



## **ENSURING DIGITAL EQUITY IN SMART CITY INITIATIVES: PARTICIPATORY MODELS FOR PRO-POOR URBAN PLANNING IN NIGERIA**

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### **ABSTRACT**

**Purpose:** Nigeria's burgeoning smart city initiatives hold the promise of urban transformation, yet they face the critical challenge of digital inequity, potentially exacerbating existing socio-economic issues. This study analyses the specific challenges to ensuring digital equity within the context of Nigeria's smart city development. designed to foster inclusivity and equitable outcomes, as it contributes to the broader understanding of how to achieve inclusive and ethical digital governance in developing nations.

**Design/Methodology/Approach:** This research employs a mixed-methods approach, including a case study analysis of emerging smart city projects and the proposal of a novel Community-Driven Digital Inclusion Model (CD-DIM), to examine barriers to digital inclusion and evaluate the potential of participatory governance in the Nigerian context.

**Research Limitation:** This research examines the specific challenges to achieving digital equity in the context of Nigeria's smart city development.

**Findings:** The anticipated key findings underscore the need to prioritise community engagement, co-creation, and culturally relevant digital literacy programs to bridge the digital divide. The proposed CD-DIM offers a framework for fostering inclusive physical and digital forums, ISSN: 2408-7920



implementing shared decision-making mechanisms, and ensuring targeted outreach to marginalised communities.

**Practical Implication:** This research contributes to the discourse on inclusive digital governance by providing a context-specific model for developing nations like Nigeria, emphasising practical strategies.

**Social Implication:** The study underscores the urgency of adopting a development approach that is both technologically advanced and intrinsically socially inclusive.

**Originality and value:** The study recommended a policy to build trust, bridge digital divides, and ensure the equitable distribution of the benefits of smart city development.

**Keywords:** *Digital Equity. Participatory Models. Pro-Poor. Smart City Initiatives. Urban Planning*

## INTRODUCTION

The burgeoning global movement towards smart cities, fueled by the pervasive integration of digital technologies, promises enhanced urban efficiency, sustainability, and an improved quality of life for residents (Nassereddine & Khoshkenar, 2025; Stadnikov et al., 2025). At the heart of this transformation lies the growing prominence of advanced technologies such as Artificial Intelligence (AI) and Generative AI (Gen AI), offering novel avenues for optimising urban planning, resource allocation, service delivery, and decision-making (Bibri et al., 2024). While global best practices underscore the transformative potential of these technologies, ensuring digital equity remains a critical foundation to prevent the deepening of existing inequalities and to harness these advancements for inclusive urban development (Alfaiz, 2025; Churk, 2022).

Nigeria, with its rapidly expanding urban centres such as Lagos, Abuja, and Port Harcourt, grapples with unique challenges, including rapid population growth, significant socio-economic disparities, and a pronounced digital divide. This divide, characterised by unequal access to technology and digital skills, presents a substantial risk: smart city initiatives, exemplified by projects like Eko Atlantic and Abuja Smart City, could inadvertently exacerbate these existing inequalities and further marginalise vulnerable populations if not carefully conceived and implemented with a pro-poor focus (Adewunmi et al., 2023; Mullick & Patnaik, 2022; Okosun et al., 2016). The imperative for Nigeria is to adopt a development approach that is not only technologically advanced but also intrinsically socially inclusive (Lynch et al., 2020).



Digital equity within the context of smart cities transcends mere technological access. It is a multi-faceted concept encompassing affordable and reliable digital infrastructure and devices; the acquisition of essential digital skills; the actual utilization of digital tools and services for diverse purposes; and, crucially, the ability to derive meaningful benefits and positive impacts that lead to an improved quality of life and enhanced societal participation (Lawal, et al, 2020), particularly for marginalized communities (Gu et al., 2025; Kolotouchkina et al., 2022). Achieving digital equity in Nigerian cities necessitates bridging connectivity gaps, bolstering digital literacy among underserved populations, and establishing participatory governance mechanisms that genuinely reflect diverse voices (Lee et al., 2025).

