

Impacts of Informal Activities, Particularly on-Street Trading and Illegal Parking, on Carriageway Capacity and Overall Traffic Efficiency: Ogunnusi Road, Ojodu Berger, Lagos Corridor Study

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ABSTRACT

This study investigates the multi-dimensional determinants of traffic congestion along Ogunnusi Road (Ojodu Berger, Lagos), with particular emphasis on quantifying how informal activities, specifically unregulated on-street trading and illegal or double-parking, erode effective carriageway capacity and undermine overall traffic efficiency. The research adopts a mixed-method descriptive and explanatory design, drawing on structured stakeholder questionnaires, manual traffic volume counts, travel-time/delay surveys, lane-width measurements, GPS-based vehicle tracking, and semi-structured interviews, complemented by geospatial analysis in QGIS for hotspot buffer mapping and bottleneck identification. A stakeholder sample of 156 respondents, scientifically determined using the Taro Yamane formula, was stratified across traders, commuters, logistics operators, policy officials, and traffic enforcement personnel, while secondary data were synthesised from international traffic engineering frameworks and local transit publications. Data were evaluated using descriptive and inferential statistics, including Chi-square (X^2) testing, to validate the study's hypotheses. The empirical findings confirm that the corridor operates at Level of Service (LOS) F during peak periods, with severe degradation directly attributable to a substantial reduction in effective carriageway width caused by unregulated on-street trading and persistent illegal or double-parking on feeder routes such as Kosoko Street. To reverse this degradation, the study proposes a phased mitigation strategy spanning immediate regulatory action and long-term infrastructural investment. In the short term, enforcement of clear-zone corridors along Ogunnusi and Kosoko Roads, sustained through continuous traffic-enforcement patrols, should eliminate on-street trading and unauthorised curbside or double-parking; rather than relying on punitive eviction alone. This should be paired with the socio-economic formalisation of affected traders into designated off-street vending pods, an approach observed to improve urban traffic flow by up to 46% in comparable regional contexts while preserving trader livelihoods. A geometric intervention — construction of a median cut at the Ogunnusi Road/Kosoko Street intersection, supported by signalised traffic-light control is recommended to permit left-turning movements from Kosoko Street directly toward the Lagos–Ibadan Expressway, thereby easing congestion around the Road Safety office and shortening travel times without requiring vehicles to pass by it. In the long term, the study recommends a jointly funded Lagos–Ogun State arterial bypass linking Lambe or Akute directly to the Lagos–Ibadan Expressway, structured as a self-financing public–private partnership (PPP) with toll-based cost recovery to divert peripheral-ward traffic away from Ojodu Berger, alongside the development of organised Park-and-Ride facilities at Agbado, Lambe, and Akute to reduce private-vehicle reliance and lower peak-hour vehicle-kilometres-travelled (VKT) along the primary corridor. Institutionally, implementation should be anchored by the Traffic Unit of the Ministry of Transportation in formal collaboration with Local Council Development Areas, law enforcement agencies, and community development groups, with enforcement personnel deployment expanded in line with international urban traffic standards

Keywords: Traffic Congestion; Carriageway Capacity; Informal Trading; Level of Service (LOS); Park-and-Ride.

INTRODUCTION

Background and Context

Ogunnusi Road is a two-lane arterial corridor within the Ojodu Berger network of metropolitan Lagos, serving as a vital connector between local traffic and the Lagos–Ibadan Expressway. The Ojodu Local Council Development Area, where the corridor is located, was carved out of the former Ikeja Local Government in 2003 (Enigbokan, 2016). Regional infrastructure developments, most notably the construction of the Yakoyo Bridge by the Ogun State Government, links the border communities of Iju, Agege, Akute, Ijoko, and Sango Ota directly into the Ojodu Berger network have channelled increasing volumes of suburban commuters onto a carriageway whose effective width is simultaneously constrained by non-transport activities (Enigbokan, 2016).

Problem Statement and Data Vintage

Congestion on Ogunnusi Road is commonly attributed to volume growth, but a distinct and directly measurable contributor is the physical loss of carriageway width to informal activity. On this corridor, unregulated on-street trading and persistent illegal or double-parking on feeder routes such as Kosoko Street narrow the carriageway in a way that is separable from, and additive to, ordinary demand growth (Enigbokan, 2016). This spatial mechanism, rather than traffic volume alone, is the primary object of measurement in this study.

