Digital Infrastructure Gaps as Barriers to Transport Technology Adoption in Rural Nigeria

[1]Yassar Zakari
yassarzkari@gmail.com

[2]Aliyu Jibril
aliyujibz@gmail.com
[1]Nigerian Institute of Transport Technology,
Zaria, Kaduna State
[2]Department of Economics,
University of Jos, Nigeria

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Abstract
Transport technology ride-hailing platforms, digital freight-matching systems, e-ticketing, and mobile-money-based fare payment has transformed urban mobility and logistics efficiency across Nigeria's major cities. Yet these innovations have diffused unevenly, concentrating in Lagos, Abuja, and a handful of state capitals while leaving rural transport markets largely untouched. This article examines the extent to which gaps in digital infrastructure electricity supply, broadband and mobile network coverage, device ownership, and digital literacy constrain the adoption of transport technology in rural Nigeria, and considers the transport-economics implications of this divide. Drawing on a structured review of secondary data from the Nigerian Communications Commission, the Rural Electrification Agency, the World Bank, and the transport-economics and technology-adoption literatures, the article develops a conceptual framework linking infrastructure readiness to technology adoption outcomes along four dimensions: energy access, connectivity, affordability, and institutional capacity. The analysis finds that rural electricity access (approximately 30 percent) and rural internet access (approximately 23 percent) remain markedly below urban levels (approximately 91 percent and 57 percent respectively), and that this infrastructure deficit imposes real economic costs: higher transaction costs for rural transport operators, persistence of inefficient informal dispatch systems, weaker price discovery in agricultural haulage markets, and continued exclusion of rural populations from the productivity gains associated with digital mobility platforms. The article argues that closing the rural digital infrastructure gap is not merely a telecommunications policy question but a transport-economics imperative, since connectivity functions as a complementary input to transport service delivery in the same way that roads and vehicles do. It concludes with policy recommendations spanning energy, telecommunications, transport regulation, and rural finance, and proposes a research agenda for primary, survey-based validation of the framework developed here.

Keywords: *Digital Infrastructure; Transport Technology; Rural Nigeria*

1. Introduction

Over the past decade, digital technology has reshaped how people and goods move within Nigeria's transport system. In Lagos, Abuja, and Port Harcourt, ride-hailing platforms such as

Bolt, Uber, and in Drive coexist with digitally dispatched commercial motorcycles, while freight-matching platforms such as Kobo360 and Lori Systems connect truck owners with shippers, and cashless fare-collection systems such as the Lagos Cowry Card have begun to formalise mass-transit revenue collection. These innovations are generally associated with efficiency gains: shorter search times for vehicles, better utilisation of truck capacity, more transparent pricing, and reduced opportunities for revenue leakage in public transit operations. Outside the major urban centres, however, this transformation has been far more limited. Rural transport markets in Nigeria — where the majority of agricultural produce is moved from farm gate to market, and where the bulk of intra-rural passenger travel occurs — continue to rely overwhelmingly on informal, cash-based, and analogue systems: motorcycle taxis (okada) and tricycles (keke) dispatched by word of mouth, shared bush taxis with no fixed schedule, and haulage arrangements negotiated in person at motor parks. This is not simply a matter of consumer preference or slower cultural adoption. A substantial part of the explanation lies in the physical and digital infrastructure on which transport technology depends: reliable electricity to power devices, mobile network coverage sufficient to run location-based applications, affordable smartphones and data plans, and a baseline of digital and financial literacy among both operators and users. This article investigates the relationship between digital infrastructure gaps and transport technology adoption in rural Nigeria, situating the discussion within the broader field of transport economics. Transport economics is concerned with how transport services are produced, priced, and consumed, and with the efficiency, welfare, and distributional consequences of transport markets. Digital transport technology alters the cost structure of transport service provision — chiefly by lowering search, matching, and transaction costs — but only where the underlying digital infrastructure exists to support it. Where that infrastructure is absent, as in much of rural Nigeria, the potential efficiency gains from technology adoption cannot be realised, and rural transport markets remain locked into higher-cost, lower-efficiency modes of operation.

