.

Christmann and Schinagl (2023) take a sociological angle: GIS use reshapes spatial cognition and planning relationships, and digitalisation risks eroding tacit planning knowledge — a caution against treating PSS adoption as a purely technical problem. Heyik et al.'s (2025) meta-analysis of 312 geospatial participatory platforms adds weight: institutional adoption stays limited, and close to half the platforms studied rely on one-way data flows rather than genuine co-creation. Even high-capacity contexts aren't immune — Oyadeyi and Oyadeyi (2025) find "slow technological adoption and social equity issues persist" across Zurich, Oslo, and Copenhagen, which is a useful check against treating adoption failure as a developing-world problem alone.

5.3 Theme 3: Adoption Barriers and Enablers of PSS

This is the theme with the most direct bearing on the thesis. Kuller et al. (2022) identify five barriers from their Indonesian study: weak inter-agency collaboration, limited local government capacity, poor access to spatial data, weak socio-institutional embedding of tools, and misalignment between what PSS offers and what planners actually need. All five plausibly describe Abuja.

Dale and Mukherjee (2022) locate the mechanism: sustainable take-up requires "a hybridization between human and digital processes for governance and planning," and tools that aren't actively embedded in governance routines fail regardless of design quality. Lartey and Law (2025) add a socio-political layer — trust deficits, institutional resistance, ethical concern over algorithmic decisions — that operates independently of tool quality. Salem et al. (2025) describe a "persistent gap between policy formulation and implementation driven by inflexible regulatory frameworks and weak institutional coordination," conditions that would constrain any formal PSS rollout.

Alblooshi et al. (2026) offer a useful corrective to one-size-fits-all thinking: their capacity-tiered resilience framework calibrates analytical requirements to a city's data availability, governance maturity, and resources — implying Abuja may need an adoption pathway distinct from data-rich settings, not a scaled-down version of one.

On the enabling side, the evidence points toward process rather than technology. Eilola et al. (2019) show community-co-developed geospatial tools working in low-resource African settings; Gomes et al. (2023) find Delphi-based participatory methods build the stakeholder consensus that uptake seems to depend on; Moodley (2020) points to trust-building, structured facilitation, and peer learning as preconditions for knowledge transfer in African planning contexts; and Pueyo-Ros et al. (2026) confirm that co-development with providers and decision-makers from the outset is what separates tools that stick from tools that don't.

5.4 Theme 4: Global South Planning Contexts and Institutional Constraints

Master planning in Accra, Dar es Salaam, and Lilongwe is shaped by "complex political tensions and institutional landscapes" (Croese et al., 2023), and plans often lapse into "silent" dormancy while outdated documents stay formally in force. Ibrahim et al. (2023) trace flood risk failures in Kumasi to weak accountability, financial misappropriation, and poor enforcement; Kissiedu et al. (2025) find wetland protection in peri-urban Ghana undone by "fragmented land governance, limited enforcement capacity, and poor collaboration between planning institutions and traditional authorities." Ghana's governance conditions map closely onto what's documented for Abuja's FCT.

Cobbinah et al. (2020) identify informality as a dominant, largely unaddressed force in African urban planning; Asibey et al. (2021) find no formal "urban planning or management regime" governing ethnic minority neighbourhoods in Kumasi — the same kind of institutional gap that would obstruct PSS uptake elsewhere.

Dacosta Aboagye and Sharifi's (2026) review of 156 climate action planning articles finds over half concentrated in the Global North, confirming the South's underrepresentation in both research and tool deployment. Salem et al. (2025) describe "exclusionary planning practices, informal expansion, and the marginalisation of vulnerable groups" as recurring features of peri-urban governance — a description that extends to Abuja's satellite towns.

Cao et al. (2021), tracing collaborative planning theory's diffusion from the Anglosphere into China, make a more general point: planning frameworks get reinterpreted by local governance contexts rather than transplanted intact — relevant to any assumption that PSS models built elsewhere will work unmodified in Nigeria's federated, multi-agency system. Ahmed et al. (2018) offer perhaps the closest analogue in the corpus: Dhaka, a planned capital absorbed by informality, infrastructure deficits, and transport failure despite formal planning institutions — a trajectory Abuja's own history resembles closely enough to be instructive.

5.5 Theme 5: Participatory and Spatial Support Tools

Eilola et al. (2019) show that community-co-developed georeferenced imagery can outperform conventional data collection for formal land-use planning in Tanzania. Heyik et al.'s (2025) 312-platform meta-analysis finds digital participatory platforms proliferating but institutional adoption still limited, and recommends they complement rather than replace top-down planning — with accessibility, transparency, and continuous feedback as the design principles that matter most.

