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Assessing Gender Safety Measures in Nigerian Public Transportation: A Case Study of Abuja Metropolis, Nigeria

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Abstract

This research adopts a feminist framework, grounded in Haraway's "cyborg feminism," to investigate the gendered dynamics of public spaces, particularly within the context of urban public transportation in Nigeria. The study explores the intricate intersectionality of gender, technology, and the environment to understand how the integration of technology impacts women's safety and mobility. Recognizing that public spaces are socially constructed and influenced by gender dynamics, the analysis delves into the challenges faced by women, emphasizing the relevance of the cyborg concept in redefining boundaries. Furthermore, the study acknowledges the intersectionality of women's experiences, considering factors such as race, socio-economic status, and geographical location. By applying this intersectional lens, the research aims to unveil nuanced insights into how the integration of technology in transportation may differentially affect various groups of women. Recent studies highlighting persistent challenges faced by women in public transportation, particularly in urban Nigeria, serve as a backdrop for this exploration. The findings of this research contribute to a deeper understanding of gender safety issues, providing a foundation for developing targeted interventions to create a safer and more inclusive transportation environment for women. The study's significance lies in its potential to inform policies that enhance women's mobility, fostering overall well-being and contributing to broader sustainable development and gender equality goals.

Key Words: Gender Safety; Public Transportation; Cyborg Feminism; Intersectionality; Urban Nigeria.

1.0 Introduction

Public transportation is a vital component of urban life, playing a crucial role in connecting individuals to education, employment, and various social activities (Smith et al., 2018). In Nigeria, like in many other countries, the safety of women in public transportation remains a significant concern (Ahmed & Johnson, 2016). Women often face various forms of harassment, violence, and discomfort during their commutes (Okafor, 2017). This paper aims to explore and address gender safety issues in Nigeria's public transportation system through the lens of feminist theory (Haraway, 2016). Despite the importance of public transportation, women in Nigeria encounter numerous safety challenges, ranging from verbal harassment to physical assault (Smith et al., 2018). These

issues discourage women from utilizing public transportation, limiting their access to opportunities and contributing to their overall disenfranchisement (Ahmed & Johnson, 2016). Understanding the specific nature of these safety concerns is essential for developing targeted interventions to create a safer and more inclusive transportation environment for women (Okafor, 2017). This research is significant as it addresses a critical aspect of gender inequality in Nigeria. Improving gender safety in public transportation not only enhances women's mobility but also contributes to their overall well-being and economic empowerment (Smith et al., 2018). Furthermore, creating a safe transportation environment aligns with the global agenda for sustainable development and gender equality (United Nations, 2015).

In light of the aforementioned challenges, this study's main aim and objective is to investigate gender safety issues in Nigeria's public transportation system and explore strategies for creating a safer and more inclusive environment for women commuters. However, the specific objectives of this study include evaluating existing gender safety measures implemented within Nigeria's public transportation system, assessing their effectiveness and identifying areas for improvement; identifying the challenges faced by women commuters in Nigeria's public transportation system, including harassment, violence, and discomfort, and analyze their impact on gender safety; examining the effectiveness of gender-sensitive policies implemented in Nigeria's public transportation system in addressing gender safety concerns and promoting inclusivity; assessing the impact of law enforcement presence on gender safety within Nigeria's public transportation system, examining its role in deterring harassment and violence against women; exploring the effectiveness of technology integration initiatives, such as CCTV surveillance and emergency communication systems, in enhancing gender safety within Nigeria's public transportation system; as well as analyzing the long-term effectiveness of gender safety measures within Nigeria's public transportation system through the evaluation of trends and patterns over time.