The article pursues three specific objectives: first, to map the current state of digital infrastructure electricity, connectivity, and affordability across urban and rural Nigeria, drawing on the most recent available secondary data; second, to develop a conceptual framework identifying the specific channels through which infrastructure gaps constrain transport technology adoption; and third, to derive the transport-economics and policy implications of persistent rural digital exclusion, including its effects on transaction costs, market integration, and rural livelihoods. The remainder of the article is organised as follows. Section 2 reviews the relevant theoretical and empirical literature. Section 3 sets out the methodology. Section 4 presents the digital infrastructure landscape in rural Nigeria. Section 5 develops the barriers framework. Section 6 discusses the transport-economics implications, and Section 7 offers regional illustrations. Section 8 sets out policy recommendations, and Section 9 concludes.

2. Literature Review and Theoretical Framework

2.1 Transport Technology and Transaction-Cost Reduction

A well-established strand of transport economics treats digital platforms as mechanisms for reducing the transaction costs that historically constrained transport markets: the cost of finding a vehicle, verifying its availability, agreeing a price, and settling payment. By digitising search and matching, platforms shorten the time between a transport demand arising and a transport supply being deployed, which in turn improves asset utilisation for vehicle owners and reduces waiting costs for users. This logic underlies the economic case for ride-hailing, freight-matching, and digital-ticketing platforms across many developing economies, including Nigeria. The efficiency gains, however, are conditional: a platform can only reduce transaction costs where it can reliably operate, which in turn depends on the digital infrastructure available to both the platform operator and the end user.

2.2 The Digital Divide and Diffusion of Innovation

The concept of the digital divide describes systematic differences in access to, and effective use of, digital technology across population groups, commonly distinguishing a first-level divide (physical access to infrastructure and devices) from a second-level divide (differences in skills and usage) and, more recently, a third-level divide (differences in the tangible outcomes derived from technology use). Applied to rural Nigeria, the first-level divide is the most binding constraint on transport technology adoption: without electricity to charge a phone or a mobile signal to run an application, questions of skill or outcome do not arise.

Rogers' diffusion of innovation theory offers a complementary lens, describing how the adoption of an innovation spreads through a population over time according to the innovation's relative advantage, compatibility with existing practice, complexity, trialability, and observability. Infrastructure gaps affect several of these attributes simultaneously: an application that cannot function reliably because of poor connectivity has reduced relative advantage over the informal system it seeks to replace, cannot be meaningfully trialled by a potential rural adopter, and is less observable to peers, since visible, successful use by early adopters a key driver of diffusion is itself constrained by the same infrastructure gap.

The Technology Acceptance Model further distinguishes perceived usefulness from perceived ease of use as the two central determinants of an individual's intention to adopt a technology. In infrastructure-constrained rural settings, both dimensions are depressed: a transport application is less useful where network coverage is intermittent, and less easy to use where device access is shared, data is expensive, and digital literacy is limited. These frameworks together suggest that transport technology adoption in rural Nigeria cannot be understood, or promoted, independently of the underlying digital and energy infrastructure.

2.3 Infrastructure as a Complementary Input to Transport Services

A further relevant strand of the literature treats infrastructure — physical and digital — as a complementary input to the production of transport services, analogous to the classical treatment of roads, terminals, and vehicles as capital inputs in transport production functions. Where digital infrastructure is treated as a complementary input, its absence functions similarly to a missing physical input: it does not merely slow adoption but caps the technically feasible level of service that a digitally enabled transport system can provide in a given area, regardless of demand or willingness to adopt.

2.4 Nigerian Evidence to Date

Existing Nigerian evidence on transport technology has focused predominantly on urban markets, documenting the growth of ride-hailing in Lagos and Abuja, the expansion of freight-matching platforms serving inter-state haulage corridors, and the digitisation of fare collection on the Lagos Bus Rapid Transit system. Parallel but largely separate bodies of work document Nigeria's rural electrification shortfall and the rural-urban broadband gap reported by the Nigerian Communications Commission. This article's contribution is to connect these two literatures explicitly, treating digital infrastructure gaps as a first-order explanatory variable for the rural-urban divide in transport technology adoption, rather than as background context.

