

Public-Private Partnerships and Urban Road Infrastructure Quality in Emerging Nigerian Urban Areas: Evidence from Nasarawa State

Ali Adamu¹; Davidson S.A. Alaci²; Eya M.A.³

² Department of Urban and Regional Planning, University of Jos

^{1,3} Department of Urban and Regional Planning, Nasarawa State University Keffi

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Abstract: Urban road infrastructure is critical to the functioning, accessibility and economic integration of emerging urban areas. In Nigeria the provision continues to be constrained by inadequate funding, weak budget execution, institutional fragmentation and limited maintenance capacity. This study examines the potential of Public-Private Partnerships (PPPs) as a mechanism for improving the quality and sustainability of urban road infrastructure in selected urban areas of Nasarawa State, Nigeria. The study adopted a mixed-methods research design involving questionnaire surveys, key-informant interviews, stakeholder consultations and analysis of policy and budgetary documents. The study focused on Lafia, Akwanga, Keffi and Nasarawa urban areas. Data were analysed using descriptive statistics, correlation and regression analysis, alongside thematic and content analysis of qualitative evidence. The analysis considered investment type, policy consistency, PPP adoption and stakeholder participation in relation to the sustainability and quality of urban road infrastructure. Findings indicate a substantial gap between approved allocations and actual expenditure on urban roads. This reflects challenges in translating financial commitments into infrastructure delivery. Between 2017 and 2020, ₦11.71 billion was approved for urban roads, but only ₦1.34 billion was expended. Investment was also spatially uneven, with Lafia and Keffi received larger expenditure shares than Akwanga and Nasarawa. Stakeholder evidence further indicates dissatisfaction with existing road delivery, while 49% expressed support for collaborative mechanisms involving government, private-sector actors and communities. The study also establishes the importance of governance and institutional capacity in determining infrastructure outcomes, with governance indices explaining 48% of the variation in road quality. The study concludes that PPPs can complement public financing and improve urban road infrastructure delivery. Nonetheless, their effectiveness depends on transparent financing arrangements, institutional capacity, policy consistency, stakeholder participation, effective monitoring and accountability. It recommends a diversified financing framework incorporating performance-based budgeting and PPPs to support sustainable and spatially equitable urban road infrastructure provision in emerging Nigerian urban areas.

Keywords: Public-Private Partnerships; Urban Road Infrastructure; Infrastructure Financing; Road Quality; Urban Governance; Sustainable Infrastructure; Nasarawa State; Nigeria.

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I. INTRODUCTION

Urban road infrastructure is fundamental to the functioning, accessibility and economic competitiveness of cities. Rapidly urbanising developing countries in particular where roads provide the principal links between residential areas, employment centres, markets and regional transport corridors are appeared to be socio-economic integrated. However, the growing demand for urban mobility is occurring alongside persistent constraints in public infrastructure financing, project implementation and maintenance. Public-Private Partnerships (PPPs) have consequently gained

renewed attention as an alternative institutional arrangement through which governments can mobilise private capital, technical expertise and management capacity for infrastructure development. Recent evidence indicates that private participation in infrastructure has recovered substantially following the COVID-19 downturn, with transport accounting for a major share of private infrastructure investment in low- and middle-income countries, particularly through road projects (World Bank, 2023). A recent review of road PPPs similarly identifies PPPs as an increasingly important alternative to conventional public procurement for the construction, operation and maintenance of road

infrastructure (Babalola et al., 2024). However, PPPs should not be absolutely regarded simply as a means of transferring infrastructure costs from the public to the private sector. Their effectiveness depends on appropriate risk allocation, long-term contractual arrangements, institutional capacity, financial sustainability and effective public oversight. Thus, the contemporary debate has shifted from whether PPPs can mobilise private resources to whether they can deliver quality, value for money and sustainable infrastructure outcomes.

The literature increasingly demonstrates that the performance of PPPs infrastructure projects is strongly conditioned by the institutional and governance environment within which partnerships operate. Gupta and Sharma (2023), examining emerging economies, argue that institutional and governance factors are central to the ability of PPPs arrangements to attract investment and achieve sustainable infrastructure outcomes. Similarly, recent research on transport infrastructure in Africa identifies project governance, performance management, institutional strengthening, participatory governance and accountability as important determinants of infrastructure performance (Ahiaga-Dagbui et al., 2024). Evidence from comparative research on Nigeria and South Africa further shows that PPP performance is influenced by factors including the legal and regulatory framework, conditions of financial-market, economic stability and procurement transparency, with institutional weaknesses constituting a major constraint to successful PPPs implementation in Nigeria (Deinde-Adedeji et al., 2024). The experience of PPPs in other emerging economies also cautions against assuming that private participation automatically produces better infrastructure. For example, research on China's increasing use of PPPs in Africa highlights concerns relating to financial terms, public accountability, corruption and popular contestation, demonstrating that PPPs can generate new governance and fiscal risks when institutional safeguards are weak (van Wieringen & Zajontz, 2023). These findings suggest that the quality of infrastructure delivered through PPPs is not determined by private participation alone; rather, it emerges from the interaction between investment mobilisation, institutional capacity, governance quality, regulatory consistency, stakeholder participation and project management.

Conceptually, this study therefore views PPPs-Based urban road infrastructure delivery as a governance-investment-infrastructure quality system, rather than merely a financing mechanism. The framework assumes that PPPs adoption can influence road infrastructure quality through the mobilisation of additional investment, private-sector technical expertise, risk sharing, improved project management and lifecycle maintenance. However, these potential benefits are mediated by policy consistency, institutional capacity, transparency, monitoring and evaluation, and above all meaningful participation of relevant stakeholders. This conceptualisation appears consistent with contemporary PPPs literature, which emphasises that governments require appropriate legal frameworks, institutional capacity and project-preparation mechanisms to convert private capital into sustainable infrastructure outcomes (World Bank, 2023; Gupta & Sharma, 2023). The framework also recognises that private

participation may generate adverse outcomes where contracts are poorly designed, risks are inefficiently allocated, or public accountability is weak. Indeed, the World Bank emphasises that successful PPPs programmes require political wills and commitment, appropriate but also genuine legal and regulatory frameworks and institutional capacity to prepare, procure and manage PPPs projects.

Accordingly, the proposed relationship can be represented as PPPs adoption → investment mobilisation and risk sharing → project implementation and maintenance → urban road infrastructure quality, with governance, institutional capacity, policy consistency and stakeholder participation acting as critical enabling conditions.

