Relationship of Policy Adherence, Knowledge of Infrastructure Standards, and Road Safety Regulation Compliance with Road User Benefits of the Coastal Road Project

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ABSTRACT

This study examined the factors that shaped the Coastal Road Project in Cagayan de Oro City, focusing on adherence to policies, knowledge of infrastructure standards, and compliance with road safety regulations. It aimed to evaluate how these factors contributed to mitigating traffic congestion, enhancing travel time, and reducing road accidents despite ongoing infrastructure improvements. Using a descriptive-correlational research design, the study was guided by the Sustainable Urban Transport Theory (SUTT) and surveyed 134 respondents, including drivers, commuters, and local government officials. Descriptive statistics, Pearson's correlation, and regression analysis were employed to examine relationships among key variables and their contributions to the project's outcomes. The results revealed that policy adherence, particularly the enforcement of penalties for traffic violations, played a significant role in reducing traffic congestion and improving road safety. However, no significant correlation was found between policy adherence and improvements in travel time. Regression results further indicated that although policy adherence, knowledge of infrastructure standards, and compliance with road safety regulations were important, they did not significantly contribute to the project's overall success in reducing travel time or road congestion. This suggested that other factors, such as improvements in infrastructure quality, were essential to optimizing the project's outcomes. The study concluded that while policy enforcement could play an important role in improving road safety and reducing traffic congestion, it was crucial to pair it with ongoing infrastructure improvements, consistent rule enforcement, and heightened public awareness. Overall, the findings contributed to a broader understanding of how multiple factors collectively impacted urban mobility and road safety in rapidly growing cities like Cagayan de Oro.

Keywords: policy adherence, infrastructure standards, road safety regulation compliance, road user benefits, urban mobility

INTRODUCTION

Road safety regulations were crucial for minimizing traffic-related accidents and enhancing transportation efficiency, especially in cities undergoing rapid urbanization. Traffic accidents remained a leading cause of death and injury worldwide, with the **World Health Organization (2023)** noting their significant relationship with public health. In urban areas, insufficient infrastructure and poor traffic management exacerbated the problem despite efforts to implement stricter road-safety laws.

Traffic-related accidents posed serious socio-economic challenges, resulting in loss of life, healthcare expenses, and lost productivity. In the Philippines, over **12,000 fatalities** were reported due to road accidents in 2022 (**Philstar, 2025**). These incidents strained public health systems, emergency services, and economic productivity, making road safety a critical public policy issue in rapidly growing cities such as Cagayan de Oro.

Cagayan de Oro has experienced rapid urbanization, increasing congestion and straining traffic management and road safety systems. According to **Gamboa et al. (2021)**, the expansion of the city has intensified congestion in key areas. Inadequate pedestrian facilities, poor road design, insufficient traffic signage, and poorly maintained pedestrian crossings have contributed to higher accident rates. **Zhang et al. (2024)** also emphasized that inadequate enforcement of traffic laws and insufficient infrastructure were major factors contributing to road accidents.

This study focused on two key elements affecting road safety in Cagayan de Oro: **infrastructure quality and compliance with traffic regulations**. Well-designed road infrastructure, including clear signage, pedestrian paths, and traffic signals, plays an essential role in preventing accidents, while public compliance with traffic laws determines the effectiveness of these safety measures.

Despite ongoing efforts to improve road safety through regulations and infrastructure projects, traffic accidents remained concerning in Cagayan de Oro. The research gap lies in the limited focus on the **interaction between road safety regulations and infrastructure quality**. While previous studies examined these factors separately, few assessed how both elements interact to improve road safety in urban areas.

The primary objective of this study was to assess the effectiveness of road safety measures in Cagayan de Oro by analyzing infrastructure and compliance. By integrating accident data, infrastructure evaluations, and compliance observations, the study aimed to identify factors contributing to accidents and provide insights for improving road safety and promoting sustainable urban mobility in the city.

REVIEW OF RELATED LITERATURE

Road User Related of the Coastal Road Project

Coastal road infrastructure projects provide significant road user benefits, particularly in addressing traffic congestion, travel time, and road safety in urban areas. Studies show that coastal roads improve urban mobility and transportation efficiency by providing alternative routes that redistribute traffic and reduce congestion in overcrowded areas (Fattah et al., 2022; Mambiravana & Umejesi, 2023). These infrastructure improvements contribute to the reduction in traffic congestion, smoother traffic flow, and enhanced accessibility, allowing commuters to travel more efficiently and improving the overall performance of transportation systems (Kanwal et al., 2020; ADB, 2022). Coastal roads also contribute to the improvement in travel time, as alternative routes shorten travel duration, reduce peak-hour delays, and enhance commuting efficiency and productivity (Ojile, 2021; Tien et al., 2021; Volden & Welde, 2022).