3. Methodology

This article adopts a desk-based, analytical review methodology appropriate to an exploratory, framework-building study of an emerging and data-scarce topic. Primary, survey-based data on transport-technology use among rural Nigerian transport operators and users are not yet systematically collected by any national statistical agency, which itself reflects the nascent state of the field. The article therefore synthesises secondary data from four categories of source: (i) regulatory and infrastructure agency statistics, principally the Nigerian Communications Commission's industry performance reports and the Rural Electrification Agency's supply data; (ii) international development-data sources, principally the World Bank's SDG7 electrification tracking database; (iii) peer-reviewed and grey-literature studies of Nigerian rural electrification and broadband policy; and (iv) documented industry information on Nigerian transport-technology platforms. Data were triangulated across sources to identify consistent order-of-magnitude estimates for urban-rural gaps in electricity and internet access, rather than relying on any single point estimate, given that Nigerian infrastructure statistics vary somewhat by reporting agency, survey wave, and definition of "rural." The conceptual barriers framework presented in Section 5 was developed by mapping the technology-adoption literature reviewed in Section 2 onto the infrastructure indicators identified in Section 4, and cross-checking the resulting categories against documented operational challenges reported by Nigerian transport-technology platforms and telecommunications operators. This approach yields a structured, evidence-grounded framework suitable for guiding future primary research, rather than a set of statistically validated causal estimates; the limitations of this approach, and the primary-data research agenda needed to move beyond it, are discussed in Section 9.

4. The Digital Infrastructure Landscape in Rural Nigeria

Digital transport technology depends on three layered infrastructure inputs: a source of electrical power to operate devices and, in some cases, roadside or in-vehicle equipment; a telecommunications network capable of carrying data with sufficient reliability and speed; and an affordable device and data plan through which the end user or operator accesses the network. Table 1 summarises the available evidence on each of these dimensions for urban and rural Nigeria.

Table 1. Urban-Rural Digital Infrastructure Indicators in Nigeria

Infrastructure Indicator	Urban Nigeria	Rural Nigeria	Source
Access to electricity (%)	≈ 91%	≈ 30%	Isihak (2023); World Bank SDG7 data
Internet / broadband access (%)	≈ 57%	≈ 23%	Nigerian Communications Commission (2025)
National broadband penetration (%)	—	≈ 50.6% (national average, Nov. 2025)	NCC Industry Statistics (2025)
4G / 5G network coverage	Concentrated in state capitals and cities	4G ≈ 47%; 5G ≈ 2.4% (national)	TechCabal / NCC (2025)
Broadband Plan target (2020–2025)	25 Mbps minimum speed; 90% coverage target	10 Mbps minimum speed target; largely unmet	Nigerian National Broadband Plan (NCC, 2020)

Source: Compiled by the author from Isihak (2023); World Bank SDG7 Electrification Dataset; Nigerian Communications Commission Industry Statistics (2025); Nigerian National Broadband Plan (NCC, 2020).

4.1 Electricity Access

Electrification remains the most fundamental constraint. National electricity access is estimated at approximately 62 percent, but this average obscure a sharp urban-rural divide: urban access is estimated at roughly 91 percent while rural access stands at approximately 30 percent. Nearly half of Nigeria's population lives in rural areas, meaning that a large absolute number of Nigerians spread across the Niger Delta, the Middle Belt, and the northern savannah zones have no reliable connection to the national grid. Where grid electricity is unavailable, rural residents rely on solar lanterns, small generators, or periodic trips to charging kiosks in the nearest trading centre to power mobile phones, a pattern that directly constrains the ability of both transport operators and passengers to keep a smartphone charged and available for use with a digital transport application.

