

Navigating Towards Resilience: A Case Study of Overcoming Infrastructure Hurdles and Boosting Transportation Effectiveness in Sitio Ampere, Barangay Gupa, Dipaculao, Aurora, Philippines

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Abstract- *Sitio Ampere is a known road segment in town and a tourist spot along the national highway, that brings economic and tourism advantages for the municipality of Dipaculao. It is known for its beautiful rock formations and astonishing seashore that attracts tourists more often. This research examines the structure conditions, challenges, and efficiency of road segments and a tourist spot at Sitio Ampere, Barangay Gupa, Dipaculao, Aurora, through a comprehensive analysis of the current infrastructure, including road conditions, transportation modes, environmental challenges, and the impact of seasonal weather patterns, this study will identify key factors that contribute to the problems and challenges as well as the efficiency and development of the road. The researchers utilized hermeneutic phenomenology using qualitative approaches in gathering information about the conditions of the road, both present and past.*

Indexed Terms- *Transportation Efficiency, Road Conditions, Infrastructure Development, Sustainable Infrastructure.*

I. INTRODUCTION

Background of the Study: Roads are one of the most important infrastructures that enable human

movement and transportation of goods and services. Road construction has been one of the most significant factors that have shaped modern society and made it more accessible and connected. Effective planning, design, and maintenance are essential to ensure that roads meet the diverse needs of all road users. The construction and maintenance of roads have been an ongoing process since ancient times and continue to evolve with the growing demands of modern society.

Roads have various importance to us humans such as economic development, improved accessibility and connectivity; safer transportation; and environmental benefits. Improved road infrastructure enables the smooth flow of goods and services, thereby reducing the transportation time and cost. This, in turn, makes the goods and services more accessible to a larger audience, leading to increased trade and commerce. It provides a convenient and fast mode of transportation, connecting remote and rural areas to urban areas. This improved connectivity promotes social and economic development in rural areas and makes it easier for people to access essential services like healthcare, education, and employment opportunities. Improved road infrastructure ensures safer transportation for passengers and goods. Properly constructed and maintained roads reduce the risk of accidents and make transportation smoother

and more efficient. Furthermore, well-lit roads and proper signage also improve road safety and make it easier for drivers to navigate through unfamiliar areas. Improved road infrastructure enables the efficient transportation of goods, reducing the number of vehicles on the road and reducing emissions. In addition, the use of environmentally friendly construction materials and techniques can also reduce the negative impact of road construction on the environment.

Roads have different issues that affect transportation efficiency such as lack of infrastructure; lack of funds; poor road quality; inadequate maintenance; and parking issues. Lack of proper signage, streetlights, and pedestrian facilities can cause accidents and inconvenience. When these infrastructures are not operating properly, the chain of production is disrupted. Lack of funds can cause poor road quality and can lead to road damages such as potholes, cracks, uneven surface and it risks the lives of travelers and tourists. Parking issues are common, especially on the roads where a tourist spot and parking in the pedestrian lane disturb pedestrians and other travelers.

As a result, the researchers must conduct a relevant study to improve the issues on how to enhance transportation efficiency and mitigate infrastructure challenges in Sitio Ampere Barangay Gupa Dipaculao Aurora. This concerns the safety of the travelers and residents of Barangay Gupa, Dipaculao, Aurora and required solutions to the issues. The researchers proposed a study that might provide valuable insight and influence the improvement of designing roads and highways.

Objectives: The objective of this study, titled *Navigating towards Resilience: A Case Study of Overcoming Infrastructure Hurdles and Boosting Transportation Effectiveness in Sitio Ampere, Barangay Gupa, Dipaculao, Aurora,* is to comprehensively analyze the existing infrastructure challenges faced by the road segment to enhance transportation efficiency and overall resilience in the region. The primary aims of the study include:

1. Identifying Infrastructure Challenges: Examine and document the current state of infrastructure in Sitio Ampere, with a specific focus on road

conditions, transportation systems, and related facilities. Identify the key challenges and bottlenecks that impede efficient transportation and contribute to overall vulnerability.