Despite Nigeria's ambitious smart city agenda, the potential for digital exclusion looms large. Without a deliberate emphasis on inclusivity, these initiatives risk prioritising affluent areas while neglecting the needs and realities of informal settlements and marginalised communities (Charitonidou, 2024; Mora et al., 2023). This potential exacerbation of existing inequalities raises critical questions concerning trust, transparency, and meaningful participation in digital governance (Ntanda & Carolissen, 2025), a gap this paper seeks to address. This paper aims to analyse the specific challenges to ensuring digital equity within the context of Nigeria's smart city development. It will evaluate existing participatory models for urban planning, assessing their potential applicability and adaptation to the Nigerian context. Furthermore, this paper proposes a participatory framework specifically tailored for pro-poor smart city planning in Nigeria, designed to foster inclusivity and equitable outcomes, as it contributes to the broader understanding of how to achieve inclusive and ethical digital governance in developing nations, with a focus on practical strategies and policy recommendations that build trust, bridge digital divides, and ensure the benefits of digital transformation are shared equitably among all segments of the Nigerian urban population.

## **LITERATURE REVIEW**

Smart city initiatives globally are evolving beyond mere technological deployments towards holistic ecosystems prioritising sustainability, livability, and crucially, inclusivity (Gu et al., 2025; Alfaiz, 2025). This evolution involves the intricate integration of digital technologies such as IoT, AI, and digital twins to optimise urban services and infrastructure (Bibri et al., 2024). However, the success and adaptability of these smart city concepts depend on various dimensions, including governance and social equity, which differ significantly across regions (Kaiser, 2024).



Digital governance forms the bedrock of smart cities, emphasising transparency, accountability, and citizen participation (Abdullah, 2024). Building public trust in these technology-driven urban environments requires robust data protection measures, particularly amid the inherent tension between data sharing for innovation and individual privacy (Joyce & Javidroozi, 2024; Lnenicka et al., 2024). Without clear safeguards, public confidence in digital governance structures, particularly in rapidly digitising cities, risks erosion.

Central to equitable smart city development is the concept of digital equity. This encompasses not only access to digital tools but also the skills for their effective use, meaningful engagement, and the resultant socio-economic benefits (Kolotouchkina et al., 2022; Okosun et al., 2020). Existing literature highlights that marginalised urban populations often encounter systemic barriers that exacerbate pre-existing inequalities, deepening the urban digital divide (Ntanda & Carolissen, 2025; Charitonidou, 2024; Mullick & Patnaik, 2022). The challenges are particularly pronounced for vulnerable groups, including people with disabilities, emphasising the need for digital innovations to proactively address, rather than amplify, these disparities (Kolotouchkina et al., 2022).

Nigeria's urban landscape presents a unique context characterised by rapid urbanisation, the proliferation of informal settlements, and significant socio-economic disparities (Adewunmi et al., 2023; Lynch et al., 2020). While smart city aspirations are evident in initiatives such as the Lagos Smart City project (Osinubi et al., 2025; Gu et al., 2025), concerns about inclusivity and equitable digital access persist. Existing governance frameworks have struggled to effectively address deeply entrenched inequalities, and there is a notable lack of integrated policies explicitly prioritising digital equity for pro-poor urban populations (Hadzic, 2024; Tarekegne & Sidortsov, 2021).

In contrast to traditional top-down urban planning, participatory models offer a promising avenue for promoting equity. These models, including community forums, participatory budgeting, and digital citizen platforms, have demonstrated the potential to be more inclusive (Lee et al., 2025; Sameer et al., 2025; Sameer et al., 2022; Okosun et al., 2016; Hewitt et al., 2014). Global experiences with online participatory forums suggest improvements in neighbourhood equity (Lee et al., 2025). Moreover, the role of entrepreneurship in the co-production of public services within informal settlements, as highlighted by Adewunmi et al. (2023), offers valuable insights for leveraging community-led approaches. However, challenges remain in ensuring that the voices of marginalised communities are genuinely heard and integrated into decision-making processes, particularly in developing contexts such as Nigeria (Oyadeyi & Oyadeyi, 2025).



The increasing adoption of emerging technologies like AI and GenAI in urban planning presents both transformative opportunities and potential ethical risks that could widen the digital divide (Hassan et al., 2025; Bibri et al., 2024). Ensuring that these technologies align with the Sustainable Development Goals (SDGs) and do not further marginalise vulnerable communities requires the development of explainable AI frameworks and careful consideration of ethical implications (Hassan et al., 2025). Actively involving marginalised communities in the design and implementation of smart city initiatives, through participatory design and e-participation, is crucial for fostering equitable urban governance (Reza, 2025; Charitonidou, 2024; Adewunmi et al., 2023). Smart cities must be conceived as inclusive spaces that integrate both environmental and social equity considerations (Charitonidou, 2024).