In addition, coastal road infrastructure incorporates modern road safety features such as improved road markings, signage, lighting, pedestrian crossings, and traffic management systems, which contribute to road safety and accident reduction by improving visibility, guiding driver behaviour, and reducing accident risks (Mohamad, 2024; Cafiso et al., 2021). Infrastructure improvements, when supported by proper traffic management and continuous monitoring, further enhance commuter satisfaction, transportation efficiency, and long-term urban mobility (Vaiana et al., 2021; Zahran et al., 2021). Overall, these findings show that coastal road infrastructure development strengthens road user benefits, particularly through reduction in traffic congestion, improvement in travel time, and road safety and accident reduction, which serve as key indicators in evaluating the effectiveness of the coastal road project.

Policy Adherence

Policy adherence in traffic management and road infrastructure is a multi-faceted concept that influences commuter behaviour, road safety, and the effectiveness of public infrastructure investments. Literature emphasizes three key sub-dimensions of policy adherence: compliance with stricter traffic laws, perceptions of penalties and enforcement, and road safety education and awareness. Studies show that stricter traffic laws addressing risk factors such as speeding, drunk driving, and non-use of safety devices contribute to lower traffic fatality rates and promote safer driving behaviour when consistently enforced (World Health Organization, 2023; Cestac & Carnis, 2024; Himawan, 2023). In the Philippines, initiatives such as the No Contact Apprehension Policy (NCAP), Anti-Distracted Driving Act (RA 10913), and Motorcycle Crime Prevention Act (RA 11235) demonstrate efforts to strengthen compliance and accountability.

Research also highlights that perceptions of penalties and enforcement influence driver behaviour, as stronger fines, demerit point systems, and consistent enforcement increase the perceived risk of violations and encourage compliance (Banuri, 2021; Du Plessis et al., 2020; Kang & Silveira, 2021). Furthermore, road safety education and awareness programs, such as the Students Today, Road Users Tomorrow (STRUT) initiative and community-based campaigns, play a crucial role in fostering long-term behavioural change by increasing

awareness and promoting responsible road use (Von Beesten & Bresges, 2022; Gella & Manansala, 2023). International studies further show that education programs combined with enforcement measures can significantly reduce traffic violations and accidents (Elvik et al., 2020; Chang et al., 2022). Overall, the literature suggests that integrating stricter traffic law compliance, effective penalties and enforcement, and continuous road safety education strengthens policy adherence and enhances road user benefits of the coastal road, particularly in improving traffic management, safety, and transportation efficiency.

Knowledge of Infrastructure Standards

Knowledge of infrastructure standards is critical in ensuring the effectiveness of road systems, particularly in large-scale projects like the coastal road development, as it directly affects road safety, travel efficiency, and user satisfaction. Studies show that road conditions and maintenance—including structural integrity, smoothness, durability, and preventive upkeep—are essential for reducing traffic hazards, vehicle damage, and accidents, with poorly maintained roads associated with higher accident rates and traffic disruptions (Suwarto et al., 2021; Alam et al., 2022; World Bank, 2020). Similarly, road signs, traffic signals, and navigation systems provide crucial guidance for drivers, improving compliance and reducing accidents, especially when regularly maintained and aligned with international standards (Babic et al., 2022; Zhou et al., 2020; LTO, 2023; UNRSC, 2021).

Pedestrian safety and infrastructure, including sidewalks, crosswalks, overpasses, and accessibility features, are also vital for protecting vulnerable road users, lowering pedestrian fatalities, and supporting inclusive mobility (WHO, 2021; Saltarin-Molino et al., 2023; Ramos et al., 2020; Pires et al., 2022). Proper drainage systems, integrated into infrastructure planning, further enhance road safety and prevent accidents caused by water-related deterioration (Zhang & Cheng, 2023; Maniyasakan et al., 2021). Collectively, these standards ensure safer, more efficient, and sustainable road networks, highlighting the importance of knowledge of infrastructure standards as a key determinant of road user benefits in coastal road projects.

