A LEGACY OF LEADERSHIP: A SPECIAL ISSUE HONOURING THE TENURE OF OUR VICE CHANCELLOR, PROFESSOR ARMAYA'U HAMISU BICHI, *OON, FASN, FFS, FNSAP*

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Perceived Environmental Impacts of the Katsina-Kano Highway: A Community Perspective on Noise, Air Pollution, and Road Safety

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ABSTRACT
This study examines the environmental impacts of the Katsina-Kano road project on local communities, focusing on areas of noise pollution, air quality, land degradation, and safety concerns. Using a survey questionnaire, interview and FGD, the findings revealed that accidents appeared to be the most significant issue affecting road users and residents in the area, suggesting the need for enhanced safety interventions like improved signage and stricter law enforcement. Noise and air pollution also emerged as notable concerns, though comparatively lower significance. Results were presented using percentage frequency distribution table and charts. Compared mean of each environmental variable was computed where noise pollution has 2.2891, air pollution has 2.2839, accident with 2.1328, destruction of vegetation with 2.3229, destruction of buildings with 2.3281 and land pollution with 2.3620. The paper proposes specific mitigation strategies and policy recommendations to minimize accidents for sustainable road management and enhanced welfare of the community and other road users.

INTRODUCTION

The Katsina-Kano road project represents is a critical infrastructural development designed to improve regional connectivity, stimulate economic growth, and enhance access to services. However, while beneficial, infrastructure projects of this scale often present environmental challenges that affect nearby communities. The communities along the Katsina-Kano road have raised concerns about the project's environmental effects, particularly regarding pollution, vegetation loss, and accidents. The lack of adequate data on these impacts has limited the development of effective mitigation strategies. Therefore, this study seeks to provide a structured, data-driven analysis of the road's environmental impacts, guided by community perspectives. The paper therefore, assessed the perceived environmental impacts of the Katsina-Kano road project and suggested recommendations for managing and mitigating negative environmental impact of the road to the neighboring communities.

THEORETICAL BACKGROUND

Infrastructure projects such as highways are often associated with both positive and negative impacts. While they support economic growth and enhance accessibility, they also contribute to environmental challenges, including noise pollution, air quality degradation, land displacement, and road safety concerns. Environmental Kuznets Curve (EKC): The EKC hypothesis suggests that environmental degradation initially increases with economic development but decreases after reaching a certain level of income due to improved technologies and policies. This perspective explains the dual impacts of infrastructure development—initial environmental

degradation due to construction and long-term improvements through mitigation measures (Grossman & Krueger, 1995). This highlight that transport systems influence environmental systems through land-use changes, emissions, and noise. Highways act as catalysts for regional development but often disrupt ecosystems, necessitating integrated environmental planning.

Nature of Transportation

From an environmental perspective, transportation has significant impacts on ecosystems, air quality, and climate change. Researchers in this field focus on sustainable transportation practices, emissions reduction, and the ecological consequences of transportation systems (Gössling, Scott & Hall, 2018). Studies by Kimani & Nyaga (2017) and Cervero & Gakenheimer (2013) illustrate that road development projects in developing regions can introduce adverse environmental effects, with noise and air pollution as notable examples. Recent research by Wang *et al.,* (2020) employed environmental modeling to assess the ecological impact of transportation infrastructure projects. Their study emphasized the importance of considering environmental factors in transportation planning and decision-making. In Nigeria, Onyema (2019) highlights the high incidence of road accidents linked to infrastructure expansion. This review underscores the importance of managing environmental risks to achieve sustainable benefits from road infrastructure projects.

Noise Pollution

A study by Graham et al. (2018), examined the impacts of road traffic noise on nearby communities, finding that increased exposure correlated with heightened stress levels and sleep disturbances. The authors reported that community members frequently cited noise as a primary concern associated with living near highways (Graham et al., 2018).