Despite the expanding international literature on PPPs, important empirical and contextual gaps remain in understanding how PPPs can contribute to the quality and sustainability of urban road infrastructure in the Nigeria emerging urban areas. Much of the recent debate has concentrated on national-scale infrastructure programmes, major transport corridors or large PPP projects, while comparatively less attention has been given to the urban road systems of secondary and emerging cities where infrastructure deficits, limited municipal resources and uneven investment are particularly pronounced. This gap is significant in Nasarawa State, where the present study identifies substantial differences between approved and actual urban-road expenditure and uneven spatial distribution of investment across Lafia, Akwanga, Keffi and Nasarawa. The proposition evidence shows, for example, that although ₦11.71 billion was approved for urban roads during 2017-2020, only ₦1.34 billion was actually expended, while Lafia and Keffi received substantially larger expenditure shares than Akwanga and Nasarawa. Stakeholder evidence also indicates considerable dissatisfaction with existing road delivery alongside support for collaborative mechanisms involving government, private-sector and community actors. Against this background, this paper examines Public-Private Partnerships and urban road infrastructure quality in emerging Nigerian urban areas, using Nasarawa State as a case study. It specifically investigates the relationship between PPP adoption, investment mechanisms and road infrastructure outcomes while examining the institutional and governance conditions that may enhance or constrain PPPs effectiveness. The study contributes empirical evidence from a sub-national Nigerian context and provides a framework for integrating PPPs with transparent financing, accountable governance and sustainable urban road infrastructure planning.

II. LITERATURE REVIEW

➤ *Public-Private Partnerships and Urban Infrastructure Financing*

Public-Private Partnerships have increasingly become an important institutional mechanism for addressing infrastructure financing constraints, particularly where public resources are insufficient to meet rapidly expanding infrastructure needs. The rationale for PPPs extends beyond the mobilisation of private capital to include the transfer or sharing of project risks, access to technical expertise,

innovation and improved lifecycle management. Global evidence indicates that private investment in infrastructure has become an increasingly important component of infrastructure finance. Although, the investment remains unevenly distributed between high-income and developing economies. The World Bank's Infrastructure Monitor 2023 reported a significant rebound in private infrastructure investment, with large transport projects contributing substantially to this recovery, while observing that investment growth remained much stronger in high-income economies than in low- and middle-income countries. This disparity is important for emerging Nigerian urban areas because the availability of private capital does not automatically imply its availability for smaller urban infrastructure projects. Fleta-Asín and Muñoz (2023), using evidence from 9,121 PPP projects across 107 developing countries, found that competitive procurement, appropriate risk allocation, government support and stronger institutional environments are associated with larger PPP investment volumes. The implication appears that PPPs require more than private-sector willingness to invest but also require an institutional environment capable of reducing uncertainty and making infrastructure projects financially and administratively viable.

The relevance of this issue is particularly pronounced in Nigeria, where infrastructure deficits coexist with substantial fiscal pressures and rapidly growing urban populations. Recent policy developments demonstrate an increasing emphasis on private-sector participation in infrastructure provision. In 2025, the Nigerian Federal Government reaffirmed its commitment to long-term private concessions for highway development, with nine highway projects covering more than 900 km reportedly being developed under concession arrangements valued at approximately ₦1.5 trillion. The Federal Ministry of Works has similarly sought to strengthen the operational model of the Highway Development and Management Initiative (HDMI) to improve quality delivery and utilisation of road infrastructure under PPPs arrangements. More recently, in February 2026, the Federal Ministry of Budget and Economic Planning and the International Finance Corporation announced cooperation to develop a pipeline of PPPs projects across key infrastructure sectors, including transport. The objective centre around mobilising private capital and expertise. These developments demonstrate the growing policy relevance of PPPs in Nigeria. However, most prominent Nigerian PPPs initiatives have focused on major highways and nationally significant infrastructure, creating an important question regarding whether and how PPPs arrangements can contribute to the provision and quality of urban roads in emerging and secondary urban areas, where revenue streams, institutional capacity and private-sector incentives may be considerably weaker.

➤ *Public-Private Partnerships and Urban Road Infrastructure Quality*

The Public-Private Partnerships literature has increasingly moved beyond the question of whether partnerships can provide additional financing to consider whether they generate superior infrastructure and service outcomes. In road infrastructure, PPPs may potentially

improve quality through integrated responsibility for construction, operation and maintenance, stronger performance incentives, lifecycle costing and private-sector technical expertise. Babalola et al. (2024), in their review of PPPs in road infrastructure projects, identify PPPs as an increasingly important approach to road development while emphasising the importance of appropriate contractual, financial and institutional arrangements for successful implementation. The quality argument is particularly important because conventional public procurement may separate road design, construction and maintenance, potentially creating weak incentives for lifecycle performance. A PPPs arrangement can, where appropriately designed, link these functions and transfer some performance risks to the private partner. However, the relationship between PPPs and infrastructure quality is not necessarily automatic. Poor contract design, weak monitoring, inadequate risk allocation, political interference and limited institutional capacity can undermine expected efficiency gains. Research comparing developed and emerging economies similarly demonstrates that the appropriate choice of PPPs procurement model depends on the institutional and economic conditions of the host environment. Thus, the relevant question is not simply whether PPPs are present, but whether the institutional arrangements surrounding PPPs create incentives for quality, maintenance, accountability and long-term infrastructure performance.

This distinction is particularly important for urban roads because infrastructure quality has multiple dimensions. A road may be physically constructed but still perform poorly if maintenance is insufficient, connectivity remains weak, accessibility is limited or the facility deteriorates rapidly. Accordingly, PPPs performance should be assessed in relation to infrastructure outcomes rather than financial participation alone. The present study therefore conceptualises urban road infrastructure quality as an outcome influenced by the interaction between investment mechanisms, project implementation and institutional governance. This approach is consistent with Gupta and Sharma's (2023) empirical analysis of 114 emerging economies over a 20-year period, which found a positive relationship between institutional and governance conditions and private investment in PPPs infrastructure arrangements. Additionally, evidence from developing countries PPPs indicates that government effectiveness, control of corruption and other dimensions of governance can shape the ability of PPPs arrangements to attract and sustain private investment. The implication for urban road infrastructure is that the quality benefits expected from PPPs depend substantially on the capacity of government to formulate appropriate contracts, regulate private partners, monitor performance and ensure compliance with agreed MOU and standards.

➤ *Governance, Institutional Capacity and PPPs Performance*

Governance constitutes a central explanatory dimension in understanding PPP performance because infrastructure partnerships involve long-term relationships between actors with different interests, resources and levels of power. Unlike conventional procurement, PPPs require governments to

perform multiple roles as policy makers, regulators, contract managers and, in some cases, financial partners. Weakness in any of these functions can affect project execution. Gupta and Sharma (2023) demonstrate that government effectiveness, regulatory quality, political stability and control of corruption are positively associated with PPP investment in emerging economies. This suggests that private investors respond not only to the financial attractiveness of projects but also to the predictability and credibility of the institutional environment. Fleta-Asín and Muñoz (2023) similarly show that stronger economic and institutional frameworks are conducive to larger PPP investment projects in developing countries. These findings reinforce the argument that PPPs should be understood as institutional arrangements embedded within wider systems of public governance rather than as independent financing instruments.

The Nigerian context provides a particularly relevant setting for examining this relationship. Although Nigeria has established a federal institutional framework for PPPs through the Infrastructure Concession Regulatory Commission (ICRC), implementation challenges remain at different levels of government. The ICRC current framework emphasises project development, procurement and regulation, while its records indicate the existence of multiple PPP contracts across infrastructure sectors, including road and highway projects. The Federal Government has also directed Ministries, Departments and Agencies to comply with the National Policy on PPP and the ICRC Establishment Act when undertaking PPP arrangements. Nevertheless, the existence of a formal framework at the national level does not necessarily guarantee effective PPP implementation at the state and urban levels. Differences in institutional capacity, financial resources, technical expertise, political priorities and monitoring arrangements can influence how PPPs are structured and implemented. This creates a particularly important research problem for states such as Nasarawa, where urban infrastructure needs are substantial but the financial and institutional capacity of local urban systems may be considerably more constrained than that of major metropolitan centres.

