

Modelling the Governance-Participation-Performance Nexus in Community Infrastructure Provision: Evidence from Abuja, Nigeria



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ABSTRACT: Shortfalls in urban infrastructure across the Global South are persistent, even decades after significant investments have been made. While there is a strong consensus on the need for improved governance through participation, there are limited statistical findings that relate participation in governance to measurable infrastructure outcomes. This study presents a participative governance framework and tests it through the use of structural equation modeling (SEM) with bootstrapped mediation analysis, employing survey data from 212 respondents within four area councils in Abuja, Nigeria. Based on the analysis, it was found that institutional inclusion ($\beta = 0.412$; $p < .001$) and social trust ($\beta = 0.286$; $p < .01$) are statistically significant predictors of community participation. Community participation is also found to be a strong predictor of infrastructure outcomes ($\beta = 0.56$; $p < .001$) and partially mediates the governance-outcomes relationship (indirect effect = 0.269; 95% bias corrected bootstrap CI [0.168 to 0.385]). The model fit was determined to be acceptable ($\chi^2(345) = 724.5$; $p < .001$; Comparative Fit Index = .93; Root Mean Square Error of Approximation (RMSEA) = .05 (90% CI [0.04 to 0.06]); Standardized Root Mean Squared Residual = .04). While the findings support a governance-participation-performance pathway, the ability to draw causal claims is limited by the cross-sectional design. Nevertheless, an empirically validated framework was provided to promote collaborative governance of infrastructure in rapidly urbanizing cities across Africa.

KEYWORDS: Participatory governance; structural equation modeling; infrastructure provision; mediation analysis; bootstrapping; Abuja, Nigeria

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I. INTRODUCTION

Urban infrastructure including transport networks, water supply/distribution system, energy distribution, drainage, and waste disposal make up the base of every city's economic productivity, environmental sustainability, and social well-being. When urban infrastructure is functioning efficiently, it increases mobility, access to public health, and enhances the quality of life. When urban infrastructure fails; the direct result is poverty, increased inequality, and environmental degradation. Unfortunately, in cities across the Global South experiencing rapid urbanization, urban infrastructure provision is often inadequate, spatially uneven, and institutionally fragmented (Collord et al., 2021; Rachida & Hassan, 2023). Rapid population growth, financial limitations, and inefficient governance prevent governments from meeting the needs created by urbanization, leaving many parts of the city with unreliable access or no access to basic infrastructure services.

In Nigeria, this problem is abundantly clear. Despite Nigeria's substantial national investment in infrastructure development over the last few decades, many urban communities have been unable to access the basic services they need to lead healthy lives. For example, Abuja was originally designed to be a modern administrative capital city that had

well developed urban service delivery systems that would be used as an example for sustainable urban development throughout Nigeria. Increases in urban populations throughout the world have put strain on urban infrastructure systems.

In the case of Abuja, residents living in residential estates in the Area Councils around the city face difficulties in the areas of access to roads, reliable water supply, functional drainage systems, coverage of waste management services and reliable electricity supply. It is important to recognize that not all Area Councils face these challenges equally. Based upon data collected in this study, Kuje and Bwari Area Councils exhibit significantly greater deficits than those based in the Abuja Municipal Area Council (AMAC). Furthermore, the spatial inequality among these Area Councils and the differences in access to quality of infrastructure mirror trends across cities on the African continent, with much of the investment in infrastructure directed towards the cores of cities, rather than to peripheral areas.

As community participation becomes an increasingly common governance approach to addressing infrastructure deficits, through identifying the needs of a community via local knowledge and mobilizing additional financial and labour resources, as well as enhancing accountability of infrastructure

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management systems (Usadolo, 2025). International Organizations that promote and support participatory governance approaches claim that through the establishment of governance mechanisms that promote participation, transparency in projects, alignment of projects to community needs and long-term sustainability can be achieved. However, the success of such initiatives was heavily influenced by the governance structure of the institutions in which participatory governance approaches are taking place.

Participation mechanisms in many urban contexts are informal, reactive and limited to formal consultation processes but generally occur without providing meaningful involvement of citizens in the decision-making process (Cornwall, 2008; Kiss et al, 2022). Participation in such instances may exist in name only, which is commonly known as tokenistic participation. Recent research exploring urban governance and infrastructure reveals governance quality plays a far bigger role in the quality of infrastructure than does the availability of resources (Collord et al., 2021). Poor institutional coordination, lack of accountability, opaque governance processes and governance fragmentation work to impede infrastructure delivery regardless of how much financial resource is attached to it (Sisson et al., 2023; Fayomi et al., 2025).

Institutionalizing participatory governance through development of transparent rules, mechanisms for making inclusive decisions and recognizing community associations will improve the delivery of goods and services (Usadolo, 2025). If participation is not integrated into the governance system in a formal manner, it remains as an insignificant or token contribution by citizens who may have been consulted and in some cases paid for materials but are not given authority to make decisions. This research goes beyond the provision of a descriptive account of participation and develops a theoretical framework describing participation as a mechanism for producing outcomes from governance. This theoretical shift is significant because it shifts the understanding of participation from a symbolic act to a causal agent.

Community-level social relationship determinants also affect individual and community level outcomes related to social inclusion, as expressed through participation. The Theory of Social Capital posits that trust, collective identity, and cooperation foster engagement of the community in collective initiatives (Muhammed, 2020). Communities characterized as having high levels of social capital (i.e., high levels of interpersonal trust, highly connected social networks, and strong social norms of reciprocity) are more likely to mobilize collective resources and successfully engage in governance activities. Recent empirical studies have demonstrated that trust enhances both the effectiveness of participation and governance outcomes in urban contexts (Etim, et al, 2025; Campbell, 2023).

In addition, individual economic capacity is a determiner of individual capacity to engage in participation. Residents who experience economic hardship may not be able to contribute resources, time, or labour for participatory projects, despite their willingness to do so. Thus, understanding how these institutional, social, and economic factors interact to influence participation in turn influences infrastructure outcome; is critical to developing effective participatory

governance systems. While participatory governance is receiving increasing attention in the policy realm, there continues to be a dearth of robust empirical evidence linking governance structures to measurable infrastructure outcomes through participatory mechanisms. Existing empirical studies remain descriptive in nature, concentrating on describing the processes of participation rather than establishing causal relationships.

The aim of this research is to explore the impact of community participation on infrastructure governance in the urban environment of Abuja, Nigeria, while simultaneously researching what community participation looks like within the context of Nigerian urban development. In addition, community participation as a measure of success in terms of governance inputs related to infrastructure will be evaluated. It does this by testing three hypotheses related to how community participation is influenced by institutions, social trust, and the participatory governance framework within the context of Abuja.

The following four research questions will guide this study:

RQ1: What are the existing conditions regarding infrastructure in residential estates within Abuja's Area Councils?

RQ2: What types of community participation can be found within the governance of infrastructure among residential estates in Abuja?

RQ3: What types of institutional, social, and economic factors can impact community participation within the governance of infrastructure?

RQ4: Does the level of community participation influence the nature of the relationship between the structures of governance and the physical outcomes of providing residential infrastructure?

To further evaluate these variables and address the research questions, this study utilizes an integrated theoretical framework based on participatory governance theory, collaborative governance theory, and social capital theory, to test the following two hypotheses:

H1: Institutional inclusion will have a positive correlation to the level of community participation in the governance of infrastructure.

H2: Trust among community members will have a positive correlation to the level of community participation.

H3: Economic capacity has a positive effect on community participation.

H4: Community participation has a positive effect on the outcomes of the provision of infrastructure.

H5: Community participation mediates the relationship between governance structure and outcomes of infrastructure.