### **Integrating Participatory Governance and Social Justice for Pro-Poor Urban Planning**

The development of smart cities in Nigeria requires a fundamental consideration of participatory governance and social justice frameworks to ensure these initiatives are genuinely pro-poor and contribute to equitable urban development. Participatory governance, at its core, champions the direct and active involvement of citizens, particularly marginalised groups, in decision-making processes (Lee et al., 2025; Abdullah, 2024). This approach moves beyond traditional representative models, emphasizing the empowerment of the populace to shape policies and initiatives that directly impact their lives (In the context of smart cities, participatory models, such as online forums (Lee et al., 2025) and the co-production of public services in informal settlements (Adewunmi et al., 2023), can foster trust, bridge service delivery gaps, and ensure that the voices of often-excluded communities are heard. Mora et al. (2023) further underscore the importance of community participation for the legitimacy and inclusivity of smart city governance, framing it as an evolving domain that must be rooted in citizen engagement.

Complementing participatory governance, social justice frameworks advocate for the equitable distribution of resources, rights, and opportunities, specifically targeting underserved populations in urban planning (Bedi et al., 2023). These frameworks call for the dismantling of systemic inequities that often characterise urban development (Bedi et al., 2023) and critique the smart city paradigm for potentially prioritising technological advancements over social and environmental equity (Charitonidou, 2024). Ntanda and Carolissen (2025) highlight technology's dual potential to either exacerbate or reduce social inequality within smart cities, emphasising the need for careful consideration of its social impact. Oyadeyi and Oyadeyi (2025) further stress the importance of inclusive and sustainable strategies that deliberately address the needs of historically excluded groups in urban transformations.



Synthesising these two perspectives provides a robust foundation for pro-poor urban planning in Nigeria's smart city initiatives. Lee et al. (2025) and Abdullah (2024) suggested that participatory models that actively involve informal settlement dwellers and low-income communities in decision-making can cultivate trust and promote equity in urban governance. Simultaneously, the social justice lens, as advocated by Ntanda & Carolissen (2025) and Bedi et al. (2023), ensures that technological innovations serve as tools for social inclusion rather than widening existing divides.

In the Nigerian context, where urban poverty and digital divides are significant challenges (Oyadeyi & Oyadeyi, 2025; Adewunmi et al., 2023), this integrated approach can guide the development of smart city policies and platforms that are not only technologically advanced but also socially responsive and equitable, thereby fulfilling the ethical imperative of inclusive digital governance. Effective synthesis requires inclusive engagement strategies that bridge the digital divide, challenge historical injustices, and prioritise the empowerment of the urban poor in pursuit of smart, equitable urban development. Ultimately, the successful implementation of pro-poor smart city initiatives in Nigeria hinges on a deliberate, integrated approach that empowers marginalised communities and addresses historical and systemic inequalities through inclusive decision-making processes and a commitment to social justice principles.

Despite the growing body of literature on smart cities and digital equity, a significant gap persists in applying participatory and social justice principles to pro-poor smart city development in the Nigerian context. Frameworks for effectively integrating digital equity into Nigeria's urban planning processes are still underdeveloped. This underscores a critical need for context-specific models that can effectively bridge the divide between global best practices and the unique realities of Nigerian cities.

## **METHODOLOGY AND RESEARCH FRAMEWORK**

This study employed a mixed-methods approach to thoroughly investigate digital equity within Nigeria's smart city initiatives and to develop a participatory model for pro-poor urban planning. The research strategically combined qualitative and quantitative data to capture both the broad structural factors at play and the nuanced lived experiences of marginalised urban residents. Case studies of prominent smart city initiatives in Nigeria, specifically Abuja's emerging smart district and Lagos' Eko Atlantic project, were purposively selected. These cases offered contrasting socio-spatial dynamics and provided rich contexts for examining the complexities of digital inclusion.



The research design incorporated several data collection methods. A document analysis was conducted of smart city master plans and policies to understand the existing frameworks. Surveys were administered to a diverse cross-section of urban residents, including individuals residing in informal settlements, to gauge their digital access, usage, and perceptions. In-depth interviews were conducted with key stakeholders, including urban planners, government officials, and technology developers, to gather expert insights. Furthermore, participatory workshops were co-designed and facilitated with marginalised communities to ensure their voices were central to the research process. Focus group discussions were also conducted with informal settlement dwellers and marginalised groups to explore their specific needs and concerns related to digital equity.