Air Pollution

Research conducted by Kumar et al. (2020) in urban areas of India indicated that traffic emissions significantly degraded air quality, leading to increased respiratory illnesses among residents. The study highlighted that community members were acutely aware of the health implications associated with air pollution from nearby highways (Kumar et al., 2020).

Road Safety

A meta-analysis by Elvik (2019) evaluated the relationship between road infrastructure and safety outcomes, revealing that poorly designed highways led to higher accident rates. Community surveys indicated that residents felt unsafe and demanded improved road safety measures (Elvik, 2019). Community Perception and Recommendations. A qualitative study by Thompson et al. (2021), explored community perceptions of highway impacts in rural areas of Nigeria, finding that residents prioritized noise and air quality issues. The study concluded that effective community engagement in highway planning could lead to better environmental management strategies (Thompson et al., 2021). These studies provide a solid foundation for discussing the perceived environmental impacts of highways, particularly in relation to noise, air pollution, and road safety. You can draw on these findings to support your objectives of assessing community perceptions and offering recommendations for mitigation strategies.

The Study Area

The study area is the route connecting the two capital cities of Katsina and Kano in the northwestern on Nigeria. Kasina is located on Lat 7^0 40' to 8^0 E and Long 11^0 40' to 13^0 00' N. while Kano is located on Lat 8^0 5' to 8^0 40' E and Long 12^0 00 to12^0 35' N. Katsina has total land mass area of 24, 192 km^2 (9,342 sq mi) while Kano has a total land mass area of 20,131km^0 (7,773 sq mi). The two cities have a total land mass area of 44,323 km^2 , and share a common border with Jigawa state from the east, Bauch and Kaduna states from the south, and Zamfra state from the west with some stretch of the Sahara desert from the Republic of Niger (Katsina. 2021, Kano, 2021). Fig 1. Shows the map of the study area showing the highway linking the two states.