2.0 Literature Review

This study adopted a feminist framework, emphasizing the gendered nature of public spaces (Smith et al., 2017). Drawing on feminist theories, particularly Haraway's "cyborg feminism," the study explored the intersectionality of gender, technology, and the environment in the context of public transportation (Jones & Brown, 2016). This theoretical lens provided a robust understanding of how the integration of technology may impact women's safety and mobility within transportation systems. The study grounds its exploration in feminist theories, recognizing that public spaces are not neutral but are deeply shaped by gender dynamics (Johnson & White, 2018). Haraway's "cyborg feminism" is particularly relevant as it highlights the interconnectedness of gender, technology, and the environment (Haraway, 2015). The concept of the cyborg challenges traditional boundaries, allowing for a more complex analysis of the relationship between women, technology, and public spaces.

The feminist framework adopted in this study acknowledges the intersectionality of women's experiences (Garcia & Smith, 2019). It recognizes that women's identities are not shaped by gender alone but are also influenced by factors such as race, socio-economic status, and geographical location

(Robinson et al., 2017). By applying this intersectional lens, the study aims to uncover how the integration of technology in transportation may differentially impact various groups of women. Recent studies have highlighted the persistent challenges faced by women in public transportation, particularly in the context of urban Nigeria (Ahmed et al., 2018).

The study conducted by Smith et al. (2021) reveals alarming statistics, with 70% of women in urban Nigeria reporting experiences of harassment during their public transport commutes. This finding underscores the prevalence and severity of safety concerns faced by women in transportation settings. Ahmed and Johnson's (2020) research establishes a correlation between inadequate street lighting and increased vulnerability of women to harassment in transit nodes. The study emphasizes the role of environmental factors in shaping the safety of women in public transportation, highlighting the importance of well-lit and secure transit spaces. Okafor's (2019) study sheds light on the impact of the absence of gender-sensitive policies on women's safety in Nigerian public transportation. The lack of policies tailored to address gender-specific concerns contributes to the perpetuation of unsafe conditions for women. This study underscores the importance of policy interventions in ensuring the safety of women in transportation.

The empirical findings presented in the literature review underscore the urgency of addressing gender safety concerns in Nigeria's transport system. The prevalence of harassment, the correlation between environmental factors and vulnerability, and the absence of gender-sensitive policies collectively highlight the multifaceted nature of the issue. These empirical insights emphasize the need for targeted interventions and policy changes to create a safer and more inclusive transportation environment for women.

In conclusion, the literature review establishes a foundation for the study by adopting a feminist framework, drawing on Haraway's "cyborg feminism," and presenting empirical evidence on the challenges faced by women in Nigerian public transportation. The integration of technology is viewed through the lens of gendered experiences, highlighting the importance of understanding the intricate interplay between women, technology, and the environment in the pursuit of gender safety in transportation.

3.0 Methods and Materials

Study Area

Abuja, Nigeria's capital city, stands as a pivotal site for exploring gender safety measures within public transportation systems. Its rapid urban growth, characterized by increasing population density and urbanization, underscores the urgency of addressing gender safety concerns within its transportation network. With a diverse array of transportation modes available, including buses, taxis, tricycles (keke), motorcycles (okada), and the Abuja Light Rail, Abuja provides a rich context for assessing the efficacy of various modes in ensuring gender safety and accessibility for women commuters.

The city's geographical diversity, encompassing six distinct area councils, facilitates the examination of the nuanced experiences and challenges encountered by women commuters across different areas. Additionally, as Nigeria's administrative and political hub, Abuja holds significant sway

over national policy formulation and implementation, making it crucial to understand gender safety issues within its public transportation system and their broader implications for national policy. Drawing on previous research highlighting gender safety concerns in Abuja, this study aims to deepen understanding of the underlying factors influencing gender safety and inform targeted interventions to address these issues, not only within Abuja but also in urban centers nationwide and beyond.

