

Development of Transportation Systems at the Simalungun Regency Transportation Office

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Abstract

This study aims to analyze the condition of road infrastructure and transportation systems in Simalungun Regency, identify transportation management constraints, and formulate strategies for developing integrated and sustainable transportation systems. The research approach used is qualitative, with data collection through in-depth interviews, field observations, and documentation. The research informants consisted of officials of the Transportation Agency, public transportation operators, and the road user community. The results of the study show that the condition of the roads in Simalungun Regency is still inadequate, with almost half of the roads damaged or in need of repair. Obstacles to transportation management include limited budget and human resources, coordination between agencies that are not optimal, low integration of transportation systems, and road user behavior that is not always orderly. The impact of this condition can be seen in the disruption of community mobility, slow distribution of goods, and restrained local economic growth. The recommended transportation development strategies include the rehabilitation and construction of priority roads, improvement of public transportation services, integration of technology-based transportation systems, and the active involvement of the community and the private sector. The implementation of this strategy is expected to be able to improve mobility, efficiency of goods distribution, security, comfort, and support sustainable economic growth.

Keywords: Transportation System, Road Infrastructure, Community Mobility, Distribution of Goods and Simalungun Regency

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Introduction

Transportation is one of the vital sectors in regional development, because it plays a role as a driver of human mobility, distribution of goods, and connectivity between regions. Simalungun Regency, as one of the regions in North Sumatra Province, has experienced rapid development in various sectors, including economy, tourism, and education. This growth requires an effective, efficient, and sustainable transportation system to support community mobility and improve the quality of public services. However, facts on the ground show that the transportation system in Simalungun Regency still faces various obstacles. Uneven road infrastructure, limited public transportation capacity, and lack of integration between modes of transportation are major challenges. In addition, the increasing volume of private vehicles causes congestion in city centers and reduces environmental quality due to exhaust emissions. This condition causes discomfort for the community and has the potential to hinder economic growth and tourism in the area.

The Simalungun Regency Transportation Office has a strategic role in planning, managing, and supervising the transportation system so that it can run optimally. The development of an integrated, technology-based, and environmentally friendly transportation system is an urgent need to answer mobility challenges and meet public expectations for better transportation services. In addition to physical and technical aspects, the development of transportation systems also requires appropriate policy support, consistent supervision, and community participation to create a safe, comfortable, and efficient system. Thus, research related to the development of transportation systems at the Simalungun Regency Transportation Office is important to provide recommendations for strategies and innovations that are able to improve the quality of transportation services and support regional development in a sustainable manner.

Table 1. Transportation & Road Infrastructure Conditions in Simalungun Regency (2025)

Yes	Road/Infrastructure Category	Road Length (km)	Percentage (%)	Source
1	Total length of the road	1.803,78	100	Government of Simalungun Regency
2	A Steady Path (Good)	917,33	50,9	Government of Simalungun Regency
3	Unstable road (damaged/in need of repair)	886,45	49,1	Government of Simalungun Regency
4	Severely damaged / impassable road (estimate)	±2,000	—	Mistar
5	Impact on society & distribution	—	—	Mistar

Source : Databoks.com

Based on the data above, the total length of roads in Simalungun Regency in 2025 will reach 1,803.78 km consisting of 448 road sections. Of the total, about 917.33 km or 50.9% were in stable condition, while the remaining 886.45 km (49.1%) were reported to be in unstable condition, meaning they needed serious repairs or maintenance. Furthermore, the report by the end of 2025 said that almost half of the roads in Simalungun were severely damaged, with an estimated length of ±2,000 km, including district roads. This condition

clearly has a significant impact on public mobility, distribution of goods, and public services. The community complained about the many puddles, potholes, and damage to asphalt which made access difficult, vehicles quickly damaged, and even posed a safety risk for road users. The damage to road infrastructure is also a major obstacle to the distribution of agricultural and plantation products, reducing transportation efficiency, and hindering the growing tourism sector in Simalungun Regency. Therefore, the development of an integrated transportation system and the improvement of the quality of road infrastructure are urgent needs to support mobility, improve connectivity between regions, and encourage sustainable local economic growth.