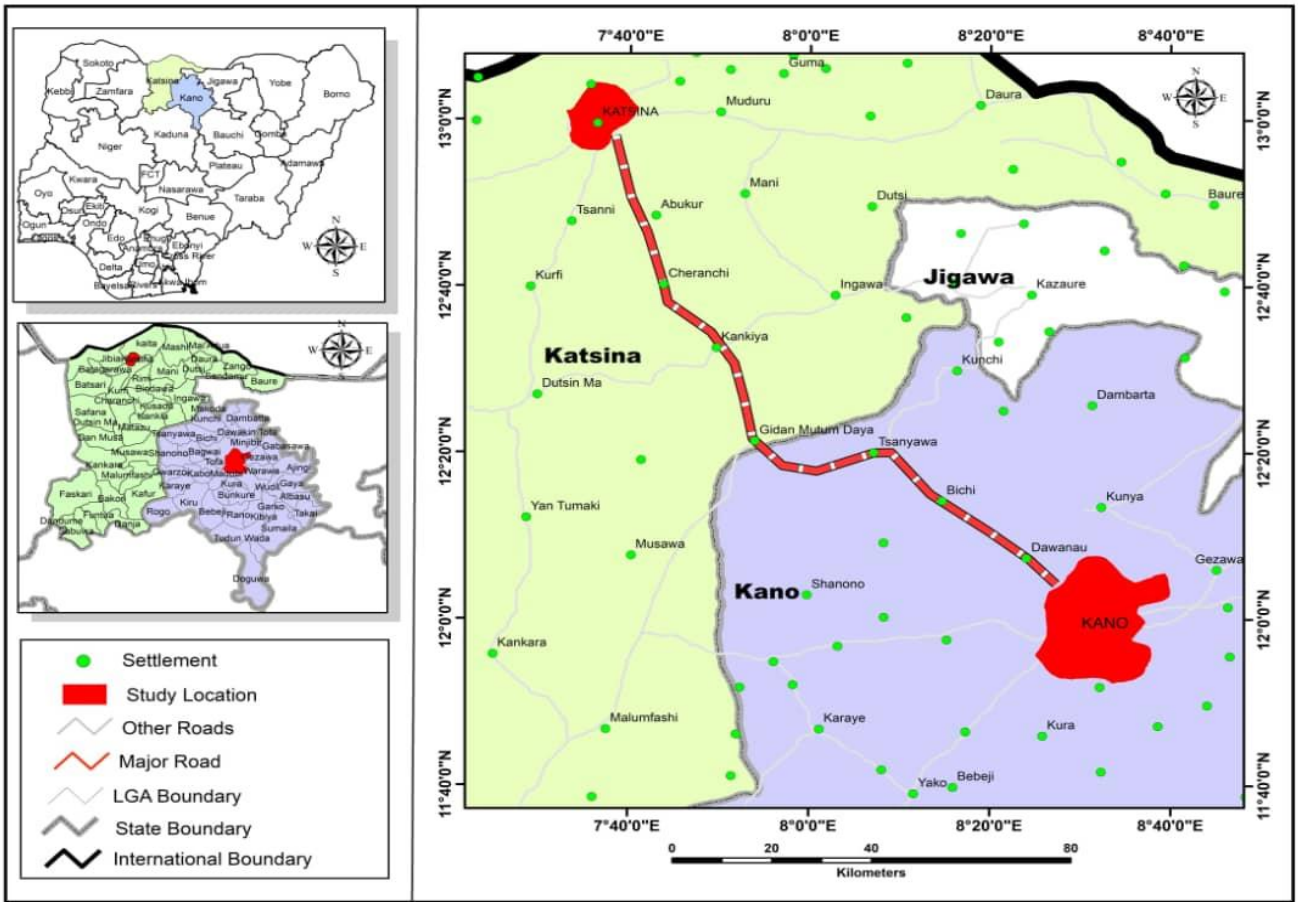

Figure 1: The Map of the Study Area Showing Katsina-Kano Road linking the two state

METHODOLOGY

Research Design and Sample Selection

This study employs a quantitative approach using survey data collected from residents along the Katsina-Kano road. A stratified sampling method was used to ensure representativeness across different community segments.

Sample Size and Procedure

A sample size of 384 respondents was chosen, distributed across key communities affected by the road project. Survey questionnaires were designed to capture perceptions on various environmental impacts, including noise pollution, air quality, land degradation, and accidents.

Types and Sources of Data

Primary data were collected through structured questionnaires, while secondary data from environmental studies and government reports provided contextual support. Each response was rated on a Likert scale, allowing for quantifiable analysis of perceived environmental impacts.

RESULTS AND DISCUSSION

Data were analyzed using descriptive statistics to summarize community feedback. The mean score for each environmental category was computed to identify the most significant issues, with accident rates surpassing noise and air pollution in community concern. Statistical tests assessed the correlation between respondent demographics and perceived impact levels, enhancing the study's interpretive depth.

Socio-Economic Characteristics of Respondents

Sex Distribution of the Respondents

Figure 4.1 illustrates the gender distribution of respondents from the survey data. Male respondents constitute 51.8% of the sample, represented by the light blue segment of the pie chart. While, female respondents make up 48.2% of the sampled respondents. There is almost equal distribution between male and female respondents which suggests a balanced representation of sex in the survey, ensuring that perspectives from both groups are adequately captured. This sex distribution also aligns with the sex distribution pattern of the north western states of Nigeria, and indeed in Nigeria which indicates an almost equal distribution of males and females in the population.

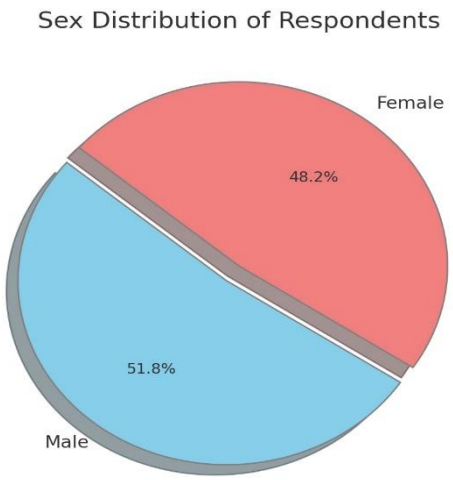

Figure 2: Sex Distribution of the Respondent
Source: Researchers Survey, 2024.