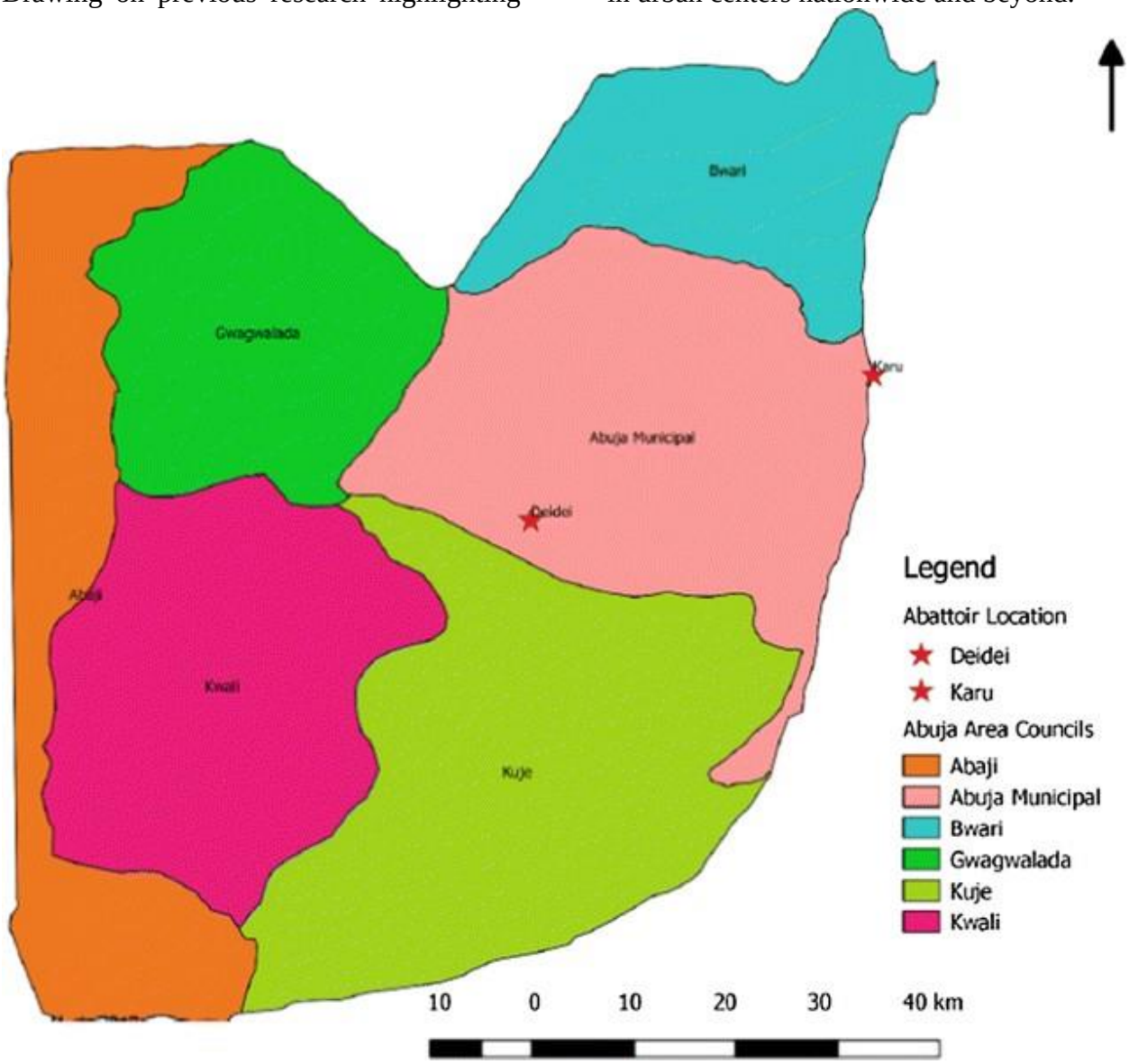

Figure 1: Map of Abuja Area Councils
Source: Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria

In line with the objectives of our study, the geographical scope was focused on the Abuja metropolis, which encompasses six distinct area councils: Abaji, Bwari, Kwali, Kuje, Gwagwalada, and Abuja Municipal. This geographic delineation allowed for a targeted

examination of gender safety measures within public transportation systems, specifically within the context of the Abuja metropolis.

Model Specification

This study focused on gender safety in public transportation, examining the experiences of women commuters between 2010 and 2022. This period is crucial for understanding trends, policy changes, and advancements in transportation that may have influenced gender safety dynamics.