2. Analyzing Environmental Factors: Examine the environmental factors contributing to infrastructure challenges, such as geographical and climatic considerations. Evaluate the susceptibility of the current infrastructure to natural disasters and climate change and assess the implications for long-term sustainability.
3. Assessing Socio-Economic Impacts: Investigate the socio-economic impacts of the existing infrastructure challenges on the residents of Sitio Ampere and the broader Barangay Gupa. Evaluate how these challenges affect daily life, economic activities, and access to essential services.
4. Transportation Efficiency: Explore avenues for enhancing transportation efficiency in the area, including the introduction of innovative technologies, and optimized traffic management caused by accidents.

Statement of the Problem: The study aims to answer the following questions:

1. Insufficient Infrastructure: What are the existing inadequacies in the road infrastructure of Sitio Ampere, Barangay Gupa, Dipaculao, Aurora, and how do these deficiencies impact the community's daily life and socio-economic activities?
2. Transportation Inefficiency: How does the current state of transportation systems contribute to inefficiencies in Sitio Ampere, and what specific challenges are faced by residents in terms of accessibility, connectivity, and timely transportation services?
3. Environmental Vulnerability: What environmental factors, such as geographical features and susceptibility to natural disasters, exacerbate the infrastructure challenges in Sitio Ampere, and how do these factors pose risks to the resilience of the existing transportation systems?
4. Community Perspectives: What are the perceptions, preferences, and concerns of the local community in Sitio Ampere regarding the current state of infrastructure and transportation efficiency? How do these perspectives influence

the formulation of effective and community-centric solutions?

5. **Technological Integration:** To what extent is technology integrated into the existing transportation systems in Sitio Ampere, and what role can innovative technologies play in mitigating infrastructure challenges and enhancing transportation efficiency in the area?

Significance of the Study: The significance of the study is multifaceted and extends to various stakeholders, including the local community, policymakers, governmental bodies, and researchers. The study holds importance for the following reasons:

1. **Community Empowerment:** The study empowers the community of Sitio Ampere by giving voice to their concerns and actively involving them in the identification of infrastructure challenges. Through community engagement, residents become active participants in the decision-making process, fostering a sense of ownership and empowerment.
2. **Sustainable Development:** By addressing infrastructure challenges and enhancing transportation efficiency, the study contributes to the sustainable development of Sitio Ampere. Sustainable infrastructure can improve the overall quality of life, stimulate economic activities, and ensure long-term environmental and social resilience.
3. **Improved Socio-Economic Conditions:** Successful mitigation of infrastructure challenges and the enhancement of transportation efficiency directly impact the socio-economic conditions of the community. Improved accessibility and connectivity can lead to increased economic opportunities, better access to education and healthcare, and an overall enhancement of the residents' well-being.
4. **Resilience to Natural Disasters:** The study's focus on resilience aims to equip the community and its infrastructure to withstand and recover from natural disasters. This is crucial in regions prone to environmental challenges, contributing to the safety and security of the residents.
5. **Policy Guidance:** Policymakers and local government officials can benefit from the study's findings and recommendations. The insights

provided can guide the formulation of effective policies and strategies for infrastructure development, ensuring that they align with the unique needs and challenges of Sitio Ampere and similar rural areas.

6. **Academic Contribution:** Researchers and academics in the fields of infrastructure, transportation, and community development can use the study as a valuable reference. The case study provides real-world insights into the complexities of rural infrastructure challenges and the implementation of solutions, contributing to the academic discourse and literature.
7. **Demonstration of Best Practices:** The study can serve as a model for other rural areas facing similar infrastructure challenges. Successful strategies and best practices identified in Sitio Ampere can be adapted and replicated in different contexts, thereby promoting knowledge transfer and the dissemination of effective solutions.
8. **Investment Attraction:** The identification of feasible and sustainable solutions enhances the attractiveness of Sitio Ampere for potential investors. Improved infrastructure and transportation efficiency create a conducive environment for economic activities, potentially attracting investments that contribute to the community's growth.

In summary, the significance of this study lies in its potential to bring about positive, tangible changes in the lives of the residents of Sitio Ampere while providing valuable insights and guidance for broader regional development and infrastructure planning.

