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Crime and Community Safety in Urban Mobility Spaces:Spatial Evidence from Transportation Activity Areas in Cross River State, Nigeria

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Abstract

The study examines associations between transportation activity areas and community-level crime patterns across eight urban centres in Cross River State, Nigeria. A multi-stage household survey administered 1,075 questionnaires across 96 urban communities. Five transportation-space categories and 11 crime categories were examined using Pearson correlations and canonical correlation analysis (CCA). Two canonical functions were statistically significant: Function 1 ($Rc = 0.604$, $Rc^2 = 0.365$, $p < .001$) and Function 2 ($Rc = 0.517$, $Rc^2 = 0.267$, $p = .016$). Local streets recorded the strongest transportation-space loading on Function 1 (0.920), while kidnapping, robbery and arson contributed prominently to the associated crime pattern. The findings reveal differentiated spatial associations between mobility environments and crime and underscore the value of place-based, context-sensitive approaches integrating environmental design, community guardianship and spatial safety auditing into urban crime-prevention planning.

1. Introduction

Crime prevention is inseparable from the places in which people live, move and interact. Streets, footpaths, transport nodes and neighbourhood connectors are not merely physical conduits; they are everyday settings in which people, activities, opportunities and forms of guardianship converge. Contemporary place-based crime research increasingly emphasises the environmental, social and management conditions that make some locations more vulnerable than others (Ceccato & Newton, 2024; Ceccato, 2025). Transportation spaces are especially important because they combine movement, waiting, exchange and access to services, creating distinctive patterns of exposure and guardianship. Safety in such environments is therefore a concern for both community safety and transport planning (Abenoza et al., 2018; Ceccato et al., 2022).

The connection between crime and mobility is particularly important because travel unfolds through sequences of paths, intersections, stops and transfer points. Research on transport environments has shown that crime and safety perceptions vary across space and time and can differ between nodes and along the journey (Ceccato & Uittenbogaard, 2014; Ceccato et al., 2021; Ceccato et al., 2022). Evidence from travel-behaviour research further indicates that fear of crime and perceived danger can affect walking, active travel, public transport use and other mobility decisions (Foster et al., 2014; Caros & Chow, 2020; Heinen, 2023). These findings suggest that crime prevention cannot be separated from the spatial conditions through which everyday mobility occurs.

Geographically, much of the established evidence on transport safety and crime has been generated in North America, Europe and other relatively well-documented urban systems. Less is known about how crime-related vulnerability is organised across ordinary transportation environments in rapidly urbanising African cities, where formal and informal mobility systems coexist with mixed land uses, variable pedestrian infrastructure and uneven institutional surveillance. In such settings, a single street or path may simultaneously function as a movement corridor, commercial space, social space and access route

to essential services. These overlapping functions make the spatial organisation of safety especially relevant to community life (Uteng & Turner, 2019; Vanderschuren et al., 2023; Moreira & Ceccato, 2021).

A further issue concerns the distinction between crime occurring near a destination and crime-related vulnerability encountered along the path of everyday movement. Recent studies increasingly examine exposure along routes rather than only at origins and destinations, showing that crime-related characteristics can be relevant to active travel and mode choice (Singleton et al., 2017; Zhou et al., 2025; Lim & Li, 2026). From a crime-prevention perspective, paths and nodes can therefore be treated as place-based environments whose characteristics influence opportunities for offending, visibility, guardianship and perceived safety. The present study adopts this place-based perspective while avoiding the assumption that any particular transportation-space type causes a particular crime.

This study examines the association between transportation activity areas and community-level crime patterns across urban communities in Cross River State, Nigeria. The study does not estimate individual travel responses, route switching or mode substitution because these outcomes were not directly measured. Instead, it asks how different transportation-space categories relate to the broader spatial structure of observed crime patterns. This distinction allows the study to contribute to crime prevention and community-safety scholarship without overstating the evidential reach of the survey data.

Three questions guide the analysis: (1) how do crime patterns vary across the sampled urban communities and transportation environments; (2) which transportation-space categories exhibit the strongest associations with particular crime categories; and (3) what multivariate relationship exists between the transportation-space variables and the observed crime profile? Pearson correlation and canonical correlation analysis (CCA) are used to answer these questions. CCA is appropriate because it examines relationships between two sets of variables simultaneously, allowing combinations of transportation-space characteristics and combinations of crime patterns to be analysed jointly rather than treating each pairwise association as an isolated effect (Uurtio et al., 2017).

The study makes three contributions. First, it extends place-based crime and community-safety research to an underrepresented Nigerian urban context. Second, it differentiates among ordinary mobility environments; major roads, local streets, cul-de-sacs, footpaths and traffic interchanges rather than treating the transport network as a homogeneous setting. Third, it translates the resulting spatial evidence into prevention-oriented implications concerning environmental design, guardianship, safety auditing and targeted place management. The central argument is that safer communities require attention not only to where crime is recorded but also to the everyday paths and nodes through which community life is organised (Ceccato & Newton, 2024; Cozens et al., 2022).