Road Safety Regulation Compliance

Road safety regulation compliance is a critical determinant of the effectiveness of coastal road infrastructure projects, encompassing adherence to speed limits and traffic rules, use of safety gear, and law enforcement effectiveness. Studies indicate that compliance with speed limits and traffic regulations significantly reduces accidents and fatalities, particularly when supported by consistent enforcement and capacity-building programs for traffic law enforcers (WHO, 2021; Majid, 2023; Fleiter et al., 2023). The use of safety gear, including helmets and seatbelts, further mitigates injury severity during accidents, while public education campaigns and financial accessibility enhance compliance rates (Akuh et al., 2023; Al-Hajj et al., 2022; European Transport Research Review, 2023).

Effective and fair law enforcement fosters a disciplined driving culture, reinforces accountability, and deters risky behavior, while automated and digital enforcement technologies improve monitoring and compliance consistency (Sonde et al., 2024; Colgan, 2022; CT Insider, 2025). Research highlights that these regulatory measures are most effective when integrated with infrastructure standards, traffic management systems, and public awareness initiatives, creating a holistic approach to road safety. Consequently, road safety regulation compliance is vital in maximizing the road user benefits of the coastal road project, contributing to reduced traffic congestion, improved travel time, and enhanced road safety, while ensuring the infrastructure functions as intended and meets long-term transportation objectives.

METHODS

Research Design

This study employed a descriptive-correlational research design to examine the relationships between policy adherence, knowledge of infrastructure standards, compliance with road safety regulations (independent variables), and the road user benefits of the Coastal Road Infrastructure Project (dependent variable). The descriptive component allowed the researcher to provide a detailed account of respondents' current experiences,

behaviors, and perceptions regarding traffic policies and infrastructure conditions without manipulating the study environment, thereby identifying prevailing patterns and practices (Khalid et al., 2025). The correlational component enabled the analysis of the strength and direction of relationships between the independent variables and road user benefits, facilitating the identification of potential predictors while acknowledging that association does not imply causation (Creswell & Creswell, 2023). Data were collected once from a selected sample to represent the broader population, allowing timely insights into perceptions and behaviors related to infrastructure and policy interventions (Wang & Cheng, 2020). This approach was particularly suitable for evaluating road infrastructure projects, as it captures associations among variables such as traffic congestion, travel time, and accident reduction, providing a comprehensive understanding of factors influencing road user benefits.

Research Locale

The study was conducted in Cagayan de Oro City, a key economic and transportation hub in Northern Mindanao, Philippines, serving as a primary gateway for trade and commerce in the region (DPWH, 2022). The city is divided into two congressional districts, each encompassing major thoroughfares critical for urban transportation and regional connectivity. In District 1, significant roads include the Butuan-Cagayan de Oro-Iligan Road and Sayre Highway, facilitating movement between major cities and supporting agricultural and commercial transport. In District 2, key roads include the National Highway in Barangay Gusa and the Coastal Road, which functions as an alternative route to decongest city roads and enhance access to coastal barangays and industrial zones (CPDO, 2023; DPWH, 2023). Due to rapid urbanization and increasing vehicular volume, traffic congestion, road safety, and infrastructure development remain pressing concerns, highlighting the importance of examining the effectiveness of policy and infrastructure improvements in enhancing transportation efficiency, road safety, and urban mobility in Cagayan de Oro City (LTO, 2023).

Participants and Sampling

The study utilized a quota sampling design, a non-probability method, to select a representative sample of 134 stakeholders from Cagayan de Oro City, ensuring coverage of commuters, public utility vehicle (PUV) drivers, private vehicle owners, business operators, and government officials across Districts 1 and 2. Stratification variables, including vehicle type, travel hours, and days of the week, captured variations in road usage, while purposive sampling targeted business owners and government officials with expert knowledge, providing context-specific and policy-relevant insights. This hybrid approach allowed the study to collect comprehensive quantitative and qualitative data, reflecting the diverse perspectives of everyday road users and urban planning experts.