The development of transportation systems is a strategic aspect in supporting regional development. In Simalungun Regency, data shows that almost half of the roads are in unstable or damaged condition, and there are even roads that are not suitable for passing. This condition has caused various negative impacts, including disruption of people's mobility, increased cost of distributing goods, safety risks, and obstacles to the economic and tourism sectors. In addition, the number of motorized vehicles in Simalungun Regency continues to increase, especially private vehicles, while the public transportation system is still limited. This creates public dependence on private vehicles, increases congestion, accelerates road damage, and worsens environmental quality. This condition shows that there is a gap between the mobility needs of the community and the availability of a safe, efficient, and integrated transportation system. On the policy side, the Simalungun Regency Transportation Agency has a central role in transportation planning and management, but challenges related to road infrastructure, public transportation, and transportation mode integration have not been fully answered. Therefore, this research is important to provide strategic recommendations in the development of transportation systems that can improve accessibility, efficiency, and safety, while supporting economic growth and regional connectivity.

The common thread of this research lies in the relationship between the condition of transportation infrastructure, the availability of public transportation, and the mobility needs of the community with the effectiveness of transportation system management at the district level. The data shows a gap between the growth of private vehicles, uneven road conditions, and limited public transportation services. This research will examine how the Transportation Department can design and implement an integrated, efficient, and environmentally friendly transportation system, so as to be able to answer real problems in the field. By understanding the existing conditions, the challenges faced, and the potential for innovative solutions, this research is not only academically relevant but also has high practical value for transportation development planning in Simalungun Regency. In other words, the urgency of this research arises from the urgent need to improve the quality of transportation services, reduce infrastructure damage due to vehicle loads, improve the safety of road users, and support the economic mobility of the community. This research is worthy of being carried out because it makes a real contribution to decision-making, public policy, and sustainable improvement of the transportation system.

Several recent studies have shown a positive relationship between transportation infrastructure and economic growth and community mobility. For example, Raditya Yudhan Kustanto and Benedictus Raksaka Mahi (2025) found that road infrastructure improvements contribute significantly to local economic activities, especially in the areas of retail, recreation and the provision of basic necessities using mobility data. Meanwhile, Mursyid Al Fadhil, Abdul Haris and Baiq Ratna Muhimmah (2022) in their study showed that the development of transportation infrastructure supports inclusive economic growth in regional areas, especially when road access is improved. However, most of the research focuses on the macro aspect: the influence of roads/infrastructure on economic growth or mobility in general. They tend to see urban areas or regions with relatively homogeneous economic characteristics. For example,

the study of the integration of public transportation modes in large systems such as in big cities is shown in a study by Danny Setiawan et al. (2024) which discusses "Integration of Public Transport Systems for Enhanced Passenger Mobility". Also, research by Lucano Farros Naufal (2023) shows the importance of intermodal connectivity, integrated information systems, and integrated tariff policies in improving public mobility in the context of public transportation.

Problem Identification

Based on data and field observations, some of the main problems related to the transportation system in Simalungun Regency can be identified as follows:

1. **Uneven Road Infrastructure Conditions**
Of the total road length of 1,803.78 km, almost half (± 886.45 km) is in a damaged or unstable condition, even about 2,000 km of roads are not suitable for walking. This road damage causes community mobility to be disrupted, the distribution of goods and agricultural/plantation products is hampered, and increases the risk of traffic accidents.
2. **Limitations of Public Transportation Systems and Modal Integration**
Public transportation is still limited and less integrated, so people are more dependent on private vehicles. This causes congestion on several roads, accelerates road damage, and causes inconvenience and higher transportation costs for the community.
3. **Economic and Social Impact**
Inadequate transportation infrastructure impacts the efficiency of goods distribution, access to educational services, health, markets, and local economic opportunities. Transportation limitations also reduce the potential for tourism and regional economic growth.
4. **Lack of Data and Evaluation of Local Transportation Systems**
There has been no comprehensive study on the condition of the transportation system at the district level, especially related to modal integration, road conditions, community mobility, and the need for public transportation services that are in accordance with local characteristics.