➤ *Public-Private Partnerships, Stakeholder Participation and Sustainable Urban Infrastructure*

Stakeholder participation is another important dimension of PPP effectiveness. PPPs involve more than government and private investors most especially urban road projects that affect communities, businesses, transport operators, landowners, road users and other public agencies. Meaningful participation can improve project legitimacy, identify local needs, reduce implementation conflicts and strengthen accountability. Equally, limited participation can generate opposition, reduce public trust and undermine project sustainability. Contemporary PPP scholarship therefore increasingly treats collaboration, transparency and stakeholder engagement as components of effective infrastructure governance rather than optional additions to project implementation. The Nigeria recent experience also illustrates the importance of stakeholder consensus. In reviewing road concession arrangements under the HDMI programme, the Federal Government identified stakeholder consensus

building and active citizen participation among issues requiring attention in the effective implementation of road construction, tolling and maintenance. This is particularly relevant to urban roads because their effects are immediate and geographically concentrated, making community acceptance and local participation critical to project success.

Moreso, within the context of Nasarawa State, stakeholder participation is especially significant because the study empirical evidence suggests dissatisfaction with existing urban road delivery while simultaneously revealing support for collaborative approaches involving government, private-sector actors and communities. The proposition reports that 66% of stakeholders expressed dissatisfaction with existing road infrastructure delivery, whereas 49% agreed that collaborative mechanisms involving government, the private sector and communities could significantly improve urban road delivery. These findings indicate that the challenge may not be a lack of stakeholder willingness to participate, but rather the inadequacy of institutional mechanisms through which participation can influence investment decisions, project design, implementation and monitoring. Consequently, stakeholder participation is treated in this study as an important component of the institutional environment within which PPP-based road infrastructure delivery occurs.

➤ *Research Gap*

Although the literature provides substantial evidence on PPP financing, institutional governance and infrastructure development, three significant gaps remain. First, much of the empirical PPP literature examines national infrastructure systems, major transport corridors or large-scale infrastructure investments, with relatively limited attention to the financing and quality of urban road infrastructure in secondary and emerging urban areas. Second, existing studies frequently examine PPP investment and governance as separate issues, whereas the quality of urban road infrastructure is likely to emerge from their interaction. Third, there is insufficient sub-national empirical evidence from Nigeria linking PPP adoption and investment mechanisms to observable urban road infrastructure outcomes while simultaneously accounting for institutional capacity, policy consistency and stakeholder participation.

This study addresses these gaps by examining the relationship between PPP adoption, investment mechanisms and urban road infrastructure quality in four selected urban areas of Nasarawa State namely; Lafia, Akwanga, Keffi and Nasarawa. The study builds upon these variables investment type, policy consistency, PPP adoption and stakeholder participation, with sustainability of road investment as the dependent outcome. It further incorporates the governance and institutional dimensions, thereby moving beyond a narrow financing interpretation of PPPs. The study consequently asks whether greater reliance on collaborative investment mechanisms is associated with better road infrastructure outcomes and under what institutional conditions PPPs can contribute to sustainable urban road provision.

III. METHODOLOGY

The study adopted a mixed-methods research design as shown in table 1 to examine the relationship between Public-Private Partnerships (PPPs), investment mechanisms and urban road infrastructure quality in selected emerging urban areas of Nasarawa State, Nigeria. The study focused on Lafia, Akwanga, Keffi and Nasarawa. The urban areas provide contrasting contexts for examining urban road investment, accessibility and infrastructure delivery. The mixed-methods approach was considered appropriate because PPP-based infrastructure provision is simultaneously a financial, institutional, spatial and governance phenomenon that cannot be adequately understood through quantitative evidence alone.

Quantitative data provided evidence on stakeholder perceptions and relationships among the study variables. The qualitative on the other hand provided contextual evidence explanations concerning financing, institutional coordination, policy implementation, stakeholder participation and infrastructure delivery. The use of mixed methods also permitted triangulation of evidence and the development of integrated interpretations rather than treating the quantitative and qualitative components as independent investigations (Creswell & Plano Clark, 2018 and McKim, 2023). The study focusses on the four urban centres and its integration of questionnaire surveys, interviews, stakeholder consultations and documentary evidence.

Table 1 Research Design and Evidence Integration

Component	Application in the study	Purpose
Research design	Convergent mixed-methods design	Integrate quantitative and qualitative evidence on PPPs, investment and road infrastructure quality.
Quantitative strand	Structured questionnaire; descriptive and inferential analysis	Measure perceptions of PPP adoption, policy, budget, participation, road quality and related outcomes.
Qualitative strand	Semi-structured interviews and stakeholder consultations	Explain institutional arrangements, financing constraints, implementation, maintenance and stakeholder participation.
Secondary evidence	Budget/expenditure records, policy/planning documents and institutional reports	Establish investment patterns and provide documentary evidence for triangulation.
Integration	Triangulation and joint interpretation	Identify convergence, explanation and divergence between quantitative and qualitative evidence.

Source: The Researcher, 2026.

Primary and secondary data were utilised. Primary data were obtained through structured questionnaires administered to relevant respondents and through semi-structured interviews and stakeholder consultations involving actors with knowledge of urban road planning, financing, implementation, regulation and use. This was done according to prevailing population distribution of the study areas as shown in table 2 and the sampling techniques adopted also shown in table 3. However, the questionnaire captured perceptions relating to PPP adoption, investment mechanisms, policy consistency, stakeholder participation and urban road infrastructure quality/sustainability, whereas interviews provided deeper evidence concerning institutional arrangements, financing constraints, implementation challenges and opportunities for private-sector participation.

The secondary data were obtained from state budget and expenditure records, policy and planning documents, institutional reports and relevant PPP documentation. This documentary component is particularly important because it provides evidence of actual investment patterns against which stakeholder perceptions can be assessed. In addition, the analysis incorporated the emerging institutional environment for PPPs in Nasarawa State, including the state's PPP framework, thereby allowing the study to consider PPP not merely as a financing mechanism but as an institutional arrangement requiring appropriate governance, regulation and accountability. This approach is supported by recent studies showing that institutional and governance conditions are important determinants of PPP investment and performance in emerging economies (Gupta & Sharma, 2023; Deinde-Adedeji et al., 2024).

Table 2 Study Area and Sampling Distribution

Urban centre	Projected 2026 population	Sample/respondents	Share (%)
Akwanga	525,312	460	30
Keffi	760,000	307	20
Lafia	1,548,272	384	25
Nasarawa	878,560	384	25
Total	3,712,144	1,534	100

Source: The Researcher, 2026.

Table 3 Sampling Approaches and Data Sources

Analytical component	Sampling/data approach	Principal evidence
Urban road network provision	Stratified sampling and secondary spatial/planning data	Road network distribution, condition and connectivity.
Inter-urban accessibility	Stratified sampling of transport officials, planners and road users	Travel time, accessibility and network efficiency.
Institutional framework	Purposive and random sampling	Government/institutional perspectives and public perceptions.
Strategic interventions	Convenience sampling of accessible stakeholders	Perceptions of strategic interventions, investment and stakeholder engagement.
Documentary analysis	Policy, budget, project and institutional records	Funding patterns, implementation and policy environment.