2. Conceptual Framing and Literature Review

2.1 Community Safety and Mobility Environments

Community safety is shaped by the interaction between people, places, activities and institutional responses. A place can be formally accessible while remaining practically avoided or weakly used because users perceive it as unsafe. For crime-prevention research, this makes the everyday environment important: streets, paths and transport nodes are settings in which routine activities occur and where formal and informal guardianship may vary. The concept of risky places is particularly useful because it draws attention to facilities, paths and nodes where crime opportunities and safety concerns can become concentrated rather than assuming that risk is evenly distributed across a community (Ceccato & Newton, 2024).

The mobility environment is therefore part of the community-safety system. Transport users encounter physical design, land-use interfaces, lighting, visibility, maintenance, other users and guardianship as they move. Perceptions of safety may influence walking, transit use and route decisions, but the environmental conditions that generate those perceptions are themselves worthy of investigation (Abenoza et al., 2018; Ceccato & Loukaitou-Sideris, 2022; Heinen, 2023). In this study, transportation spaces are consequently treated as place-based environments whose crime associations can inform prevention even though individual behavioural adaptation is not directly measured.

This approach is also consistent with the broader community-safety literature, which increasingly calls for interdisciplinary analyses linking environmental conditions, social vulnerability, place management and evidence-based prevention. Rather than viewing safety as solely a policing outcome, place-based approaches recognise the roles of planning, design, maintenance, community organisations and other local actors in reducing opportunities for harm (Clarke, 1995; Ceccato & Newton, 2024).

2.2 Transportation Spaces as Risky Places

Transportation environments are distinctive crime settings because they bring together movement, targets, opportunities and social interaction. Research on transport nodes demonstrates that crime varies across locations and times, while systematic reviews show that safety concerns can arise throughout the journey rather than only at formal stations or terminals (Ceccato & Uittenbogaard, 2014; Ceccato et al., 2022). This makes ordinary streets, paths and transfer spaces relevant to community safety, particularly where transport infrastructure is intertwined with residential, commercial and informal activities.

Place-based crime prevention also requires attention to the interaction between environmental opportunity and guardianship. High pedestrian activity can increase natural surveillance in some settings while anonymity and weak management can increase vulnerability in others. Evidence on fear of crime and transport use suggests that users respond not only to recorded incidents but also to environmental cues and social conditions (Abenoza et al., 2018; Yavuz & Welch, 2010; Heinen, 2023). The prevention challenge is therefore to understand the characteristics of particular places rather than assume that high movement volumes automatically make a location safe.

Recent route-level research strengthens this argument by showing that exposure along paths can matter for mobility decisions (Singleton et al., 2017; Zhou et al., 2025; Lim & Li, 2026). For community-safety planning, this implies that crime-prevention strategies should extend beyond fixed destinations to include the routes and nodes that connect them. The present study contributes to this perspective by examining several transportation-space categories simultaneously across multiple urban communities.

2.3 Routine Activity, Environmental Criminology and CPTED

Routine activity theory proposes that crime opportunities emerge when motivated offenders, suitable targets and the absence of capable guardians converge in time and space (Cohen & Felson, 1979). Transportation spaces can facilitate such convergence because they structure flows of people and create predictable points of movement, waiting and interaction. Environmental criminology and crime-pattern theory similarly emphasise the spatial organisation of opportunities and the importance of paths, nodes and activity spaces (Brantingham & Brantingham, 1993; Sherman et al., 1989).

Crime Prevention Through Environmental Design (CPTED) and related place-based approaches add a practical prevention dimension. Jacobs (1961) emphasised natural surveillance and active public space, while Newman (1972) linked defensible space with territorial control. Contemporary CPTED incorporates surveillance, access management, territorial reinforcement, activity support and maintenance, with increasing attention to context and user experience (Cozens et al., 2005; Cozens et al., 2022; Armitage, 2018). Nigerian evidence also indicates that environmental characteristics can be associated with crime, although design interventions must be adapted to local social and spatial conditions (Badiora et al., 2021).

Taken together, these perspectives offer plausible explanations for why different transportation spaces may have different crime profiles. Major roads may combine visibility and high movement with anonymity; local streets may support routine community activity while receiving less formal surveillance; cul-de-sacs may restrict through movement; footpaths may provide direct pedestrian access while becoming vulnerable under poor environmental conditions; and interchanges may concentrate people and opportunities. These are theoretical possibilities rather than variables directly measured in the present study. The empirical task is therefore to identify whether the transportation-space categories are statistically associated with differentiated crime patterns.