Problem Formulation

Based on the identification of the above problems, the formulation of this research problem can be formulated as follows:

1. What is the current condition of road infrastructure and transportation systems in Simalungun Regency?
2. What are the obstacles faced in the management of the transportation system by the Simalungun Regency Transportation Office?
3. How do transportation conditions impact community mobility, goods distribution, and local economic growth?
4. What is the strategy for developing an integrated and sustainable transportation system in Simalungun Regency?

Literature Review

2.1 Transportation Infrastructure and Economic Development

Transportation infrastructure is a major factor that affects economic growth and community mobility. According to Al Fadhil, Haris, and Muhimmah (2022), the development of transportation infrastructure such as roads, bridges, and other supporting facilities significantly increases inclusive economic growth in the region. They emphasized that good transportation access allows for more efficient distribution of goods, increased population

mobility, and strengthens connectivity between regions, which ultimately supports equitable development.

Rosik & Wójcik (2023) add that investment in transportation infrastructure has an impact not only on economic aspects, but also on spatial and social aspects. Improving roads and regional connectivity can reduce the development gap between regions, improve access to public services, and support more equitable economic growth. This emphasizes the importance of strategic infrastructure planning, including in districts such as Simalungun, so that the benefits of development can be widely felt by the community.

2.2 Public Transportation and Community Mobility

Public transportation plays an important role in supporting community mobility and economic efficiency. Ermalin (2022) shows that the availability of public transportation infrastructure in the Sumatra region has a significant effect on increasing community mobility and economic welfare. Increased accessibility of public transportation shortens people's travel time to education, health, and market facilities, and facilitates the distribution of agricultural products and local commodities (Marwazi et al., 2023).

On the other hand, Mastuti & Chalik (2022) emphasize the importance of transportation accessibility at the village level. They found that the construction of village roads and local transportation facilities improves connectivity between regions, facilitates population mobility, and supports socio-economic interaction. This condition directly affects people's quality of life, as they have easier access to markets, public services, and local economic activities.

2.3 The Impact of Transportation Infrastructure on the Development of Regency Areas

In the context of districts or rural areas, the development of transportation infrastructure has a specific and important impact. Chaidir Hajia et al. (2023) emphasized that the construction of farmer roads or local roads in coastal villages allows farmers and fishermen to reach the market more effectively. Without adequate road access, the distribution of agricultural or fishery products becomes hampered, which negatively impacts the local economy and food security.

Furthermore, research by Moh Luthfi Nurul Afif (2023) shows that adequate access to public transportation in sub-districts affects local economic development. Good integration of public transportation, including road improvements and transportation services, is able to increase productivity and mobility of the population, while encouraging more equitable economic growth in the district.

2.4 Implications of Transportation System Development in Simalungun Regency

Based on the above literature, it can be concluded that the development of transportation systems in districts needs to pay attention to aspects of physical infrastructure (roads and transportation facilities), public transportation systems, community mobility, and economic-spatial impacts. Simalungun, with its varied road conditions and wide distribution of population, requires comprehensive, sustainable, and contextual transportation planning. This study seeks to fill the gap in the literature that is still minimal on the development of transportation systems at the district level, especially those that integrate infrastructure conditions, mobility, and their influence on local economic development (Marwazi et al., 2023).

Methods

3.1 Research Approach

This study uses a qualitative approach to understand the phenomenon of transportation system development in Simalungun Regency in depth and contextually. According to Creswell

& Poth (2022), a qualitative approach allows researchers to explore the experiences, perceptions, and social interactions of actors related to a phenomenon, as well as understand the social, cultural, and institutional contexts that influence the phenomenon.

In line with that, Merriam & Tisdell (2021) emphasize that qualitative research is effectively used when studies aim to explore the processes, patterns, and meanings of an event in a real environment. In the context of Simalungun, this approach is relevant because the transportation system is influenced by many factors, including road conditions, local government policies, public transportation capacity, and the behavior of the transportation user community.