Age Distribution of the Respondents

The bar graph (Figure 4.2) shows the distribution of the respondents across different age groups. The highest frequency is in the 25-29 years age group, with 162 respondents (42.2%). The next highest is the 35-39 years age group, with 60 respondents (15.6%). The age group with the lowest frequency is 50-54 years, with only 2 respondents (0.5%).

The large number of respondents aged 20-24 suggests a youthful population, which could impact various sectors such as education, employment, and healthcare. The significant presence of respondents aged 30-34 and 25-29 indicates that a considerable portion of the population is in their prime working age, which might influence the local economy and workforce dynamics. The low number of respondents in older age groups suggests a smaller elderly population, potentially affecting the demand for age-specific services and infrastructure.

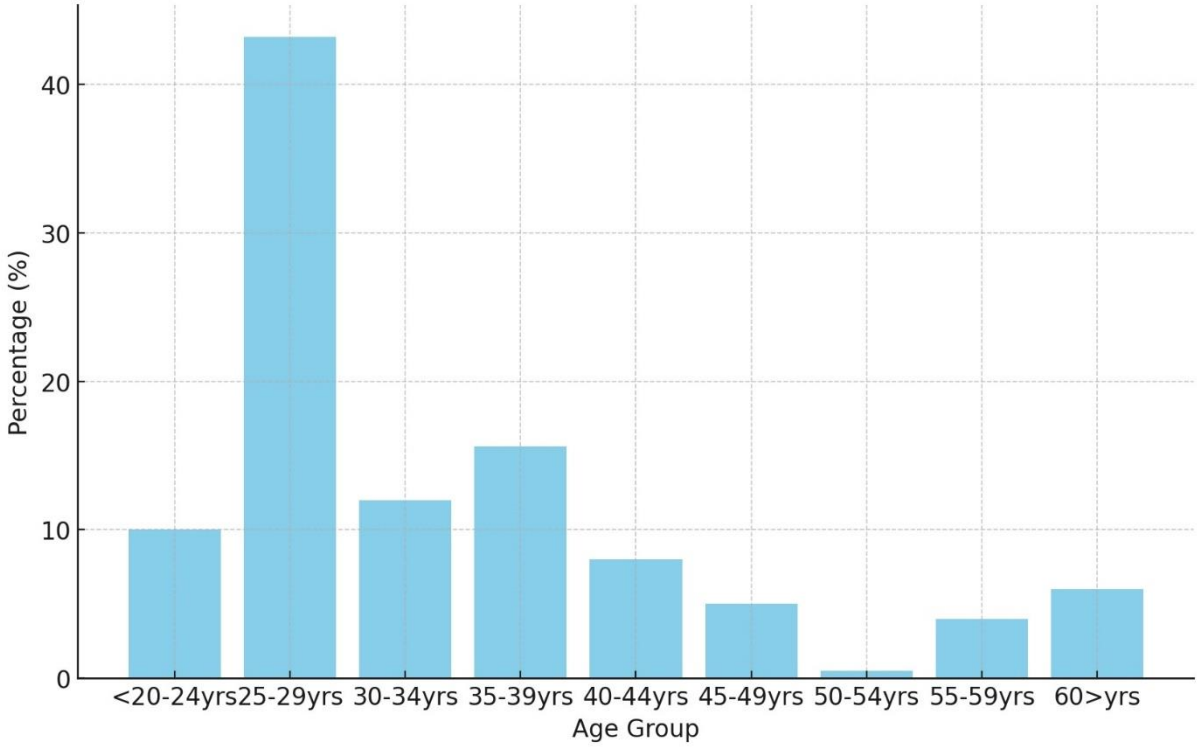

Figure 3: Age Distribution Bar Graph
Source: Researcher's Survey, 2024.