Source: The Researcher, 2026.

The principal dependent construct was urban road infrastructure quality/sustainability, while the major explanatory variables were PPP adoption, investment type, policy consistency and stakeholder participation as shown in table 4. These supported by the available data, institutional capacity and governance were considered as additional

explanatory or enabling conditions. The quantitative data were analysed using descriptive statistics, including frequencies, percentages, means and standard deviations, while inferential analysis was used to examine relationships between the explanatory variables and road infrastructure outcomes.

Table 4 Variables and Analytical Operationalisation

Construct	Role	Indicative measurement/analysis
PPP adoption/participation	Independent variable	PPP Index/perceived private-sector participation; relationship with quality and accessibility.
Policy consistency	Independent/governance variable	Policy Index; direct relationship with quality, accessibility and other outcomes.
Budget/investment conditions	Independent/governance variable	Budget Index and documentary expenditure/utilisation evidence.
Stakeholder participation	Independent/governance variable	Participation Index; relationship with accessibility and satisfaction.
Urban road quality	Dependent/intermediate outcome	Quality Index; road quality and infrastructure performance.
Accessibility	Intermediate outcome	Accessibility Index; links to economic impact and satisfaction.
Economic impact	Outcome	Economic Impact Index.
User satisfaction	Outcome	Satisfaction Index.

Source: The Researcher, 2026.

Correlation and regression techniques were employed using propositions in table 5, where the measurement properties of the variables permitted, with the general analytical relationship expressed as: $URIQ = \beta_0 + \beta_1PPP + \beta_2INV + \beta_3POL + \beta_4STAKE + \epsilon$, where URIQ represents Urban Road Infrastructure Quality, PPP represents PPP adoption, INV represents Investment Mechanisms, POL represents Policy Consistency and STAKE represents Stakeholder Participation. Importantly, the study treats these relationships as associations or predictive relationships rather than definitive causal effects, given the observational nature of the data. This is methodologically important because recent

evidence indicates that the effects of private-sector participation on road infrastructure outcomes vary according to contractual arrangements, institutional conditions and project context (Esperilla-Niño-de-Guzmán et al., 2024 and Transport Reviews, 2026). Qualitative interview and stakeholder evidence was analysed thematically, focusing particularly on institutional coordination, budget execution, policy implementation, political influence, private-sector participation, community engagement and maintenance. The quantitative and qualitative findings were subsequently integrated through triangulation to identify areas of convergence, explanation and divergence.

Table 5 Quantitative and Qualitative Analysis Matrix

Research evidence	Statistical/analytical technique	Purpose
Likert-scale survey responses	Frequencies, percentages, means and standard deviations	Describe stakeholder perceptions and index performance.
PPP and road-quality indices	Scatter plot/fitted regression relationship	Assess direction and pattern of association.
Governance predictors and outcomes	Path coefficients (β)	Assess direct relationships among policy, budget, PPP, participation and outcomes.

Investment records	Budget utilisation calculation and spatial comparison	Compare approved allocations with actual expenditure.
Interviews/stakeholder evidence	Thematic analysis	Identify governance, financing, maintenance and participation constraints.
Mixed evidence	Triangulation/joint interpretation	Explain statistical patterns using institutional and stakeholder evidence.

Source: The Researcher, 2026.

The study recognises limitations associated with its focus on four urban centres, the perception-based nature of some variables, and the observational design, which limits broad causal generalisation. Nevertheless, combining questionnaire evidence, interviews, stakeholder consultations, budgetary records and policy documents provides a strong basis for triangulating the financial, institutional and infrastructure dimensions of PPP-based road delivery. This approach is particularly relevant because contemporary PPP research emphasises that successful infrastructure partnerships depend not only on private capital but also on effective governance, institutional capacity, appropriate risk allocation, transparency and stakeholder engagement (Gupta & Sharma, 2023; Babalola et al., 2024). The methodology therefore provides an empirical basis for assessing whether PPPs can contribute to improved and sustainable urban road infrastructure in emerging Nigerian urban areas while recognising the institutional conditions required for such arrangements to be effective.

IV. THE RESULTS

The analysis in tables 6 and 7 were the strategic investment mechanisms, revealed a substantial gap between approved funding and actual expenditure on urban roads in Nasarawa State. Between 2017 and 2020, ₦11.71 billion was approved for urban road infrastructure, but only ₦1.34 billion was expended. The expenditure ratio was therefore approximately 11.47%, indicating substantial under-utilisation of approved resources. The period between 2021-2024, approved allocations increased to ₦27.71 billion. On the other hand, actual expenditure reached ₦5.91 billion, representing approximately 21.33%. Although this indicates improvement in budget utilisation, the level of implementation remained considerably below approved allocations. Spatially, expenditure was uneven where Lafia accounted for 30% (₦402.8 million) of expenditure during 2017-2020 and 32% (₦1.89 billion) during the periods 2021-2024, whereas Keffi accounted for 20% and 22%, respectively. Akwanga and Nasarawa received substantially smaller shares. This pattern suggests that the challenge confronting urban road provision is not simply the availability of budgetary allocations but also the conversion of approved resources into actual infrastructure delivery and their spatial distribution.

Table 6 Urban Road Investment and Expenditure Performance of the Sampled Urban Centres (2017-2024).

Period	Approved allocation (₦)	Actual expenditure (₦)	Utilisation (%)	Expenditure gap (₦)
2017-2020	11,713,340,330.80	1,342,671,697.50	11.47	10,370,668,633.30
2021-2024	27,717,482,821.22	5,909,161,150.87	21.32	21,808,321,670.35

Source: Nasarawa State Government (2026).

Table 7 Spatial Distribution of Actual Urban-Road Expenditure of the Sampled Urban Centres.

Urban area	2017-2020 amount (₦)	2017-2020 (%)	2021-2024 amount (₦)	2021-2024 (%)
Lafia	402,801,509.25	30	1,890,931,568.20	32
Akwanga	134,267,169.75	10	886,374,172.63	15
Keffi	268,534,339.50	20	1,300,015,453.19	22
Nasarawa	67,133,584.88	5	236,366,446.03	4
Other urban areas	469,935,094.12	35	1,595,473,510.82	27
Total	1,342,671,697.50	100	5,909,161,150.87	100

Source: Nasarawa State Government (2026).

Stakeholder evidence further demonstrates that PPPs were viewed as a potential but underutilised investment mechanism. Only 22% of respondents identified PPPs as an important mechanism for expanding and sustaining road infrastructure, compared with higher concern about maintenance (78%), funding constraints (62%) and political interference (49%). At the same time, the more direct collaboration question produced a cautiously positive response: 25% agreed and 24% strongly agreed that collaboration among government, the private sector and

communities could improve road provision, giving a combined positive response of 49%. Conversely, 17% strongly disagreed and 17% disagreed, while 18% remained neutral. This produces an important result for the paper: stakeholders did not reject PPPs; rather, they appeared to recognise their potential while perceiving them as insufficiently utilised within the existing road-delivery system.