Scope and Delimitation: The study is to give a focused and thorough investigation of infrastructure difficulties and transportation efficiency in Sitio Ampere, Barangay Gupa, Dipaculao, Aurora, by defining its scope and delimitations. The study is delimited by time constraints, focusing on the conditions and challenges present in Sitio Ampere up to the knowledge cutoff date in May 2024. Any developments or changes beyond this date will not be considered in the analysis. Findings and recommendations of the study are specific to the context of Sitio Ampere and may not be directly applicable to other regions without considering their unique characteristics. Generalization to broader

contexts will be limited. While technological integration is explored, the study may not provide an exhaustive technical analysis of specific technologies. The focus is on the role of technology in mitigating challenges rather than an in-depth technical assessment.

Review of Related Literature: Introduction to Infrastructure Challenges in Rural Areas
Infrastructure development is crucial for the socio-economic development and resilience of rural communities worldwide. Rural areas often face unique challenges in infrastructure provision due to factors such as geographical isolation, rugged terrain, limited resources, and sparse populations. These challenges hinder access to essential services, economic opportunities, and social connectivity, impacting the overall well-being of residents. This section provides an overview of the infrastructure challenges faced by rural areas, emphasizing the need for targeted interventions to enhance transportation efficiency and resilience (Shahid Hussain, 2022)

Infrastructure Challenges in Rural Areas:

Rural communities often contend with inadequate road networks, unreliable transportation systems, and deficient facilities, which impede economic growth and social development (Asafu-Adjaye, 2019). Poor road conditions, including unpaved roads, limited access routes, and inadequate maintenance, restrict mobility and increase transportation costs for residents and businesses (OECD, 2019). Furthermore, geographical barriers such as rivers, mountains, and forests pose significant challenges to infrastructure development, requiring innovative solutions to ensure connectivity and accessibility (Noland & Graham, 2017). Environmental vulnerabilities exacerbate infrastructure challenges in rural areas, with natural disasters such as floods, landslides, and storms causing damage to roads, bridges, and other critical infrastructure (Ward, 2020). Climate change further amplifies these risks, leading to increased frequency and intensity of extreme weather events, which threaten the resilience of transportation networks and infrastructure systems (Teytelboym, 2018).

In summary, infrastructure challenges in rural areas pose multifaceted obstacles to community resilience

and development. Addressing these challenges requires comprehensive strategies that integrate environmental considerations, community participation, and innovative solutions tailored to the specific needs of each locality.

Transportation Efficiency and Resilience in Rural Areas

Efficient transportation systems are essential for rural resilience, enabling access to markets, employment opportunities, healthcare, and education. This section explores the importance of transportation efficiency in enhancing rural resilience and outlines strategies for improving transportation networks in rural areas.

Transportation Efficiency and Resilience:

Transportation networks play a critical role in facilitating economic activities, social interactions, and emergency response in rural communities (Ward, 2020). Efficient transportation systems improve community resilience by reducing vulnerability to external shocks, enhancing mobility options, and facilitating timely access to essential services during emergencies (Teytelboym, 2018). Furthermore, resilient transportation infrastructure can adapt to changing environmental conditions, such as floods or landslides, minimizing disruptions and supporting long-term sustainability (OECD, 2019).

In rural areas, where distances between communities and services are often significant, transportation efficiency is paramount for ensuring equitable access to opportunities and resources (Noland & Graham, 2017). Well-connected transportation networks enable farmers to transport their produce to markets, workers to commute to job sites, and students to access educational institutions, thereby fostering economic growth and social development (Asafu-Adjaye, 2019).

Sustainable Infrastructure Development:

Sustainable infrastructure development is essential for addressing infrastructure challenges in rural areas. This includes investing in road upgrades, bridge construction, and drainage improvements to enhance accessibility and connectivity (OECD, 2019). Sustainable infrastructure projects prioritize environmental considerations, such as minimizing ecological impacts and promoting ecosystem

resilience, to ensure the long-term sustainability of transportation networks (Benešová, 2020).

Community-Based Approaches:

Community-based approaches empower local residents to participate in decision-making processes and contribute to infrastructure planning and development. Participatory planning exercises, community consultations, and stakeholder engagement sessions enable communities to identify transportation priorities, voice their concerns, and collaborate with government agencies and non-governmental organizations to implement solutions (Foley & McCarthy, 2019). By involving local stakeholders in infrastructure projects, communities can ensure that investments meet their needs and aspirations, enhancing the effectiveness and sustainability of interventions.