2.4 Research Gap and Analytical Proposition

Three gaps motivate the study. First, place-based crime research has often concentrated on formal facilities or documented hotspots, while ordinary mobility environments remain comparatively underexamined in many African cities. Second, studies of transport safety frequently emphasise perceptions or behavioural responses, leaving fewer analyses of the spatial relationship between multiple transportation-space types and multiple crime categories. Third, evidence from the Global South remains uneven despite calls for more geographically diverse and context-sensitive crime-prevention

research (Ceccato, 2025). Accordingly, this study proposes that transportation-space characteristics and community-level crime patterns form an interrelated multivariate structure. The proposition is explicitly associative rather than causal: the analysis identifies spatial relationships that can inform prevention, but it does not establish that a particular transportation-space type causes a particular crime.

3. Materials and Methods

3.1 Study Area

Cross River State occupies approximately 23,074 km² in southeastern Nigeria and extends from about 4°28' to 6°55' N and 7°50' to 9°28' E. It is bounded by Benue State to the north, Ebonyi and Abia States to the northwest and west, Akwa Ibom State and the Atlantic coast to the south, and Cameroon to the east (Fig. 1). The state comprises 18 local government areas and contains urban centres with markedly different settlement structures, economic functions and transport environments. The study deliberately treats the state as a multi-urban system rather than focusing on a single metropolitan core because the objective is to identify patterns that recur across different urban contexts.

3.2 Research Design and Sampling

The study used a cross-sectional, multi-stage survey design. The spatial unit of analysis was the urban community, while household heads constituted the principal respondents. The analytical unit for the inferential statistics was the urban community, using aggregated community-level measures. Eight of the state's recognised urban centres were selected: Calabar, Ikang, Ugep, Ikom, Akamkpa Urban, Obubra Urban, Itigidi and Yala. Within the selected urban centres, 96 urban communities were included using systematic selection procedures. Population estimates were projected from the 1991 census base using a 3% annual growth assumption to obtain an estimated 2024 population of approximately 1,624,391 persons across the selected urban centres. Using an assumed average household size of six persons produced an estimated 270,681 households. Yamane’s (1967) formula at a 5% tolerable error produced a minimum sample of approximately 399 households. To improve coverage at community level, the allocation was adjusted so that communities with very small calculated allocations received a minimum of ten respondents. This expanded the planned allocation to 1,066 households, and 1,075 questionnaires were ultimately administered. (National Population Commission, 1998; National Population Commission, 2009; Yamane, 1967)

The sampling procedure provides broad spatial coverage, while the inferential analysis is explicitly conducted at the community level. The distinction between administered questionnaires and the effective analytic unit is therefore important: 1,075 household questionnaires supplied the underlying observations, whereas 96 complete urban-community observations were retained for the bivariate and canonical analyses. This aggregation reduces the risk of presenting community-level associations as individual-level behavioural effects, although ecological inference remains a limitation.

3.3 Measurement of Transportation Activity Areas and Crime

Five transportation-space categories were examined: major roads, local streets, cul-de-sacs, footpaths and traffic interchanges. Eleven crime categories were assessed: theft, assault, vandalism, burglary, kidnapping, rape, homicide, robbery, arson, drug trafficking and human trafficking. Respondents assessed crime-related conditions using a five-point response scale, and responses were aggregated to community-level mean scores. These scores were used to represent the relative level of reported or observed crime-related conditions across the sampled communities and transportation environments.

The measurement captures perceived or observed community-level crime exposure rather than verified police incident counts. It may therefore reflect direct experience, indirect experience, community knowledge and perceptions of local conditions. This distinction matters because the analysis concerns community-level spatial association, not official incident prevalence or individual victimisation. The measures should consequently be interpreted as survey-derived indicators of crime-related conditions, not as counts of confirmed offences (Abenoza et al., 2018; Ceccato & Loukaitou-Sideris, 2022).

3.4 Analytical Strategy

The analysis proceeded in three stages. First, descriptive mean scores were examined to characterise variation in crime patterns across the sampled communities. Second, Pearson correlation coefficients were calculated between the five transportation-space variables and each crime category. Third, canonical correlation analysis (CCA) was used to examine the multivariate association between the transportation-space set and the crime-pattern set (Uurtio et al., 2017).

Set 1 in the CCA comprises major roads, local streets, cul-de-sacs, footpaths and traffic interchanges; Set 2 comprises the eleven crime categories. The canonical correlation coefficient (Rc) represents the correlation between a linear combination of Set 1 and a linear combination of Set 2. Rc^2 indicates the squared canonical correlation for each function. Wilks' Lambda was used to test the joint statistical significance of the canonical functions. Interpretation focuses on canonical structure coefficients/loadings because they indicate the contribution of individual variables to each canonical variate without implying that the variables are causal determinants of one another (Uurtio et al., 2017).