This interpretation is reinforced by the finding that 66% of respondents were dissatisfied or very dissatisfied with current government interventions, while only 24% expressed satisfaction or strong satisfaction. The result is consistent with contemporary PPP literature which emphasises that private

participation does not automatically produce infrastructure improvements and that institutional arrangements, accountability and stakeholder engagement condition PPP performance (Gupta & Sharma, 2023; Babalola et al., 2024).

Table 8 Stakeholder Assessment of Government Interventions and Collaborative PPP Delivery

Indicator	Result (%)	Interpretation
Very dissatisfied/dissatisfied with current interventions	66	Low satisfaction with existing government interventions.
Agree/strongly agree collaboration improves road provision	49	Moderate support for government-private sector-community collaboration.
PPP identified as promising/underutilised mechanism	22	PPP recognised but remains weakly utilised.
Maintenance identified as major challenge	78	Lifecycle maintenance is the most prominent stakeholder concern.
Funding constraints	62	Financing remains a major constraint.
Political interference	49	Governance/political influence remains significant.

Source: Field Survey, 2026.

The descriptive indices shown in table 9, provide further evidence that the strategic intervention system is characterised by moderate rather than optimal performance. The Economic Impact Index recorded the highest mean ($M = 3.12$, $SD = 0.36$), followed by the Policy Index ($M = 3.10$, $SD = 0.34$) and Quality Index ($M = 3.05$, $SD = 0.38$). Accessibility and satisfaction recorded means of 2.96 and 3.00, respectively.

However, the Participation Index was the lowest ($M = 2.78$, $SD = 0.33$), whereas the Budget Index was also relatively modest ($M = 2.95$, $SD = 0.33$). These results suggest that policy frameworks and road interventions have generated some economic and infrastructure benefits, but weaknesses remain in budget effectiveness and participatory governance.

Table 9 Strategic Intervention Indices

Variable	Mean (M)	SD	Minimum	Maximum
Policy Index	3.10	0.34	1.9	4.0
Budget Index	2.95	0.33	1.8	3.9
PPP	2.85	0.34	1.8	3.8
Participation Index	2.78	0.33	1.7	3.8
Quality Index	3.05	0.38	2.0	4.2
Accessibility Index	2.96	0.35	2.0	4.0
Economic Impact Index	3.12	0.36	2.0	4.2
Satisfaction Index	3.00	0.34	2.1	4.1

Source: SPSS Output, 2026

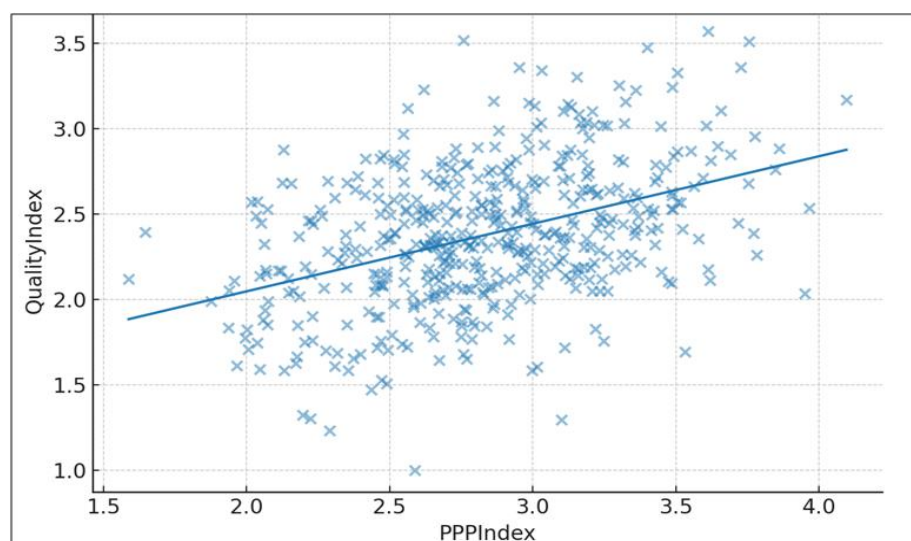


Fig 1 PPP Effectiveness vs Road Quality (scatter + fit).

Source: SPSS path analysis, 2026.

The structural path analysis provides more specific evidence as shown in table 10 where policy and budget each had a coefficient of $\beta = 0.28$ for Urban Road Quality, whereas PPP recorded a smaller direct coefficient of $\beta = 0.13$. thus, accessibility, policy recorded $\beta = 0.20$, budget $\beta = 0.24$, PPP $\beta = 0.20$, and participation $\beta = 0.11$. Quality and accessibility subsequently predicted Economic Impact at $\beta = 0.27$ and $\beta = 0.25$, respectively, and Satisfaction at $\beta = 0.20$ for both

pathways. The broader governance model as shown at table 11 explains 48% of the variation in road quality ($R^2 = 0.48$), with budget execution and institutional capacity identified as the most influential predictors, while qualitative evidence points to delayed budget releases, weak enforcement, poor coordination and tokenistic engagement as important constraints (table 12).

Table 10 Governance Path Coefficients for Urban Road Outcomes

Path	B	Interpretation
Policy → Urban Road Quality	0.28	Positive and relatively strong direct association.
Budget → Urban Road Quality	0.28	Positive and relatively strong direct association.
PPP → Urban Road Quality	0.13	Positive but modest direct association.
Policy → Accessibility	0.20	Positive association.
Budget → Accessibility	0.24	Positive association.
PPP → Accessibility	0.20	Positive association.
Participation → Accessibility	0.11	Weak positive association.
Policy → Economic Impact	0.22	Positive direct contribution.
Policy → Satisfaction	0.25	Positive direct contribution.
Participation → Satisfaction	0.10	Marginal positive contribution.
Quality → Economic Impact	0.27	Positive intermediate/outcome relationship.
Accessibility → Economic Impact	0.25	Positive intermediate/outcome relationship.
Quality → Satisfaction	0.20	Positive relationship.
Accessibility → Satisfaction	0.20	Positive relationship.

Source: SPSS path analysis,2026.

Taken together, these findings indicate that PPP adoption is positively associated with better road infrastructure outcomes, but its contribution is weaker than that of policy and budget conditions and is dependent on institutional and governance capacity. This is consistent with recent research showing that PPP road infrastructure outcomes are context-dependent and that institutional quality, contractual arrangements and lifecycle management are critical to

performance (Gupta & Sharma, 2023; Deinde-Adedeji et al., 2024; Babalola et al., 2024). However, the study demonstrates that PPPs have a positive but modest association with urban road infrastructure quality in Nasarawa State, and that their effectiveness depends less on private-sector participation alone than on the complementary strength of policy consistency, budget execution, institutional capacity and stakeholder participation.

Table 11 Governance Model Explanatory Power

Statistic	Value	Interpretation
R^2 for urban road quality	0.48	Governance-related predictors explain 48% of variation in road quality.
Strongest direct predictors of road quality	Policy = 0.28; Budget = 0.28	Policy and budget conditions exceed the direct PPP coefficient.
PPP direct coefficient	0.13	Positive but modest contribution.
PPP direct coefficient for accessibility	0.20	Positive association with accessibility.