Technological Innovation:

Technological innovation plays a crucial role in mitigating infrastructure challenges and enhancing transportation efficiency in rural areas. Geographic Information Systems (GIS), remote sensing, and satellite imagery enable more accurate mapping and assessment of transportation networks, facilitating data-driven decision-making and resource allocation (Dong, 2018). Advanced technologies, such as Intelligent Transportation Systems (ITS) and real-time monitoring systems, improve traffic management, enhance road safety, and reduce congestion, thereby increasing the efficiency and reliability of transportation systems (Teytelboym, 2018).

Innovative Financing for Rural Infrastructure Development

Innovative financing mechanisms have enabled rural communities to overcome funding constraints and implement infrastructure projects that enhance resilience and improve quality of life. In Norway, the Rural Road Investment Program (RRIP) utilizes value capture mechanisms, such as land value taxation and development fees, to finance road upgrades and maintenance in rural municipalities (Tennøy, 2019). By capturing a portion of the increased land values resulting from infrastructure improvements, the RRIP generates revenue streams that fund ongoing maintenance and rehabilitation

activities, ensuring the long-term sustainability of rural transportation networks. Additionally, the RRIP leverages PPPs to finance larger infrastructure projects, such as bridge construction and road expansion, by partnering with private sector investors and contractors. Through innovative financing mechanisms, the RRIP has transformed rural infrastructure development in Norway, enhancing transportation efficiency and resilience in remote communities.

Conclusion and Implications for Sitio Ampere

The literature review highlights the interconnectedness of infrastructure challenges, transportation efficiency, and resilience in rural areas. Infrastructure development plays a critical role in supporting economic growth, social development, and environmental sustainability in rural communities. By addressing infrastructure challenges through sustainable development strategies, community engagement, and technological innovation, rural areas can enhance their resilience and improve the well-being of their residents.

The case study on mitigating infrastructure challenges and enhancing transportation efficiency in Sitio Ampere, Barangay Gupa, Dipaculao, Aurora, holds significant implications for the local community and policymakers. By drawing on insights from the literature review and applying best practices from case studies, Sitio Ampere can develop targeted interventions that address its specific infrastructure needs and vulnerabilities. Through community-based approaches, technological innovation, and innovative financing mechanisms, Sitio Ampere can enhance its transportation networks, improve access to essential services, and build resilience to future uncertainties. The case study's findings and recommendations will inform future infrastructure development initiatives in Sitio Ampere and serve as a model for rural communities facing similar challenges worldwide.

II. METHODOLOGY

Research Design: To understand the experiences of riders and citizens of the given community, the researchers utilized hermeneutic phenomenology using qualitative approaches in gathering information

about past and present conditions. As elaborated in the study of S Tenny (2022), Qualitative research is a type of research that explores and provides deeper insights into real-world problems. It helps generate hypotheses as well as further investigate. Hermeneutic phenomenology involves to understand and interpret the lived experiences and perceptions of the respondents. According to Van Manen (2017), hermeneutic phenomenology is a method that is a description of personal experiences, conversational interviews, and close observation. This approach aims to uncover the interpretations of the respondents given to their experiences, rather than simply collecting and categorizing data. In this way, we will understand and identify the problems in the highways of Sitio Ampere during day and night through their experiences.

The researcher chose this method because it allows us to fully explore the experiences and traumatic conditions of the citizens because of the lack of signs, infrastructure, and streetlights. Rather than generalizing our findings from just looking at the given location, we will focus on gaining an in-depth understanding of the problems. We will conduct an extensive interview with the respondents about the experiences, challenges, and their concerns. The Researchers then analyze the data gathered by reviewing transcript to identify major problems. And then finally, we the Researchers will interpret our findings to answer our assumptions.