4.2 Telecommunications Connectivity

Nigeria's national broadband penetration rose from approximately 44 percent in December 2024 to just over 50 percent by November 2025, driven by growth concentrated in urban and peri-urban markets. The rural-urban gap in internet access is, however, substantial and persistent: the Nigerian Communications Commission has reported that only about 23 percent of rural communities have internet access, compared with approximately 57 percent of urban communities. Fourth-generation (4G) network coverage, the minimum standard required for most modern transport applications to function reliably, was estimated at approximately 47 percent nationally as of early 2025, with fifth-generation (5G) coverage below 3 percent and concentrated almost entirely in major cities. The Nigerian National Broadband Plan (2020–2025) explicitly targeted a lower minimum download speed for rural areas (10 Mbps) than for urban areas (25 Mbps), implicitly acknowledging that rural connectivity would lag urban connectivity even under a successful policy scenario; independent reporting indicates that even this reduced rural ambition has not been met.

4.3 Structural Barriers to Rural Network Expansion

Telecommunications operators cite several structural reasons for the slow pace of rural network expansion: the high cost of extending fibre-optic backbone infrastructure to sparsely populated areas; elevated Right-of-Way charges levied by some state governments on infrastructure deployment; the high cost of powering base transceiver stations in areas without reliable grid electricity, often requiring diesel generation; and recurrent vandalism and theft of telecommunications equipment, with several thousand fibre cuts and equipment theft incidents reported nationally within a single reporting period in 2025. These structural cost barriers mean that, absent policy intervention, rural network expansion is likely to remain commercially less attractive to operators than continued densification of already-covered urban markets.

4.4 Device Affordability and Digital Literacy

Even where network coverage exists, effective use of transport technology requires an internet-capable device and an affordable data plan. Rural incomes in Nigeria are, on average, lower than urban incomes, and data affordability commonly benchmarked internationally against the cost of a standard data allowance as a share of income remains a binding constraint for many rural households and small-scale transport operators. Digital literacy, encompassing both the ability to navigate a smartphone application and confidence in digital financial transactions, is similarly less developed in rural areas, where formal education access and exposure to digital services have historically been more limited than in urban centres. Together, these affordability and literacy gaps compound the physical infrastructure gap, so that even a rural community reached by a mobile network signal may see limited effective uptake of transport technology among operators and passengers.

5. Barriers to Transport Technology Adoption: A Conceptual Framework

Building on the infrastructure landscape described in Section 4 and the theoretical perspectives reviewed in Section 2, this section develops a conceptual framework identifying five interlinked categories of barrier through which digital infrastructure gaps constrain transport technology adoption in rural Nigeria. These categories are summarised in Table 2 and discussed in turn below.

Table 2. Digital Infrastructure Barriers to Rural Transport Technology Adoption

Barrier Category	Manifestation in Rural Transport Technology	Illustrative Effect
Electricity gap	Inability to charge smartphones, POS terminals, or e-ticketing devices reliably	Drivers and commuters revert to cash and word-of-mouth dispatch
Network coverage gap	Weak or absent 3G/4G signal along rural routes and feeder roads	Ride-hailing, GPS tracking, and freight-matching apps cannot function
Device and affordability gap	Low smartphone penetration; high data costs relative to rural income	Exclusion of low-income transport operators from digital platforms
Digital and financial literacy gap	Limited familiarity with app interfaces, digital payments, and e-tickets	Slower adoption even where coverage and devices exist
Institutional and policy gap	Weak last-mile broadband policy delivery; high Right-of-Way charges	Delayed private investment in rural telecom infrastructure

Source: Author's conceptual synthesis, based on the digital-divide, diffusion-of-innovation, and technology-acceptance literatures reviewed in Section 2, applied to the infrastructure evidence in Section 4.

5.1 The Electricity Constraint

The electricity gap operates as a first-order constraint because nearly every downstream transport technology depends on a powered device somewhere in the transaction chain: the passenger's or shipper's smartphone, the driver's or dispatcher's phone, and, for more advanced applications, point-of-sale terminals or GPS tracking units fitted to commercial vehicles. In areas with unreliable or absent grid electricity, devices are charged intermittently, often at a cost, at shared kiosks, which reduces the number of hours per day during which a device is available and discourages continuous, real-time use of location-based applications. This constraint falls hardest on lower-income transport operators, such as individual okada and keke drivers, who are least able to afford solar-charging solutions or backup power sources.