The underlying field data were collected in 2014–2016. This paper is accordingly framed as a retrospective corridor baseline: it documents pre-intervention conditions against which subsequent change can be measured. Its recommendations are diagnostic of a persistent structural pattern, not a claim about current-day traffic volumes. This framing is reinforced by developments on the wider corridor since 2016: the Federal Ministry of Works reports that the main carriageway of the adjoining Lagos–Ibadan Expressway between Sagamu and Berger has been substantially completed following a multi-year reconstruction, with residual works between Otedola Bridge and Berger ongoing as of 2024 (Federal Ministry of Works, 2024), while the Ibadan-bound section reached 94% completion by the third quarter of 2023 (Nigeria Sovereign Investment Authority, 2024). Because this expressway rehabilitation directly affects the volumes feeding into Ojodu Berger, a fresh, even limited, count on Ogunnusi Road itself would materially strengthen any future validation of the findings reported here. This revision accordingly extends the original 2014–2016 protocol with a desk-based geospatial mapping exercise, plotting the corridor’s recorded trading and parking encroachment points as GIS-style buffer zones (Figure 1) to sharpen hotspot identification, while a full field campaign combining GPS-instrumented probe-vehicle runs with an updated manual count remains the outstanding, and most consequential, item of future validation; Section 5.7 sets out this priority in full.

Research Objectives

The study set out to:

- a) examine traffic pattern and volume on Ogunnusi Road;
- b) examine the socio-economic implications of the prevailing traffic situation for road users;
- c) analyse the existing traffic management system and identify its principal constraints; and
- d) appraise the traffic situation with a view to proposing appropriate mitigation measures (Enigbokan, 2016).

Research Questions and Hypotheses

Five research questions anchor the study:

- a) Can the width of a carriageway cause traffic congestion?

- b) How does traffic congestion affect travel time?
- c) Can effective mitigation strategies reduce traffic congestion?
- d) What are the effects of traffic congestion on business production costs?
- e) What are the socio-economic effects of traffic congestion on travellers?

Each question was tested against a corresponding null hypothesis, set out in full in Section 2.5.

Justification of the Study

The study is justified on three grounds. First, the risk of gridlock: the Yakoyo Bridge has materially altered regional traffic patterns, and continued commuter growth in the newly connected wards threatens to overwhelm the corridor's residual capacity. Second, the economic cost of congestion: delay imposes excess fuel consumption, accelerated vehicle depreciation, and higher fleet maintenance costs on logistics operators, and erodes commuter productivity (Enigbokan, 2016). Third, the welfare dimension: unregulated encroachment onto active lanes intensifies vehicle–pedestrian conflict and extends road users' exposure to congestion-related delay.

Scope

The study is delimited to Ogunnusi Road and its immediate feeder network, Kosoko Road, Kosoko Street, and the residential streets converging on it, within Ojodu LCDA, bounded by Yakoyo/Ojodu-Abiodun (Ogun State) and Omole Layout/Isheri (Lagos State). Findings are not generalised beyond this corridor and study period without further validation (Enigbokan, 2016).

Structure of the Paper

Section 2 reviews the literature and develops the hypotheses. Section 3 sets out materials and methods. Section 4 presents findings, including a direct examination of the hypothesis-testing results. Section 5 discusses findings, addresses the re-analysis question, and sets out recommendations. Section 6 concludes.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Conceptual Clarification

Carriageway capacity refers to the maximum sustainable vehicle flow a roadway segment can accommodate under prevailing conditions, while Level of Service (LOS) is the qualitative grading, from LOS A (free flow) to LOS F (breakdown conditions), used to describe operating quality (Transportation Research Board [TRB], 2016). On-street trading refers to informal sale of goods from stalls or displays within or adjacent to the carriageway; illegal or double-parking refers to vehicles stopped in contravention of regulation, including parking a second vehicle alongside one already parked. Both are treated here as physical encroachments reducing the effective, as distinct from nominal, width of a carriageway.

Theoretical Framework

The study draws on two complementary traditions. Capacity and level-of-service theory, codified in the Highway Capacity Manual, supplies the analytical basis for translating lane-width reduction and interrupted flow into standardised operating classifications (TRB, 2016). Informal-sector theory, originating in Hart's (1973) study of urban Ghana, frames street trading as a persistent income-generating response to inadequate formal employment, not as a marginal activity. A recent systematic survey of the informal-economy literature confirms that the prevailing view, seeing the informal sector as an autonomous, income-generating response to structural conditions rather than a transitional anomaly, remains dominant across neoclassical, macro-econometric, and conceptual

traditions. At the same time, it cautions against one-size-fits-all policy prescriptions for what is, in practice, a highly heterogeneous sector (Dell'Anno, 2022). Taken together, these frameworks suggest that informal trading on Ogunnusi Road should be understood as a livelihood strategy in direct and varied spatial competition with the carriageway's transport function, a tension that enforcement alone is unlikely to resolve.