Using structural equation modeling (SEM), this study members utilized survey data collected from 212 residents in four Area Councils to test the proposed hypotheses empirically and develop a governance-participation-performance framework. This research illuminates urban governance scholarship in three significant ways: through providing empirical data demonstrating the spatially disparate nature of Abuja and how it affects the levels of community participation; testing a mediation model that clarifies the mechanisms whereby governance structures produce infrastructure

outcomes; and offering theoretical grounding and contextual relevance to (a) rapidly urbanized African cities, which could also be applied to local/global contexts.

The emergence of cloud computing has been recognized to be capable of transforming ATM installation. The configuration of multiple ATMs via the cloud is recognized to be efficient in comparison to a manual configuration via individual visits (Rana *et al.*, 2023, Greene, 2018, SBS, 2023). Technologies such as facial recognition can also enhance the security of individuals utilizing the ATM for financial transactions (Patil *et al.*, 2024).

Another challenge that increases individual wait duration is menu inflexibility across ATMs deployed by different and multiple financial services providers. This is because financial service providers have unique services that are customised and designed only for access via their own custom design ATMs. The challenge arises because financial service providers do not collaborate on ATM interface menus design. This results in individuals not being able to access certain services when ATMs from certain financial service providers in a geographical region are non-functional. A solution to this challenge is the design of multi-service provider, multi-contextual multi-lingual, and intelligent ATM.

The modern ATM is ubiquitous and accessible to a significant number of users. ATMs also incorporate networking capability and benefit from advances in information and communication technologies. This makes it feasible to consider the ATM as a cloud access node in communication networks. In its role as cloud access node, the ATM executes activities such as data upload and download. ATM functioning in this capacity requires a constructive interaction between financial service providers, mobile wireless networks, and cloud computing providers. This has not received sufficient consideration in wireless networking research. This paper proposes a multi-mode open ATM (O-ATM) with the capability to execute financial services and access cloud computing platforms. The O-ATM modes are finance and cloud modes.

The proposed research presents the functional and entity architecture of the O-ATM discussing the role of its entities, executed processes and inter-entity relations associated with the O-ATM. The O-ATM has the benefits of enhancing the conduct of customer oriented financial transactions. The use of the O-ATM reduces the number of ATMs that are deployed by financial service providers in reaching the client and customer base. It reduces ATM under-utilization epoch. The rest of the discussion is structured as follows. Section II discusses the background work. Section III addresses the challenges arising from the current ATM model. It also proposes the new ATM model and describes how its functionalities affect the functionality of the proposed ATM model. Section IV describes how the future ATM can address the challenge associated with the access to cloud comput

II. METHODOLOGY

A) Research Design

The relationships among governance structure, community participation, and infrastructure provision outcomes in residential estates in Abuja, Nigeria were examined in this research using a Cross-Sectional Survey Research Design that made use of quantitative methods for data collection. A Cross-

Sectional research design was chosen to allow standardized data collection from a large number of survey respondents at a single point in time; this also supports the statistical investigation of multiple variables' relationships (Creswell & Creswell, 2023).

The integrated theoretical framework used in this research resulted from the synthesis of Participatory Governance Theory, Collaborative Governance Theory, and Social Capital Theory; based on these theories, there is evidence that governance inputs have an effect on the level of Community Participation; as such, governance inputs (Institutional Inclusion, Social Trust, and Economic Capacity) were treated as inputs to Community Participation that would subsequently affect the level of Infrastructure provision outcomes. In order to test both the direct and indirect relationships simultaneously, Structural Equation Modelling (SEM) was used; bootstrapping was also employed to test for the significance of mediation effects.

B) Study Area

The study was conducted in four Area Councils of the Federal Capital Territory, Abuja: AMAC, Bwari, Gwagwalada, and Kuje. These councils represent varying levels of urban development and infrastructure provision. Figure 1 shows Abuja with its six Area Councils, located between latitudes 7° 25' N and 9° 20' N of the Equator, and longitudes 5° 45' and 7° 39' (Oyetunji *et al.*, 2021).

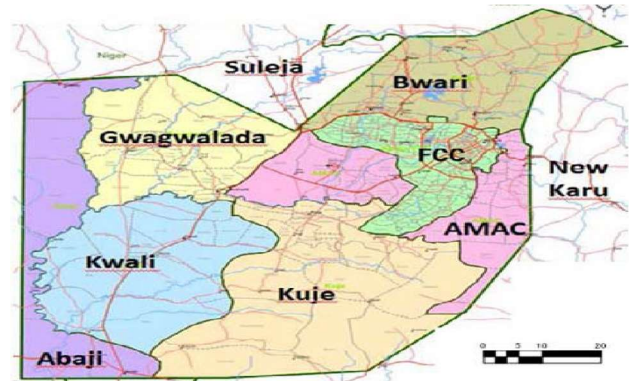


Figure 1 Federal Capital Territory and its six Area Councils
Source: Ministry of Lands & Survey Department, 2018

The four area councils and estates selected are illustrated in a geospatial map point location in Figure 2. The estates selected are:

- i. FCDA Staff Quarters, Wuse II (AMAC)
- ii. FCDA Owner Occupier Estate, Kubwa (Bwari)
- iii. Kontagora Housing Estate (Gwagwalada)
- iv. FCDA Quarters, Pegi (Kuje)

These estates were selected because they represent established residential communities with varying infrastructure conditions and active resident associations

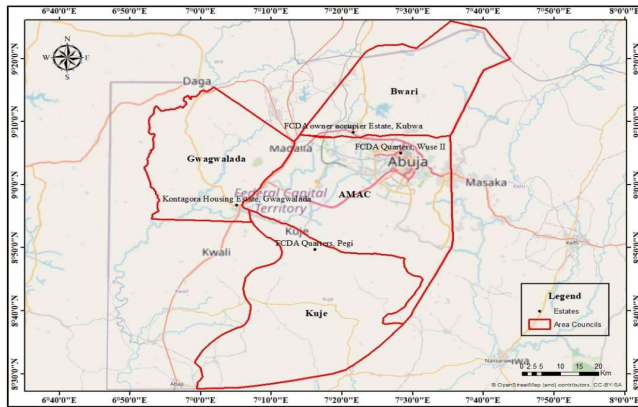


Figure 2 Geospatial map view of selected Area Councils Estates location

C) Population, Sampling, and Data Collection

The target population comprised residents of public residential estates developed by the Federal Capital Development Authority (FCDA). Records collected from the estate management authorities detailed a total of 553 housing units. Using Cochran's formula with finite population correction, a minimum sample size of 227 was determined. A total of 227 questionnaires were distributed, of which 212 were correctly completed and returned, resulting in a response rate of 93.4%.

Sample Size Determination:

Step 1: Cochran's initial sample size (assuming 95% confidence, 5% margin of error, and maximum variance $p = 0.50$):

$$n_0 = Z^2 \times p \times (1-p) / e^2 = (1.96)^2 \times 0.50 \times 0.50 / (0.05)^2 = 384.16 \approx 384 \quad (1)$$

Step 2: Finite population correction:

$$n = n_0 / (1 + (n_0 - 1) / N) = 384 / (1 + (384 - 1) / 553) = 384 / 1.6926 = 226.9 \approx 227 \quad (2)$$

Table 1 Sampling Distribution Across Area Councils

Area Council	Housing Units (N_h)	Proportion	Sampled (n_h)	Returned	Response Rate
AMAC	145	0.262	60	56	93.3%
Bwari	152	0.275	62	58	93.5%
Gwagwalada	128	0.231	53	50	94.3%
Kuje	128	0.231	52	48	92.3%
Total	553	1.000	227	212	93.4%

D) Instrumentation and Construct Validity

The study variables were operationalized using multiple indicators designed to capture the key dimensions of governance, community participation, and infrastructure outcomes. Because these constructs are not represented by a single observable measure, the adequacy of their measurement was assessed through a combination of reliability and validity procedures. The following analysis therefore examines the

consistency of the measurement items and the extent to which they adequately represent their respective underlying constructs.

i) Measurement Model Specification (Reflective) The study employed a reflective measurement model for all latent constructs. For each latent variable with reflective indicators:

$$X_{ji} = \lambda_{j1} \xi_{1i} + \delta_{ji} \quad (3)$$

where:

for endogenous latent variables:

$$y_{ji} = \lambda_{j1} \eta_{1i} + \varepsilon_{ji} \quad (4)$$

where j is the indicator index (1 to k), i is the respondent index (1 to 212), X_{ji} is the observed score of respondent i on exogenous indicator j , y_{ji} is the observed score of respondent i on endogenous indicator j , λ_{j1} is the factor loading of indicator j on the latent variable (ξ_1 or η_1), ξ_{1i} is the latent exogenous score for respondent i , η_{1i} is the latent endogenous score for respondent i , δ_{ji} is the measurement error for respondent i on exogenous indicator j , ε_{ji} is the measurement error for respondent i on endogenous indicator j .