Respondents included 70 commuters (employees, students, and residents), 15 PUV drivers, 27 private vehicle and motorcycle users, 12 business owners and logistics personnel, and 10 government officials from agencies such as the LTO, DPWH, and CPDO. Commuters used roads for daily travel, while PUV drivers provided firsthand insights into traffic flow, road conditions, and enforcement challenges. Private vehicle users highlighted mobility issues, and business owners addressed economic impacts of congestion and infrastructure. Government officials contributed expertise on urban planning, traffic regulation, and policy implementation. Minors were excluded from direct participation, with parental feedback used for indirect input on child road safety. This sampling strategy ensured a balanced, representative dataset to inform evidence-based recommendations on improving road safety, traffic efficiency, and urban mobility in Cagayan de Oro.

Table 1. Distribution of Respondents

Respondents Group	Number of Respondents	Description
Commuters	70	Employees, students, and residents use roads at least three times a week for daily transportation.
Public Utility Vehicle (PUV)	15	Jeepney, taxi, and bus drivers are impacted by road infrastructure and traffic flow.

Private Vehicle Owners and Motorcycle	27	Private vehicle owners and motorcycle users are experiencing traffic congestion, road quality, and safety concerns.
Business Owners and Logistics	12	Business owners and logistics personnel are affected by traffic congestion, road quality, and infrastructure projects.
Government Officials	10	Officials from LTO, DPWH, and CPDO are providing expert knowledge on urban planning and infrastructure development.

Research Instrument

The study utilized a researcher-made, structured survey questionnaire to gather stakeholders' perceptions, experiences, and behaviors regarding road infrastructure and traffic policies in Cagayan de Oro City. The instrument was based on constructs identified in the literature, covering policy adherence, knowledge of infrastructure standards, and compliance with road safety regulations. Part I collected demographic data (age, sex, occupation) to contextualize responses. Part II assessed perceptions of policy adherence, including adherence to traffic rules, enforcement consistency, stricter traffic laws, penalties, and road safety education, using a Likert scale. Part III focused on knowledge of infrastructure standards, examining road conditions and maintenance, road signs, signals, navigation, and pedestrian-friendly infrastructure. Part IV evaluated road safety regulation compliance, including speed limits, safety gear usage, and law enforcement fairness. Finally, Part V measured the overall road-user benefits of the coastal road project, addressing traffic congestion, travel time, road safety, and accident reduction.

Validity and Reliability

The research instrument, a structured researcher-made survey, underwent rigorous validation and reliability testing to ensure accuracy and consistency. Expert validators with backgrounds in traffic management, urban planning, and research methodology reviewed the questionnaire to establish content validity, ensuring all items aligned with the study's constructs of policy adherence, knowledge of infrastructure standards, and compliance with road safety regulations. Revisions were made to enhance clarity and relevance. Reliability was assessed using Cronbach's alpha, with a benchmark of 0.70 for internal consistency. Pilot testing with 30 participants confirmed that the items consistently measured the intended constructs. Cronbach's alpha results were 0.877 for Policy Adherence, 0.873 for Knowledge of Infrastructure Standards, 0.873 for Road Safety Regulation Compliance, and 0.870 for Road User Benefits of the Coastal Road Project, all within the "Good" range. This combination of expert validation and reliability testing ensured that the instrument was both accurate and dependable, enabling meaningful measurement of stakeholders' perceptions regarding traffic regulation, infrastructure effectiveness, and policy implementation.

Table 2. Qualifications of Validators

Validator	Academic Background	Field of Expertise
1	Doctor of Management	Construction Management and Structural Design
2	Doctor of Philosophy	Data Analyst
3	Doctor of Philosophy	Urban Planning

Data Gathering Procedure

The data-gathering process began with securing the Dean of the Graduate School's endorsement to ensure official approval, ethical compliance, and access to potential participants. The researcher identified respondents from a pre-established list according to the study's criteria and objectives, visiting their offices to explain the study's purpose and voluntary participation. Informed consent was obtained, assuring confidentiality and giving respondents the opportunity to ask questions. Participants then received the research instrument with clear

instructions and additional explanations as needed. Completed instruments were reviewed for completeness, with missing responses politely collected, and all data were organized, tabulated, and cross-checked for accuracy. Finally, the data were securely stored to maintain confidentiality and ensure reliability in aligning with the study's objectives.