Only statistically supported canonical functions are substantively interpreted. The final analysis uses the ordering reported in the statistical table: Rc = 0.604 for Function 1 and Rc = 0.517 for Function 2. The inferential unit is the complete community-level dataset (n = 96), not the 1,075 individual questionnaires. The distinction is retained throughout the interpretation so that community-level spatial associations are not presented as individual-level victimisation or behavioural effects.

4. Results

4.1 Spatial Variation in Community-Level Crime Patterns

The descriptive results show substantial spatial heterogeneity in reported or observed crime-related conditions across the sampled communities. Theft is widespread, while kidnapping, robbery and drug trafficking reach relatively high values in particular communities. This variation establishes the spatial context for the subsequent transportation-space analysis (Table 1 and Fig. 2). Importantly, the descriptive table concerns community-level crime patterns; the bivariate and canonical analyses below examine their association with the five transportation-space variables.

Table 1
Spatial Variation in Community-Level Crime Patterns

Crime type	Observed pattern	Highest reported value	Lowest reported value
Theft	Widespread; moderate to high	Four Corners (3.8)	Obot 20 (1.0)
Assault	Moderately high and persistent	Ikot Ansa/Otop Abasi/Archibong/Duke Town (3.7–3.8)	Ikot Effanga (2.0)
Vandalism	Low to moderate and dispersed	Archibong/Egbizum (2.9)	Eburutu Barracks (1.0)
Burglary	Substantial exposure; clustered	Ikot Efa/Ishie Town/Akim Qua/Anantigha (3.8)	Obot 20 (2.4)
Kidnapping	Prevalent in selected areas	Cobham Town/Four Corners/Ikot Ebuk (4.5)	Eburutu Barracks (1.0)
Rape	Lower overall prevalence with spikes	Olachor (3.8)	Several communities (2.0)
Homicide	Relatively uncommon but severe	Owakande II (4.4)	Several communities (2.0)
Robbery	Entrenched in several locations	Henshaw Town (4.5)	Island/Utukpo (2.0–2.5)
Arson	Generally low and uneven	Archibong (2.7)	Many areas (2.0–2.2)
Drug trafficking	Acute in selected enclaves	Lekemkabali (4.8)	Broad areas (3.0–3.3)
Human trafficking	Moderate with localised peaks	Obioko (2.9)	Eburutu Barracks (1.0–1.5)

Note. Values are mean scores reported in the original field-survey analysis (2025).

4.2 Bivariate relationships between transportation spaces and crime

The bivariate results as shown in Table 2 explain a differentiated but generally modest pattern of association. Local streets have significant positive associations with kidnapping (r = .332, p = .001), robbery (r = .309, p = .002) and arson (r = .321, p = .001), alongside a significant negative association with human trafficking (r = − .351, p < .001). Traffic interchanges are positively associated with homicide (r = .222, p = .029). Footpaths show inverse association with vandalism (r = − .225, p = .027) and positive associations with robbery (r = .219, p = .031) and drug trafficking (r = .201, p = .048). Cul-de-sacs show a significant negative association with human trafficking (r = − .209, p = .039). These coefficients are modest and should not be interpreted as evidence that a transportation-space type causes a crime; rather, they identify pairwise spatial associations that warrant multivariate interpretation.

Table 2
Bivariate relationships between transportation spaces and crime

Crime	Major road r (p)	Local street r (p)	Cul-de-sac r (p)	Footpath r (p)	Interchange r (p)
Theft	−.126 (.217)	.153 (.135)	.080 (.436)	.053 (.604)	−.060 (.559)
Assault	.126 (.219)	−.208 (.041)	.182 (.075)	.029 (.775)	.021 (.836)
Vandalism	.044 (.666)	.192 (.059)	−.062 (.543)	−.225 (.027)	.171 (.093)
Burglary	.167 (.102)	.023 (.821)	−.025 (.811)	.087 (.397)	−.089 (.384)
Kidnapping	−.066 (.523)	.332 (.001)	.032 (.756)	−.033 (.747)	.161 (.116)
Rape	−.139 (.174)	.060 (.561)	.164 (.109)	.114 (.265)	−.018 (.864)
Homicide	−.067 (.512)	.101 (.323)	−.050 (.629)	.008 (.942)	.222 (.029)
Robbery	.157 (.125)	.309 (.002)	−.064 (.534)	.219 (.031)	.090 (.381)
Arson	−.013 (.903)	.321 (.001)	.069 (.503)	−.138 (.177)	.191 (.061)
Drug trafficking	.070 (.496)	.031 (.766)	−.072 (.482)	.201 (.048)	−.004 (.970)
Human trafficking	.018 (.861)	−.351 (< .001)	−.209 (.039)	−.028 (.783)	−.132 (.196)

Note. p-values are two-tailed.