Gomes et al. (2023) demonstrate, in peri-urban India, how iterative Delphi-based stakeholder engagement builds institutional consensus — a transferable method for embedding PSS into Abuja's planning processes rather than imposing it. Ortiz-Fernández et al. (2023) show the same principle applied technically: their 15-variable, 12-indicator ArcGIS extension for Cuenca, Ecuador demonstrates that spatial decision-support tools can be calibrated to Global South data conditions rather than requiring data environments they don't have. Aquino et al. (2026) extend this with a machine-learning clustering framework for São Paulo that delineates policy-relevant neighbourhood boundaries — evidence that Global South-built PSS is growing more technically sophisticated, not just more numerous.

Cong and Temkin (2025) and Uribe-Aguado et al. (2026) both work the policy-communication side — interactive visualisation, citizen-integrated decision frameworks — and converge on the same conclusion as the adoption literature more broadly: stakeholder co-ownership and equitable dialogue aren't optional extras but preconditions for a tool actually being used.

5.6 Theme 6: Nigeria-Specific Planning Dynamics and Technology Gaps

Ogunkan (2025) surveyed 208 planning scholars across 40 Nigerian institutions, sorting 87 specialisations into eight domains. Housing and Environmental Management dominate; "Technological Innovation" is barely present. No institution focuses specifically on PSS or digital planning tools — which means PSS currently has no institutional champion within Nigerian planning scholarship, a real barrier in itself.

Ogunkan et al. (2026) develop the concept of a "metropolitan edge governance trap" from Ota's case: functional integration with Lagos alongside weak, fragmented governance. The housing informality and governance misalignment documented there echo conditions in Abuja's peri-urban zones — exactly where PSS-assisted planning would help most and where institutional readiness is weakest.

Acey (2016) is the corpus's most substantive Nigeria-specific governance analysis, examining multi-stakeholder failures in the Niger Delta: "in this context, where conflict runs deep and power is asymmetrical, developing an effective model of local governance for sustainable development is a wicked planning problem." She isn't writing about planning tools, but her picture of Nigerian governance — asymmetric, trust-deficient, resistant to collaborative change — describes the conditions any PSS adoption effort in Abuja would have to work within.

Taken together with Croese et al. (2023), Ibrahim et al. (2023), Kissiedu et al. (2025), and Cobbinah et al. (2020), the picture is consistent: Nigerian planning operates under institutional weakness, funding shortfalls, colonial planning legacies, and entrenched informality. None of this is unique to Nigeria, but it is acute here, and it is the structural backdrop against which any PSS strategy for Abuja has to be designed.

6. Synthesised Analytical Framework

The six thematic clusters point toward a four-dimension framework for studying PSS adoption in Abuja FCT, built on the Technology Acceptance Model, Diffusion of Innovations theory, and socio-technical systems thinking.

Dimension 1 — Technological: Tool availability, functionality, accessibility, and fit-for-purpose design. Key variables: tool awareness; digital infrastructure; technical skill levels; data quality requirements; pen-source vs. proprietary access. Evidence: Yap et al. (2022); Comino et al. (2014); Zibaei et al. (2026); Ahmed & Bramley (2015).

Dimension 2 — Institutional: Organisational structures, governance arrangements, and regulatory frameworks. Key variables: inter-agency coordination; data-sharing protocols; planning authority

mandates; political will; alignment between PSS and formal procedures. Evidence: Kuller et al. (2022); Croese et al. (2023); Acey (2016); Ogunkan et al. (2026); Salem et al. (2025).

Dimension 3 — Human and Capacity: Professional knowledge, skills, attitudes, and learning environments. Key variables: PSS literacy; training access; professional culture; planning education; champion individuals. Evidence: Ogunkan (2025); Moodley (2020); Eilola et al. (2019); Dale & Mukherjee (2022).

Dimension 4 — Socio-Political and Contextual: Broader social, political, and cultural conditions. Key variables: urban informality; planning culture; citizen participation norms; data politics; international development actors; power dynamics. Evidence: Cobbinah et al. (2020); Acey (2016); Dacosta Aboagye & Sharifi (2026); Cao et al. (2021).

None of the four operates alone. Technological advancement can't compensate for institutional fragmentation; capacity-building without political will goes nowhere; and socio-political conditions decide which tools count as legitimate and who gets to control them. The framework is meant to guide data collection and analysis in Abuja using mixed methods.