Sampling Technique and Sampling Size: Survey is defined as the collection of information from a sample of individuals through their responses to questions. In this research, the target respondents comprised within the vicinity in the barangay Gupa Dipaculao, Aurora to barangay Ditale road. In this study, there are 30 respondents. Twenty (20) of the respondents are male and ten (10) of them are female. Two (2) of the respondents are cyclist, twenty-eight (28) are using motorcycle, twenty (20) of the respondents are residents who live within that area, and ten (10) of the respondents are from other barangays. The respondents are regularly used the Brgy. Gupa to Brgy. Ditale road. Non-probability Purposive sampling is a sampling method in which respondents are selected because they have characteristics that you need in your research topic. It

does not give all the individuals in the population equal chances of being selected. It was used as the type of sampling in order to select the right type of respondents based on their experiences on the road, particularly the motorcycle riders, drivers within the area of barangay Gupa. The researchers conducted the gathered data by a massive one on one interview with the respondent.

Sources of Data: To collect the data needed for this study, the researchers prepared a survey questionnaire that was face validated by the researchers' adviser. The interview questions were aimed to answer the infrastructure challenges and on how to enhance transportation efficiency in barangay Gupa sitio Ampere Road.

The questionnaire has sections.

> Section "A" is on the personal data of the respondents;

> Section "B" is on the needs/objectives of enhancing the transportation efficiency;

> Section "C" contains questions on the perceived problems of road segment at Sitio Ampere, Barangay Gupa, Dipaculao, Aurora

Data Analysis: The data collected in this study is tabulated, summarized, analyzed, and entered into appropriate tables and graphs for analysis and discussion. By efficiently organizing the data into graphs and tables, a conclusion is drawn about mitigating the infrastructure challenges and enhancing transportation efficiency. Cross-tabulation was done to show the frequency and percentage distribution of data using the following formula:

$$\% = \frac{f \times 100\%}{N}$$

Where:

% is the percentage,

f is the frequency, and

N is the total number of the participants

III. RESULTS AND DISCUSSION

Site Observations: The subject of the study, which is the road from Sitio Ampere to Barangay Ditale road, is an Asphalt pavement and has a total of 1km.

After conducting site visits and investigations, the researchers have observed the following constructive aspects:

1. One of the most noticeable changes is the improvement in the road surface. Like asphalt pavement but don't have markings.
2. The road is now elevated compared to its previous state, and the concrete thickness has been increased for enhanced structural integrity.
3. The road doesn't have any road signs.
4. The road is suitable for various modes of transportation, and it can accommodate even substantial vehicles like trucks.
5. Residents and commuters experience an increase in satisfaction when roads are fixed and restored.

On the contrary, the following are destructive aspects and aspects that have not changed with the road restoration as observed by the researchers:

1. Despite recent road improvements, certain areas still lack road shoulders and sidewalk spaces.
2. Regardless the restoration and fixing of the road, the road width still has not changed.
3. The absence of pavement markings on the road in this area raises concerns about road safety and traffic organization.
4. The area still lacks road lighting, posing challenges to visibility and safety during nighttime.
5. The area is characterized by a limited number of road signs, emphasizing the need for an increased presence of clear and visible signage for improved navigation and awareness in the area.
6. Some parts of the road don't have seawall and damaged which can cause poor road durability because of big waves.
7. The absence of slope protection on the mountain caused large rocks to fall which concerns the safety of the citizens and motorists.
8. Some parts of the roads are lacks of barricades.

Survey Findings of the Residents and Road Users:

Section A. Demographic Information

Respondents were described using age and gender as the variables. The information that corresponds with each variable is presented in the table.

Table 1. Gender Distribution of the Respondents

| Gender | Frequency (f) | Percentage (%) |
|--------|---------------|----------------|
| Male | 20 | 66.66% |
| Female | 10 | 33.34% |
| Total | 30 | 100% |

Table 1. shows the gender distribution of the respondents. Twenty respondents are male (66.66%) and ten are female (33.34%). The results show that most of the respondents are male.

Table 2. Age Group Distribution of the Respondents

| Age Group | Frequency (f) | Percentage (%) |
|-----------|---------------|----------------|
| Youth | 13 | 43.33% |
| Adult | 17 | 56.67% |
| Total | 30 | 100% |

Table 2. shows the age group distribution of the respondents. Two respondents are youth (43.33%) and eight are adult (56.67%). The results show that most of the respondents are adults.