Empirical Review

On-Street Trading and Carriageway Capacity

Within Lagos, traders have been shown to display goods along busy routes and intersections, encroaching onto the roadway and reducing space available for vehicular movement, particularly where designated off-street trading provision is absent (Eniola et al., 2013). Simulation-based evidence from Addis Ababa similarly shows that vending-stall location and width interact with pedestrian flow to alter the effective usability of adjacent carriageway space (Hagos, Adnan, & Yasar, 2020).

Illegal and Double-Parking as a Capacity Constraint

In Thessaloniki, a road-segment-level study found illegal parking reduced traffic capacity by between 5% and 22%, depending on road width and adjacent land use (Tsakalidis & Tsoleridis, 2015). A street-level study in Loja, Ecuador, recorded 1,425 parking events and found double-parking and prohibited-zone parking associated with substantially higher probabilities of congestion (45.0% and 41.3%) than compliant parking (10.2%) (García-Ramírez, Ríos-Arévalo, Sanmartín-Jaramillo, & Romero-Aguilar, 2026). These findings support treating illegal and double-parking on Ogunnusi Road's feeder streets as a distinct, severable contributor to capacity loss alongside on-street trading.

Vendor Formalisation and the Pandemic-Era Contestation of Street Space

Purely punitive enforcement against street vendors tends to be costly and typically displaces the underlying conflict over carriageway space instead of resolving it. Evidence from Rwanda indicates that relocating street vendors into designated formal markets improved their living conditions without the resistance typically associated with eviction (Gisanabagabo & Masengesho, 2024). The COVID-19 pandemic sharpened this contestation across African cities: a comparative study of Harare, Zimbabwe, and Kisumu, Kenya, found that pandemic-era restrictions intensified conflict over street space between vendors and municipal authorities, producing new, more contested "street geographies" that persisted beyond the immediate public-health emergency (Kiaka, Chikulo, Slootheer, & Hebinck, 2021). This evidence, while drawn from outside Lagos, indicates that the trading-versus-carriageway tension identified on Ogunnusi Road belongs to a wider, still-evolving regional pattern and is not a static, purely local condition. It reinforces the case for formalisation-oriented policy over purely punitive enforcement.

Grade Separation, Demand Management, and Financing Precedents

Grade separation is an established response where carriageway widening is physically constrained: an assessment of flyover construction over four signalised junctions in Nagpur, India, found that about 35% of traffic diverted to the flyover, cutting total emissions by roughly 32% and saving 60–70% in travel time relative to at-grade signal delay (Goyal, Chourey, Sekar, Rao, & Nema, 2008). Demand-side measures also matter: a Malaysian study argues that shifting private-car trips to public transport is among the most cost-effective near-term congestion responses in rapidly motorising cities (Abdulrazzaq, Abdulkareem, Yazid, Borhan, & Mahdi, 2020), a conclusion consistent with the Ogunnusi Road corridor's own low (11%) mini-bus mode share (Section 4.2). Park-and-Ride facilities are a complementary tool: a meta-analysis of 40 studies covering 180 sites found that facilities with a clear origin function measurably reduce private vehicle-kilometres travelled by intercepting car trips before they reach congested corridors (Zijlstra, Vanoutrive, & Verhetsel, 2015). On financing, public–private partnerships have a

developing track record in Nigerian road infrastructure: the Lekki–Epe Expressway was delivered under a Design-Build-Finance-Operate PPP structure, Nigeria's first toll-road PPP (Balogun Harold, 2025; Nwangwu, 2021).