Scoring Procedure

The study employed a 4-point Likert scale to assess respondents' perceptions and behaviors across four main variables: Policy Adherence, Knowledge of Infrastructure Standards, Road Safety Regulation Compliance, and Road User Benefits of the Coastal Road Project. Each item was rated from 1 (Strongly Disagree) to 4 (Strongly Agree), avoiding a neutral midpoint to elicit decisive responses. Mean scores were interpreted using equal-interval ranges of 0.75, providing clear categorizations for each construct. For Policy Adherence, scores ranged from Very Low to Very High Adherence; for Knowledge of Infrastructure Standards, from Not Manifested to Highly Manifested; for Road Safety Regulation Compliance, from Very Low to Very High Compliance; and for Road User Benefits, from Very Low to Very High Effectiveness. This structured scoring enabled consistent classification of perceptions, facilitated comparison across respondent groups (commuters, PUV drivers, private vehicle users, business owners, and government officials), and supported visualization of data for analysis, ensuring reliable interpretation of relationships among variables and the effectiveness of the coastal road infrastructure project.

Table 3. Scale and Interpretation for Policy Adherence

Scale	Verbal Interpretation	Mean Range	Qualitative Description
4	Strongly Agree	3.25-4.00	Very High
3	Agree	2.50-3.24	High
2	Disagree	1.75-2.49	Low
1	Strongly Disagree	1.00-1.74	Very Low

Table 4. Scale for Knowledge of Infrastructure Standards

Scale	Verbal Interpretation	Mean Range	Qualitative Description
4	Strongly Agree	3.25-4.00	Highly Manifested
3	Agree	2.50-3.24	Manifested
2	Disagree	1.75-2.49	Less Manifested
1	Strongly Disagree	1.00-1.74	Not Manifested

Table 5. Scale for Road Safety Regulation Compliance

Scale	Verbal Interpretation	Mean Range	Qualitative Description
4	Strongly Agree	3.25-4.00	Very High
3	Agree	2.50-3.24	High
2	Disagree	1.75-2.49	Low
1	Strongly Disagree	1.00-1.74	Very Low

Table 6. Scale for Road User Benefits of the Coastal Road Project

Scale	Verbal Interpretation	Mean Range	Qualitative Description
4	Strongly Agree	3.25-4.00	Very High
3	Agree	2.50-3.24	High
2	Disagree	1.75-2.49	Low
1	Strongly Disagree	1.00-1.74	Very Low

Data Analysis

The study employed a combination of descriptive and inferential statistical methods to analyze respondents' perceptions of policy adherence, knowledge of infrastructure standards, compliance with road safety regulations, and the road user benefits of the Coastal Road Infrastructure Project. Descriptive statistics, including means, standard deviations, and frequency distributions, summarized respondents' perceptions using a 4-point Likert scale categorized into Very High, High, Low, and Very Low adherence or effectiveness. Pearson's correlation coefficient (r) was applied to determine the strength and direction of relationships between independent variables and the dependent variable, with normality confirmed through the Shapiro-Wilk test to ensure appropriate parametric analysis. Multiple linear regression was conducted to assess the combined effect of policy adherence, knowledge of infrastructure standards, and road safety regulation compliance on road user benefits, with multicollinearity checked using Variance Inflation Factors (VIFs). Qualitative data from stakeholders' insights were analyzed through thematic analysis to identify patterns regarding policy enforcement, infrastructure quality, and safety measures. Finally, quantitative and qualitative results were integrated to provide evidence-based recommendations for enhancing road infrastructure, safety, and urban mobility.

Ethical Considerations

This study strictly adhered to ethical research standards to ensure participant protection and maintain research integrity. Ethical practices ensured transparency, accountability, and respect for participants, who were fully informed and participated voluntarily, reinforcing trust and credibility. The study involved 134 respondents, selected using quota sampling to ensure proportional representation of diverse stakeholders, including commuters, PUV drivers, private vehicle owners, business operators, and government officials, thereby enhancing the validity and relevance of findings. Informed consent was obtained, allowing participants to withdraw at any time without penalty.

Data collection, storage, and processing were conducted with strict confidentiality and security. Identifying information was anonymized, and data were securely stored in both digital and physical forms, ensuring privacy and encouraging honest responses. Research was conducted in Districts 1 and 2 of Cagayan de Oro City, covering peak and off-peak hours to capture a comprehensive view of traffic and infrastructure challenges.

Potential risks, including privacy concerns, emotional distress, and response bias, were minimized. Participants could skip questions causing discomfort, and impartiality was ensured by excluding respondents directly involved in transportation management or urban planning. Personal data were strictly confidential, with coded identifiers for survey responses and secure storage in password-protected files and locked physical storage, aligning with ethical standards and data protection requirements.