Section B. Needs/Objectives of Enhancing Transportation Efficiency

Table 3. Have you observed any recent improvements in transportation efficiency in Sitio Ampere?

| Response | Frequency (f) | Percentage (%) | Rank |
|----------|---------------|----------------|------|
| Yes | 27 | 90 | 1 |
| No | 3 | 10 | 2 |
| Total | 30 | 100% | |

Table 3. shows the response of twenty-seven (27) or 90% have observed recent improvements in transportation efficiency in Sitio Ampere and three (3) or 10 % have not observed any recent improvements.

Table 4. Have transportation challenges in sitio Ampere ever hindered your access to essential services like healthcare and education?

| Response | Frequency (f) | Percentage (%) | Rank |
|----------|---------------|----------------|------|
| Yes | 10 | 33.33 | 2 |
| No | 20 | 66.67 | 1 |
| Total | 30 | 100% | |

Table 4. shows that (20) or 66.66% of the respondents answered that transportation challenges have not hindered their access to essential services like healthcare and education while the (10) or 33.33% of respondents have hindered their access to essential services.

Table 5. Do you believe that ongoing infrastructure projects are effectively addressing transportation issues in Sitio Ampere?

| Response | Frequency (f) | Percentage (%) | Rank |
|----------|---------------|----------------|------|
| Yes | 16 | 53.33 | 1 |
| No | 14 | 46.67 | 2 |
| Total | 30 | 100% | |

Table 5. shows sixteen (16) or 53.33% of the respondents believe that ongoing infrastructure projects are effectively addressing transportation issues in Sitio Ampere while fourteen (14) or 46.67% of the respondents do not believe.

Table 6. Have you personally adopted any resilience strategies to cope with transportation challenges in Sitio Ampere?

| Response | Frequency (f) | Percentage (%) | Rank |
|----------|---------------|----------------|------|
| Yes | 8 | 26.67 | 2 |
| No | 22 | 73.33 | 1 |
| Total | 30 | 100% | |

Table 6 shows the response twenty-two (22) of 73.33% have not personally adopted any resilience strategies to cope with transportation challenges in Sitio Ampere while eight (8) or 26.67% of the respondents have personally adopted resilience strategies.

Table 7. In your opinion, what are the most critical aspects that need improvement to enhance transportation efficiency in Sitio Ampere?

| Response | Frequency (f) | Percentage (%) | Rank |
|------------------------------------|---------------|----------------|------|
| Road Conditions | 10 | 33.33 | 2 |
| Public Transportation Availability | 3 | 10 | 3 |

| | | | |
|-----------------------------|----|-------|---|
| Weather Resilience Measures | 17 | 56.67 | 1 |
| Total | 30 | 100% | |

Table 7. shows responses of seventeen (17) or 56.67% answered weather resilience measures as the most critical aspect that needs improvement to enhance the transportation efficiency in Sitio Ampere. Based on the table, ten (10) or 33.33% of responses answered road conditions, and three (3) or 10% of responses answered public transportation availability.

Section C. Perceived problem of Transportation Infrastructure in Sitio Ampere.

Table 8. How would you rate overall condition of the roads and in Sitio Ampere?

| Response | Frequency (f) | Percentage (%) | Rank |
|-----------|---------------|----------------|------|
| Excellent | 6 | 20 | 2 |
| Good | 13 | 43.33 | 1 |
| Fair | 5 | 16.67 | 3 |
| Poor | 6 | 20 | 2 |
| Total | 30 | 100% | |

Table 8 shows thirteen (13) or 43.33% of respondents answered good in overall rate of conditions of the road in Sitio Ampere, six (6), or 20% response both excellent and poor, and five (5), or 16.67% of response answered fair.

Table 9. Which mode of transportation do you primarily rely on in sitio Ampere?

| Response | Frequency (f) | Percentage (%) | Rank |
|-----------------------|---------------|----------------|------|
| Personal Vehicle | 24 | 80 | 1 |
| Public Transportation | 2 | 6.67 | 3 |
| Walking/Cycling | 4 | 13.33 | 2 |
| Total | 30 | 100% | |

Table 9. shows twenty-four (24) or 80% of the response answered personal vehicle, four (4) or 13.33% of response answered public transportation, and two (2) or 6.67% of the response answered walking/cycling.