Source: SPSS path analysis,2026.

Table 12 Institutional and Governance Constraints

Constraint	Share of responses (%)
Weak monitoring and evaluation mechanisms	17
Overlapping responsibilities between agencies	13
Corruption/diversion of funds	13
Political influence in project prioritization	12
Bureaucratic delays	12
Poor collaboration between government and contractors	10
Insufficient technical capacity	9
Lack of transparency in budgeting	11
Other	4

Source: Field Survey, 2024.

V. DISCUSSION, POLICY AND PLANNING IMPLICATIONS, AND PROPOSED PPP FRAMEWORK

The findings demonstrate that PPP adoption has a positive but modest association with urban road infrastructure quality in Nasarawa State ($\beta = 0.13$), compared with stronger associations for policy consistency and budget conditions ($\beta = 0.28$ each). This suggests that PPPs should not be conceptualised as a substitute for effective public governance and fiscal management but as a complementary institutional mechanism for mobilising resources, expertise and lifecycle management. The finding is consistent with Gupta and Sharma (2023), whose evidence from 114 emerging economies shows that institutional and governance quality is positively associated with private investment in PPP infrastructure. It also agrees with Deinde-Adedeji et al. (2024), who found that the Nigeria PPPs performance is constrained by weaknesses in critical success factors, including financial conditions, legal and regulatory arrangements, policy stability and procurement transparency.

The relatively modest PPPs coefficient in the present study therefore has an important interpretation as private participation alone cannot overcome weak public institutions. The finding also helps explain why the study recorded substantial gaps between approved and actual road expenditure. PPPs may provide an additional investment channel, but without credible project preparation, predictable policy, transparent procurement and effective contract management, private participation is unlikely to translate automatically into higher-quality or sustainable roads. This is consistent with recent road-PPP literature which identifies PPPs as an alternative to conventional public works but also emphasises that procurement, financing, construction, operation and maintenance arrangements must be appropriately integrated to achieve sustainable infrastructure outcomes (Esperilla-Niño-de-Guzmán et al., 2024).

The findings from a policy perspective, suggest that the Nasarawa State should move from an essentially project-by-project approach to a strategic PPP urban-road investment programme. First, government should establish a prioritised pipeline of economically and socially viable urban road projects based on network connectivity, accessibility deficits, traffic demand, economic importance and maintenance needs through the gazettment of the Nasarawa State Urban Hierarchies. Second, each proposed PPP should undergo rigorous project appraisal, including technical feasibility, value-for-money assessment, affordability analysis, risk assessment and lifecycle-cost analysis before procurement. Third, PPP contracts should clearly allocate construction, financing, demand, maintenance and operational risks to the party best able to manage them. Fourth, performance-based specifications should link private-sector remuneration to measurable outcomes such as construction quality, road availability, maintenance response time and pavement condition rather than simply completion of construction. These measures are particularly important because research comparing developed and emerging economies indicates that PPP procurement models need to reflect the financial,

institutional and market conditions of the host environment rather than applying a uniform model (Almarri & Boussabaine, 2023). Therefore, the Nasarawa State, PPP policy should also distinguish between commercially viable corridors and socially necessary but financially weak urban roads. The latter may require hybrid PPP arrangements, government viability-gap support, availability payments or other public contributions rather than relying exclusively on user charges.

The urban planning implication is that PPPs should be embedded within urban and regional spatial planning rather than treated solely as financial or procurement instruments. The proposed framework should therefore integrate five sequential stages such as spatial identification and prioritisation, project preparation and feasibility, transparent procurement and risk allocation, performance-based implementation and maintenance, and monitoring, evaluation and community accountability. At the first stage, roads should be prioritised according to their contribution to urban connectivity, accessibility, economic activity and spatial equity. At the second, government should establish technical and financial feasibility and determine whether PPP is the appropriate delivery option. At the third, transparent competitive procurement should be accompanied by explicit risk allocation and contractual safeguards. At the fourth, construction and maintenance should be governed by measurable service standards and lifecycle-performance requirements. At the fifth, government, communities and private partners should jointly monitor performance using indicators such as road condition, accessibility, maintenance response, expenditure efficiency and user satisfaction. This framework responds directly to the finding of the study, that governance explains 48% of the variation in road quality ($R^2 = 0.48$) and that weak monitoring, overlapping institutional responsibilities, corruption, political influence, bureaucratic delays and poor government-contractor collaboration remain important constraints. It also reflects international evidence that stronger institutions and governance arrangements create a more conducive environment for PPP investment (Gupta & Sharma, 2023).

Therefore, the evidence from the findings suggests for the Proposed Nasarawa State Urban Road Infrastructure PPP Framework as shown at figure 2.