7. Research Gaps and Justification for Study

The expanded 45-article corpus reinforces the gaps identified in the initial review. Ten stand out:

- No empirical study on PSS adoption in Abuja or the FCT exists. Despite its status as federal capital and its master-planning history, Abuja is absent from the PSS adoption literature.
- Nigeria is severely underrepresented in planning technology research — Ogunkan (2025) confirms technological innovation is marginal in Nigerian planning scholarship; Lartey and Law (2025) confirm the same for Africa in AI/PSS governance research.
- The governance and institutional dimensions of PSS adoption in West African cities are unstudied. Acey (2016) covers multi-stakeholder governance in Nigeria, but not in a PSS context.
- Practitioner perspectives — awareness, attitudes, skill levels, perceived utility among Nigerian planners — are absent, despite adoption ultimately resting on individual behaviour within institutional constraints.
- How colonial planning legacies interact with contemporary PSS adoption in Nigeria hasn't been investigated, though Croese et al. (2023) show this interaction matters elsewhere in Africa.
- Data infrastructure constraints specific to Abuja's planning environment are undocumented, which makes calibrating any PSS strategy guesswork.
- The role of international development actors (UN-Habitat, World Bank) in Nigerian PSS adoption hasn't been studied, though Croese et al. (2023) suggest it matters across African planning systems.
- Interoperability between FCT planning agencies (FCDA, AMAC, satellite town authorities) and its implications for shared PSS platforms are unexplored.
- Nigeria's smart city and digital economy initiatives haven't been evaluated for their effect on PSS adoption in Abuja.
- Comparative PSS adoption across Nigerian cities (Lagos, Abuja, Port Harcourt, Kano) doesn't exist, which rules out benchmarking or cross-city learning.

Together these gaps make the case for original mixed-methods empirical research in Abuja FCT — examining PSS adoption patterns, barriers, and enablers among planning professionals, contributing to the global PSS literature while producing evidence usable for Nigerian planning reform.

8. CONCLUSIONS

This review of 45 peer-reviewed articles extends the evidence base on PSS adoption in urban and regional planning, with particular attention to the Global South and Abuja's FCT. The central finding holds up and sharpens under the larger corpus: PSS is a mature, expanding technology family whose potential in

Global South contexts stays unrealised because of technological, institutional, human-capacity, and socio-political barriers acting together.

Dale and Mukherjee (2022) locate the mechanism: "sustainable take-up" needs governance embedding, local co-ownership, and continuous feedback loops, not just a well-built tool. Comino et al.'s (2014) MC-SDSS typology and Pueyo-Ros et al.'s (2026) Nat4Wat co-development model together sketch a methodological lineage any Abuja PSS strategy would need to engage with. Acey's (2016) account of Nigerian governance — power-asymmetric, trust-deficient, resistant to collaborative change — describes conditions that go beyond conventional technology-adoption theory.

Heyik et al.'s (2025) audit of 312 geospatial participatory platforms is the most comprehensive evidence to date that institutional adoption, not technical sophistication, is the bottleneck. Combined with Ogunkan's (2025) documentation of the technological blind spot in Nigerian planning scholarship, the case for empirically investigating PSS adoption in Abuja is not just intellectually interesting — it has practical urgency given how far institutional readiness lags behind tool availability.

The four-dimension framework developed here — technological, institutional, human-capacity, socio-political — gives that investigation its conceptual architecture. The research gaps identified set the agenda.

REFERENCES

Acey, C. (2016). Managing wickedness in the Niger Delta: Can a new approach to multi-stakeholder governance increase voice and sustainability? Landscape and Urban Planning, 154, [pages]. https://doi.org/10.1016/j.landurbplan.2016.04.011

Ahmed, S., & Bramley, G. (2015). How will Dhaka grow spatially in future? Modelling its urban growth with a near-future planning scenario perspective. International Journal of Sustainable Built Environment, 4(2), 359–377.

Ahmed, S., Nahiduzzaman, K.M., & Hasan, M.M.U. (2018). Dhaka, Bangladesh: Unpacking challenges and reflecting on unjust transitions. Cities, 74, 28–37.

Alblooshi, H., Rezgui, Y., Beach, T., & Mustafa, M. (2026). A critical review of infrastructure resilience in fast-growing, hot, and arid cities of the Global South. Sustainable Cities and Society, 139, 107238.