Educational Distribution of the Respondents

Figure 3 displays the educational attainment levels of the respondents. The highest frequency is among those with secondary education, totaling 280 respondents representing (72.9%). This is followed by those with no formal education, comprising with 57 respondents representing (14.8%). The smallest group are those with tertiary education, with 21 respondents (5.5%). therefore, the predominance of secondary education indicates a moderate level of educational attainment in the population, which could influence the types of jobs available and the overall skill level of the workforce. The significant percentage of individuals with no formal education highlights potential challenges in literacy and access to education, which may necessitate educational initiatives or policies to improve basic education levels. The relatively low number of respondents with tertiary education suggests limited access to higher education, which could impact economic growth and the ability to attract high-skilled jobs to the area.

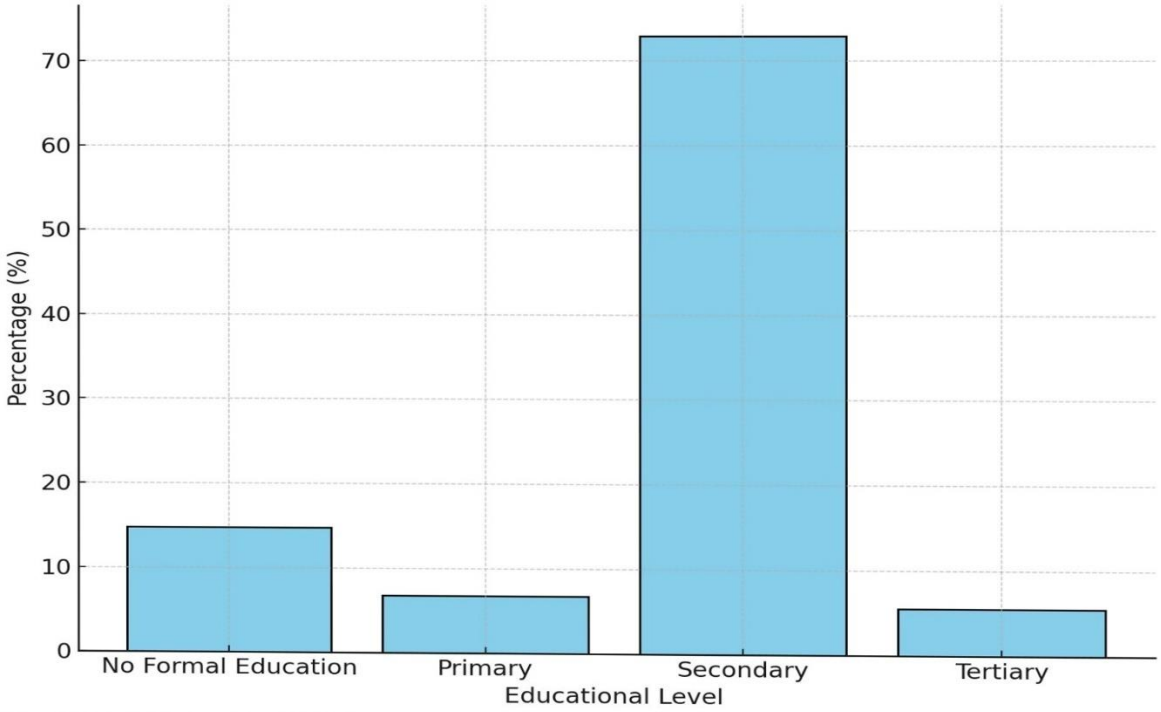

Figure 4: Educational Distribution of the Respondents
Source: Researcher's Survey, 2024.