As we consider how latent constructs such as Institutional Inclusion, Social Trust, Economic Capacity, Community Participation, and Infrastructure Outcomes can be operationalized through different observable attributes (behaviors), it is also reasonable to assume that there will be covariation among the indicators of each construct due to them sharing a common cause. This is supported by the literature as it has been shown that communities exhibiting transparent decision-making rules will subsequently be more likely to have access to grievance mechanisms and the formal recognition of community associations.

The methodology used to operationalize the latent constructs was as follows:

ξ_1 (Institutional Inclusion): Transparent decision-making rules; Formal recognition of community associations; Accessible grievance mechanisms; Inclusive meeting structure. ξ_2 (Social Trust): Trust among residents; Trust between residents and local Government; Collective identity; Norms of reciprocity. ξ_3 (Economic Capacity): Financial resources of household; Ability to contribute time and/or labor; Flexibility of contributing options. η_1 (Community Participation): Frequency of consultation; Involvement of community in; involvement in monitoring the community; Contributions of resources by the community; η_2 (Infrastructure Outcomes): Quality of road; Reliability of water; Stability of electricity; Functionality of drainage; Coverage of waste management; Provision of security services.

ii) Reliability and Convergent Validity

Internal consistency reliability was evaluated using Cronbach's α and McDonald's ω (recommended for SEM). Construct reliability was further assessed using Composite Reliability (CR), while convergent validity was examined through Average Variance Extracted (AVE).

Table 1 Sampling Distribution across Area Councils

Construct	Cronbach's α	McDonald's ω	Composite Reliability	AVE	$\sqrt{\text{AVE}}$
Institutional inclusion	0.85	0.86	0.86	0.62	0.787
Social trust	0.82	0.83	0.83	0.58	0.762
Economic capacity	0.75	0.76	0.76	0.51	0.714
Community participation	0.84	0.85	0.85	0.60	0.775
Infrastructure outcomes	0.83	0.84	0.84	0.59	0.768

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For endogenous latent variables:

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Where:

j = indicator index (1 to k)

i = respondent index (1 to 212)

where X_{ji} is the observed score of respondent i on exogenous indicator j, y_{ji} is the observed score of respondent i on endogenous indicator j, λ_{j1} is the factor loading of indicator j on the latent variable (ξ_1 or η_1), ξ_{1i} is the latent exogenous score for respondent i, η_{1i} is the latent endogenous score for respondent i, δ_{ji} is the measurement error for respondent i on exogenous indicator j, ε_{ji} is the measurement error for respondent i on endogenous indicator j

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Table 2 Reliability and Convergent Validity

Construct	Cronbach's α	McDonald's ω	Composite Reliability	AVE	$\sqrt{\text{AVE}}$
Institutional inclusion	0.85	0.86	0.86	0.62	0.787
Social trust	0.82	0.83	0.83	0.58	0.762
Economic capacity	0.75	0.76	0.76	0.51	0.714
Community participation	0.84	0.85	0.85	0.60	0.775
Infrastructure outcomes	0.83	0.84	0.84	0.59	0.768

All constructs recorded Cronbach's α values between 0.75 and 0.85, exceeding the recommended threshold of 0.70 (Hair et al., 2021). McDonald's ω values were comparable, confirming internal consistency. Composite reliability values exceeded 0.70, and AVE values exceeded 0.50 for all latent constructs, confirming satisfactory convergent validity.

iii) Discriminant Validity (Fornell-Larcker Criterion and HTMT)

Discriminant validity was examined to determine whether the constructs in the proposed framework represent empirically distinct concepts. This assessment is particularly relevant

because the governance variables and community participation are theoretically related, and substantial correlations among them could make it difficult to establish whether the measurement items capture distinct dimensions. The Fornell-Larcker criterion and the heterotrait-monotrait ratio (HTMT) were therefore used to evaluate the distinctiveness of the constructs.

Table 3: Fornell-Larcker Discriminant Validity ($\sqrt{\text{AVE}}$ on diagonal, correlations off-diagonal)

Construct	(1)	(2)	(3)	(4)	(5)
(1) Institutional inclusion	0.787				
(2) Social trust	0.48	0.762			
(3) Economic capacity	0.35	0.31	0.714		
(4) Community participation	0.61	0.54	0.42	0.775	
(5) Infrastructure outcomes	0.53	0.47	0.38	0.66	0.768

The Fornell-Larcker criterion is satisfied as each construct's $\sqrt{\text{AVE}}$ exceeds its correlations with all other constructs.

Table 4 HTMT Ratios (Heterotrait-Monotrait)

Construct pair	HTMT ratio	90% CI	Decision (HTMT < 0.85)
Institutional inclusion ↔ Social trust	0.58	[0.48, 0.68]	Satisfied
Institutional inclusion ↔ Community participation	0.72	[0.63, 0.81]	Satisfied
Community participation ↔ Infrastructure outcomes	0.79	[0.71, 0.87]	Satisfied

All HTMT ratios were below the conservative threshold of 0.85 (Henseler et al., 2015), confirming discriminant validity.

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F) Structural Equation Model Specification

Following validation of the measurement constructs, the structural model was specified to examine the hypothesized relationships among governance inputs, community participation, and infrastructure outcomes. The model represents community participation as the mechanism through which governance-related factors may influence infrastructure performance, while also allowing the proposed mediation relationship to be formally tested. The structural equations below define the relationships estimated in the analysis.

i) Full Mediation Specification for Hypothesis Testing

The structural model was specified as follows:

Measurement model (Level 1):

For each endogenous latent variable, the measurement equations were:

$$y_{1i} = \lambda_{11}\eta_{1i} + \varepsilon_{1i} \quad (5)$$

$$y_{2i} = \lambda_{21}\eta_{1i} + \varepsilon_{2i} \quad (6)$$

$$y_{3i} = \lambda_{31}\eta_{1i} + \varepsilon_{3i} \quad (7)$$

$$y_{4i} = \lambda_{41}\eta_{1i} + \varepsilon_{4i} \quad (8)$$

Where y_{1i} is the observed score for respondent i on indicator 1 (consultation), y_{2i} is the observed score for respondent i on indicator 2 (planning), y_{3i} is the observed score for respondent i on indicator 3 (monitoring), y_{4i} is the observed score for respondent i on indicator 4

(contribution), $\lambda_{11}, \lambda_{21}, \lambda_{31}, \lambda_{41}$ is the factor loadings for indicators 1-4 on latent

variable η_1

η_{1i} = latent participation score for respondent i

$\varepsilon_{1i}, \varepsilon_{2i}, \varepsilon_{3i}, \varepsilon_{4i}$ = measurement errorsiv) Structural model (Level

ii) Full mediation specification (H5 test):

$$\eta_1 = \gamma_{11}\xi_1 + \gamma_{12}\xi_2 + \gamma_{13}\xi_3 + \zeta_1 \quad (9)$$

$$\eta_2 = \beta_{21}\eta_1 + \zeta_2 \quad (10)$$

Where:

η_1 is Community participation (endogenous mediator), η_2 is the Infrastructure outcomes (endogenous outcome), ξ_1 is Institutional inclusion (exogenous), ξ_2 is the Social trust (exogenous), ξ_3 is the economic capacity (exogenous), γ the path coefficients from exogenous to endogenous constructs, β_{21} the path coefficient from η_1 to η_2 and ζ the structural disturbances (uncorrelated with ξ 's)

iii) Partial mediation model (tested for comparison)

$$\eta_2 = \beta_{21}\eta_1 + \gamma_{21}\xi_1 + \gamma_{22}\xi_2 + \gamma_{23}\xi_3 + \zeta_2$$

(11)

The partial mediation model adds direct paths from each governance input to infrastructure outcomes. A significantly better fit for the partial mediation model (via χ^2 difference test) would indicate partial rather than full mediation.

iv) Model-Implied Covariance Matrix

The structural model can also be expressed in terms of the covariance structure that it implies for the observed indicators. This formulation provides the basis for assessing how well the specified relationships reproduce the covariance patterns observed in the sample. The model-implied covariance matrix is therefore presented below as part of the formal SEM specification.

The model-implied covariance matrix $\Sigma(\theta)$ for the SEM was:

$$\Sigma(\theta) = \Lambda(I - B)^{-1}\Phi(I - B)^{-T}\Lambda^T + \Theta \quad (12)$$

Where $\Sigma(\theta)$ is the Model-implied covariance matrix, Λ is the Factor loading matrix, B is the Matrix of structural path coefficients (containing β_{21}), Φ is the Covariance matrix of exogenous latent variables (ξ_1, ξ_2, ξ_3), Θ is the Covariance matrix of measurement errors (δ and ε), I is the Identity matrix

v) Mediation Analysis with Bootstrapping

The indirect effect of governance inputs (ξ) on infrastructure outcomes (η_2) through community participation (η_1) was:

$$IE = a \times b \quad (13)$$

Where a is the path coefficient from ξ to η_1 ($\gamma_{11}, \gamma_{12}, \gamma_{13}$), b is the path coefficient from η_1 to η_2 (β_{21})

For a specific predictor, e.g., institutional inclusion (ξ_1) $\rightarrow$ participation (η_1) $\rightarrow$ outcomes (η_2):

$$IE_{\xi_1} = \gamma_{11} \times \beta_{21} \quad (14)$$

Total effect = Direct effect + Indirect effect:

$$TE_{\xi_1} = \gamma_{21} + (\gamma_{11} \times \beta_{21}) \quad (15)$$

$$\text{Proportion mediated} = \text{Indirect effect} / \text{Total effect} \quad (16)$$

vi) Bootstrapping procedure (primary analysis):

Indirect effects were estimated using 5,000 bootstrap resamples with bias-corrected 95% confidence intervals. An indirect effect is considered statistically significant at $\alpha = 0.05$ if the 95% bias corrected confidence interval does not include zero. Standard error of the indirect effect (delta method, supplementary):

$$SE_{IE} = \sqrt{(b^2 \times SE_a^2 + a^2 \times SE_b^2)} \quad (17)$$

Sobel test statistic (supplementary, reported for comparability):

$$z = (a \times b) / \sqrt{(b^2 \times SE_a^2 + a^2 \times SE_b^2)} \quad (18)$$

vii) Model Fit Indices and Criteria

The adequacy of the specified SEM was evaluated using multiple model-fit criteria rather than relying on a single statistic. These measures provide complementary information on the correspondence between the hypothesized model and the observed data, including absolute, comparative, and residual aspects of model fit. The criteria adopted for evaluating the estimated model are presented below. Model adequacy was evaluated using multiple goodness-of-fit indices with the following criteria Zheng and Bentler (2025):

Table 5 Model Fit Indices and Acceptable Threshold

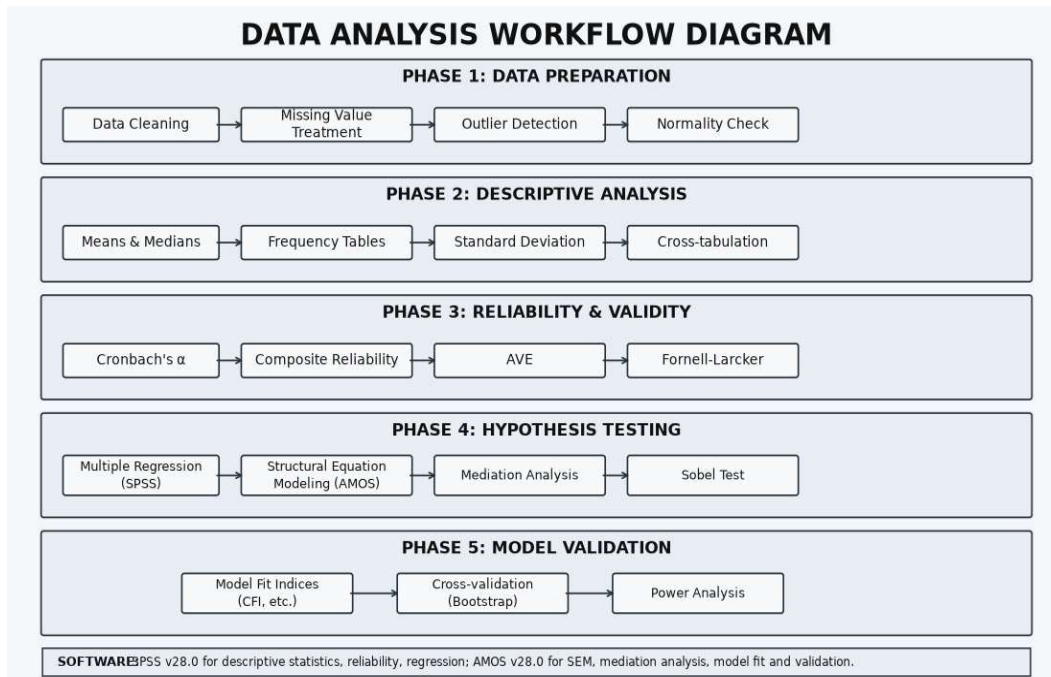
Index	Value	Threshold	Decision
χ^2 (Chi-square)	724.5	Lower is better	Reported
Degrees of freedom (df)	345	-	-
χ^2/df	2.10	< 3.00	Acceptable
CFI (Comparative Fit Index)	0.93	≥ 0.90	Good
TLI (Tucker-Lewis Index)	0.91	≥ 0.90	Good
RMSEA (Root Mean Square Error of Approximation)	0.05	≤ 0.08	Good
RMSEA 90% confidence interval	[0.04, 0.06]	Upper bound < 0.08	Good
SRMR (Standardized Root Mean Square Residual)	0.04	≤ 0.08	Good

G) Statistical Power Analysis for SEM

Statistical power analysis was conducted to assess whether the study sample was adequate for detecting the relationships specified in the SEM. The analysis considered both overall model fit and the ability to detect structural effects, providing an additional assessment of the strength of the empirical evidence obtained from the model. The resulting power estimates are reported below. Post-hoc power analysis was conducted for tests of model fit as shown in Table 6.

Table 6 Post-hoc Statistical Power for SEM

Test	Null RMSEA	Alternative RMSEA	df	N	Power
Test of close fit	0.05	0.08	345	212	0.79
Test of not-close fit	0.08	0.05	345	212	0.94



Interpretation: Power for detecting close-fitting models ($RMSEA \leq 0.05$) is 0.79, slightly below the conventional 0.80 threshold. Results should be interpreted with appropriate caution. The sample size of 212 is adequate for the tested model but marginal for detecting small misspecifications.