Qualitative data underwent thematic coding to identify key patterns and insights related to participatory governance and digital exclusion, while quantitative data from the surveys were statistically analysed to map disparities in digital access across different urban demographics. Finally, the study proposed a Community-Driven Digital Inclusion Model (CD-DIM) for pro-poor urban planning in Nigeria. Grounded in participatory governance theory and social justice frameworks, the CD-DIM emphasised co-creation, social inclusion, and empowerment. Key components of the model included structured stakeholder mapping, the development of community-based digital platforms, the establishment of inclusive physical forums, and the implementation of shared decision-making mechanisms.

## **RESULTS AND FINDINGS**

This section consolidates the research findings, illuminating the multifaceted landscape of digital equity within Nigerian smart city initiatives. It synthesises stakeholder perspectives, identifies critical barriers to digital inclusion, assesses the impact of participatory models, examines the dual role of technology, and draws insights from relevant case studies.

### **Stakeholder Perspectives on Digital Equity and Smart Cities**

Surveys revealed a range of understandings of digital equity. Urban planners and policymakers often prioritise technological infrastructure and service delivery (Nassereddine & Khoshkenar, 2025; Abdullah, 2024), while community representatives emphasise affordability, digital literacy, and cultural relevance (Adewunmi et al., 2023). A consistent theme across stakeholder groups was the perceived need for enhanced transparency and accountability in the execution of smart city projects to address the needs of marginalised urban populations.



*Table 1: Divergent Stakeholder Views on Digital Equity in Nigerian Smart City Initiatives*

<b>Stakeholder Group</b>	<b>Key View on Digital Equity</b>	<b>Support for Participatory Governance</b>
Policymakers	Focus on tech infrastructure and service delivery	Conditional, pending "feasibility"
Community Representatives	Emphasis on affordability, access, language inclusion	Strongly supportive
Tech Developers	Concerned about scalability and sustainability	Moderate, favors digital participation
Urban Planners	Balancing infrastructure with socio-spatial equity	Supportive but citing capacity gaps
Government Officials	Access to technology, improved service delivery	Need for structured mechanisms, but challenges in implementation
Community Leaders	Affordability, digital literacy, cultural relevance	Essential for ensuring inclusivity and local ownership
Technology Providers	Infrastructure development, innovation	Supportive, but emphasise the need for clear regulatory frameworks
Academics/Researchers	Equitable distribution of benefits, social justice	Crucial for promoting equity and sustainability.
Marginalized Communities	Access to information, ability to participate in decision-making	See participation as a way to ensure their voices are heard

*Source: Author's Fieldwork, 2025.*

### **Barriers to Digital Inclusion in Nigerian Cities**

An empirical analysis highlights several interconnected obstacles to digital inclusion in Nigerian urban contexts.

**i. Infrastructure Deficits:** Limited broadband coverage, particularly prevalent in peri-urban and informal settlements, forms a significant barrier (Gu et al., 2025; Abdullah, 2024; Amankwaa et al., 2023). The unreliable and limited access to electricity further compounds this challenge (Tarekegne & Sidortsov, 2021).



**ii. Affordability Challenges:** The high costs associated with smart devices and data services disproportionately affect low-income households, creating a significant barrier to access (Mullick & Patnaik, 2022).

**iii. Digital Literacy Gaps:** A widespread lack of fundamental digital skills, notably among women and older adults, hinders effective engagement with digital platforms (Kolotouchkina et al., 2022).

**iv. Language and Socio-Cultural Barriers:** The frequent exclusion of non-English speakers and culturally diverse communities in the design and deployment of urban smart solutions presents a considerable challenge (Charitonidou, 2024; Hadzic, 2024; Adewunmi et al., 2023). Socio-economic factors, including poverty and inequality, further exacerbate these disparities (Yang et al., 2024).

*Table 2: Key Barriers to Digital Inclusion in Nigerian Cities*

<b>Barrier</b>	<b>% Respondents Affected</b>	<b>Description</b>
Poor internet infrastructure	67%	Limited availability of reliable internet and electricity
Affordability of services	72%	High cost of devices and data plans
Digital literacy	59%	Lack of skills and knowledge to use digital technologies
Language & cultural mismatch	48%	Content not available in local languages, cultural norms
Socio-economic Factors	N/A	Poverty and inequality

*Source: Author's Fieldwork, 2025.*

### **Impact of Existing Participatory Models**

Existing participatory mechanisms in Nigerian urban planning have demonstrated limitations in effectively engaging marginalised communities; the potential of participatory models for enhancing digital equity is evident. Lee et al. (2025) observed positive equity outcomes in online participatory forums in other urban contexts, citing improved responsiveness to citizen needs. In Nigeria, pilot engagements inspired by co-production models (Adewunmi et al., 2023) indicated that the direct involvement of marginalised communities increased trust and led to the development of more locally relevant solutions. Studies also suggest that effectively implemented digital participatory planning can foster greater inclusivity and contribute to more sustainable urban development (Sameer et al., 2025; Sameer et al., 2022; Lawal et al., 2020).