Occupational Distribution of the Respondents

Figure 4 outlines the occupational distribution of respondents. The largest group is represented by traders, with 135 respondents (35.2%). Those respondents engaged in one type of business or the other follow, with 68 respondents (162%). The 'others' category has the lowest frequency, with 10 respondents (2.6%). The high number of traders indicates that commercial activities play a significant role in the local economy, likely influenced by the highway facilitating trade and business. The presence of a substantial number of traders, business persons and farmers suggest a diverse economic base, with both commerce and agriculture being vital sectors. The others categories might include various unclassified occupations, highlighting the need for more detailed occupational data to fully understand the economic landscape. Understanding the occupational distribution can help in tailoring economic policies, infrastructure development, and support services to boost the main economic activities in the area. These insights from the demographic and socio-economic characteristics of the respondents can inform targeted interventions, policy-making, and development planning in the region.

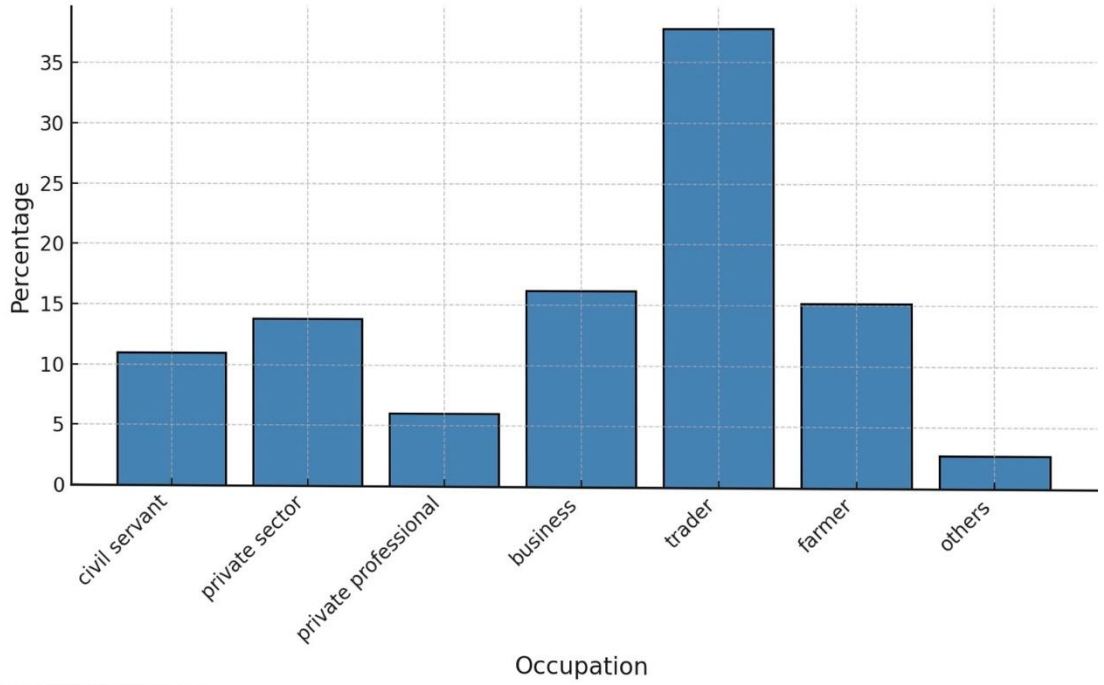

Figure 5: Occupational Distributions of the Respondents
Source: Researcher's Survey, 2024.