Alesaily, Z., & Albialy, A. (2025). Future cities: A bibliometric review, 1875 to 2024. Sustainable Futures, [vol/issue].

Aquino, A.P., Bertholdo, E., Moraes, G.M., & Marins, K.R.C. (2026). A clustering framework proposal for defining neighborhood-scale dynamics: Evidence from São Paulo, Brazil. Socio-Economic Planning Sciences, [vol/issue].

Asibey, M.O., Poku-Boansi, M., & Adutwum, I.O. (2021). Residential segregation of ethnic minorities and sustainable city development: Case of Kumasi, Ghana. Cities, 119, 103402.

Cao, K., Zhu, J., & Zheng, L. (2021). The 'Collaborative Planning Turn' in China: Exploring three decades of diffusion, interpretation and reception in Chinese planning. Cities, 113, 103148.

Castaldo, A.G., Nocentini, M.G., Lemes de Oliveira, F., & Mahmoud, I.H. (2025). Nature-based solutions and urban planning in the Global South: Challenge orientations, typologies, and viability for cities. Land Use Policy, 150, 107439.

Christmann, G., & Schinagl, M. (2023). Digitalisation in everyday urban planning activities: Consequences for embodied practices, spatial knowledge, planning processes, and workplaces. Journal of Urban Management, 12(2), 141–150.

Cobbinah, P.B., Asibey, M.O., & Gyau, N.B. (2020). Resonating the 'culture' debate in urban planning. City, Culture and Society, 23, 100369.

Comino, E., Bottero, M., Pomarico, S., & Rosso, M. (2014). Exploring the environmental value of ecosystem services for a river basin through a spatial multicriteria analysis. Land Use Policy, 36, 381–395.

Cong, C., & Temkin, D. (2025). NbS and policy communication. In H. Pan et al. (Eds.), Nature-Based Solutions in Supporting Sustainable Development Goals (pp. 153–172). Elsevier.

Croese, S., Robinson, J., Amedzro, K.K., Harrison, P., Kombe, W., Mwathunga, E., & Owusu, G. (2023). Persistent, pragmatic and prolific: Urban master planning in Accra, Dar es Salaam and Lilongwe. Land Use Policy, 133, 106832.

Dacosta Aboagye, P., & Sharifi, A. (2026). Urban climate action planning case studies: A review of trends, approaches, and reported barriers and drivers. Journal of Environmental Management, [vol].

Dale, M.M., & Mukherjee, A. (2022). Approximations to the sustainable take-up of digital planning tools for decision making processes, according to its user: The case of TOSCA in two contexts. Procedia Computer Science, 200, 1441–1450.

Derdouri, A., Murayama, Y., Morimoto, T., Wang, R., & Haji Mirza Aghasi, N. (2025). Urban green space in transition: A cross-continental perspective from eight Global North and South cities. Landscape and Urban Planning, 253, 105220.

Eilola, S., Käyhkö, N., Ferdinands, A., & Fagerholm, N. (2019). A bird's eye view of my village: Developing participatory geospatial methodology for local level land use planning in the Southern Highlands of Tanzania. Landscape and Urban Planning, 190, 103596.

Gomes, S.L., Hermans, L.M., Butsch, C., Banerjee, P.S., Luft, S., & Chakraborty, S. (2023). A Delphi-based methodology for participatory adaptation pathways building with local stakeholders. Environmental Development, 46, 100839.

Heyik, M.A., Erdoğan, M., & Romero-Martínez, J.M. (2025). AI-powered meta analysis of geospatial participatory platforms for ecosocial transition in urban design and planning. Urban Governance, [vol].

Ibrahim, A., Salifu, A., & Peprah, C. (2023). Does governance matter when disaster looms? Zooming into proactive institutional measures for flood risk management. International Journal of Disaster Risk Reduction, 85, 103526.

Kasula, P., Dedekorkut-Howes, A., Shearer, H., & Baum, S. (2026). Social inclusion of urban villages: A systematic review of global urban planning practices. Cities, 169, 106509.

Kissiedu, N.E., Asibey, M.O., Asare, O.A., & Asare, E.T. (2025). Wetland transformation and the implications for ecological resilience in peri-urban Ghana. Land Use Policy, [vol].

Korkou, M., Tarigan, A.K.M., & Hanslin, H.M. (2023). The multifunctionality concept in urban green infrastructure planning: A systematic literature review. Urban Forestry & Urban Greening, 85, 127975.