5.2 The Network Coverage Constraint

Ride-hailing, GPS-based fleet tracking, and freight-matching platforms are fundamentally location-based services that require a continuous, sufficiently fast data connection to function. Where 3G or 4G coverage is weak, intermittent, or entirely absent along rural feeder roads and in rural trading centres, these applications either fail to load, provide inaccurate location information, or drop connections mid-transaction. Operators and users experiencing repeated application failures rationally revert to the informal, non-digital alternative, reinforcing reliance on word-of-mouth dispatch and in-person price negotiation at motor parks. This dynamic illustrates why network coverage gaps do not merely delay adoption but can actively discourage sustained use even among early triallists.

5.3 The Affordability Constraint

Smartphone ownership and mobile data consumption both carry a real cost that competes with other household and business expenditures in rural areas where incomes are, on average, lower and more seasonal particularly where they are tied to agricultural cycles than in urban centres. For a rural transport operator, the marginal cost of a data plan sufficient to run a ride-hailing or freight-matching application continuously may exceed the marginal revenue gained from the small number of digitally sourced trips available in a thin rural market, producing a weak business case for adoption even where technical access exists. This affordability constraint is compounded for passengers and shippers, who must also bear data and device costs to interact with the same platforms.

5.4 The Digital and Financial Literacy Constraint

Effective use of transport technology requires more than physical access: it requires the ability to navigate an application interface, interpret fare or pricing information, and, increasingly, complete a digital payment. Digital and financial literacy levels are, on average, lower in rural areas, reflecting historically lower access to formal education and to prior exposure to digital financial services. This constraint interacts with the affordability constraint, since operators and users with limited experience of mobile money or bank-linked payment systems may be reluctant to trust digital transactions for a service as immediate and cash-dependent as local transport, independent of the underlying network and electricity conditions.

5.5 The Institutional and Policy Constraint

Finally, the pace of rural infrastructure rollout is itself shaped by institutional and regulatory conditions. Elevated Right-of-Way charges in some states, inconsistent implementation of national broadband policy at the state level, and the commercial unattractiveness of low-density rural markets to profit-seeking telecommunications operators together slow the extension of network infrastructure into rural Nigeria relative to the pace of urban network densification. Because private operators bear the capital cost of network expansion, areas offering lower expected commercial returns predominantly rural, low-income areas — are systematically the last to be reached absent explicit public intervention, such as the Universal Service Provision Fund model used by the Nigerian Communications Commission.

5.6 Interaction Effects Between Barriers

The five barrier categories described above do not operate independently; they interact, and the interaction effects are often more binding than any single constraint viewed in isolation. A rural trading centre may, for example, sit within range of a functioning 4G mast addressing the network coverage constraint while still exhibiting negligible transport-technology adoption because most local transport operators cannot afford a smartphone capable of running a modern application, or lack a reliable source of power to keep that device charged throughout a working day. Conversely, a community with reasonable electricity access through a solar mini-grid may remain outside effective network coverage, so that the electrification gain cannot translate into transport-technology use. This interaction implies that partial infrastructure interventions addressing only electrification, or only network coverage, without regard to the others are unlikely to produce measurable gains in transport-technology adoption unless the remaining constraints are addressed concurrently. It also implies that the marginal economic return to closing any single infrastructure gap is likely to depend on the state of the other four, a hypothesis that is testable with appropriately designed primary data but cannot be confirmed from the secondary evidence reviewed here.