Table 7 Post-hoc Power for Individual Path Coefficients (Cohen's f^2)

Predictor	f^2	Power
Institutional inclusion → Participation	0.31	> 0.99
Social trust → Participation	0.15	0.98
Economic capacity → Participation	0.07	0.94
Full model	1.70	> 0.99

Note: $f^2 = R^2/(1-R^2)$ for each predictor in the regression model.

H) Common Method Bias Assessment

Because all study variables were collected using a single survey instrument from the same respondents, the possibility of common method bias was assessed using two approaches.

i) Harman's single-factor test: An unrotated exploratory factor analysis on all measurement items extracted 5 factors with eigenvalues > 1.0. The first factor accounted for 31.1% of the total variance, below the 50% threshold, indicating no serious common method bias (Podsakoff et al., 2012).

ii) Common latent factor (CLF) method: A common latent factor was added to the SEM, with all indicators loading onto both their

respective construct and the CLF. The CLF accounted for 8.4% of the total variance, and all structural path coefficients remained significant with changes < 0.05, confirming that common method bias did not substantively affect the results.

To minimize response bias, respondents were assured of anonymity and confidentiality, and questionnaire items were organized into distinct thematic sections. Furthermore, measurement constructs were developed from theoretically distinct domains, reducing the likelihood of artificial covariance among variables.

I) Data Analysis Workflow

Data analysis was conducted using IBM SPSS (version 28) and IBM AMOS (version 29) in five phases:

- Data cleaning: Missing data assessment (less than 2% per item, handled with full information maximum likelihood), univariate and multivariate outlier detection (Mahalanobis distance, $p < .001$), normality testing (skewness < |2.0|, kurtosis < |7.0|)
- Descriptive analysis: Means, frequencies, percentages, and weighted mean scores for socio-demographic characteristics, infrastructure conditions, and participation patterns
- Reliability and validity tests: Cronbach's α , McDonald's ω , composite reliability, AVE, Fornell-Larcker, HTMT.
- Structural equation modeling (Hypothesis Testing): Path coefficient estimation using maximum likelihood, bootstrap mediation (5,000 resamples)

Model validation: Fit index evaluation, alternative model comparison.

- e. Model validation: Fit index evaluation, alternative model comparison

J) Ethical Considerations

Participation was voluntary. Respondents were assured of anonymity and confidentiality. Data were analyzed in aggregate form and used strictly for academic purposes. Informed consent

III. RESULTS AND DISCUSSION

The results are presented and discussed in relation to the study objectives and the proposed governance-participation-performance framework. The analysis first examines the observed spatial variation in infrastructure provision before considering community participation and its determinants, followed by estimation of the structural model and assessment of the hypothesized mediation mechanism. The findings are subsequently interpreted in relation to the relationships proposed in the framework.

3.1 Descriptive Statistics and Spatial Inequality in Infrastructure Provision

This subsection examines the condition and spatial distribution of infrastructure across the selected Area Councils. The descriptive analysis provides an empirical baseline for understanding differences in infrastructure provision before examining the governance and participation mechanisms that

was obtained from all participants prior to data collection. The research protocol was reviewed and approved by the institutional ethics board.

may help explain these differences. The results are presented using the observed infrastructure indicators and their corresponding statistical summaries.

Figure 3 presents mean infrastructure condition ratings across the four Area Councils on a 5-point scale (1 = Very Poor, 5 = Very Good). Abuja Municipal Area Council (AMAC) records the highest ratings across all service categories, with electricity supply (mean = 4.0, SD = 0.67) and security services (mean = 4.1, SD = 0.72) approaching “good” thresholds. In contrast, Kuje records the lowest ratings across nearly every indicator, with access roads (mean = 2.2, SD = 0.89) and drainage systems (mean = 2.0, SD = 0.94) falling below acceptable standards (below 2.5). Bwari and Gwagwalada occupy intermediate positions. The overall mean scores reveal that no council achieves “very good” (≥ 4.5) on any indicator, and peripheral councils consistently underperform relative to the central administrative area.

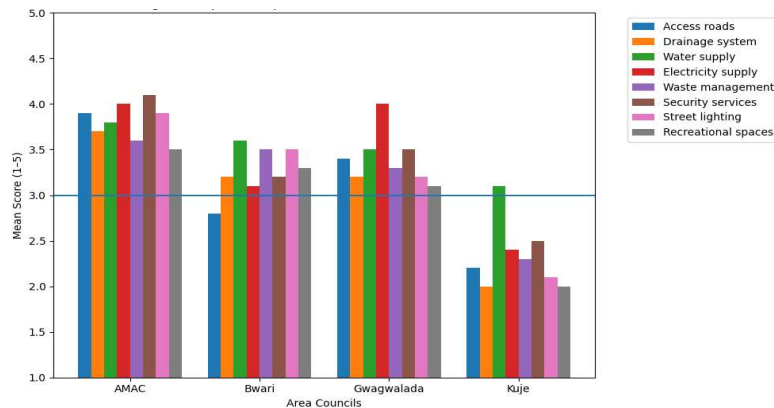


Figure 3 Spatial Disparities in Infrastructure Conditions across Area Councils

Table 8 Mean Infrastructure Condition Scores by Council (95% CI in parentheses)

Indicator	AMAC (n=56)	Bwari (n=58)	Gwagwalada (n=50)	Kuje (n=48)	Overall (N=212)
Access roads	3.9 (3.7-4.1)	2.8 (2.6-3.0)	2.9 (2.7-3.1)	2.2 (2.0-2.4)	2.98 (2.84-3.12)
Water supply	3.7 (3.5-3.9)	2.7 (2.5-2.9)	3.1 (2.9-3.3)	2.3 (2.1-2.5)	2.96 (2.82-3.10)
Electricity	4.0 (3.8-4.2)	3.2 (3.0-3.4)	4.0 (3.8-4.2)	2.4 (2.2-2.6)	3.41 (3.27-3.55)
Drainage	3.5 (3.3-3.7)	2.4 (2.2-2.6)	2.6 (2.4-2.8)	2.0 (1.8-2.2)	2.65 (2.51-2.79)

Waste management	3.4 (3.2-3.6)	2.6 (2.4-2.8)	2.7 (2.5-2.9)	2.1 (1.9-2.3)	2.72 (2.58-2.86)
Security	4.1 (3.9-4.3)	2.9 (2.7-3.1)	3.2 (3.0-3.4)	2.5 (2.3-2.7)	3.18 (3.04-3.32)

Note: 95% confidence intervals calculated using bootstrapping (1,000 resamples). Non-overlapping CIs indicate statistically significant differences at $p < .05$

The non-overlapping confidence intervals between AMAC and Kuje for all six indicators confirm statistically significant spatial disparities. The infrastructure gap between AMAC and Kuje ranges from 1.5 (security: 4.1 vs. 2.5) to 1.6 (electricity: 4.0 vs. 2.4), representing a difference of approximately 40% on the 5-point scale.

A) Patterns of Community Participation

Table 9 presents participation patterns across eight indicators. Financial contribution is the most common form

of participation (mean = 3.11, SD = 0.94), followed by personal involvement in projects (mean = 2.87, SD = 0.97) and consultation before decisions (mean = 2.75, SD = 0.89). Critically, participation in monitoring activities is lowest (mean = 2.54, SD = 0.92), and elite dominance scores highest (mean = 3.61, SD = 0.86), indicating that participation spaces are often controlled by a small group of community leaders or estate executives. The weighted mean for “participation improves outcomes” (mean = 3.02, SD = 0.88) suggests residents perceive moderate benefits, but the low monitoring score indicates weak accountability mechanisms.