RESULTS

Summary of Policy Adherence

Indicator	Mean	SD	Qualitative Description
Compliance with Stricter Traffic Laws	3.51	0.51	Very High
Perceptions of Penalties and Enforcement	3.47	0.51	Very High
Road Safety Education and Awareness	3.52	0.51	Very High
Overall	**3.50**	**0.51**	**Very High**

The results indicate that respondents demonstrated a **very high level of policy adherence overall**, with a **grand mean of 3.50** and a **standard deviation of 0.51**. Among the indicators, **road safety education and awareness obtained the highest mean (3.52)**, followed by **compliance with stricter traffic laws (3.51)**, while **perceptions of penalties and enforcement recorded the lowest mean (3.47)**, although still interpreted as **very high**.

Summary Result Distribution of Knowledge of Infrastructure Standards

Indicator	Mean	SD	Qualitative Description
Road Conditions and Maintenance	3.57	0.53	Highly Manifested
Road Signs, Signals, and Navigation	3.55	0.53	Highly Manifested
Pedestrian Safety and Infrastructure	3.53	0.54	Highly Manifested
Overall	**3.55**	**0.53**	**Highly Manifested**

The results show that respondents' knowledge of infrastructure standards is **highly manifested**, with a **grand mean of 3.55** and a **standard deviation of 0.53**. Among the indicators, **road conditions and maintenance obtained the highest mean (3.57)**, while **pedestrian safety and infrastructure recorded the lowest mean (3.53)**, though all are interpreted as **highly manifested**.

Summary Result Distribution of Road Safety Regulation Compliance

Indicator	Mean	SD	Qualitative Description
Speed Limits and Traffic Rule Compliance	3.46	0.55	Very High
Use of Safety Gear	3.48	0.52	Very High
Law Enforcement and Fairness	3.47	0.51	Very High
Overall	**3.47**	**0.51**	**Very High**

The results indicate that respondents demonstrated a **very high level of compliance with road safety regulations**, with a **grand mean of 3.47** and a **standard deviation of 0.51**. The highest compliance was observed in **use of safety gear (3.48)**, while **speed limits and traffic rule compliance recorded the lowest mean (3.46)**, though all indicators are interpreted as **very high**.

Summary Result Distribution of the Road User Benefits of the Coastal Road Project

Indicator	Mean	SD	Qualitative Description
Reduction in Traffic Congestion	3.42	0.56	Very High
Improvement in Travel Time	3.47	0.51	Very High
Road Safety and Accident Reduction	3.50	0.49	Very High
Overall	**3.46**	**0.52**	**Very High**

The results indicate that respondents perceived the **Coastal Road Project as highly effective**, with a **grand mean of 3.46** and a **standard deviation of 0.52**. The highest-rated benefit was **road safety and accident reduction (3.50)**, while **reduction in traffic congestion recorded the lowest mean (3.42)**, although all indicators are interpreted as **very high**.

Test of Significant Relationship on Policy Adherence, Knowledge of Infrastructure Standards, and Road Safety Regulation Compliance to the Road User Benefits of the Coastal Road Project

Indicator	B	Std. Error	Beta	t	Sig.
(Constant)	2.560	0.650		3.940	0.000
Policy Adherence	0.083	0.101	0.082	0.817	0.416
Knowledge of Infrastructure Standards	0.059	0.102	0.059	0.576	0.566
Road Safety Regulation Compliance	0.127	0.102	0.127	1.247	0.216

The regression analysis indicates that **Policy Adherence, Knowledge of Infrastructure Standards, and Road Safety Regulation Compliance do not significantly predict Road User Benefits** of the Coastal Road Project. This is supported by the non-significant p-values for all predictors ($p > 0.05$) and the very low adjusted R^2, suggesting that these factors alone cannot explain the variation in respondents' perception of road user benefits.