4.3 Canonical correlation analysis

The first canonical correlation is 0.604 (Rc^2 = 0.365), and the first function is statistically significant (p < .001). The second canonical correlation is 0.517 (Rc^2 = 0.267), and the second function is also statistically significant (p = .016). The third, fourth and fifth functions are not statistically significant (Table 3). Accordingly, the substantive interpretation is restricted to Functions 1 and 2. The results indicate that transportation-space variables and crime variables share a statistically detectable multivariate structure at the community level, rather than that the transportation variables independently predict crime.

Table 3
Canonical correlation analysis

Function	Rc	Rc^2	Eigenvalue	Wilks' Lambda	F	df	p
1	0.604	0.365	0.575	0.315	1.954	55, 378.518	< .001
2	0.517	0.267	0.365	0.495	1.592	40, 312.790	.016
3	0.466	0.217	0.277	0.676	1.291	27, 243.045	.160
4	0.312	0.097	0.108	0.864	0.798	16, 168.000	.686
5	0.207	0.043	0.045	0.957	0.546	7, 85.000	.797

4.4 Canonical loadings and spatial meaning

As noted in Table 4, canonical function 1 is dominated on the transportation side by local streets (0.920), followed by traffic interchanges (0.487). On the crime side, kidnapping (0.583), robbery (0.526), arson (0.556) and human trafficking (− 0.586) have comparatively strong loadings (Table 4). The function therefore represents a multivariate spatial dimension in which neighbourhood-scale transportation environments and interchange settings are aligned with a differentiated profile of crime-related conditions. The coefficients describe the structure of the canonical variate; they should not be interpreted as effect sizes or causal pathways.

Table 4
Canonical loadings and spatial meaning

Transportation variable	**Function 1**	**Function 2**
Major roads	−0.016	−0.445
Local streets	0.920	0.109
Cul-de-sacs	0.069	0.595
Footpaths	0.096	−0.596
Traffic interchanges	0.487	−0.113
Crime variable	Function 1	Function 2
Theft	0.206	0.178
Assault	−0.311	0.099
Vandalism	0.341	0.127
Burglary	−0.029	−0.251
Kidnapping	0.583	0.140
Rape	0.107	0.219
Homicide	0.302	−0.056
Robbery	0.526	−0.459
Arson	0.556	0.267
Drug trafficking	0.074	−0.391
Human trafficking	−0.586	−0.290

Function 2 is characterised by cul-de-sacs (0.595), footpaths (− 0.596) and major roads (− 0.445). Robbery (− 0.459), drug trafficking (− 0.391) and arson (0.267) have comparatively notable crime loadings (Table 4). The opposing transportation-space loadings indicate that different types of movement environments occupy different positions within the second multivariate dimension. The analysis does not demonstrate that cul-de-sacs, footpaths or major roads cause these crime patterns. Instead, it identifies a shared spatial structure that can be examined further through geocoded incident data, environmental audits and place-based prevention research.

5. Discussion

5.1 Transportation Spaces as Places of Crime Prevention and Community Safety

The principal contribution of the findings is to reposition transportation space as a component of the community-safety environment rather than as infrastructure considered only in terms of movement capacity. The significant canonical functions show that the five transportation-space categories do not occupy interchangeable positions within the multivariate structure of crime-related conditions. This finding is consistent with place-based approaches that conceptualise crime risk as emerging from the interaction of people, activities, physical environments and guardianship (Cohen & Felson, 1979; Ceccato & Newton, 2024). It also supports the view that safer mobility requires attention to the environmental conditions of paths and nodes, not only to policing after offences occur.

The result is compatible with research showing that transport users experience safety through particular places and journeys. Crime and fear can influence walking and other travel decisions (Foster et al., 2014; Heinen, 2023), while studies of transit environments show that safety concerns vary across locations and contexts (Ceccato et al., 2022). The present study complements that literature by identifying spatial associations between transportation-space categories and crime patterns in a Nigerian setting. Because behavioural adaptation was not measured, the findings should be understood as identifying potential environmental conditions of community safety rather than estimating behavioural responses.

5.2 Local Streets as Priority Community-Safety Environments

Local streets have the strongest transportation-space loading in Function 1 (0.920), making them the most structurally prominent transportation variable in the canonical solution. This is important from a community-safety perspective because local streets are embedded in everyday residential and neighbourhood activity. They can function simultaneously as access routes, social spaces and connectors to markets, schools and public transport. Their importance therefore extends beyond conventional traffic engineering.

This result is consistent with environmental-criminology and CPTED arguments concerning surveillance, activity and place management, but the present data do not directly measure lighting, visibility, permeability, land-use frontage or guardianship. These mechanisms should therefore be treated as plausible explanations for future testing rather than as established causes in this study. Jacobs' (1961) emphasis on natural surveillance and contemporary CPTED principles provide useful prevention frameworks, while the Nigerian evidence base suggests that environmental-design interventions require local adaptation (Cozens et al., 2022; Badiora et al., 2021).