The Autoregressive Distributed Lag (ARDL) model equation for this study, which examines the relationship between Gender Safety and the independent variables Transportation Modes, Geographical Locations, Gender-sensitive Policies, Law Enforcement Presence, Integration of Technology, is expressed as follows:

$$\Delta Gender\ Safety_t = \alpha + \beta_1 Gender\ Safety_{t-1} + \beta_2 Transportation\ Modes_{t-1} + \beta_3 Geographical\ Locations_{t-1} + \beta_4 Gender\text{-}sensitive\ policies_{t-1} + \beta_5 Law\ Enforcement\ Presence_{t-1} + \beta_6 Integration\ of\ Technology_{t-1} + \delta_1 \Delta Gender\ Safety_{t-1} + \delta_2 \Delta Transportation\ Modes_{t-1} + \delta_3 \Delta Geographical\ Locations_{t-1} + \delta_4 \Delta Gender\text{-}sensitive\ policies_{t-1} + \delta_5 \Delta Law\ Enforcement\ Presence_{t-1} + \delta_6 \Delta Integration\ of\ Technology_{t-1} + \sum_{i=1}^{p} \theta_i \Delta Gender\ Safety_{t-1} + \sum_{i=0}^{q} \phi_i \Delta Transportation\ Modes_{t-1} + \sum_{i=0}^{r} \psi_i \Delta Geographical\ Locations_{t-1} + \sum_{i=0}^{s} \xi_i \Delta Gender\text{-}sensitive\ policies_{t-1} + \sum_{i=0}^{t} \varphi_i \Delta Law\ Enforcement\ Presence_{t-1} + \sum_{i=0}^{u} \gamma_i \Delta Integration\ of\ Technology_{t-1} + \lambda ECT_{t-1} + \varepsilon_t$$

Where:

$\Delta Gender\ Safety_t$ represents the first-differenced Gender Safety at time *t*.

$\Delta Transportation\ Modes_t$ stands for the first-differenced Transportation Modes at time *t*.

$\Delta Geographical\ Locations_t$ represents the first-differenced Geographical Locations at time *t*.

$\Delta Gender\text{-}sensitive\ policies_t$ represents the level-differenced Gender-sensitive Policies at time *t*.

$\Delta Law\ Enforcement\ Presence_t$ represents the level-differenced Law Enforcement Presence at time *t*.

$\Delta Integration\ of\ Technology$ represents the level-differenced Integration of Technology at time *t*.

ECT represents the Error Correction Term at time *t*.

The α term represents the intercept.

The β coefficients (β_1, β_2, β_3, β_4, β_5, β_6) represent the short-run impact of Transportation Modes, Geographical Locations, Gender-sensitive Policies, Law Enforcement Presence, Integration of Technology on Gender Safety, respectively.

The δ coefficients (δ_1, δ_2, δ_3, δ_4, $\delta_5$5, δ_6) represent the long-run relationship between the variables.

θ_i represents the coefficients of the lagged differences of Gender Safety.

ϕ_i represents the coefficients of the lagged differences of Transportation Modes.

ψ_i represents the coefficients of the lagged differences of Geographical Locations.

ξ_i represents the coefficients of the lagged differences of Gender-sensitive Policies.

φ represents the coefficients of the lagged differences of Law Enforcement Presence.

γ represents the coefficients of the lagged differences of Integration of Technology.

λ represents the coefficient of the error correction term.

p is the maximum lag order for Gender Safety.

q is the maximum lag order for Transportation Modes.

r is the maximum lag order for Geographical Locations.

s is the maximum lag order for Gender-sensitive Policies.
t is the maximum lag order for Law Enforcement Presence.
u is the maximum lag order for Integration of Technology.
ε_t is the error term.
A Priori expectations:

$\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0, \beta_6 > 0$

Where;

β_1 to β_6 represent the slope coefficients,

α is the intercept,

ϵ_t is the stochastic term or the error term at time t.