3.2 Research Location and Time

The research was carried out in Simalungun Regency, especially the areas that are the focus of transportation development by the Transportation Agency. The selection of this location is based on the diverse road conditions, the level of community mobility, and the role of the Transportation Office in the management of district transportation.

The research time is planned for 2 months to allow in-depth field data collection, direct observation of road and public transportation conditions, and interviews with related parties. According to Yin (2022), a fairly long duration of data collection can increase the validity of findings in qualitative studies that are single case studies.

3.3 Data Sources

The research data sources are divided into:

1. Primary Data: obtained through in-depth interviews with key informants such as Transportation Department officials, public transportation operators, and road users. A study by Patton (2022) emphasizes that in-depth interviews allow for a comprehensive exploration of informants' perspectives, experiences, and perceptions of social phenomena.
2. Secondary Data: includes official documents, annual reports of the Transportation Agency, road network maps, public transportation distribution data, as well as publications related to transportation development and government policies. According to Bowen (2020), secondary document analysis can be used to triangulate data and increase the validity of qualitative research findings.

3.4 Data Collection Techniques

Data collection is carried out through several techniques:

1. Participatory and Non-Participatory Observations: The researcher observed road conditions, community mobility, and public transportation operations. This observation technique helps capture real phenomena that the informant may not have revealed in the interview (Merriam & Tisdell, 2021).
2. In-depth Interview: Conducted with Transportation Department officials, public transportation drivers, and road users. The interview is semi-structured to tailor the questions to the respondent's context (Patton, 2022).

3.5 Data Analysis Techniques

Data were analyzed using thematic analysis to identify patterns, themes, and relationships between variables in the development of transportation systems. Braun & Clarke (2021) explain that thematic analysis is effective for extracting themes from qualitative data that are complex and context-rich. The stages of analysis include:

1. Transcription of interview data and documentation;
2. Re-reading of the data to understand the whole context;

3. Coding of important statements and information;
4. Grouping of codes into main themes;
5. Interpretation of findings based on theoretical and literature frameworks.

3.6 Data Validity and Reliability

To maintain validity, the study used a data triangulation technique: a combination of interviews, observations, and documentation (Denzin, 2021). In addition, the researcher conducts a member check, which is to verify findings with informants to ensure the suitability of interpretation (Sugiarto et al., 2024).

Result and Discussion

4.1 What is the current condition of road infrastructure and transportation system in Simalungun Regency

Simalungun Regency has a road network of 1,803.78 km, consisting of 448 road sections, including district and provincial roads. Of the total length, about 917.33 km are in stable condition, while 886.45 km are reported to be damaged or in need of repair. This data shows that almost half of the road network in Simalungun Regency has not met the feasibility standards, which certainly has an impact on community mobility and the distribution of goods. The condition of this damaged road is often a complaint of the community, especially related to potholes, asphalt damage, and puddles of water that interfere with the comfort and safety of road users.

Road conditions that are not optimal not only affect the transportation aspect, but also have an impact on the economic sector. Damaged roads hinder the distribution of agricultural and plantation products, slow people's access to markets, schools, and health services, and disrupt the tourism sector. Several severely damaged roads even make it difficult for public transportation to pass, so that people, especially in rural areas, experience limited mobility. This shows that poor road infrastructure is a real obstacle in improving connectivity, productivity, and people's quality of life.

The Simalungun Regency Government has made various efforts to repair roads in stages, by prioritizing strategic roads that connect the city center with sub-districts and rural areas. However, budget limitations and the size of the area make the road repair process still slow. In some cases, support from the private sector through CSR programs is also used to help repair roads in villages, especially in plantation areas, to improve accessibility for local communities and commodity transportation.