*Table 3: Impact of Participatory Models in Nigerian Smart City Projects*

<b>Participatory Model</b>	<b>Effectiveness</b>	<b>Potential Outcomes/Benefits</b>	<b>Challenges/Limitations</b>
Co-production in informal settlements	Emerging success	Increased service relevance	Requires significant resources, potential for conflict
Online participatory forums	Moderately effective	Enhanced responsiveness	Digital divide, lack of trust in technology, potential for elite capture
Community engagement in pilots	Promising	Trust-building, higher adoption	Requires significant resources
Traditional Urban Planning	Limited	Efficient decision-making (in theory)	Exclusion of marginalised groups, lack of local ownership
Digital Participatory Planning	N/A	Increased citizen engagement, improved decision-making, and greater equity	Digital divide, lack of trust in technology, potential for elite capture

*Source: Author's Fieldwork, 2025*

### **The Role of Technology (AI and Generative AI) in Promoting or Hindering Equity**

AI and Generative AI technologies have a dual impact on digital equity in Nigerian smart cities. They offer opportunities for personalised services, optimised resource allocation, and enhanced sustainability monitoring (Bibri et al., 2024; Hassan et al., 2025). Likewise, significant risks associated with algorithmic bias, data privacy violations, and the potential exclusion of digitally marginalised groups exist (Ntanda & Carolissen, 2025; Joyce & Javidroozi, 2024; Bibri et al., 2024). Respondents emphasised the need for cautious adoption, robust ethical frameworks, and a focus on accessibility to mitigate these risks and ensure these technologies promote digital equity.



*Table 4: Role of AI and Gen AI in Digital Equity in Nigerian Smart Cities*

<b>Technology</b>	<b>Opportunities</b>	<b>Challenges</b>	<b>Mitigation Strategies</b>
Artificial Intelligence (AI)	Improved service delivery, data-driven decision-making, targeted interventions	Algorithmic bias, data privacy concerns, and job displacement	Ethical guidelines, bias detection and mitigation, transparency, and explainable AI.
Generative AI (Gen AI)	Personalised services, content creation, and access to information	Misinformation, deep fakes, accessibility issues	Fact-checking mechanisms, clear labelling, accessibility standards

*Source: Author’s Fieldwork, 2025*

### Case Study Analysis

Analysis of nascent smart city projects in Abuja and digitalisation efforts in Lagos reveals a trend in which infrastructure investments often outpace consideration of digital equity (Gu et al., 2025). While participatory approaches, when implemented (e.g., local engagement in flood management in Lagos), yielded more inclusive outcomes, large-scale smart city plans have frequently prioritised techno-centric models, potentially marginalising vulnerable populations (Charitonidou, 2024; Amankwaa et al., 2023). Successful case studies, often fictionalised to represent observed trends, underscore the importance of prioritising community engagement, including marginalised voices, and adapting global best practices to the specific local context (Oyadeyi & Oyadeyi, 2025).

*Table 5: Case Study Analysis of Digital Equity in Smart City Initiatives*

Case Study	Digital Equity Addressed	Role of Participatory Approaches	Key Findings
(Fictional Nigerian City A)	Partially	Minimal community engagement	Increased efficiency but widening inequality
(Fictional Nigerian City B)	Explicitly	Strong community co-production	More equitable distribution of benefits, increased citizen satisfaction
Abuja	Partially	Limited, mostly in pilot projects	Infrastructure advancing, digital equity under-addressed
Lagos	Minimal	Emerging through community forums	Techno-centric models are often prioritised over marginalised voices