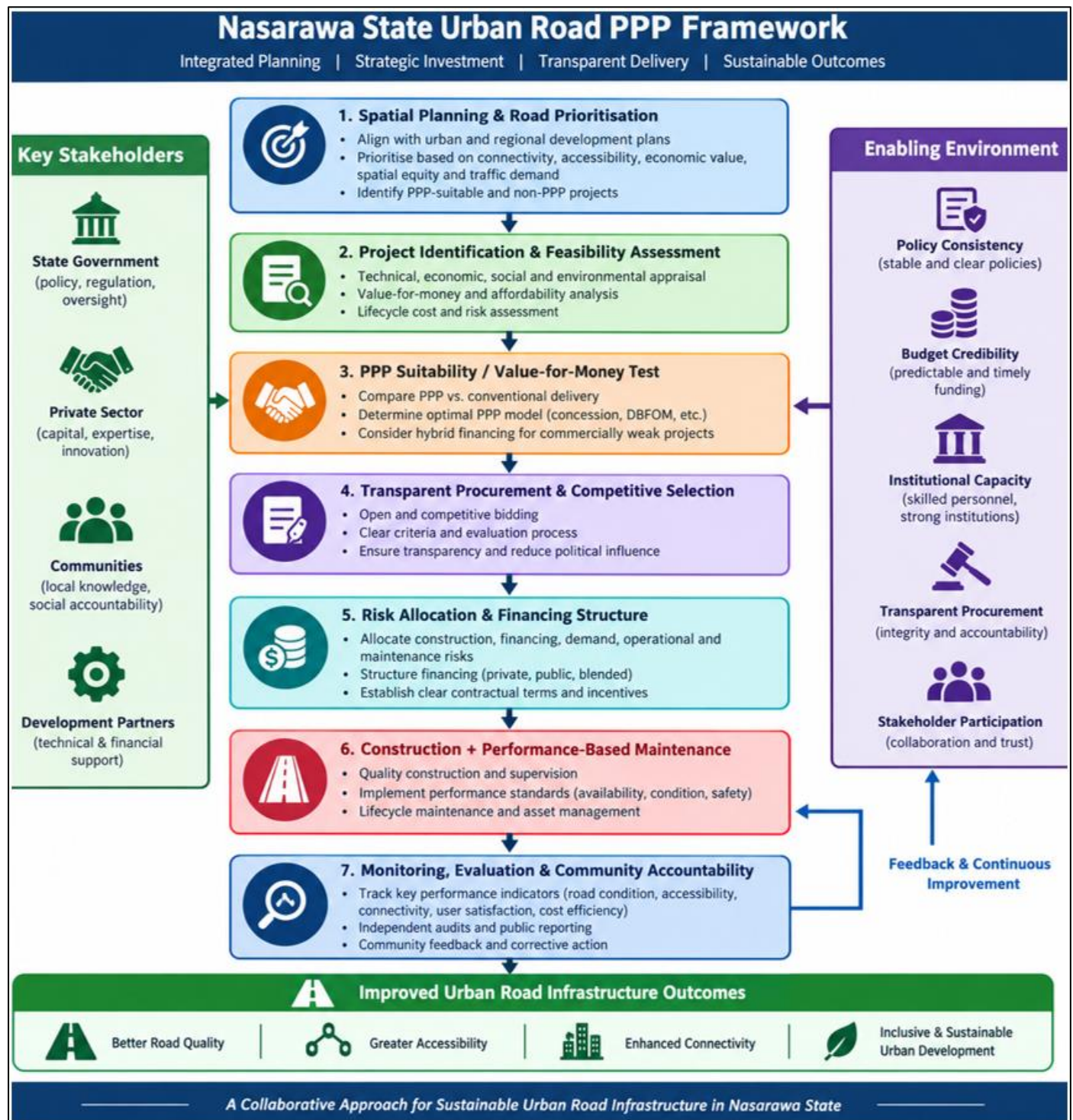


Fig 2 The Proposed Nasarawa State Urban Road PPP Framework

Source: Researcher, 2026

The framework is deliberately governance-centred rather than finance-centred. Its central proposition is that PPP investment should pass through a chain in which spatial planning determines what should be invested in; feasibility determines what can appropriately be delivered through PPP; transparent procurement determines who should deliver it; contractual risk allocation determines who bears which risks; performance-based management determines how quality is maintained; and monitoring determines whether the investment produces sustainable public value. This responds

directly to evidence of the study, that PPP has a positive but comparatively modest relationship with road quality, while policy and budget conditions have stronger relationships. It is also consistent with evidence from Nigeria and South Africa that PPP success depends upon appropriate financial markets, stable policy, legal and regulatory frameworks and transparent procurement (Deinde-Adedeji et al., 2024). Accordingly, the framework proposes PPP as a complementary governance and delivery mechanism rather than a replacement for government responsibility.

The government remains responsible for strategic planning, regulation, public-interest protection and performance oversight, whereas private partners contribute capital, technical expertise, innovation and lifecycle management, and communities provide local knowledge, social accountability and feedback. This integrated model offers a more realistic pathway for improving urban road infrastructure quality in emerging Nigerian cities than relying either exclusively on public budgets or on private-sector finance. Thus, the study contributes a governance-centred PPP framework showing that sustainable urban road outcomes in emerging Nigerian cities depend not on private-sector participation alone, but on the alignment of PPP investment with spatial planning, policy consistency, budget credibility, institutional capacity, transparent procurement, performance-based maintenance and stakeholder accountability.

VI. CONCLUSION

This study examined the role of Public-Private Partnerships (PPPs) and investment mechanisms in improving urban road infrastructure quality in emerging urban areas of Nasarawa State, using Lafia, Akwanga, Keffi and Nasarawa as the study areas. The findings demonstrate that PPPs constitute a promising but underutilised mechanism for urban road infrastructure delivery. Although PPP adoption was positively associated with urban road quality ($\beta = 0.13$) and accessibility ($\beta = 0.20$), its contribution was weaker than those of policy and budget conditions, each of which recorded $\beta = 0.28$ for road quality. The governance model explained 48% of the variation in road quality ($R^2 = 0.48$), indicating that infrastructure outcomes depend substantially on the broader institutional and governance environment rather than on purely private-sector participation. The substantial gap between approved and actual road expenditure further demonstrates that increasing financial allocations without corresponding improvements in implementation capacity may not produce commensurate infrastructure outcomes.

The study therefore concludes that PPPs should not be regarded as a replacement for public investment but as a complementary institutional mechanism through which government can mobilise private capital, technical expertise, innovation and lifecycle management. The relatively modest PPP coefficient suggests that private participation can contribute to infrastructure improvement only when supported by consistent policies, credible budgets, effective institutions, transparent procurement, appropriate risk allocation and meaningful stakeholder participation. This interpretation is consistent with recent evidence that institutional and governance quality significantly shapes PPP investment and performance in emerging economies (Gupta & Sharma, 2023; Deinde-Adedeji et al., 2024). The study consequently advances a governance-centred understanding of urban road PPPs in which the quality of the institutional environment determines the extent to which private participation can be translated into sustainable infrastructure outcomes.

RECOMMENDATIONS

Firstly, the Nasarawa State Government should institutionalise a strategic urban-road PPP programme linked directly to spatial and infrastructure planning embedded in the gazettelement of Nasarawa State Urban Development Plan/Policy. PPP projects should not be selected solely on the basis of available private finance or political priority; rather, roads should be prioritised according to network connectivity, accessibility, economic significance, spatial equity, traffic demand and infrastructure deficits. Each proposed project should undergo a systematic PPP-suitability assessment, including technical feasibility, affordability, value-for-money analysis, lifecycle costing and risk assessment before procurement. Projects that are socially essential but commercially weak should be considered for hybrid financing arrangements, including government support, viability-gap funding or availability-based payments. This approach would enable the State to distinguish between projects that are genuinely suitable for PPP delivery and those that are better financed through conventional public investment. Such careful project selection is important because PPP outcomes depend on the characteristics of individual projects and the institutional environment in which they are implemented (Gupta & Sharma, 2023; Esperilla-Niño-de-Guzmán et al., 2024).

Second, the State Government should strengthen the institutional, regulatory and financial capacity required to manage urban-road PPPs throughout their entire lifecycle. Particular attention should be given to project preparation, competitive procurement, contract negotiation, risk allocation, financial monitoring and performance management. PPP agreements should clearly assign construction, financing, operational and maintenance risks to the actors best positioned to manage them, while incorporating measurable performance standards for pavement quality, road availability, maintenance response and service delivery. The findings on low budget utilisation demonstrate the need to improve the conversion of approved resources into actual infrastructure delivery. Consequently, PPP commitments should be integrated into realistic medium- and long-term expenditure frameworks, with transparent reporting of government contributions, private investment, project costs and performance. Strong institutional capacity is essential because evidence from emerging economies indicates that regulatory quality, government effectiveness and institutional credibility influence the attractiveness and performance of PPP infrastructure investment.

Third, PPP planning and implementation should incorporate meaningful stakeholder and community participation as a formal component of project governance. The finding that 49% of respondents supported collaboration among government, private-sector actors and communities, alongside the relatively low Participation Index ($M = 2.78$), suggests that there is an opportunity to strengthen participatory approaches to urban road delivery. Community engagement should begin during project identification and continue through design, construction, operation and maintenance rather than being restricted to consultation after

decisions have already been made. Stakeholder platforms involving government agencies, private partners, professional planners, transport operators, residents, businesses and affected communities should be established to provide local information, monitor implementation and report infrastructure defects. Such arrangements can improve transparency, strengthen social accountability and ensure that PPP projects respond to actual urban accessibility and connectivity needs. This recommendation is consistent with contemporary PPP scholarship which emphasises stakeholder engagement, institutional collaboration and accountability as important conditions for successful infrastructure partnerships.