In addition to road infrastructure, the transportation system in Simalungun Regency also faces challenges. The availability of public transportation is still limited, especially in remote areas, so people depend on private vehicles or unofficial transportation. Damaged road conditions worsen transportation services, increase the risk of vehicle damage, and reduce travel efficiency. This emphasizes the need to develop an integrated transportation system, combining physical infrastructure improvements with improving public transportation services, so that people's mobility is smoother, safer, and more efficient. With these conditions, the development of the transportation system in Simalungun Regency is very important, not only to facilitate mobility, but also to support economic growth, equitable development, and improve the quality of life of the community. In-depth analysis of the current condition of roads and transportation systems is the strategic foundation for effective and sustainable development planning (Milanie et al., 2025).

4.2 What are the obstacles faced in the management of the transportation system by the Simalungun Regency Transportation Office

The management of the transportation system in Simalungun Regency faces a number of complex obstacles, both in terms of infrastructure and operational management. One of the main obstacles is the condition of the road that is still damaged or not feasible. Of the total length of the district roads of around 1,803.78 km, almost half are in a damaged condition or in need of repair. This condition hinders smooth transportation, increases the risk of vehicle damage, and disrupts community mobility and the distribution of goods. Damaged roads also incur additional costs for the government and road users for vehicle maintenance and emergency road repairs.

In addition to physical infrastructure, budget and human resource limitations are significant obstacles in transportation management. The Simalungun Regency Transportation Office still faces limited funds for the maintenance and construction of the road network, procurement of public transportation, and the implementation of smart transportation system technology. Meanwhile, the number of experts and operational personnel who handle transportation planning, supervision, and maintenance is also limited, so the capacity to manage the transportation system is less than optimal.

Other obstacles that affect transportation management are coordination problems between agencies and limited transportation system integration. Transportation management is not only the responsibility of the Transportation Office, but also involves the Public Works Office, traffic police, and village/sub-district governments. Lack of synergy and integration between agencies often results in duplication of programs, delays in improvements, or mismatches in development priorities. In addition, the absence of an integrated transportation system that connects land transportation, public transportation, and other supporting facilities makes the mobility of people in some regions still limited.

In addition to internal factors, the behavior of road users and the community is also an obstacle. Many road users do not comply with traffic rules, park carelessly, or use private vehicles excessively, thus increasing congestion and the risk of accidents. On the other hand, public awareness to support infrastructure improvements, such as maintaining road conditions and participation in transportation supervision, still needs to be improved.

Overall, the obstacles to the management of the transportation system in Simalungun Regency include infrastructure problems, limited resources, coordination between agencies, system integration, and community behavior. A deep understanding of these constraints is important to formulate strategies for the development of transportation systems that are effective, sustainable, and according to local needs, so that community mobility, distribution of goods, and public services can run more smoothly and efficiently.

4.3 How does transportation conditions impact community mobility, distribution of goods, and local economic growth

Transportation conditions that are not optimal in Simalungun Regency have a significant impact on people's mobility. Damaged, potholes, and poorly maintained roads hinder the movement of residents, especially in rural or remote areas. People often experience delays in reaching essential facilities such as schools, health centers, markets, and government offices. In addition, the limitations of public transportation force citizens to rely on private vehicles or unofficial transportation, which is not always safe and efficient. This impact directly reduces the quality of life and reduces people's access to public services that should be easy to reach.

In addition, transportation conditions also affect the distribution of goods in the district area. Damaged roads slow down the movement of goods transport vehicles, so logistics costs increase and delivery times become longer. This is strongly felt by farmers, planters, and local business actors who rely on fast distribution to sell agricultural products or small industrial

products. This condition not only reduces the competitiveness of local products, but also has the potential to cause economic losses due to perishable goods, especially agricultural products that are sensitive to delivery times.

The impact of poor transportation conditions is also seen on local economic growth. Inadequate infrastructure holds back the pace of investment, hinders the development of industrial or tourism estates, and limits market access. Research by Al Fadhil, Haris, and Muhimmah (2022) shows that good regional connectivity through reliable transportation is a key factor in inclusive economic growth, as it allows for smoother circulation of goods and services and expands market reach. In Simalungun Regency, transportation constraints cause inefficiency, so the potential for economic growth in several sub-districts has not been fully realized.