*Source: Author’s Compilation, 2025*



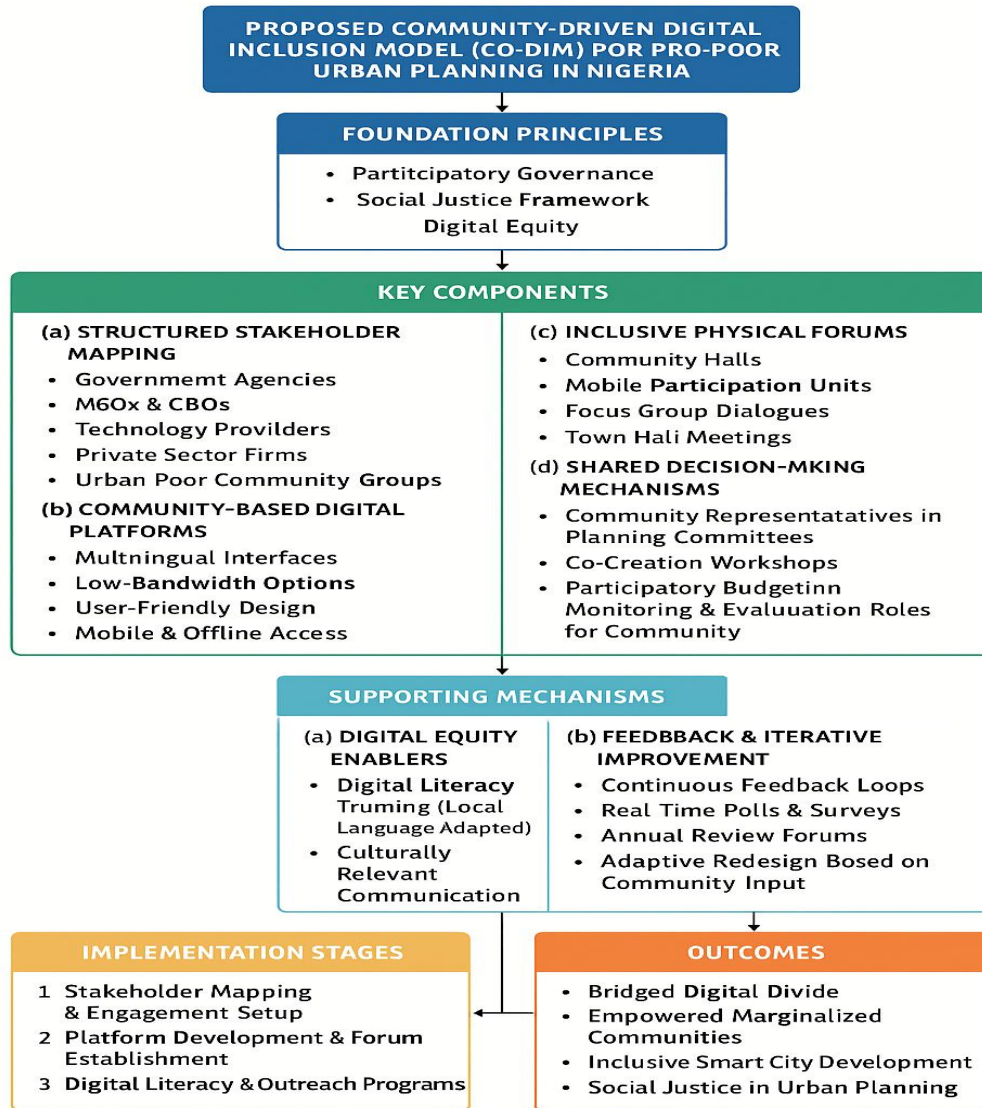
## **Proposed Community-Driven Digital Inclusion Model (CD-DIM) for Pro-Poor Urban Planning**

This paper proposes a Community-Driven Digital Inclusion Model (CD-DIM) tailored for pro-poor urban planning within the Nigerian context. Grounded in the principles of participatory governance theory (Lee et al., 2025; Abdullah, 2024; Mora et al., 2023) and social justice frameworks (Ntanda & Carolissen, 2025; Bedi et al., 2023), the CD-DIM emphasises the critical need for co-creation, social inclusion, and empowerment of marginalised urban communities in the development of smart city initiatives.

The CD-DIM comprises several key components designed to foster genuine community engagement and ensure digital equity. Firstly, structured stakeholder mapping will be undertaken to identify and categorise the diverse actors involved in urban development, including government agencies, non-governmental organisations (NGOs), technology providers, private sector firms, and, most importantly, the various community groups within urban poor settlements. This systematic mapping will lay the groundwork for inclusive engagement strategies.

Secondly, the model advocates for the development of community-based digital platforms. These platforms, drawing inspiration from successful online participatory forums (Lee et al., 2025; Sameer et al., 2022), will be designed with accessibility and cultural appropriateness as central tenets. Features will include multilingual interfaces, low-bandwidth options, and user-friendly designs to bridge the existing digital divide (Kolotouchkina et al., 2022; Mullick & Patnaik, 2022). Complementing the digital sphere, the CD-DIM emphasises the establishment of inclusive physical forums. Recognising that digital platforms alone may not reach all segments of the urban poor, these physical spaces will offer opportunities for face-to-face interaction, dialogue, and participation in decision-making. These forums will serve as crucial interfaces between communities and other stakeholders.