6. Discussion: Transport-Economics Implications

The infrastructure gaps and adoption barriers described above are not simply a technology-access issue; they carry direct transport-economics consequences. First, the persistence of informal, cash-based, non-digital transport arrangements in rural Nigeria implies higher search and transaction costs than would prevail under a digitally matched market, since rural passengers, shippers, and vehicle owners must rely on in-person negotiation, physical presence at motor parks, and word-of-mouth information rather than real-time digital matching. In transport-economics terms, this represents a persistent wedge between the socially efficient allocation of transport capacity and the allocation actually achieved, since vehicles may travel underloaded or empty for want of a rapid matching mechanism, while demand goes unserved for want of information about available supply. Second, weak digital infrastructure limits the extension of freight-matching and logistics-technology platforms into rural agricultural haulage markets, where they could plausibly generate some of the largest efficiency gains, given the well-documented problem of post-harvest losses linked in part to delayed or unreliable transport arrangements between farm gate and market. Where digital freight-matching cannot reach rural collection points because of connectivity gaps, farmers and rural traders continue to depend on a narrower, less competitive set of known haulage contacts, weakening price discovery and bargaining power relative to a more digitally connected market. Third, the exclusion of rural transport markets from digital fare-collection and e-ticketing systems has public-finance implications for rural transport authorities and cooperatives, since cash-based systems are more vulnerable to revenue leakage than the digital systems now used on urban platforms such as the Lagos Bus Rapid Transit corridor. Fourth, from a distributional perspective, the urban-rural digital transport divide risks compounding existing regional income disparities in Nigeria, since the productivity and cost-saving benefits associated with transport-technology adoption accrue disproportionately to the urban, already better-connected population, while rural transport operators and users continue to bear the higher costs associated with analogue, informal transport arrangements.

Taken together, these implications support treating digital infrastructure investment as a complementary and, in some respects, prerequisite input to rural transport policy, rather than as a separate telecommunications-sector concern. A rural road-improvement programme, for example, is likely to generate additional economic value if implemented alongside parallel investment in rural electrification and network coverage, since the resulting road infrastructure can then be paired with digital matching, tracking, and payment systems that further reduce the transaction costs of using that road infrastructure efficiently.

Fifth, there are second-order effects on labour markets within the transport sector itself. In urban Nigeria, transport technology has created new categories of digitally mediated work platform-affiliated drivers, dispatch riders, and logistics coordinators alongside more transparent earnings records that can, in principle, support access to vehicle financing and insurance products keyed to verified trip and income history. Rural transport operators who remain outside these platforms are correspondingly excluded not only from the immediate efficiency gains of digital matching but also from these secondary financial-inclusion benefits, reinforcing a broader pattern in which rural informal-sector workers face a persistently higher cost of capital than their digitally visible urban counterparts. This effect is consistent with the broader transport-economics literature on the relationship between formalisation, information availability, and access to finance in transport markets.

7. Regional Illustrations

While a comprehensive primary survey lies outside the scope of this article, the available secondary evidence points to meaningful regional variation within rural Nigeria that merits brief illustration. Rural electrification and connectivity gaps are generally documented as most severe in parts of the North-West and North-East geopolitical zones, where security challenges have historically also disrupted telecommunications infrastructure maintenance and rural road access, compounding the digital and physical transport-infrastructure deficit simultaneously. In the Niger Delta, dispersed and creek-based rural settlement patterns raise the unit cost of both grid-electricity extension and telecommunications-mast deployment, producing a comparable connectivity deficit despite the region's relative proximity to urban centres such as Port Harcourt. By contrast, rural areas in the South-West geopolitical zone, benefiting from denser settlement patterns, proximity to Lagos-based telecommunications infrastructure, and comparatively higher rural incomes linked to agricultural commercialisation, tend to exhibit somewhat higher rates of mobile network coverage and mobile-money usage, even if formal transport-technology platform penetration remains limited outside urban centres. These regional differences suggest that a uniform national policy response is unlikely to be sufficient, and that infrastructure investment sequencing should account for the distinct combinations of electrification, connectivity, security, and settlement-density constraints found across Nigeria's geopolitical zones.

8. Policy Recommendations

The analysis above points toward a set of policy recommendations that treat digital infrastructure and transport policy as complementary, rather than separately administered, domains.

8.1 Coordinated Energy and Connectivity Investment

- Prioritise rural electrification investment, including off-grid solar mini-grid solutions, in corridors identified as priority rural transport routes, so that electrification and transport-technology readiness advance together rather than independently.
- Extend targeted subsidies or low-interest financing for solar-powered device-charging kiosks at rural motor parks and transport hubs, lowering the immediate cost barrier to sustained device use by transport operators.