Table 10. Have you personally experienced difficulties due to transportation infrastructure in Sitio Ampere?

| Response | Frequency (f) | Percentage (%) | Rank |
|----------|---------------|----------------|------|
| Yes | 21 | 70 | 1 |
| No | 9 | 30 | 2 |
| Total | 30 | 100% | |

Table 10. shows twenty-one (21) or 70% of the respondents have personally experienced difficulties due to transportation infrastructure in Sitio Ampere while nine (9) or 30% of the respondents have not experience.

Table 11. Do you believe that the current transportation infrastructures in Sitio Ampere is adequate to support the needs of residents and businesses?

| Response | Frequency (f) | Percentage (%) | Rank |
|----------|---------------|----------------|------|
| Yes | 18 | 60 | 1 |
| No | 12 | 40 | 2 |
| Total | 30 | 100% | |

Table 12. shows eighteen (18) or 60% of the response believe that the current transportation infrastructure is adequate to support the needs of residents and businesses while twelve (12) or 40% of the response do not believe.

CONCLUSION

The "Road to Resilience" case study has shed insight into the major transportation inefficiencies and infrastructure issues that have been restricted in Sitio Ampere's growth and well-being in Barangay Gupa, Dipaculao, Aurora. Through a detailed analysis encompassing both quantitative data and qualitative insights, this study has identified the primary obstacles as inadequate road conditions, insufficient protective barricades, and a high susceptibility to natural disasters such as flooding and landslides. Addressing these challenges requires a holistic and strategic approach. The study's recommendations conclude constructing durable, weather-resistant roads, enhancing drainage systems, installing adequate barricades, and improving public

transportation. Implementing these measures is expected to enhance transportation efficiency, boost economic activities, and significantly improve the residents' quality of life. Moreover, this study underscores the importance of community involvement and stakeholder engagement in the planning and execution of infrastructure projects. The active participation of local residents and stakeholders ensures that the solutions are tailored to the community's specific needs and are sustainable in the long term. The local community widely appreciates the road improvements, acknowledging the tangible enhancements in accessibility, reduced travel times and overall positive impact on their daily lives, showcasing the success of the road enhancement.

RECOMMENDATIONS

1. Consider installing street lights and road signs to enhance visibility and improve overall safety for drivers and pedestrian.
2. Prioritize the installation of pavement markings to delineate lanes and provide clear guidance for both drivers and pedestrians, and enhancing overall road safety.
3. Rehabilitation of seawalls considering the road is near the sea and prone to calamities like typhoons.
4. Placing slope protection on the mountains because there is often falling big rocks and sometimes piles of small rocks.
5. Implementing designated parking space for the tourist can significantly improve the traffic and reducing the risk of accidents.

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REFERENCES

- [1] Kaiser, N., & Barstow, C. (2022). Rural Transportation Infrastructure in Low- and Middle-Income Countries: A Review of Impacts, Implications, and Interventions. *Sustainability*, 14(4), 2149.
- [2] Alamgir, M., Campbell, M. J., Sloan, S., Suhardiman, A., Supriatna, J., & Laurance, W. F. (2019). High-risk infrastructure projects pose imminent threats to forests in Indonesian Borneo. *Scientific Reports*, 9(1).
- [3] Hussain, S., Maqbool, R., Hussain, A., & Ashfaq, S. (2022). Assessing the Socio-Economic impacts of rural infrastructure projects on community development. *Buildings*, 12(7), 947
- [4] Gibson, J., & Rozelle, S. (2003). Poverty and access to roads in Papua New Guinea. *Economic Development and Cultural Change/Economic Development and Cultural Change (University of Chicago. Online)*, 52(1), 159–185.
- [5] Wealth Creation without Pollution: Designing for Industry, Ecobusiness Parks and Industrial Estates. (2017). In IWA Publishing eBooks.
- [6] Sidik, M. (2021). A Land Value Capture: Taxation and value for money Perspectives. *Jurnal Pajak Dan Bisnis*, 2(1), 1–19.