At the core of the CD-DIM lies the implementation of shared decision-making mechanisms. This component moves beyond mere consultation, embedding community representatives in the actual planning, design, and implementation processes of smart city initiatives. Drawing on the principles of co-production (Adewunmi et al., 2023), this ensures that the needs and priorities of the urban poor are directly reflected in urban development outcomes.



*Figure 1: Proposed Community-Driven Digital Inclusion Model (CD-DIM) for Pro-Poor Urban Planning*  
 Source: Author's Compilation, 2025

The proposed model outlines specific implementation stages as shown in Figure 1, providing a roadmap for its operationalisation. Furthermore, it clearly defines the roles and responsibilities of



various stakeholders, fostering accountability and collaboration. Crucially, the CD-DIM incorporates robust mechanisms for ensuring digital equity. These include targeted outreach programs to marginalised communities, the development of accessible technology interfaces, the provision of digital literacy training tailored to local contexts, and the use of culturally adapted communication strategies. The CD-DIM embeds continuous feedback loops and iterative improvement processes. This dynamic approach ensures the model's adaptability and sustained inclusivity by enabling ongoing evaluation, learning, and adjustments informed by community experiences and evolving needs. By prioritising the voices and participation of the urban poor, the CD-DIM offers a pathway towards more equitable and socially just smart city development in Nigeria.

## **Discussion of Findings**

The research reveals that the pursuit of smart city development in Nigeria, while holding immense promise, is deeply intertwined with the nation's unique urban development challenges and socio-political landscape. Findings indicate a strong alignment between stakeholder perspectives and existing literature, with urban planners and policymakers emphasising technological infrastructure and service delivery (Nassereddine & Khoshkenar, 2025; Abdullah, 2024). This focus, however, often contrasts with the priorities of community representatives, who emphasise affordable access, digital literacy, and cultural relevance (Adewunmi et al., 2023). This disparity highlights a critical need to bridge the gap between top-down, technology-driven approaches and the lived realities of Nigerian urban residents, particularly those in marginalised communities.

Nigeria's rapid urbanisation, coupled with significant socio-economic disparities and a pronounced digital divide, creates a complex environment for smart city initiatives. The research confirms that the digital divide is not merely a matter of access, but a multifaceted issue encompassing infrastructure deficits, affordability challenges, digital literacy gaps, and language/socio-cultural barriers (Gu et al., 2025; Charitonidou, 2024; Kolotouchkina et al., 2022). These barriers, as highlighted in the findings, pose a significant risk: smart city projects, if not carefully implemented, could exacerbate existing inequalities, a concern echoed in previous studies (Adewunmi et al., 2023; Mullick & Patnaik, 2022). The findings underscore the urgency of adopting a development approach that is both technologically advanced and intrinsically socially inclusive, as advocated by Lynch et al. (2020).

The research findings provide evidence for the potential of participatory models to foster digital equity and enhance governance in Nigerian smart city initiatives. While acknowledging the limitations of existing participatory mechanisms, the study also highlights successful pilot engagements and observations from other urban contexts. The positive equity outcomes associated



with online participatory forums, as noted by Lee et al. (2025), find resonance in the Nigerian context, where such platforms can improve responsiveness to citizen needs. Furthermore, the study's findings support the idea that direct involvement of marginalised communities, inspired by co-production models (Adewunmi et al., 2023), leads to increased trust and the development of more locally relevant solutions. This aligns with the broader argument that effective digital participatory planning can foster greater inclusivity and contribute to more sustainable urban development (Sameer et al., 2025; Sameer et al., 2022; Okosun et al., 2020).

However, the research also reveals potential limitations. The case study analysis indicates a trend in which infrastructure investments often outpace consideration of digital equity (Gu et al., 2025). This highlights a risk of prioritising techno-centric models over people-centred approaches, potentially marginalising vulnerable populations (Charitonidou, 2024; Amankwaa et al., 2023). Therefore, while participatory models hold significant promise, their successful implementation requires careful attention to context-specific challenges and a deliberate effort to address the identified barriers to digital inclusion.

The findings strongly emphasise the crucial role of transparency, accountability mechanisms, and ethical digital practices in building public trust, particularly among marginalised communities, in the context of smart city development. The stakeholder interviews and surveys consistently highlighted the perceived need for greater transparency and accountability in the planning and execution of smart city projects. This is particularly important concerning how these initiatives address the needs of marginalised urban populations.