8.2 Telecommunications Policy Reform

- Encourage further state-level adoption of reduced or zero Right-of-Way charges for telecommunications infrastructure deployment, building on the states that have already adopted this reform, to lower the commercial cost barrier to rural network expansion.
- Direct a defined share of Universal Service Provision Fund resources specifically toward rural transport corridors and agricultural haulage routes, rather than population centres alone, recognising the transport-economics value of connectivity along routes of high freight and passenger movement.
- Strengthen security and community-engagement measures to reduce fibre-optic vandalism and equipment theft, which currently erode the reliability of newly deployed rural telecommunications infrastructure.

8.3 Transport-Sector-Specific Interventions

- Support the development of low-bandwidth, offline-capable versions of transport-matching and e-ticketing applications suitable for intermittent rural connectivity, rather than assuming continuous high-speed connectivity as a precondition for digital transport services.
- Encourage transport cooperatives and rural transport unions to pilot shared digital dispatch

systems at motor parks, lowering the individual cost burden on any single operator while building collective digital literacy and trust.

- Integrate digital and financial literacy modules addressing transport-technology use into existing rural extension and cooperative-training programmes, rather than treating digital literacy as a separate initiative from transport-sector capacity building.

8.4 Data and Monitoring

- Establish routine, transport-sector-specific data collection on rural transport-technology adoption, complementing existing telecommunications-sector statistics, to allow the framework developed in this article to be empirically tested and refined over time.

8.5 Sequencing and Coordination Across Agencies

A recurring theme in the recommendations above is that no single agency currently holds a mandate spanning rural electrification, telecommunications expansion, and transport-sector regulation in Nigeria. The Rural Electrification Agency, the Nigerian Communications Commission, and federal and state transport authorities operate under separate statutory mandates, budgets, and planning cycles, which creates a coordination challenge for any policy seeking to align electrification and connectivity investment with rural transport corridors, as recommended in Section 8.1. A practical starting point would be the establishment of an inter-agency rural connectivity and mobility working group, tasked specifically with identifying priority rural transport corridors drawing on existing agricultural-market and road-network data and aligning planned electrification and telecommunications rollout with those corridors, rather than allocating infrastructure investment on the basis of population density or administrative convenience alone. Such coordination would allow scarce public infrastructure budgets to generate compounding returns across the energy, telecommunications, and transport sectors simultaneously, consistent with the interaction effects described in Section 5.6.

9. Conclusion

This article has argued that the limited diffusion of digital transport technology into rural Nigeria is substantially explained by underlying gaps in electricity access, telecommunications connectivity, device affordability, and digital literacy, rather than by rural demand or cultural resistance alone. Drawing on the digital-divide, diffusion-of-innovation, and technology-acceptance literatures, and on the available secondary evidence on Nigeria's rural-urban infrastructure divide, the article developed a conceptual framework linking five categories of infrastructure-related barrier to transport-technology adoption outcomes, and traced the resulting transport-economics consequences: elevated transaction costs, weaker rural market integration, reduced logistics efficiency in agricultural haulage, and a widening urban-rural gap in the distribution of technology-related productivity gains.

The central policy implication is that digital infrastructure investment should be treated as a complementary input to rural transport policy rather than as a separate telecommunications concern, with electrification, network expansion, and transport-sector interventions sequenced and, where possible, co-located along priority rural transport corridors. Because this article relies on secondary, aggregate data rather than a primary rural survey, its conceptual framework should be treated as a starting point for future empirical work: subsequent research should collect firm- and household-level survey data from rural transport operators, passengers, and shippers across Nigeria's geopolitical zones to test the relative explanatory weight of each barrier category identified here, and to evaluate the effect of specific pilot interventions, such as solar-powered charging hubs or offline-capable dispatch applications, on measured transport-technology adoption rates. Such research would allow the framework developed in this article to move from a conceptual synthesis toward a validated basis for transport and digital-infrastructure policy in rural Nigeria.

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