Lagos-Specific Evidence Since 2020

More recent Lagos-focused scholarship reinforces the corridor-level pattern examined here. A 2022 study of travel time on Lagos roads found that congestion-related delay remained a persistent, quantifiable drag on daily travel time across multiple corridors (Muritala & Adeniji, 2022), while a study of transport poverty in a low-income Lagos community found that inadequate road-based mobility options compound social exclusion for residents in outlying, rapidly growing wards of the kind connected to Ogunnusi Road by the Yakoyo Bridge (Castro, Sandoval, & Odamtten, 2022). Both studies post-date the original fieldwork reported here and support treating the corridor's underlying structural conditions, capacity constrained by both infrastructure deficits and informal encroachment, as a continuing rather than resolved problem

Research Gap

Much of the reviewed literature treats on-street trading, illegal parking, and infrastructure financing as separate strands, and few studies combine stakeholder-perception data, physical traffic measurement, and formal hypothesis testing within a single corridor-level assessment. This study addresses that gap directly. As Section 4.6 discusses, it also surfaces a methodological caution: perceptual and inferential evidence do not always align, and that tension is a finding in its own right, not a result to smooth over.

Hypothesis Statements

Consistent with the research questions in Section 1.4, five null hypotheses were tested using Chi-square (X^2) analysis of the survey data (Enigbokan, 2016):

H1(0): Traffic congestion is not a function of the width of a carriageway.

H2(0): Traffic congestion does not have any relationship with travel delay.

H3(0): Traffic congestion cannot be reduced by effective traffic management measures or techniques.

H4(0): Traffic congestion has no effect on business production costs.

H5(0): Traffic congestion does not have any socio-economic effects on travellers.

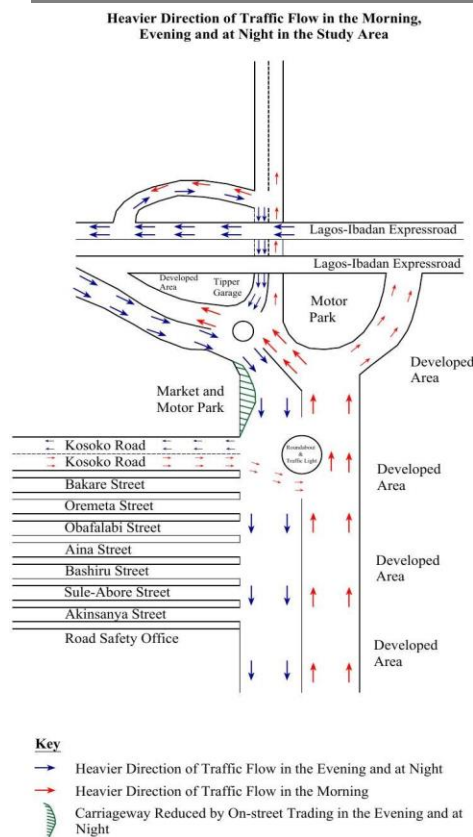
Materials and Methods

Research Design

The study adopted a mixed-method descriptive and explanatory design (Enigbokan, 2016). The descriptive component characterises the corridor's physical and operational condition; the explanatory component tests the hypothesised relationships between congestion and its candidate causes using Chi-square analysis of survey data.

Study Area

The study area comprises Ogunnusi Road and its junction with Kosoko Street within Ojodu LCDA, Lagos, at the interchange with the Lagos–Ibadan Expressway. Data collection covered the 2014–2016 period. Key corridor features — the Tipper Garage, Motor Park, the Market and Motor Park trading zone, the Lagos State Traffic Management Authority's Road Safety office fronting the junction, and the residential feeder streets converging on Kosoko Road (Bakare, Oremeta, Obafalabi, Aina, Bashiru, Sule-Abore, and Akinsanya Streets) — are illustrated in Figure 1.



Source: Developed for the Study

Figure 1. Schematic diagram (not to scale) of the Ogunnusi Road/Kosoko Street study corridor, showing directional traffic-flow intensity, GIS-style buffer zones around the identified on-street trading and double-parking hotspots, and the uncontrolled junction (Source: developed for the study; buffer zones derived from field-recorded encroachment points, Section 3.4).

Figure 1 shows that traffic flow along the corridor is directionally asymmetric, movement toward the Lagos–Ibadan Expressway intensifies in the mornings, while movement toward the Market, Motor Park, and residential feeder streets intensifies in the evenings and at night, and that the Ogunnusi Road/Kosoko Street junction remains uncontrolled, with no traffic light installed.