Stakeholders' Perspectives on the Road User Benefits of the Coastal Road Project

Indicator	Key Insight	Stakeholder Insight
Policy Adherence	Important for safety, limited direct effect	Stricter laws and penalties help safety but have limited effect on project benefits; enforcement consistency is needed
Infrastructure Quality	Critical for project benefits	Proper signage, traffic signals, and pedestrian facilities guide users and reduce accidents
Road Safety Compliance	Essential but not significantly linked to project effectiveness	Adherence to speed limits and safety gear is important but does not guarantee project success; education and enforcement are necessary

Holistic Approach	Comprehensive strategy required	Integrating infrastructure, enforcement, and public education is key; regular maintenance and policy integration are crucial

Stakeholders recognize that while **policy adherence, infrastructure quality, and compliance** are important, the **overall effectiveness of the Coastal Road Project depends on a holistic approach** combining infrastructure improvements, consistent enforcement, and public education to maximize road user benefits.

DISCUSSION

Policy Adherence

The respondents perceive policy adherence positively, including stricter traffic laws, enhanced penalties for violations, and road safety education programs. The study found that respondents strongly agree that the enforcement of more stringent traffic laws and the introduction of higher penalties have contributed to greater compliance with traffic rules. Furthermore, road safety education programs are widely regarded as effective in raising awareness and promoting safe driving behaviors. Respondents indicated that the combination of strict enforcement and educational initiatives is essential in improving road safety. However, there were varied opinions on the prioritization of environmental education and its direct connection to long-term policy adherence.

Knowledge of Infrastructure Standards

The respondents generally agree that high infrastructure standards are important, especially road quality and maintenance. Most believe well-maintained roads and clear signage greatly improve traffic safety. Proper signals and road markings are seen as essential for guiding drivers and preventing accidents. Respondents also value pedestrian-friendly infrastructure such as lanes, crosswalks, and accessibility features, suggesting these enhance safety for both drivers and pedestrians. However, opinions vary, especially about the adequacy of pedestrian infrastructure in some areas.

Road Safety Regulation Compliance

Respondents demonstrated substantial compliance with road safety regulations, primarily by following speed limits and traffic rules. Safety gear, such as seatbelts and helmets, was widely recognized for its role in injury prevention. Law enforcement effectiveness in penalizing violations was viewed as necessary for maintaining compliance. Some respondents said consistent enforcement is vital to ensuring that all road users follow the rules. Most agreed there is still room for improvement, especially in visible enforcement and public education on the importance of safety gear.

Road User Benefits of the Coastal Road Project

The respondents perceived that the road user benefits of the coastal road project were effective in reducing traffic congestion, improving travel time, and enhancing road safety. The coastal road was viewed as a successful initiative in diverting traffic from congested areas, resulting in smoother travel and reduced time spent in traffic. Respondents also noted improvements in road safety, with a decrease in the number of accidents observed since the project's completion. Despite these positive perceptions, some respondents felt that additional improvements could be made, particularly in areas not directly connected to the coastal road. Overall, the project was viewed as a valuable contribution to improving urban mobility and safety.

Relationship Between Policy Adherence and the Road Benefits of the Coastal Road Project

The analysis showed that policy adherence and road benefits in the coastal road project had both significant and non-significant results. Enhanced penalties for violations were significantly correlated with less traffic

congestion (r = -0.204, p = 0.042) and fewer accidents (r = 0.208, p = 0.043). This suggests that stricter, consistently enforced penalties modestly improve traffic discipline and safety. In contrast, implementing stricter traffic laws (r = -0.100, p = 0.322; r = 0.084, p = 0.408; r = 0.100, p = 0.322) and road safety education and awareness programs (r = 0.120, p = 0.234; r = 0.066, p = 0.512; r = -0.136, p = 0.239) showed no significant relationship (p > 0.05) to perceived road user benefits. In Cagayan de Oro City, this suggests penalty enforcement plays a small but measurable role in promoting safer, more disciplined roads. However, commuters mainly base their views on visible project benefits, such as smoother traffic flow, shorter travel times, and better road conditions, rather than on compliance or traffic awareness.

Significant Relationship between Knowledge of Infrastructure Standards and the Road Benefits of the Coastal Road Project

The analysis showed weak correlations between knowledge of infrastructure standards—such as road quality, signage, and pedestrian infrastructure—and the road user benefits of the coastal road project. With p-values above 0.05, the study suggests that infrastructure standards alone do not significantly relate to perceived road-user benefits such as reduced congestion, improved travel time, and enhanced road safety. While infrastructure quality is crucial, the findings indicate that factors such as traffic management, enforcement, and driver behavior may have a greater influence on outcomes. This shows the need for an integrated approach that combines better infrastructure with effective enforcement and public education.