Fourth, the State should establish a performance-based monitoring and evaluation framework for all PPP-supported urban road projects and use the results to guide future investment decisions. Monitoring should move beyond measuring whether a road has been constructed to assessing road condition, accessibility, connectivity, maintenance performance, expenditure efficiency, user satisfaction and socioeconomic benefits throughout the project lifecycle. Independent technical and financial audits should be undertaken periodically, while publicly accessible performance reports should disclose project costs, contractual obligations, implementation progress and maintenance outcomes. The framework should also provide mechanisms for corrective action where contractors or public institutions fail to meet agreed performance standards. This recommendation is particularly important given that weak monitoring and evaluation, overlapping institutional responsibilities, corruption, political influence and poor government-contractor collaboration were identified among the governance challenges affecting road infrastructure delivery.

A performance-oriented approach would ensure that PPPs are judged by their ability to deliver durable public value, rather than simply by the volume of private capital mobilised. It would also operationalise the study's central proposition that PPP effectiveness depends on the alignment of private-sector participation with policy consistency, budget credibility, institutional capacity and stakeholder accountability. Ultimately, sustainable urban road infrastructure in emerging Nigerian cities will depend not on PPP adoption in isolation, but on the ability of government to create a credible institutional environment in which public planning, private investment, community participation, transparent procurement and performance-based infrastructure management operate as an integrated system.

LIMITATIONS AND FUTURE RESEARCH

A major limitation of the study is its geographical and contextual scope, as the empirical investigation was restricted to Lafia, Akwanga, Keffi and Nasarawa in Nasarawa State. Although these urban centres provide useful contrasts in road infrastructure provision and investment conditions, the findings should not be generalised uncritically to all Nigerian cities, particularly large metropolitan areas where PPP markets, traffic volumes, revenue opportunities and

institutional capacities may differ substantially. A second limitation concerns the measurement of PPP adoption and infrastructure quality. Much of the evidence reflects stakeholder perceptions and institutional assessments, while PPP arrangements themselves are heterogeneous in terms of financing structure, contractual form, risk allocation and lifecycle responsibilities. Consequently, the observed positive relationship between PPP adoption and road quality ($\beta = 0.13$) should be interpreted as an association rather than definitive evidence of a causal effect. The cross-sectional and observational nature of the study also limits the ability to establish whether PPP participation actually produces improvements in road quality over time. Furthermore, the relatively modest role of PPP compared with policy and budget conditions suggests that institutional and fiscal factors may confound the relationship between private participation and infrastructure outcomes. These limitations are consistent with recent scholarship showing that PPP outcomes are strongly context-dependent and that differences in institutional quality, contractual arrangements and project characteristics can produce substantially different infrastructure results (Gupta & Sharma, 2023; Deinde-Adedeji et al., 2024; Esperilla-Niño-de-Guzmán et al., 2024).

Future research should therefore move beyond cross-sectional perception-based assessment towards longitudinal, comparative and project-level investigation of PPP performance. Studies could track individual urban road PPP projects from project preparation through construction, operation and maintenance, comparing their performance with conventionally publicly financed roads using objective indicators such as pavement condition, maintenance expenditure, construction duration, cost overruns, accessibility, traffic performance, user satisfaction and lifecycle costs. Comparative research across Nigerian states and between secondary cities and major metropolitan areas would also help determine whether the relationships identified in Nasarawa State are context-specific or reflect broader patterns in Nigeria. Future studies could further examine how different PPP models such as concessions, design-build-finance-maintain arrangements, performance-based maintenance contracts and hybrid public-private financing affect road quality and sustainability. Importantly, quasi-experimental or panel-data approaches could provide stronger evidence concerning the causal effect of PPP participation on infrastructure outcomes. Such research would extend the present study of governance-centred framework by identifying not merely whether PPPs are associated with better roads, but which PPP arrangements work, under what institutional conditions, at what cost, and for whom. This would provide stronger evidence for designing context-sensitive PPP policies capable of improving sustainable urban road infrastructure in emerging Nigerian cities

REFERENCES

- [1]. Ahiaga-Dagbui, D. D., et al. (2024). Performance controls and accountability in African transport infrastructure megaprojects: A systematic literature review. *Project Leadership and Society*, 5, 100123.
- [2]. Almarri, K., & Boussabaine, H. (2023). Critical success factors for public–private partnerships in smart city infrastructure projects. *Construction Innovation*. <https://doi.org/10.1108/CI-04-2022-0072>.
- [3]. Babalola, M. A., et al. (2024). Public-private partnership (PPP) in road infrastructure projects: A review of evolution, approaches, and prospects. *Sustainability*, 16(4), 1430. <https://doi.org/10.3390/su16041430>
- [4]. Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE.
- [5]. Deinde-Adediji, O., Nchuchuwe, F., Abasilim, U., Gberevbie, D., & Oni, S. (2024). Navigating public-private partnership success: A cross-country study of key factors in Nigeria and South Africa. *Politics & Policy*, 52(5), 1081–1100. <https://doi.org/10.1111/polp.12628>.
- [6]. Esperilla-Niño-de-Guzmán, Y. Y., Baeza-Muñoz, M. Á., Gálvez-Sánchez, F. J., & Molina-Moreno, V. (2024). Public–private partnership (PPP) in road infrastructure projects: A review of evolution, approaches, and prospects. *Sustainability*, 16(4), 1430. <https://doi.org/10.3390/su16041430>.
- [7]. Fleta-Asín, J., & Muñoz, F. (2023). When bigger is better: Investment volume drivers in infrastructure public-private partnership projects. *Socio-Economic Planning Sciences*, 86, 101473.
- [8]. Gupta, A., & Sharma, A. K. (2023). The role of institutional and governance factors in public-private partnerships infrastructure investments in emerging economies. *Journal of Public Affairs*, 23(4), e2874. <https://doi.org/10.1002/pa.2874>
- [9]. Infrastructure Concession Regulatory Commission (2024/2025). *Nigeria PPP policy, projects and implementation framework*.
- [10]. McKim, C. A. (2023). Putting the mix in mixed methods research. *Hospital Pediatrics*, 13(12), e411–e414.
- [11]. *Private sector participation in road infrastructure development: A systematic review of empirical evidence*. (2026). *Transport Reviews*.
- [12]. van Wieringen, K., & Zajontz, T. (2023). From loan-financed to privatised infrastructure? Tracing China's turn towards public–private partnerships in Africa. *Journal of Current Chinese Affairs*, 52(3). <https://doi.org/10.1177/18681026231188140>
- [13]. World Bank (2023). *Infrastructure Monitor 2023: Global Trends in Private Investment in Infrastructure*.
- [14]. World Bank. (2023). *Building stronger institutions to mobilize private capital in infrastructure*. World Bank.
- [15]. World Bank. (2023). *Data show private infrastructure investment continues to improve following pandemic slump*. World Bank.
- [16]. World Bank. (2024). *Private Participation in Infrastructure (PPI) 2024 Annual Report*. World Bank Group.