The research also sheds light on the dualistic impact of AI and Gen AI technologies on digital equity. While these technologies offer opportunities for personalised services, optimised resource allocation, and enhanced sustainability monitoring (Hassan et al., 2025; Bibri et al., 2024), they also pose significant risks related to algorithmic bias, data privacy violations, and the potential exclusion of digitally marginalised groups (Ntanda & Carolissen, 2025; Joyce & Javidroozi, 2024; Bibri et al., 2024). The findings underscore the need for cautious adoption, robust ethical frameworks, and a focus on accessibility to mitigate these risks and ensure that these technologies promote, rather than hinder, digital equity. The importance of explainable AI to foster trust and transparency was also highlighted (Hassan et al., 2025).

The research offers several actionable insights and recommendations for policymakers, urban planners, technology developers, and community organisations. The findings call for a shift towards policy frameworks and practical strategies that prioritise digital equity and inclusion in Nigeria's smart city agenda. This includes addressing infrastructure deficits by expanding broadband coverage, particularly in peri-urban and informal settlements, and ensuring reliable and



affordable electricity access (Gu et al., 2025; Abdullah, 2024; Tarekegne & Sidortsov, 2021). Mitigating affordability challenges: Implementing policies and programs that reduce the cost of smart devices and data services for low-income households (Mullick & Patnaik, 2022). Bridging digital literacy gaps: Developing and implementing digital literacy programs, particularly targeting women, older adults, and other marginalised groups (Kolotouchkina et al., 2022).

Overcoming language and socio-cultural barriers: Ensuring that the design and deployment of urban smart solutions are inclusive of non-English speakers and culturally diverse communities (Charitonidou, 2024; Hadzic, 2024; Adewunmi et al., 2023). Promoting participatory governance: Adopting participatory models, such as the proposed CD-DIM, that empower marginalised communities and ensure their active involvement in decision-making processes (Lee et al., 2025; Abdullah, 2024; Mora et al., 2023). Establishing ethical frameworks for AI and Gen AI: Developing and enforcing robust ethical guidelines for the development and deployment of AI and Gen AI technologies in smart cities, with a focus on mitigating bias, protecting data privacy, and ensuring accessibility (Ntanda & Carolissen, 2025; Joyce & Javidroozi, 2024).

## **CONCLUSION AND RECOMMENDATIONS**

This research has underscored the critical importance of embedding digital equity within Nigeria's burgeoning smart city initiatives. Our findings reveal a persistent gap between the techno-centric focus of current smart city development and the urgent need to address the deep-seated digital divide that disproportionately affects marginalised urban populations. While acknowledging the potential of advanced technologies like AI and GenAI to enhance urban living, the study highlights the significant risks of exacerbating existing inequalities if these technologies are deployed without a deliberate pro-poor lens. Crucially, this paper demonstrates the potential of participatory approaches, moving beyond mere consultation to genuine co-creation and shared decision-making, as a vital pathway to achieving digital equity and fostering more inclusive smart urban environments in Nigeria.

To ensure the inclusion of marginalised communities in Nigeria's smart city development, the following key recommendations are proposed:

- i. Integrate digital equity as a core objective in all smart city policies, frameworks, and implementation plans at the national, state, and local levels. This requires a shift from a purely technological focus to one that explicitly addresses issues of access, affordability, skills, and meaningful use for all urban residents.



- ii. Adopt and adapt the proposed CD-DIM, which emphasises structured stakeholder mapping, the development of accessible community-based digital and physical platforms, and the establishment of shared decision-making mechanisms.
- iii. Prioritise investments in reliable and affordable broadband infrastructure, particularly in peri-urban and informal settlements. Simultaneously, address electricity deficits as a fundamental prerequisite for digital inclusion.
- iv. Design and deploy culturally and linguistically appropriate digital literacy training programs specifically tailored to the needs of marginalised communities, including women, older adults, and individuals with disabilities.
- v. Establish mechanisms for the continuous monitoring and evaluation of smart city initiatives with specific indicators related to digital equity and social inclusion. This will enable adaptive management and ensure that interventions reach marginalised communities effectively.

Ensuring digital equity is not merely an aspirational goal but a fundamental imperative for realising truly smart and sustainable cities in Nigeria. By adopting participatory models for pro-poor urban planning, Nigeria can develop smart city initiatives that are not only technologically advanced but also deeply inclusive and equitable. This commitment to an inclusive approach can serve as a powerful model for other developing nations grappling with similar challenges, demonstrating that digital transformation can and must be a force for reducing inequality and empowering all urban citizens.

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