Overall, suboptimal transportation conditions have a broad domino effect: reducing people's mobility, hindering the distribution of goods, and slowing down local economic growth. Therefore, the development of an effective and sustainable transportation system is the key to improving the quality of life of the community, smoothing the movement of goods, and encouraging more equitable economic growth throughout Simalungun Regency.

4.4 What is the strategy for developing an integrated and sustainable transportation system in Simalungun Regency

The development of an integrated and sustainable transportation system in Simalungun Regency needs to be based on a multidimensional approach, which includes infrastructure improvements, improvement of public transportation services, integration of transportation modes, and the involvement of the community and the private sector. One of the main strategies is the rehabilitation and construction of priority road networks, especially roads that connect economic activity centers, rural areas, and tourism destinations. According to Al Fadhil, Haris, and Muhimmah (2022), adequate road infrastructure improvement is the main foundation for increasing community mobility and efficient distribution of goods.

In addition to physical improvements, improving public transportation is an important strategy. The Simalungun Regency Transportation Office needs to expand access to public transportation, increase service frequencies, and ensure affordable fares. This is in line with the findings of Ermalin (2022), who stated that reliable public transportation increases population mobility, reduces congestion, and supports equitable regional development. In addition, effective public transportation can reduce people's dependence on private vehicles, making it more environmentally friendly.

The next strategy is the integration of the transportation system through the use of modern information technology and traffic management. For example, the use of digital applications for public transportation routes, road condition monitoring systems, and coordination between government agencies can improve the efficiency of transportation operations. Rosik & Wójcik (2023) emphasize that transportation system integration supports better regional connectivity, facilitates coordination between land transportation, public transportation, and logistics services, and improves the effectiveness of transportation policies.

No less important, a sustainable transportation development strategy must involve the participation of the community and the private sector. Community involvement in maintaining road conditions, using public transportation, and providing policy input, as well as the contribution of the private sector through CSR programs or infrastructure development, can strengthen the implementation of a sustainable transportation system. Mastuti & Chalikh (2022) emphasized that cross-stakeholder collaboration is the key to successful transportation management, as limited resources can be maximized through strategic partnerships.

Overall, the transportation system development strategy in Simalungun Regency must be comprehensive, integrated, and sustainable, incorporating infrastructure improvements, public

service improvements, system integration, and stakeholder involvement. This approach is expected to improve community mobility, efficiency of goods distribution, and encourage equitable local economic growth, while creating a safe, comfortable, and environmentally friendly transportation system.

Conclusion

Based on the results of the analysis and discussion of research on the development of the transportation system in Simalungun Regency, several main conclusions can be drawn as follows:

1. **Road and Transportation Infrastructure Conditions**
The road network in Simalungun Regency has a total length of 1,803.78 km, with almost half of it in a damaged or unstable condition. This condition has a direct impact on community mobility, distribution of goods, and public transportation services. Damaged roads increase the risk of accidents, reduce travel comfort, and incur additional costs for the public and the government. Limited public transportation systems in rural and remote areas also exacerbate limited accessibility and mobility of people.
2. **Transportation System Management Constraints**
The study found that the main obstacles in transportation management by the Simalungun Regency Transportation Agency include: limited budget and human resources, damaged road conditions, lack of coordination between agencies, suboptimal transportation system integration, and sometimes disorderly behavior of road users. This obstacle hinders the effectiveness of transportation management and reduces the quality of public services.
3. **Impact of Transportation Conditions**
Transportation conditions that are not optimal have a significant impact on people's lives and the local economy. Citizens' mobility is disrupted, the distribution of goods becomes slow and expensive, and local economic growth is stifled. In particular, the agriculture, plantation, and tourism sectors feel limited access due to inadequate road infrastructure.
4. **Transportation System Development Strategy**
Integrated and sustainable transportation development strategies include: rehabilitation and construction of priority roads, improvement of public transportation services, integration of transportation systems through technology and traffic management, and community and private sector involvement. This approach is expected to be able to improve mobility, efficiency of goods distribution, security, comfort, and support local economic growth evenly.

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