Perceived Environmental Impact of Katsina -Kano Road
Notable environmental impact of the road is pollution encompassing noise, land and air pollution. Majority of the respondents (36.5%) agreed that noise pollution is a significant environmental effect of the road while 31.5% strongly agreed with this assertion. The two categories accounted for 68% of the respondents' survey. By implication this suggests that noise pollution is widely perceived as a problem associated with the road. Mitigation measures, such as sound barriers, may be necessary to install in the homes of the residents. Also, a substantial portion of the respondents (70.9%) agree or strongly agree that air pollution is an environmental issue caused by the road. On the other hand, 19% of respondents disagree or strongly disagree.10.2% are undecided. This implies that air pollution is a major concern, which suggests the need for strategies to reduce emissions, such as encouraging the use of cleaner vehicles. A significant majority (72.1%) of respondents agree or strongly agree that accidents are a critical issue related to the road. However, a small portion (13.8%) disagree or strongly disagree. This indicates a high concern for road safety. Measures to improve road safety, such as better signage and enforcement of traffic laws, are likely necessary destruction of vegetation is another environmental effect 51.5% of respondents agree or strongly agree that the road has led to the destruction of vegetation, while 17% disagree or strongly disagree. the implications are that there is a notable concern about vegetation loss, suggesting the need for reforestation or preservation efforts. The construction of the road and its subsequent dualization led to the destruction of buildings and creating burrow pits, where combined 57.5% of respondents strongly and agreed that the construction of the road has led to the destruction of buildings and creation burrow pits. About 68% of participants reported noise pollution as a significant impact, largely due to increased traffic volume and heavy vehicles. About 70% of the respondents' suggesting air quality as another concern linked to vehicular emissions. This reflects the cumulative impact of both increased traffic and outdated vehicle technology in the region. Land degradation and vegetation loss, though reported to a lesser extent, these concerns reflected the visible landscape changes resulting from the road expansion. The summary of the findings is shown on Table 4.1

Table 1: Respondents Perceived Environmental Impact of Katsins-Kano Road.

Environmental effects of the road	S. Agree		Agree		I can't say		Disagree		S. disagree		Total	
	Fr	%	Fr	%	Fr	%	Fr	%	Fr	%	Fr	%
Noise pollution	121	31.5	140	36.5	45	11.5	47	12.2	31	8.1	384	100
Air pollution	122	31.8	150	39.1	39	10.2	27	7.0	46	12.0	38.4	100
Land pollution	100	26.0	141	36.7	64	16.7	62	16.1	17	4.4	384	100
Accident	113	29.4	164	42.7	54	14.1	49	12.8	4	1.0	384	100
Destruction of vegetation	133	34.6	65	16.9	121	31.6	59	15.4	6	1.6	384	100
Destruction of Building during Construction Creating burrow pits	144	37.6	65	16.9	89	22.7	81	21.1	7	1.8	384	100
Total	384	100	384	100	384	100	384	100	384	100		

Source: Researcher's Survey, 2024

Mean Perception of Pollution and Accident Index

Table 1 showed the compared mean of each environmental impact variable where noise pollution has 2.2891, air pollution has 2.2839, accident with 2.1328, destruction of vegetation with 2.3229, destruction of buildings with 2.3281 and land pollution with 2.3620 respectively out of the compared group mean of 2.4237. To test which of the environmental constructs has the most significant effect, the individual compared mean (ICM) must be lower than the compared group mean (CGM) and if the environmental construct is above the CGM, then such construct is having an insignificant environmental effect in the study area. By implication, accident is the most significant environmental construct that affects the study population while noise, air and land pollution, destruction of vegetation and land are less significantly in varying degrees to the environment of the study population. In summary, the survey indicates that the majority of respondents perceive significant environmental impacts from the road, particularly concerning noise and air pollution, accidents, and destruction of vegetation and buildings. These findings suggest a need for comprehensive environmental management strategies, including pollution control, safety improvements, and mitigation of construction impacts, to address these concerns effectively. Table 4.2 presents a summary of pollution and accident index of Katsina-Kano road.

Table 2: Mean Environmental Pollution and Accident Index.

	Noise pollution	Air pollution	Accident	Destruction of vegetation	Destruction on buildings	Land pollution
N	384	384	384	384	384	384
Mean	**2.2891***	**2.2839***	**2.1328***	**2.4220***	**2.3281***	**2.3620***

COMPUTED GROUP MEAN (CGM)= 2.4237 *SIGNIFICANT TO CGM **INSIGNIFICANT TO CGM

Source: Researcher's Survey, 2024

CONCLUSION

The Katsina-Kano road project, while fostering regional development, has introduced environmental challenges, primarily in the form of accidents, noise, and air pollution. These findings emphasize the need for balanced infrastructure planning that prioritizes community welfare alongside economic objectives.