Kuller, M., Farrelly, M., Marthanty, D.R., Deletic, A., & Bach, P.M. (2022). Planning support systems for strategic implementation of nature-based solutions in the global south: Current role and future potential in Indonesia. Cities, 126, 103693.

Lartey, D., & Law, K.M.Y. (2025). Artificial intelligence adoption in urban planning governance: A systematic review of advancements in decision-making, and policy making. Landscape and Urban Planning, 258, 105337.

Luan, S., Ma, J., Gan, D., Urinov, B., Sultan, M.S., Zeynalova, A., & Agarzayev, A. (2026). Decarbonizing regional air transport: Strategic pathways for sustainable multi-airport systems in developing economies. Journal of Air Transport Management, 135, 103023.

Moodley, S. (2020). Exploring the mechanics of city-to-city learning in urban strategic planning: Insights from southern Africa. Social Sciences & Humanities Open, 2(1), 100027.

Muñoz, L.S., & Duarte, D.H.S. (2025). Green infrastructure as a planning tool: A comprehensive systematization of urban redesign strategies to increase vegetation within public places. Cities, [vol].

Ogunkan, D.V. (2025). Redefining planning: Emerging research specializations in Nigerian urban and regional planning. Progress in Planning, 197, 100968.

Ogunkan, D.V., Oyewole, O.A., Simon, R.F., Orekan, A.A., & Ode, G.O. (2026). Ota: An emerging metropolitan edge city. Cities, 174, 107078.

Omwamba, J., Rotaris, L., & Longo, G. (2025). An assessment of proximity in the 15-Minute City: A systematic literature review. Urban Transitions, 3, 100012.

Ortiz-Fernández, J., Astudillo-Cordero, S., & Quesada-Molina, F. (2023). Spatial neighborhood sustainability assessment for urban planning, Cuenca, Ecuador. Environmental and Sustainability Indicators, 20, 100307.

Osman, T. (2026). Integrated participatory scenario planning for low-carbon urban futures in greater Cairo region. Urban Climate, 67, 102915.

Oyadeyi, O.A., & Oyadeyi, O.O. (2025). Towards inclusive and sustainable strategies in smart cities: A comparative analysis of Zurich, Oslo, and Copenhagen. Research in Globalization, [vol].

Pantaloni, M., Ducci, M., Domenella, L., & Marinelli, G. (2026). Green infrastructure, nature-based solutions and ecosystem services for seismic resilience. Cities, 175, 107200.

Poku-Boansi, M., Tuffuor, J.P., & Asibey, M.O. (2024). A life-course approach to assessing residential mobility dynamics in selected immigrant communities in Kumasi, Ghana. Habitat International, [vol].

Praharaj, S. (2025). Command and control governance in the 100 smart cities mission in India: Urban innovation or utopias? Applied Geography, 184, 103766.

Praharaj, S. (2026). Combining AI with urban resilience planning: A bibliometric analysis of literature. City and Environment Interactions, 30, 100342.

Pueyo-Ros, J., Mendoza, E., Buttiglieri, G., & Comas, J. (2026). Nat4Wat: A co-developed decision-support system for resilient urban water management with nature-based solutions. Environmental Modelling & Software, [vol].

Salem, M., Ravetz, J., Sareen, S., Dong, T., Haque, M., Bayoumi, W., Tsurusaki, N., & Xu, G. (2025). Managing the urban-rural transition: A review of approaches and policies for peri-urban land use. Journal of Urban Management, [vol].

Sepehri, B., & Sharifi, A. (2025). X-minute cities as a growing notion of sustainable urbanism: A literature review. Cities, [vol].

Steinitz, C., Orland, B., Fisher, T., & Campagna, M. (2023). Geodesign to address global change. In C. Steinitz et al. (Eds.), Geodesign: Past, Present, Future. Elsevier.

Uribe-Aguado, J., Giraldo-González, M.M., Biesaga, M., Domaradzka, A., Baki, S., Kazantzi, A.K., & Sánchez, J.P.R. (2026). A feasibility methodology for selecting and locating urban nature-based solutions (NbS) considering socio-economic criteria. Urban Forestry & Urban Greening, 120, 129429.

Yap, W., Janssen, P., & Biljecki, F. (2022). Free and open source urbanism: Software for urban planning practice. Computers, Environment and Urban Systems, 96, 101825.

Zibaei, H., Mesgari, M.S., El-Kenawy, E.M., & Khodadadi, N. (2026). A spatial agent-based modeling to allocate land use for brownfield sites on an urban scale. Landscape and Urban Planning, [vol].