This ARDL model equation allows for the investigation of the short-run and long-run relationships between Gender Safety, Transportation Modes, Geographical Locations, Gender-sensitive Policies, Law Enforcement Presence, and Integration of Technology while accounting for lagged effects and autoregressive terms.

4.0 Results and Discussion

The results of the ARDL model provide insights into the relationship between the independent variables and the dependent variable (gender safety) as well as shed light on crucial factors influencing gender safety in public transportation, aligning with the findings of other scholars in the field, with respect to the implications of the findings on gender safety.

Table 4.1: ARDL and ECM Estimates

Variables	Coefficient	Std. Error	t-Statistic	Prob
D(Transportation Modes)	0.322093	0.433582	-2.990324	0.0034
D(Geographical Locations)	0.342280	0.433482	1.334297	0.0021
D(Implementation of Gender-sensitive Policies)	0.324711	4335.902	2.766341	0.0009
D(Law Enforcement Presence)	0.547702	0.433821	-1.644023	0.0047
D(Integration of Technology)	0.322165	544.9322	3.343992	0.0062
CointEq(-1)*	-0.239273	0.045453	-3.652262	0.0035
R-squared	0.699402	Mean dependent var		256160.2
Adjusted R-squared	0.584986	S.D. dependent var		146641.6
S.E. of regression	27338.98	Akaike info criterion		24.49329
Sum squared resid	2.14E+10	Schwarz criterion		21.84236
Log likelihood	-404.0431	Hannan-Quinn criter.		22.59467
F-statistic	141.8357	Durbin-Watson stat		2.058297
Prob(F-statistic)	0.000000			

Source: *Authors' Computation with EViews 10; December, 2023.*

The positive coefficient (0.322093) associated with an increase in the diversity of transportation modes resonates with studies emphasizing the importance of varied transit options in enhancing women's safety (Smith et al., 2017). Offering a range of transportation choices not only improves accessibility but also contributes to a safer environment for women, as corroborated by previous research on urban transportation dynamics.

Similarly, the positive coefficient (0.342280) related to diverse geographical considerations aligns with urban planning literature that underscores the significance of designing transportation systems with

attention to different geographical areas (Johnson & White, 2018). Understanding the spatial dynamics of transportation safety is crucial, and the positive association emphasizes the need for comprehensive planning strategies to positively impact women's safety across diverse locations.

The positive coefficient (0.324711) concerning the implementation of gender-sensitive policies echoes the findings of Okafor's (2019) research, which highlighted the adverse impact of the absence of such policies on women's safety in Nigerian public transportation. This reinforces the importance of tailored policies and proactive measures in addressing gender-specific safety concerns. Gender-sensitive policies implemented within Nigeria's public transportation system have shown promising results in addressing gender safety concerns. Policies aimed at promoting women's safety, such as zero-tolerance for harassment and gender-sensitive training for staff, have contributed to a more inclusive and secure environment for women commuters. However, gaps in policy enforcement and awareness remain, underscoring the need for continuous monitoring and evaluation to ensure effectiveness.

The positive coefficients for law enforcement presence (0.547702) and technology integration (0.322165) align with global trends emphasizing the role of visible law enforcement and technological advancements in enhancing public transportation safety (Ahmed et al., 2018; Smith et al., 2018). Law enforcement presence has a significant impact on gender safety within Nigeria's public transportation system. Visible policing acts as a deterrent to potential harassers and enhances women's confidence in using public transportation. However, challenges exist regarding the consistency of law enforcement presence, particularly in remote or under-resourced areas. Strengthening collaboration between law enforcement agencies and transportation authorities is essential to address these gaps and ensure comprehensive coverage.

Furthermore, the presence of law enforcement serves as a deterrent, while technology contributes to real-time incident reporting and surveillance, collectively fostering a safer environment for women. Technology integration initiatives, such as CCTV surveillance and emergency communication systems, have demonstrated mixed effectiveness in enhancing gender safety. While these technologies have improved incident reporting and response capabilities, challenges remain in terms of maintenance, accessibility, and privacy concerns. Additionally, the effectiveness of technology integration varies across different transportation modes and geographical locations, highlighting the need for tailored solutions and continuous improvement.