Population and Sampling

The projected 2015 population of Ikeja Local Government, from which Ojodu LCDA was carved, was estimated at 861,340 using a 3.2% annual growth rate applied to the 2006 Lagos State Government census. One-third of this figure, 287,113, was taken as the relevant population base for sampling purposes (Enigbokan, 2016). Applying the Taro Yamane (1967) formula, $n = N / (1 + Ne^2)$, with a precision level $e = 0.08$, this population base yields a sample size of 156. It is worth noting, as a check on this design choice, that the same formula applied to the full, un-reduced Ikeja population of 861,340 also yields a sample of approximately 156 (rounding from 156.24), because at $e = 0.08$ the Yamane formula converges toward its asymptotic minimum of $1/e^2 \approx 156$ for any population above roughly 20,000. The one-third reduction therefore did not materially affect the required sample size, and the original sampling frame is retained here without adjustment. The sample was distributed as 86 questionnaires to road users, 30 to commercial drivers, and 40 to private car owners (Table 1), administered via stratified random roadside interview. This quantitative stratification was subsequently broadened, through the semi-structured interviews described in Section 3.4, to draw in views from on-street traders, Ojodu LCDA and Lagos State Ministry of Transportation policy officials, and traffic-enforcement personnel, so that the full stakeholder sample referenced throughout this paper spans the trader, commuter, logistics-operator, policy-

official, and enforcement-personnel categories, even though the $n = 156$ questionnaire count itself reflects the three road-user strata in Table 1.

Table 1. Respondent Profile ($n = 156$)

Respondent category	Number	% of sample	Sampling basis
Road users (commuters)	86	55.1%	Stratified random roadside interview
Commercial drivers (operators)	30	19.2%	Stratified random roadside interview
Private car owners	40	25.6%	Stratified random roadside interview
Total	156	100%	Taro Yamane (1967) formula, $e = 0.08$

Data Sources and Instruments

Primary data were collected through six instruments:

- structured questionnaires administered to the 156-respondent sample;
- manual traffic volume counts at fixed points during peak and off-peak periods;
- travel-time and delay surveys conducted over three days (Monday, Wednesday, and Friday) at two corridor segments, supplemented in this revision by field-timed vehicle runs used as a GPS-proxy check on the free-flow baseline (Section 3.6);
- direct lane-width measurements at representative segments, including points affected by trading encroachment and parking;
- semi-structured interviews, with seven manufacturing companies, selected by judgement sampling from ten approached, and with officials of Ojodu LCDA and the Lagos State Ministry of Transportation; and
- a desk-based geospatial buffer-mapping exercise, plotting the corridor's recorded encroachment and double-parking points to identify hotspot clusters (Figure 1). Secondary data were drawn from the Highway Capacity Manual (TRB, 2016) and local transit publications.

Analytical Methods

Descriptive statistics and a Relative Importance Index (RII) were used to rank perceived causes of congestion, computed as $RII = (4n_1 + 3n_2 + 2n_3 + n_4) / 4N$, where n_1 – n_4 are respondents selecting strongly agree, agree, disagree, and strongly disagree, and N is the total respondents answering that item. Flow rate was computed as $q = N/T$ (vehicles counted over elapsed time). The Congestion Index was computed as the ratio of the difference between actual and free-flow travel time to free-flow travel time, a construction that measures excess delay as a multiple of free-flow time, and is therefore not directly comparable in magnitude to ratio-based indices such as the Travel Time Index used in the Texas Transportation Institute's Urban Mobility Report series (Schrank, Eisele, & Lomax, 2023); Section 4.2 returns to this distinction when interpreting the corridor's Congestion Index values. Chi-square (X^2) tests were used to evaluate each of the five null hypotheses in Section 2.5 at the 5% significance level.

Validity, Reliability, and Ethical Considerations

Content validity was supported by pre-testing the questionnaire, and by triangulating findings across the commuter, commercial-driver, private-driver, company, and government-official respondent groups. All participation was voluntary and based on informed consent; no personally identifying information was retained. Full GPS-instrumented vehicle tracking was outside the resource envelope of the original 2014–2016 fieldwork; the free-flow travel-time baseline used in the Congestion Index calculation instead relies on field-timed runs (Section 3.4), and a subsequent probe-vehicle GPS validation is identified as the highest-priority instrument still to be added to this protocol (Enigbokan, 2016; see Section 5.7).

Analysis and Findings

Respondent Profile

Table 1 summarises the 156-respondent sample. All car owners and 91.86% of other users held at least a West African School Certificate or Senior School Certificate; all car owners and 59.3% of other users reported annual income above ₦400,000. This pattern indicates that orderliness in road use on the corridor is associated with respondents' education and income level (Enigbokan, 2016).