5.3 Cul-de-sacs, Footpaths and Interchanges

Function 2 highlights contrasting loadings for cul-de-sacs (0.595) and footpaths (− 0.596), while major roads also contribute substantially (− 0.445). These results suggest that transportation environments should not be treated as a single category in community-safety assessments. Different spatial settings can support different combinations of movement, activity, exposure and guardianship. The finding is

particularly relevant to neighbourhood planning because low-volume or pedestrian routes can be overlooked when safety assessments focus mainly on major roads.

Traffic interchanges also load relatively strongly on Function 1 (0.487). Such locations concentrate flows, waiting and interaction and can therefore become strategic places for prevention. Research on transport safety similarly emphasises the importance of nodes and transfer environments (Ceccato et al., 2013; Ceccato et al., 2022). The appropriate response is not blanket securitisation, but context-sensitive design and management that improve visibility, lighting, legibility, maintenance and legitimate activity while avoiding unnecessary exclusion.

5.4 From Spatial Diagnosis to Community Safety

The policy relevance of the findings lies in the possibility of connecting spatial diagnosis with place-based prevention. If particular transportation environments are repeatedly associated with crime-related conditions, planning and security agencies can use that information to prioritise environmental audits, maintenance, lighting, community reporting and targeted guardianship. Such interventions are consistent with the broader shift from reactive policing toward evidence-informed prevention and place management (Braga et al., 2014; Ceccato & Newton, 2024).

Community safety should nevertheless not be reduced to environmental design. Crime patterns reflect social, institutional and economic conditions as well as physical environments. Effective prevention should therefore combine environmental interventions with community participation, responsive policing, place management and attention to vulnerable groups. This systems perspective is particularly relevant in rapidly changing urban settings where formal and informal activities overlap (Ceccato & Newton, 2024).

5.5 Implications for African and Nigerian urban Research

Evidence from Cross River State contributes to the geographical diversification of place-based crime research. Nigerian cities often combine formal and informal transport, mixed-use streets, variable pedestrian infrastructure and uneven institutional capacity. These characteristics make ordinary mobility environments important sites for studying how crime opportunities and community safety are organised. The study therefore contributes evidence from the Global South to a literature that has historically been dominated by European, North American and other better-documented settings (Ceccato, 2025; Uteng & Turner, 2019).

The findings also reinforce the value of spatially explicit crime research. Rather than treating crime as a single neighbourhood-level outcome, the analysis differentiates transportation-space categories and crime types. Future Nigerian studies should extend this approach through geocoded police incidents, environmental audits, GPS traces, community safety assessments and longitudinal designs. Such data would allow researchers to test whether the spatial associations identified here persist over time and whether specific prevention interventions change crime and safety outcomes.

6. Planning and Community-Safety Implications

6.1 Make Mobility Safety a Place-Management Variable

Planning authorities and security agencies should treat safety as an explicit dimension of transportation and place management. Conventional accessibility assessments can be complemented by safety audits that identify locations with poor lighting, weak visibility, inactive frontages, unmanaged vegetation, damaged infrastructure or limited legitimate activity. The objective should be targeted diagnosis and prevention rather than indiscriminate securitisation. (Abenoza et al., 2018; Ceccato & Newton, 2024)

6.2 Apply Context-Sensitive CPTED

CPTED interventions should be tailored to the characteristics of each place. Priority measures may include continuous and maintainable lighting, clear sightlines, active frontages, visible entrances and exits, pedestrian legibility, vegetation management and appropriately designed surveillance. CPTED should be treated as a context-sensitive prevention framework rather than a universal checklist, with interventions evaluated for both safety and their effects on legitimate community use (Cozens et al., 2005; Cozens et al., 2022; Armitage, 2018).

6.3 Combine Community Guardianship with Formal Security

Community guardianship should complement rather than replace formal policing. Residents, transport operators, local authorities and security agencies can establish structured reporting mechanisms for recurrent incidents, unsafe locations, damaged lighting and unmanaged spaces. Spatial reporting systems can then support targeted interventions and place management. This approach is consistent with evidence that concentrated, place-based interventions can be more effective than diffuse enforcement (Braga et al., 2014).

6.4 Protect Everyday and Low-Cost Mobility Environments

Safety planning should include neighbourhood connectors, footpaths, local streets and approaches to transport nodes, not only major highways. These environments are integral to everyday community life and may be especially important for residents with limited transport alternatives. Interventions should be evaluated using both crime-related outcomes and community-safety indicators such as perceived safety, legitimate use of public space and continuity of access.

7. Conclusion

The study examined the spatial association between transportation activity areas and community-level crime patterns across urban Cross River State, Nigeria. The analysis indicates that transportation environments occupy different positions within the spatial structure of crime-related conditions. Local streets, traffic interchanges, cul-de-sacs, footpaths and major roads occupy different positions across

the first two significant canonical functions. The first two canonical correlations were 0.604 and 0.517, respectively, while the remaining functions were not statistically significant.