Significant Relationship Between Road Safety Regulation Compliance and the Road Benefits of the Coastal Road Project

The study found weak relationships between compliance with road safety regulations—such as following speed limits, using safety gear, and effective law enforcement—and perceived road user benefits of the coastal road project. The correlation coefficients were low. None of the p-values were significant. This means road safety compliance alone does not significantly correlate with project effectiveness. Therefore, while regulations matter, other factors, such as infrastructure quality, traffic management, and enforcement, are also needed to fully realize the project's benefits.

Strongest Relationship

The findings indicate that policy adherence, knowledge of infrastructure standards, and compliance with road safety regulations do not significantly relate to road benefits from the coastal road project. While each variable had a positive coefficient, none were statistically significant, as all p-values exceeded 0.05. This means these factors are important for improving safety and efficiency, but their direct link to road user benefits in this project is limited. This lack of a significant relationship may result from inconsistent policy enforcement, incomplete use of infrastructure standards, or variable public compliance. Although not directly observed in this study, such challenges can be inferred from respondents' perceptions and the literature. The results highlight the need for integrated strategies that combine strong enforcement, full application of infrastructure, and effective public education to improve road user benefits, such as traffic flow, travel time, and safety.

Stakeholder Insights

Stakeholders noted that the Coastal Road Project improved traffic congestion, travel time, and road safety. However, the direct effect of policy adherence (e.g., stricter traffic laws and penalties) on road-user benefits was limited. Greater impact was attributed to physical infrastructure improvements, effective traffic management, and law enforcement. Infrastructure quality—including proper signage, road markings, and pedestrian-friendly features—was seen as vital for safety, though congestion and pedestrian infrastructure gaps remain in peripheral areas. While road safety regulation compliance is important, the lack of significant correlation with overall benefits highlights the need for stronger enforcement and public awareness campaigns. Stakeholders emphasized a holistic approach combining infrastructure upgrades, law enforcement, public education, and maintenance.

Policy Recommendation

The study found that policy adherence, including stricter traffic laws and penalties, contributes to road safety but has a limited direct relationship with road user benefits of the Coastal Road Project. Respondents highlighted the need for consistent road maintenance and infrastructure upgrades, especially in peripheral areas facing congestion and safety issues. Public awareness campaigns and road safety education were recognized as important for improving regulation compliance, although enforcement consistency remains a challenge. Stakeholders also suggested strengthening law enforcement through technology-driven solutions, such as automated speed cameras and electronic ticketing. Findings indicate that law enforcement effectiveness, combined with education and infrastructure improvements, significantly supports road safety outcomes. Therefore, an integrated approach involving maintenance, education, and enforcement is essential for the long-term success of the Coastal Road Infrastructure Project.

CONCLUSION

The study concludes that policy adherence, covering stricter traffic laws, penalties, and enforcement, and safety education and awareness, was generally perceived as important, with penalties and enforcement emerging as the most influential elements in practice. Respondents' knowledge of infrastructure standards further indicates that road condition and maintenance, clear signs and signals, and pedestrian safety facilities are necessary to sustain safe operations of the Coastal Road. Road safety regulation compliance, including adherence to speed limits and traffic rules, use of safety gear, and perceived fairness of enforcement, was likewise viewed as essential; however, compliance alone does not automatically guarantee better outcomes when enforcement is inconsistent.

Overall, the Coastal Road Project was perceived to provide road-user benefits, particularly in terms of safety and mobility, although perceived improvements vary by area and time of day. Statistically, policy adherence showed a significant relationship with road user benefits in specific components, especially where penalties and enforcement are visible and consistent. In contrast, knowledge of infrastructure standards did not show a consistently significant relationship with overall road user benefits, suggesting that technical quality must be paired with implementation and road user behavior to yield benefits. Road safety regulation compliance also did not show a consistently significant relationship with overall road user benefits, suggesting that compliance effects depend on enforcement intensity and contextual factors.

Among the three predictors, policy adherence, particularly penalties and enforcement, was identified as having the strongest relationship with road user benefits. Stakeholders emphasized that sustaining benefits requires an integrated approach that combines infrastructure maintenance, road user education, and visible enforcement.

Therefore, the policy recommendations prioritize strengthening enforcement consistency, targeted education, and routine infrastructure maintenance to sustain the road-user benefits of the coastal road project.

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