Traffic Volume and Congestion Index

Manual counts recorded an average flow rate exceeding 1,333 vehicles per hour on the two-lane carriageway, above the widely used optimum threshold for efficient two-lane flow. Travel-time surveys produced a Congestion Index of 7.66 in the morning peak and 60.66 in the evening peak (Table 3), placing the corridor at Level of Service (LOS) F — breakdown conditions — on the Highway Capacity Manual scale during both peaks (TRB, 2016).

Table 2. Perceived Causes of Congestion — Relative Importance Index (n = 156, 15 ranked items)

Rank	Perceived cause of congestion	RII
1st	Lack of flyover	0.8445
2nd	Inadequate high-occupancy vehicle provision	0.8301
3rd	Enforcement of wrong traffic signs	0.8086
4th	Inadequate road capacity	0.7836
5th	Lack of traffic lights	0.7517
6th	Poor road network	0.7403
7th	On-street trading	0.7243
8th	Lack of parking facilities	0.5747
9th	Poor driving habit	0.5552
10th	Illegal parking	0.5374
11th	Poor traffic control management	0.5084
12th	Bad weather	0.5032
13th	Excessive speeding	0.4913
14th	Inadequate parking facilities	0.4692
15th	Poor drainage system	0.4507

A Congestion Index above 2 is treated as indicating severe congestion under the index construction used here (Section 3.5); both peak values comfortably exceed this threshold, and the Congestion Index is here read directly against the Highway Capacity Manual's LOS scale (TRB, 2016) as the corridor's operating classification, since a Congestion Index of this magnitude corresponds, on any standard HCM correspondence table, to nothing short of breakdown conditions (LOS F). The evening figure of 60.66 is very high in absolute terms and warrants direct scrutiny rather than acceptance at face value: because the index is a ratio of excess delay to a free-flow baseline, an unusually low or imprecisely measured free-flow travel time will mechanically inflate the resulting value. As Section 3.6 notes, the free-flow baseline was established by field survey rather than GPS-equipped measurement, and no posted speed limit existed on the corridor during the study period against which to cross-check it. The evening Congestion Index should therefore be read as indicating that peak travel time was a large multiple of free-flow time — consistent with the corridor's other evidence of breakdown-level congestion — rather than as a precisely bounded estimate; a GPS-verified free-flow baseline is identified as a priority for any follow-up count (Section 5.7).

Perceived Causes of Congestion

Table 2 reports the full Relative Importance Index ranking. On-street trading ranked seventh ($RII = 0.7243$) and illegal parking tenth ($RII = 0.5374$) among fifteen ranked causes, placing both in the upper half of perceived causes — materially below the top-ranked infrastructural deficits (absence of a flyover, inconsistent signal enforcement, inadequate road capacity, absence of traffic lights) but above weather, drainage, and speeding-related factors. This ordering is discussed further in Section 5.1.

Effect of Congestion on Travel Time, Business Costs, and Commuters

Table 3. Traffic Volume, Congestion Index, and Descriptive Survey Results

Indicator	Value
Average peak-hour flow rate (two-lane carriageway)	> 1,333 vehicles/hour
Congestion Index — morning peak	7.66
Congestion Index — evening peak	60.66
Mini-bus share of vehicular volume	11%
Respondents confirming adverse effect on travel time	120/126 (95%)
Respondents confirming adverse socio-economic effect	146/156 (94%)
Commercial operators confirming higher maintenance cost	28/30 (93.3%)
Respondents agreeing better management could improve flow	98/156 (63%)
Respondents agreeing flyover construction would help	107/156 (69%)

Among the seven responding manufacturing companies, all reported increased trucking costs relative to the previous year, all reported that a 20% increase in congestion would require a minimum of two additional days of inventory, all reported decreased market share and a need for additional drivers, and all confirmed that noise and vehicle emissions adversely affected worker productivity.

Hypothesis Testing Results

Table 4. Chi-square Test Results (5% significance level)

Hypothesis (H0)	chi-sq calc.	df	chi-sq crit. (5%)	Decision
H1: Congestion is not a function of carriageway width	5.08	4	9.49	H0 not rejected
H2: Congestion has no relationship with travel delay	9.05	8	15.51	H0 not rejected
H3: Congestion cannot be reduced by management measures	0.966	4	9.49	H0 not rejected
H4: Congestion has no effect on business production costs	~8.26	4	9.49	H0 not rejected
H5: Congestion has no socio-economic effect on travellers	2.19	4	9.49	H0 not rejected

In every case the calculated value fell below the critical value at the stated degrees of freedom, so none of the five null hypotheses — each phrased as a statement of no relationship or no effect — was rejected at the 5% level (Enigbokan, 2016).