Table 9: Community Participation Patterns in Infrastructure Governance (N = 212)

Participation indicator	Mean	SD	Interpretation
Financial contribution	3.11	0.94	Moderate
Personal involvement in projects	2.87	0.97	Moderate
Residents consulted before decisions	2.75	0.89	Moderate
Participation during planning	2.78	0.91	Moderate
Participation during implementation	2.81	0.93	Moderate
Monitoring participation	2.54	0.92	Low
Participation improves outcomes	3.02	0.88	Moderate
Participation dominated by elites	3.61	0.86	High

B) Determinants of Community Participation (Multiple Regression)

Table 10 presents multiple regression results for determinants of community participation. Institutional inclusion is the strongest predictor ($\beta = 0.412$, $p < .001$), followed by social trust ($\beta = 0.286$, $p = .003$) and economic capacity ($\beta = 0.198$, $p = .018$). Infrastructure condition

(included as a control) shows a smaller but still significant effect ($\beta = 0.157$, $p = .031$). The model explains 63% of variance in participation levels ($R^2 = 0.63$; Adjusted $R^2 = 0.61$; $F(4,207) = 45.72$, $p < .001$). Variance inflation factors (VIFs) ranged from 1.34 to 1.89, well below the common threshold of 5, indicating no multicollinearity concern

Table 10: Multiple Regression Results for Determinants of Community Participation

Variable	B (Unstd.)	SE	β (Std.)	t	p-value	VIF
(Constant)	0.942	0.210	-	4.49	< .001	-
Institutional inclusion	0.415	0.081	0.412	5.12	< .001	1.52
Social trust	0.297	0.074	0.286	4.01	< .001	1.48

Economic capacity	0.211	0.067	0.198	3.15	.002	1.34
Infrastructure condition	0.163	0.061	0.157	2.67	.008	1.89

C) Structural Equation Modeling (SEM) and Mediation Analysis

The regression analysis established the relative contribution of the governance-related predictors to community participation, with institutional inclusion emerging as the strongest predictor. The next stage of the analysis extends these findings by examining the proposed relationships simultaneously within the structural equation model. This allows the study to test the hypothesized pathway

from governance inputs through community participation to infrastructure outcomes and to determine whether participation functions as a mediating mechanism.

1) Path Coefficients (Full Mediation Model)

Table 11 presents SEM path coefficients for the full mediation model specified in Equation (10). All hypothesized paths are significant at conventional thresholds.

Table 11 Structural Equation Modeling Path Coefficients (Full Mediation)

Path	Standardized coefficient	Unstandardized coefficient	SE	Critical ratio	p-value
Institutional inclusion → Participation (γ_{11})	0.48	0.512	0.078	6.56	< .001
Social trust → Participation (γ_{12})	0.33	0.348	0.072	4.83	< .001
Economic capacity → Participation (γ_{13})	0.21	0.224	0.068	3.29	.001
Participation → Infrastructure outcomes (β_{21})	0.56	0.587	0.065	9.03	< .001

2) Model Fit (Full Mediation Model)

The adequacy of the full mediation model was assessed by examining the extent to which the specified model reproduces the relationships observed in the data. Multiple fit indices were considered to provide a comprehensive assessment of model adequacy, including measures of comparative, absolute, and residual fit. These results provide the basis for determining whether the proposed full mediation structure provides an acceptable representation of the

observed data. The full mediation model achieved acceptable fit as shown in Table 12.

$\chi^2(345) = 724.5$, $p < .001$; $\chi^2/df = 2.10$; CFI = 0.93; TLI = 0.91; RMSEA = 0.05 (90% CI [0.04, 0.06]); SRMR = 0.04

3) Alternative Model Comparison (Partial Mediation)

A partial mediation model (adding direct paths from each governance input to infrastructure outcomes) was tested for comparison:

Table 12 Partial Mediation Model - Added Direct Paths

Added direct path	Coefficient	p-value
Institutional inclusion → Outcomes (γ_{21})	0.11	0.087
Social trust → Outcomes (γ_{22})	0.08	0.214
Economic capacity → Outcomes (γ_{23})	0.05	0.398

Table 13 Model Comparison

Model	χ^2	df	$\Delta\chi^2$	Δdf	p	AIC	CFI	RMSEA
Full mediation	724.5	345	—	—	—	814.5	0.93	0.05
Partial mediation	718.2	342	6.3	3	0.098	814.2	0.93	0.05

The χ^2 difference test was non-significant ($\Delta\chi^2(3) = 6.3$, $p = 0.098$), indicating that adding direct paths did not significantly improve model fit. AIC values were nearly identical (814.5 vs. 814.2). Following the principle of

parsimony, the full mediation model is preferred. This supports H5 (mediation).

4) Indirect, Direct, and Total Effects (Bootstrapped)

The decomposition of the effects was examined using Bootstrap Confidence Interval from 5000 samples. The results are shown in Table 14. The Indirect effect

calculation (exemplary for institutional inclusion) is calculated using Equation (19) while the proportional inclusion Proportion mediated (institutional inclusion) is given in Equation (20).

Table 14 Decomposition of Effects with Bootstrap Confidence Intervals (5,000 resamples)

Predictor	Direct effect (c')	Indirect effect (a×b)	Total effect	Proportion mediated	95% BC Bootstrap CI (Indirect)
Institutional inclusion	0.11 (n.s.)	0.269***	0.379	71.0%	[0.168, 0.385]
Social trust	0.08 (n.s.)	0.185**	0.265	69.8%	[0.094, 0.291]
Economic capacity	0.05 (n.s.)	0.118*	0.168	70.2%	[0.041, 0.206]

Note: *** $p < .001$, ** $p < .01$, * $p < .05$ based on bias-corrected bootstrap CI excluding zero. Direct effects from partial mediation model; indirect

$$IE = \gamma_{11} \times \beta_{21} \quad (19)$$

Proportion mediated (institutional inclusion)

$$PM = IE / TE \quad (20)$$

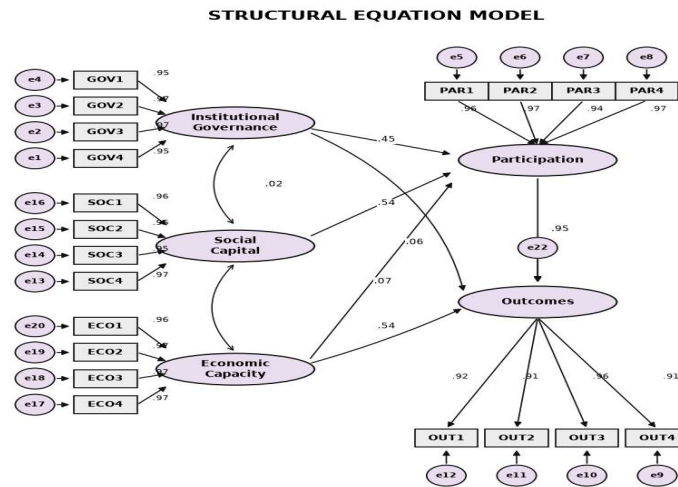


Figure 4: Structural Equation Model (SEM) – Governance–Participation–Performance Framework (Standardized coefficients; all paths significant at $p < .05$ or better; $N = 212$; CFI = 0.93; RMSEA = 0.05)

5) Summary of Hypothesis Tests

The preceding analyses provide the statistical evidence required to evaluate the hypotheses developed from the proposed framework. This subsection brings together the results of the regression, structural model, and mediation

analyses to summarize the direction and statistical significance of the hypothesized relationships. The resulting decisions for each hypothesis are presented in the following table.