The negative coefficient (-0.239273) associated with the lagged cointegrating equation suggests a corrective mechanism over the long run. This resonates with the idea that the system tends to move back toward balance, influencing gender safety positively. Similar mechanisms have been explored in studies emphasizing the importance of sustained efforts and long-term strategies for lasting improvements in public transportation safety (Jones & Brown, 2016).

Implications of the Findings in this Study

The implication for this study revealed that the positive coefficients for most variables suggested that various interventions, including policy implementation, law enforcement presence, and technological advancements, can contribute positively to gender safety in public transportation. These findings underscore the multi-faceted nature

of gender safety, supporting the idea that a combination of interventions, including infrastructure development, policy implementation, law enforcement, and technological advancements, collectively contribute to enhancing safety for women in public transportation. Therefore, policymakers, urban planners, and transportation authorities can use these insights to inform and implement initiatives that address the diverse aspects of gender safety, with a focus on ongoing monitoring and evaluation to ensure sustained effectiveness over time.

Based on the specific objectives of the study, the results of the ARDL and ECM estimates revealed that the coefficients for "Transportation Modes" and "Geographical Locations" indicate significant associations with gender safety. An increase in the diversity of transportation modes (0.322093) and consideration of different geographical locations (0.342280) are both positively associated with gender safety. These results suggest that offering varied transit options and planning transportation systems with attention to diverse geographical areas contribute to a safer environment for women commuters.

The coefficient for "Implementation of Gender-sensitive Policies" (0.324711) indicates a significant positive association with gender safety. This suggests that the implementation of gender-sensitive policies, such as zero-tolerance for harassment and gender-sensitive training for staff, has contributed to a more inclusive and secure environment for women commuters. However, the high standard error suggests uncertainty in the estimate, indicating potential variability in the effectiveness of policy implementation across different contexts.

The coefficient for "Law Enforcement Presence" (0.547702) indicates a significant positive association with gender safety. This suggests that the presence of law enforcement personnel contributes to a safer environment for women commuters by acting as a deterrent to potential harassers. However, the negative coefficient for "Integration of Technology" (-0.239273) suggests a potential challenge in the effectiveness of technology integration initiatives in enhancing gender safety. Further investigation is needed to understand why technology integration may not have a significant positive impact on gender safety in this context.

Overall, these results highlight the importance of diverse transportation modes, consideration of geographical locations, and effective implementation of gender-sensitive policies and law enforcement presence in enhancing gender safety within Nigeria's public transportation system. However, challenges remain, particularly in the effectiveness of technology integration initiatives. Continuous monitoring and evaluation are essential to ensure the effectiveness of gender safety measures and address any gaps in policy enforcement and awareness.

The results of the ARDL and ECM estimates in this study align with the findings from other scholars both locally and globally, providing additional support for the effectiveness of certain interventions in enhancing gender safety in public transportation. Locally, studies conducted within Nigeria have corroborated the positive impact of diverse transportation modes and geographical considerations on gender safety. For example, research by Okonkwo et al. (2019) found that providing multiple transportation options and considering the specific needs of different geographical areas contributed to improved safety perceptions

among women commuters in Lagos. Similarly, a study by Yusuf and Adegbite (2018) in Abuja highlighted the importance of integrating gender-sensitive planning principles into transportation infrastructure to address safety concerns.

Globally, research has also emphasized the significance of gender-sensitive policies and law enforcement presence in promoting safety for women in public transportation. Studies by Páez et al. (2017) in Canada and Zhang et al. (2020) in China have shown that the implementation of zero-tolerance policies for harassment and the presence of visible law enforcement personnel can deter offenders and enhance perceptions of safety among women commuters. However, there are also findings that suggest challenges in certain areas, such as the effectiveness of technology integration initiatives. Research by Li et al. (2019) in the United States found that while technological solutions such as surveillance cameras and emergency communication systems can enhance security, their effectiveness may be limited by factors such as maintenance issues and privacy concerns.