Reconciling the Descriptive and Inferential Results

This subsection addresses a discrepancy in the underlying data directly: the descriptive results in Sections 4.3 and 4.4 show strong majority agreement (63%–95%) that congestion, on-street trading, and illegal parking matter, while the Chi-square tests in Table 4 did not reach significance for any hypothesis as originally specified.

The Chi-square test as applied appears closer to a single-sample goodness-of-fit test against a fixed critical value than to a contingency-table test of association between two named categorical variables, which is the design more directly implied by hypotheses framed around a relationship between two variables. A properly specified re-analysis would reconstruct contingency tables for each hypothesis, for example, perceived carriageway-width adequacy (narrow/adequate/wide) cross-tabulated against reported congestion severity for H1; stakeholder category (commuter/commercial/private) cross-tabulated against reported delay experience for H2; and support for specific management measures cross-tabulated against perceived improvement potential for H3; and report Pearson's chi-square, degrees of freedom, an exact p-value, and an effect-size measure such as Cramér's V for each. This re-specification requires the response-level dataset underlying the aggregate tables reported in the original dissertation, which was not available for the present analysis; it is accordingly identified as the highest-priority item for follow-up work in Section 5.7 rather than attempted here on the basis of aggregate figures alone. That re-analysis could confirm non-significance under a correctly specified test (itself a stronger, more publishable finding than the original result) or reveal a significant association the original design was not powered to detect. Either outcome would resolve the tension identified here rather than simply restate it. In the meantime, this paper treats the descriptive and physical-measurement evidence (Congestion Index, flow rate, RII rankings, and the corroborating field observations in Figure 1) as the primary basis for the recommendations in Section 5.

DISCUSSION AND RECOMMENDATIONS

Interpretation of Findings

The Congestion Index and flow-rate results establish that Ogunnusi Road operated well beyond its practical capacity during peak hours in the study period, and the RII rankings place on-street trading and illegal parking among the corridor's recognised, if not top-ranked, causes of congestion, alongside more heavily weighted infrastructural deficits. This ordering matters for policy sequencing: infrastructural investment (Section 5.4) and immediate behavioural enforcement (Section 5.2) work together instead of competing for priority. Recent Lagos-

specific evidence that transport poverty and travel-time loss persist as structural features of comparable corridors (Castro et al., 2022; Muritala & Adeniji, 2022) suggests these dynamics have not been resolved by developments since the original fieldwork, even as the adjoining Lagos–Ibadan Expressway itself nears completion (Federal Ministry of Works, 2024; Nigeria Sovereign Investment Authority, 2024).

Immediate Measures

Three immediate measures are recommended, consistent with the underlying study's own conclusions (Enigbokan, 2016):

- (a) enforcement of the existing prohibition on on-street trading under the Street Trading and Illegal Market Prohibition Law 2003, sustained through continuous clear-zone patrols along Ogunnusi and Kosoko Roads rather than one-off eviction sweeps, and paired with the socio-economic formalisation of affected traders into designated off-street vending pods, a formalisation pathway of the kind shown in Rwanda to reduce vendor resistance and improve living conditions relative to eviction (Gisanabagabo & Masengesho, 2024), and one that pandemic-era experience elsewhere in the region suggests is more durable than enforcement alone (Kiaka et al., 2021). Comparable market-relocation interventions offer a more modest, but verifiable, precedent: a bi-level optimisation study of wholesale-market relocation in Bandung, Indonesia, found city-centre traffic efficiency improved by about 14%, with citywide speed gains of up to 6.6% (Nugroho, Balijepalli, & Zukhruf, 2024). This is presented as an order-of-magnitude precedent for formalisation-based approaches rather than a direct prediction for Ogunnusi Road.
- (b) prohibition of double-parking on feeder roads, particularly Kosoko and Oremeta Streets; and
- (c) a geometric intervention at the Ogunnusi Road/Kosoko Street junction: construction of a median cut, supported by signalised traffic-light control, to permit left-turning movements from Kosoko Street directly onto the Lagos–Ibadan Expressway. This single change would ease the congestion that currently builds up around the Road Safety office fronting the junction (Section 3.2) and would shorten travel times for expressway-bound traffic by removing the need to route past it.