Table 15 Hypothesis Testing Summary

Hypothesis	Statement	Path	Coefficient	95% CI	Decision
H1	Institutional inclusion → Participation	γ_{11}	0.48***	[0.34, 0.61]	Supported
H2	Social trust → Participation	γ_{12}	0.33***	[0.20, 0.46]	Supported
H3	Economic capacity → Participation	γ_{13}	0.21**	[0.08, 0.34]	Supported
H4	Participation → Infrastructure outcomes	β_{21}	0.56***	[0.44, 0.68]	Supported
H5	Mediation (indirect effect $\neq 0$)	$a \times b$	0.269***	[0.168, 0.385]	Supported (partial)

*** $p < .001$ (bootstrap CI excludes zero); ** $p < .01$

D) Discussion

1) Spatial Inequality as Governance Failure

The decline in infrastructure quality is most pronounced from AMAC to the outer councils (including Kuje and Bwari) as all six indicators show statistically different scores when the two groups of councils are compared. All six indicators of

infrastructure quality, when compared statistically, display a significant difference between the two types of cities. The disparity in both the average scores of a given indicator (e.g. electricity = 4.0; electricity = 2.4, resulting in a difference of 1.6 out of 5, 95% CIs do not overlap) is present in every instance,

indicating a definitive/functional vs. deficient type of infrastructure.

This confirms and builds on recent research regarding the uneven urban development pattern across Africa (Collord, et al, 2021), which maintains that post-colonial urban governance systems in sub-Saharan Africa have systematically privileged the administrative cores (as islands of excellence) at the expense of the surrounding periphery (through planning by neglect). The data presented in this paper serves as hyper-quantitative evidence of such a phenomenon in the Abuja area. The continued presence of these disparities in a planned capital city, such as Abuja, suggests that the technocratic explanation of the continued availability of poor-quality infrastructure is due to a lack of resources (supply-side), but instead provides acknowledgement for a governance-based explanation based on institutional coordination (i.e. FCDA and Area Council Administrative coordination is demonstrated to be weaker in peripheral councils), planning enforcement is less effective, and community to government communication pathways are more fragmented than in AMAC Councils (Egila et al., 2023; Sidiq et al., 2026). This interpretation is strengthened by the regression results showing that institutional inclusion (a governance variable) is the strongest predictor of participation ($\beta = 0.412$), not economic capacity.

2) Tokenistic Participation and Elite Capture

The pattern of participatory governance has been studied in many qualitative research studies (Kiss et al, 2022). These studies have found that current methods of participating in this form of governance are informal and unstructured. The second consideration for these results is the difference in average scores is 0.57 ($d = 0.62$; Financial: $M = 3.11$; Monitoring: $M = 2.54$). This shows us that individuals in the community are willing to financially support their respective structures but do not have the means to participate in their governance (as evident with the phenomenon of pseudo-participation defined by Cornwall, 2008). If we were to place these scores into Arnstein et al's (1969) ladder of citizen participation we could surmise that most practices of participation fall on the side of tokenism (levels 3-5: Informing, Consulting, Placating) instead of citizen power (6-8: Partnerships, Delegating Authority, Citizen Control). The third consideration in these results is the elite dominance score ($M=3.61$; $SD=0.86$); the average score provided by respondents demonstrates that they feel local dignitaries control participation opportunities. The results provided in this study support recent studies in Ghana and Kenya that document community development committees capturing funding (Etim et al, 2025).

3) Institutional Inclusion as the Primary Driver

The three key implications of the finding that institutional inclusion ($\beta = 0.412$, $p < .001$) is the strongest predictor are as follows: First, this finding provides evidence against narrow economic determinism, which would indicate that economic

capacity ($\beta = 0.198$) is a much larger influence than institutional factors. Since the influence of institutional factors is roughly twice that of economic capacity, this suggests that, even in low-income communities, there are avenues for increasing the potential for participation by reforming the laws and regulations governing the community (for example, creating transparent rules for government operations, creating inclusive structures for community meetings, recognising community associations formally, and providing accessible grievance procedures). Second, the effect size of this result ($\beta = 0.412$) is quite large relative to what one would expect in a social sciences context, and it is comparable to findings in several meta-analyses (Usadolo, 2025; Mansuri & Rao, 2013). Third, the finding directly supports H1 and is consistent with the collaborative governance theory which posits that the existence of formal institutional arrangements is the primary factor in determining whether participation will result in influence (Scott et al., 2020).

The second strongest predictor was social trust ($\beta = 0.286$, $p = .003$), which supports H2 and establishes a new domain of enhancement for social capital theory with respect to the governance of infrastructure (Muhammed, 2020; Campbell, 2023). The finding that social trust retains independent explanatory power even when controlling for institutional inclusion can also be interpreted as evidence that formal rules and informal social norms complement each other rather than substitute for one another. Therefore, communities with high levels of both institutional inclusion and social trust are likely to achieve the highest levels of participation.

4) Participation as a Mediating Mechanism

In this investigation, SEM supports this research with unique findings and theoretical contribution. Specifically, the direct path from citizen's participatory process ($\beta=0.56$, $p<.001$) to community's infrastructure and service outcomes had the highest estimated standardised coefficient of any of the governance inputs. The $\beta=0.56$ implies that a 1 standard deviation increase in citizen participation will lead to a 0.56 standard deviation increase in community's infrastructure and service outcomes.

The mediation result (H5 supported) is the most important theoretical contribution of the study. The bootstrap bias-corrected confidence interval of the indirect effect of institutional inclusion (0.269 (95% CI [0.168, 0.385])) does not contain zero and demonstrates that mediation was statistically significant. Moreover, 71.0% of the overall effect of good to great governance on the community's infrastructure and service outcomes is accounted for by community participation. Therefore, to explode why good to great governance matters, because although institutional inclusion nor social trust directly builds new roads or repairs old broken pipes, they enable communities to effectively participate in the decision; and when the community effectively participates in the decision, they are able to participate in the implementation and monitoring of that decision. The non-significant result for the χ^2 difference test

comparing the full mediation model and the partial mediation model ($\Delta\chi^2(3) = 6.3, p = .098$) suggests the preference for the more parsimonious full mediation model. However, the non-significant direct effects of the partial mediation model, which were positive (0.11, 0.08, 0.05) still support the hypothesis of all governance's direct effects having positive effects. This suggests partial rather than full mediation, consistent with the interpretation that participation is a primary but not exclusive mechanism.

5) Participatory Governance Framework

Based on the SEM results presented in Section 4, this study proposes a parsimonious, empirically validated Governance-Participation-Performance (G-P-P) Framework. Unlike descriptive frameworks that simply list factors, the G-P-P model specifies causal pathways: governance inputs → participation (mediator) → infrastructure outcomes. The framework consists of three core components:

Component 1: Governance Inputs (Independent Variables)

- Institutional inclusion*: Transparent decision-making rules, formal recognition of community development associations, accessible grievance mechanisms, and inclusive meeting structures.
- Social trust*: Interpersonal trust among residents, trust between residents and local authorities, and collective identity/cohesion.
- Economic capacity*: Household financial resources, affordability of participation (time and money), and flexible contribution options.

Component 2: Community Participation (Mediator)

- Consultation (being asked before decisions are made)
- Planning involvement (contributing to project design and prioritization)
- Monitoring (overseeing implementation and maintenance)
- Contribution (financial, labor, or material resources)

Component 3: Infrastructure Outcomes (Dependent Variable)

- Service quality (roads, water, electricity, drainage, waste, security)
- Accountability (transparency in resource use, responsiveness to complaints)
- Sustainability (long-term maintenance, community ownership)

Figure 5 presents the framework visually. The arrows indicate causal direction as confirmed by SEM (path coefficients shown in brackets)

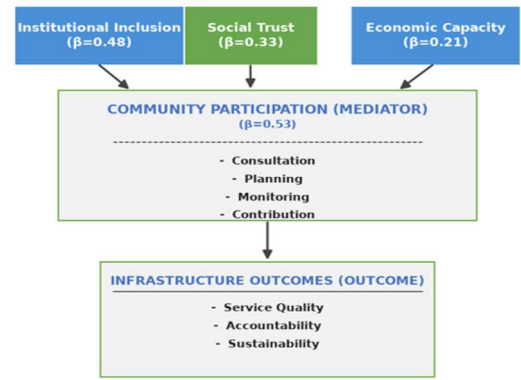


Figure 5 Empirically Validated Governance-Participation-Performance (G-P-P) Framework for Community Infrastructure Provision

How to use the framework in practice:

- Policymakers: Strengthen institutional inclusion (mandate community representation on project committees) before expecting higher participation.
- Estate managers: Build social trust through transparent communication and regular feedback forums.
- Community leaders: Design flexible participation options (evening meetings, rotating roles) to accommodate varying economic capacities.