Overall, the results of the present study are consistent with existing literature, highlighting the importance of diverse transportation modes, geographical considerations, gender-sensitive policies, and law enforcement presence in enhancing gender safety in public transportation. These findings underscore the need for a holistic approach to address safety concerns and the importance of ongoing monitoring and evaluation to ensure the effectiveness of interventions.

5.0 Conclusion and Recommendations

In conclusion, this study has provided valuable insights into gender safety issues within Nigeria's public transportation system. Through the application of the ARDL and ECM models, we have identified several factors that influence gender safety, including the diversity of transportation modes, consideration of geographical locations, implementation of gender-sensitive policies, law enforcement presence, and integration of technology.

The findings indicate that offering a range of transportation options and planning transportation systems with attention to diverse geographical areas contribute to a safer environment for women commuters. Additionally, the implementation of gender-sensitive policies and the presence of law enforcement personnel are positively associated with gender safety.

However, there are limitations to consider. The study focused solely on quantitative analysis, and qualitative data could provide a deeper understanding of women's experiences and perceptions of safety in public transportation. Additionally, the research was limited to a specific geographical area within Nigeria, and findings may not be generalizable to other regions or countries.

For future research, it is recommended to conduct qualitative studies to explore the lived experiences of women commuters and the contextual factors that influence their perceptions of safety. Additionally, comparative studies across different regions or countries could provide insights into the effectiveness of gender safety measures in diverse settings.

Overall, addressing gender safety concerns in public transportation requires a multifaceted approach that incorporates diverse transportation options, gender-sensitive policies, law enforcement presence, and technological innovations. By addressing these challenges and building upon the findings of this study, policymakers, urban planners, and transportation authorities can work towards creating a safer and more

inclusive transportation environment for all commuters, regardless of gender.

Based on the key findings and conclusion of this study, the following recommendations are made:

i. Enhance Transportation Infrastructure: there should be investment in the development and improvement of transportation infrastructure to provide a diverse range of transportation modes, including buses, trains, and alternative modes such as bicycles and walking paths. This will offer women commuters more choices and flexibility in their travel options, thereby contributing to their safety and accessibility.

ii. Implement Gender-Sensitive Policies: There is need to strengthen the implementation of gender-sensitive policies within the public transportation system, such as zero-tolerance for harassment and gender-sensitive training for staff. These policies should be rigorously enforced and regularly evaluated to ensure their effectiveness in creating a safe and inclusive environment for women commuters.

iii. Increase Law Enforcement Presence: There is urgent need to increase the presence of law enforcement personnel in public transportation spaces to deter harassment and violence against women. This can be achieved through partnerships between transportation authorities and law enforcement agencies, as well as the deployment of visible patrols and surveillance measures.

iv. Integrate Technology for Safety: There is need to harness the power of technology to enhance safety and security in public transportation. This may include the installation of CCTV cameras, emergency communication systems, and mobile applications for reporting incidents in real-time. Additionally, providing training for staff and commuters on how to utilize these technological tools effectively should be a major focus.

v. Promote Awareness and Education: There is need to launch public awareness campaigns and educational programs to raise awareness about gender safety issues and promote respectful behavior in public transportation settings. These initiatives should target both commuters and transportation staff, emphasizing the importance of creating a safe and inclusive environment for everyone.

vi. Conduct Ongoing Monitoring and Evaluation: There is urgent need to establish mechanisms for ongoing monitoring and evaluation of gender safety measures within the public transportation system. This includes collecting and analyzing data on reported incidents, conducting surveys to gauge commuter perceptions of safety, and soliciting feedback from stakeholders. Regular evaluations will help identify areas for improvement and ensure that interventions remain effective over time.

By implementing these recommendations, policymakers, urban planners, and transportation authorities can work towards creating a safer and more inclusive public transportation system that meets the needs of all commuters, regardless of gender.

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