The main contribution is to demonstrate that everyday mobility environments can serve as meaningful units of place-based crime prevention and community-safety analysis. The findings do not establish causal effects, nor do they demonstrate individual victimisation or behavioural adaptation. Instead, they identify statistically significant spatial relationships that can guide more focused environmental assessment, community guardianship and prevention planning. This is particularly valuable in contexts where ordinary streets and pedestrian routes form a substantial part of everyday urban life.

For Cross River State and comparable Nigerian urban contexts, improving community safety requires more than expanding transport infrastructure. Planning and security practice should identify risky mobility environments, diagnose their physical and social conditions, and match interventions to local circumstances. Future research should connect the spatial patterns identified here with verified incident data, environmental characteristics and individual mobility trajectories. Doing so would provide a stronger basis for understanding how safer paths and nodes can contribute to safer and more inclusive communities.

Declarations

Human Ethics and Consent to Participate

Participation in the study was voluntary. Respondents were informed of the purpose of the study and provided informed consent before completing the questionnaire. Participants were assured of the confidentiality and anonymity of their responses, and the information collected was used solely for academic research purposes.

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Author Contribution

S.E- Conceptualized the study, prepared the first and final manuscript draft, performed the data analysis and Performed text editing. J.N. and U.O. - Prepared and refined tables. C.A. and S.E.-Reviewed the references for accuracy, supervised the research and performed text editing.