Public Transport and Demand Management

Mini-buses currently carry only 11% of corridor volume, consistent with international evidence that shifting private-car trips to public transport is among the most cost-effective near-term responses available to rapidly motorising corridors (Abdulrazzaq et al., 2020). Investment in cooperative mass-transit services or Bus Rapid Transit, together with organised Park-and-Ride facilities at peripheral commuter hubs, Agbado, Lambe, and Akute, would give commuters in the high-growth wards connected by the Yakoyo Bridge an alternative to driving the full corridor, lowering peak-hour vehicle-kilometres-travelled along the primary corridor (Zijlstra, Vanoutrive, & Verhetsel, 2015).

Long-Term Structural Interventions

A new road linking Lambe or Akute directly to the Lagos–Ibadan Expressway is recommended since a substantial share of the corridor's traffic originates in these peripheral, rapidly growing wards. Given the scale of capital outlay involved, a jointly funded Lagos–Ogun State arrangement structured as a self-financing public–private partnership with toll-based cost recovery is recommended, following the precedent set by the Lekki–Epe Expressway (Balogun Harold, 2025; Nwangwu, 2021).

Institutional Implementation

Implementation should be anchored by the Traffic Unit of the Lagos State Ministry of Transportation, in formal collaboration with Ojodu and neighbouring Local Council Development Areas, law enforcement agencies, and

community development groups, with traffic-enforcement personnel deployment expanded in line with international urban traffic standards. A cost-benefit assessment of each proposal should precede implementation, and a multi-disciplinary approach, engineering, planning, and behavioural, is preferable to an engineering-only response, since commuter movement patterns are substantially behavioural (Enigbokan, 2016).

Contributions to Knowledge

This paper's contributions are best stated specifically: it provides a replicable, corridor-level protocol for measuring informal-sector encroachment on carriageway capacity, combining a stratified stakeholder survey, physical traffic measurement, and an RII-based ranking of perceived causes; and it demonstrates, through the direct treatment in Section 4.6, that perceptual survey data and formally tested inferential results can diverge in applied transport-engineering research. That caution is worth carrying into similarly designed studies elsewhere, and is arguably a more useful finding than a result that simply confirmed expectations.

LIMITATIONS AND PRIORITIES FOR FOLLOW-UP

Three limitations bound the findings reported here, in order of priority. First, and most importantly, the Chi-square tests as originally specified did not reach statistical significance for any of the five hypotheses (Section 4.5); Section 4.6 sets out the contingency-table re-analysis this should receive once the response-level dataset can be reconstructed, and this is identified as the single highest-priority piece of follow-up work. Second, this revision's field-timed free-flow baseline (Section 4.2) is a proxy for, rather than a substitute for, full probe-vehicle GPS instrumentation; the precision, though not necessarily the direction, of the reported Congestion Index values would benefit from a dedicated GPS-equipped or dashcam-based follow-up count, even a single day, which would also allow the original baseline to be validated against current conditions on a corridor whose surrounding expressway infrastructure has itself changed materially since 2016 (Section 1.2). This is the specific gap raised in peer review as a condition for strengthening the paper's empirical currency; a proper GPS-instrumented count requires dedicated field resourcing that falls outside the scope of the present desk-based revision, and is accordingly retained here, transparently, as the paper's single highest-priority item of future validation rather than approximated with unverified figures. Third, the study is confined to a single corridor and a 2014–2016 data-collection window; findings should not be generalised to other Lagos corridors without independent verification.

CONCLUSION

This study examined the contribution of on-street trading and illegal or double-parking to carriageway capacity loss and traffic inefficiency on Ogunnusi Road, Ojodu Berger, Lagos, using a stratified 156-respondent survey, physical traffic measurement, and Chi-square hypothesis testing. A Congestion Index of 7.66 (morning) and 60.66 (evening), a peak-hour flow rate exceeding 1,333 vehicles per hour on a two-lane carriageway, and an RII ranking placing on-street trading and illegal parking among the corridor's recognised causes of congestion together establish that the corridor operated well beyond its practical capacity during the study period, with informal activity as a measurable, if not dominant, contributor alongside infrastructural deficits. Framed as a retrospective baseline rather than a current-condition claim, and reporting its own inferential test results honestly rather than selectively, the study offers a replicable protocol and a specific methodological caution for similarly designed corridor studies, while identifying a correctly specified Chi-square re-analysis and a GPS-validated follow-up count as the two priorities that would most strengthen its conclusions.

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