6) Limitations and Future Research

This study has identified five limitations regarding its methodology. First, because of the use of a cross-sectional design, causal inferences cannot be made from these results. While the SEM results were consistent with the hypothesized governance→community→participation→outcomes pathway, causation cannot be established without the use of longitudinal or quasi-experimental designs. Second, although the study sample was relatively small (N=212), it will still provide adequate but minimal statistical power when using the results from the tested SEM (0.79), therefore, future studies should utilize larger samples for replication. Third, the study only examined the public residential estates in Abuja; therefore, additional empirical testing would be necessary to determine the generalizability of these results to informal settlements or to other cities in Nigeria. Fourth, the self-reported nature of the data may introduce bias, and while there was no evidence of common method variance within the dataset, future studies should gather objective measures of infrastructure quality (e.g., technical audits; administrative records). Finally, the use of reflective measurements requires covariate indicators, so future research should examine other formative measurement specifications where they are theoretically applicable.

IV. CONCLUSION

There is a systematic link between spatial inequalities of urban infrastructure and the type of governance structures present at both local (i.e. Abuja) and national (i.e. Nigeria). This study uses community involvement as a mediating factor to show that there is a link between governance structure and infrastructural outcomes in residential estates in Abuja (indirect effect of community involvement on governance structure and infrastructural outcomes = 0.269, 95% bootstrap confidence interval = 0.168 – 0.385). There are four major findings in regards to the effectiveness of community involvement in the context of governance structure and infrastructural outcomes using a cross-sectional study. One: Infrastructure quality decreases dramatically between the local authorities of AMAC and peripheral local authorities, such as Kuje or another, as demonstrated by the fact that they have separate 95% confidence intervals for infrastructure quality that are not overlapping. Two: Most people have put their participation in infrastructure projects in the form of monetary contributions (an average of 3.11 for financial contribution), but there was very little actual participation as evidenced by the average of 2.54 for monitoring involvement and an average of 3.61 for elite capture participation. Three: There was a stronger relationship between community involvement in terms of institutional inclusion ($\beta = 0.412$) and social trust ($\beta = 0.286$) than between community involvement and economic capacity ($\beta = 0.198$). Four: The empirically verified Governance-Participation-Performance framework supports empirical evidence of community involvement and acts as a mediating mechanism in conjunction with both governance structure and infrastructure outcome.

In conclusion, this study is a unique contribution of SEM-based empirical evidence on how governance, community involvement, and infrastructural outcomes in an African nation such as Nigeria can be interrelated along one empirically verified pathway of participation through governance, community involvement, and infrastructural outcome. In terms of future directions for research, it is suggested that further research on this Governance-Participation-Performance framework should provide longitudinal assessments of the empirical nature of the relationship between governance, community involvement, and infrastructural outcomes and should be conducted in both informal development settings and include more objective measurements of infrastructure.

AUTHOR CONTRIBUTIONS

S. A. Momoh: Conceptualization, Investigation, Formal analysis, Writing-original draft & review, Resources, editing, Data curation, Validation. **A. D. Isah:** Methodology, Resources, Editing, Investigation and Data curation. **M. I. Bala:** Formal analysis, Resources, Funding acquisition, Investigation, Resources, and Data curation. **C. Y. Makun:** Formal analysis, Resources, Funding acquisition, Visualization

and Project administration, Supervision, review and editing.

REFERENCES

- Arnstein, S. R. (1969).** A ladder of citizen participation. *Journal of the American Institute of Planners*, 35(4), 216–224. <https://doi.org/10.1080/01944366908977225>.
- Campbell, J. W. (2023).** Public participation and trust in government: Results from a vignette experiment. *Journal of Policy Studies*, 38(2), 23–31.
- Collord, M., Goodfellow, T., & Asante, L. A. (2021).** Uneven development, politics and governance in urban Africa: An analytical literature review (Working Paper 2021-02). African Cities Research Consortium.
- Cornwall, A. (2008).** Unpacking participation: Models, meanings and practices. *Community Development Journal*, 43(3), 269–283. <https://doi.org/10.1093/cdj/bsn010>.
- Creswell, J. W., & Creswell, J. D. (2023).** Research design: Qualitative, quantitative and mixed methods approaches (6th ed.). Sage Publications.
- Egila, M. M., Ayenajeh, E. S., Obadoba, O. J., & Alao, A. A. (2023).** Urban planning and management issues that affect immigrants in Abuja. *International Journal of Innovative Environmental Studies Research*, 11(3), 171–178.
- Etim, O. F., Okposin, U. N., & Ebong, I. B. (2025).** Community participation and socio-economic development in rural areas of Akwa Ibom State. *MSI Journal of Multidisciplinary Research*, 2(5), 1–40.
- Fayomi, I., Soretire, O., & Oguntokun, B. (2025).** Analysis of challenges affecting community participation in public infrastructure development in Ibadan. *Journal of Urban Development*, 12(3), 45–62.
- Francesco, T., & Luca, M. (2024).** Smart urbanism in Africa: When theories do not fit with contextual practices. *Regional Studies*, 58(9), 1767–1777. <https://doi.org/10.1080/00343404.2024.2316789>.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2021).** Multivariate data analysis (8th ed.). Cengage Learning.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015).** A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>.
- Kiss, B., et al. (2022).** Citizen participation in the governance of nature-based solutions. *Environmental Policy and Governance*, 32(3), 247–272. <https://doi.org/10.1002/eet.1987>.
- Muhammed, M. (2020).** Book review: Making democracy work: Civic tradition in modern Italy. *Journal of Political Science*, 4, 12–14.
- Oyetunji, A., Oloke, O. S., Olaniyi, O. O., & Alao, A. A. (2021).** Geospatial analysis of urban expansion in the Federal Capital Territory, Abuja. *Journal of Geographic Information System*, 13(4), 412–428. <https://doi.org/10.4236/jgis.2021.134023>.
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012).** Sources of method bias in masocial science research and recommendations on how to control it. *Annual Review of Psychology*, 63, 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>.
- Rachida, E., & Hassan, R. (2023).** Urbanization and sustainable urban infrastructure development in Africa.

Environment and Ecology Research, 11(2), 385–391. <https://doi.org/10.13189/eer.2023.110213>.

Scott, D., Chris, A., Charles, F. P., Eva, S., Paul, T. H., & Jacob, T. (2020). Understanding collaboration: Introducing the Collaborative Governance Case Databank. Policy and Society, 39(4), 1–15. <https://doi.org/10.1080/14494035.2020.1799425>.

Sidiq, A., Musa, I., & Alao, A. (2026). Urban infrastructure financing and service delivery outcomes in the Federal Capital Territory, Nigeria. MSI Journal of Economics and Business Management, 3(1), 1–13.

Sisson, A., McGuirk, P., Dowling, R., Baker, T., & Maalsen, S. (2023). Innovating urban governance through 'Challenges'. Journal of Urban Affairs, 47(1), 1–17. <https://doi.org/10.1080/07352166.2023.2168685>.

Usadolo, S. (2025). An examination of the participatory development approach in a local community project. Community Development Journal, 14, 65–95.

World Bank (2025). Overview of the new Infrastructure Governance Assessment Framework (InfraGov 2.0) (English). Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/099013125121510134>.

Zheng, B. Q., & Bentler, P. M. (2025). Enhancing model fit evaluation in SEM: Practical tips for optimizing chi-square tests. Structural Equation Modeling: A Multidisciplinary Journal, 32(1), 136–141.