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Figures

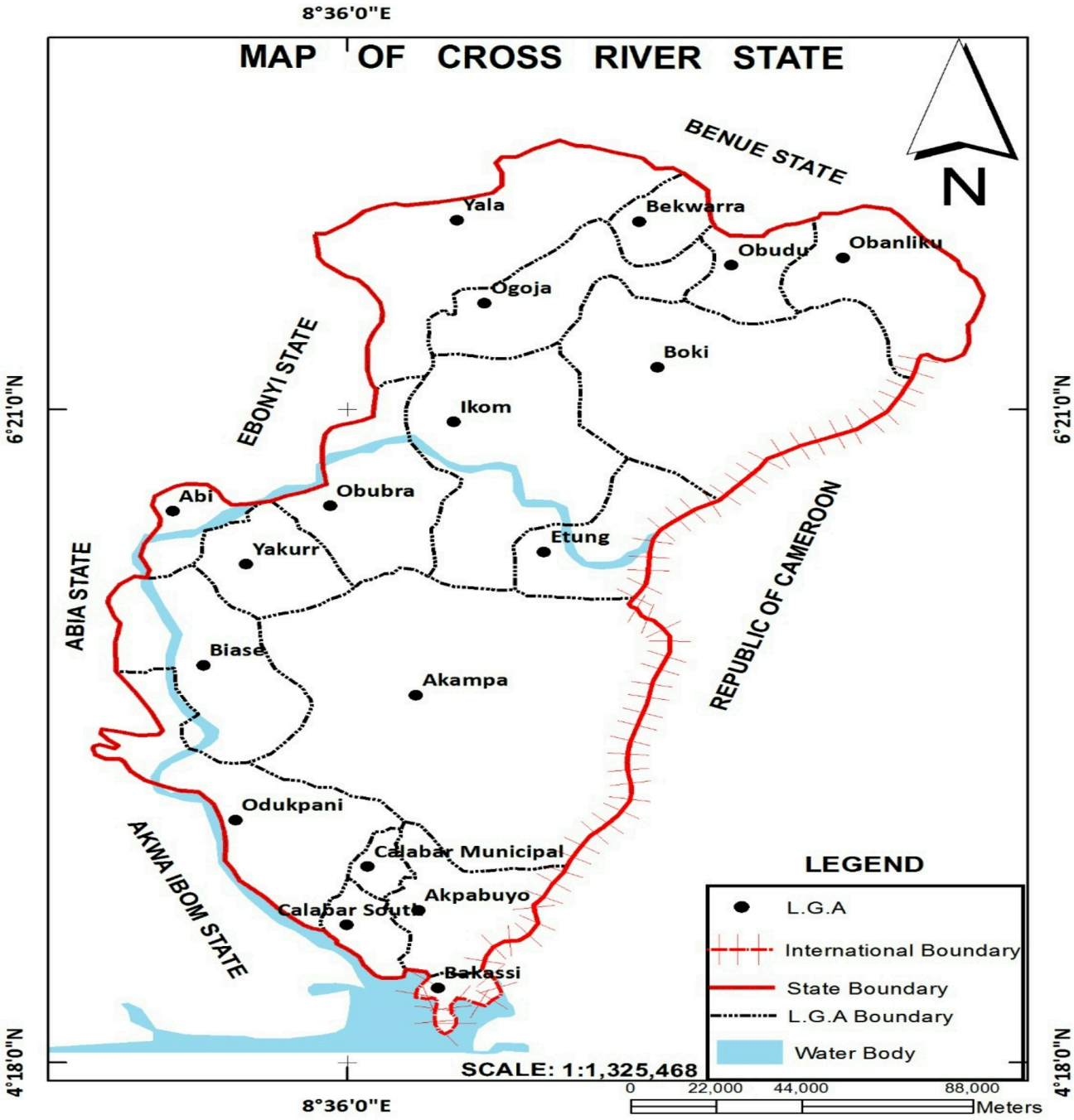


Figure 1

Location of the Study Area

Source: GIS Laboratory, Department of Urban and Regional Planning, University of Cross River State (2024).

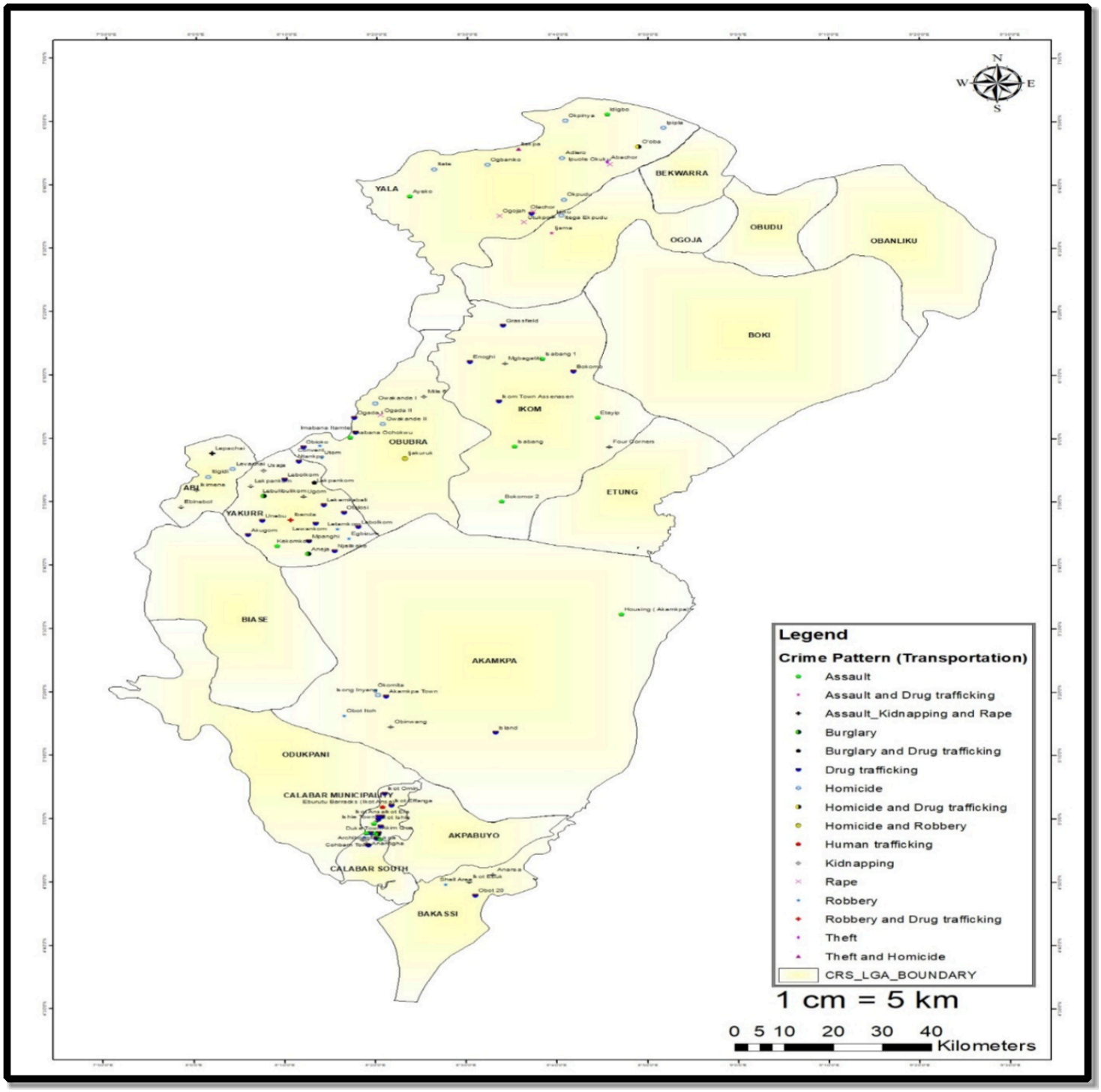


Figure 2

Spatial Distribution of Community-Level Crime Patterns Across the Sampled Urban Communities.

Source: Field Survey (2025).