RECOMMENDATIONS

It is therefore recommended that efforts should be made to install all necessary road furniture such as traffic signage, speed bumps, and barriers in all accident-prone zones to minimize the rate of accidents on the road. Traffic law enforcement agencies be supported to exercise their duties to ensure strict compliance to existing traffic rule and regulation. Collaborate with the Federal Ministry of Environment to establish vehicle emission standards and introduce noise barriers along critical sections of the road. Develop environmental awareness programs to educate residents and other road users the importance of pollution control and community driven mitigation measures. Create Sustainable Development Initiatives to encourage the establishment of green spaces and vegetation buffer zones along the road corridors to reduce pollution impacts. Introduce and support economic growth initiatives that align with environmental conservation, leveraging the highway's connectivity for eco-friendly economic activities etc.

REFERENCES

Cervero, R., & Gakenheimer, R. (2013). Transport, Urban Form, and Economic Growth.

Development in Sub-Saharan Africa." African Journal of Environmental Science. 13 (2), 112-124.

Dovonou, F., Adounvo, A., & Gbenou, M. (2022). "Environmental and Social Impacts of Highway Projects in

Developing Countries." International Journal of Environmental Studies, 79(3), 456-473.

Elvik, R. (2019). The Importance of Road Design in Reducing Accidents: A Meta-Analysis. Accident Analysis and Prevention, 132, 105-112. https://doi.org/10.1016/j.aap.2019.05.014.

Gössling, S., Scott, D., & Hall, C.M. (2018). *Tourism and Water: Interactions and Implications*. Cannel View Publications.

Graham, J., Tiwari, G., & Sinha, A. (2018) Traffic Noise and Its Effects on Health: Emerging Perspectives. *Journal of Environmental Psychology*, 55, 1-10. https://doi.org/10.1016/j.jenvp.2018.01.002.

Grossman, G. M., & Krueger, A. B. (1995). Economic growth and the environment. The Quarterly *Journal of Economics,* 110(2), 353–377. https://doi.org/10.2307/2118443

Kimani, J., & Nyaga, G. (2017). "The Environmental Implications of Road Infrastructure. Development in sub-Saharan Africa. *African journal of environmental science,* 13 (2),112-124.

Kumar, P., Khare, P., & Gupta, S. (2020). Impact of Traffic-Related Air Pollution on Community Health: *A* Case Study in Urban India. *Environmental Science and Pollution Research*, 27(14), 17362-17372. https://doi.org/10.1007/s11356-020-08746-7.

Odongo, J., & Ong'ang'a, O. (2021). Community-based mitigation of highway environmental impacts: A case study of Nairobi-Mombasa road. *Environmental Management and Sustainability,* 10(2), 45-57.

Onyema, J. (2019). "Road Infrastructure and Accident Trends in Nigeria: A Case Study of Major Highways." *Journal of Transport Studies in Africa*, 15(1), 45-60.

Rodrigue, J.-P., Comtois, C., & Slack, B. (2017). *The Geography of Transport Systems* (4th ed.). New York: Routledge

Thompson, J., Adebayo, A., & Nwankwo, C. (2021). Community Perspectives on Highway Development: A Case Study in Rural Nigeria. *Journal of Transport Geography*, 89, 102886. https://doi.org/10.1016/j.jtrangeo.2020.102886.

Wang, Y., Chen, J., & Yang, C. (2020). Assessing the ecological impact of transportation infrastructure development: A case study in a mountainous region of China. Transportation Research Part D: *Transport and Environment*, 85, 102399.

World Commission on Environment and Development (WCED). (1987). *Our Common Future*. Oxford University Press.