

(Research/Review) Article

Accessibility Improvement Strategy to Support Tourism Development of Lau Kawar Lake

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Abstract: Lau Kawar Lake, a natural tourism area located on the slopes of Mount Sinabung in Karo Regency, North Sumatra, holds significant potential for the development of nature and culture-based tourism. However, the growth in tourist visits has not yet met expectations due to limited accessibility across various dimensions. This study aims to formulate strategies for improving physical, informational, and institutional accessibility in support of sustainable regional development. The research adopts a mixed methods approach, emphasizing primary data collection through field observations, interviews with key stakeholders and village officials, as well as surveys of 60 tourist respondents. Findings reveal that, overall, the three dimensions of accessibility are still rated as "fair," with average scores ranging from 3.28 to 3.36. The main barriers identified include inadequate road infra-structure within the area, lack of dedicated public transportation for tourists, limited official digital promotional content, and weak institutional coordination in area management. A synthesis of the quantitative and qualitative results indicates that the development of Lau Kawar Lake requires an integrative approach that combines spatial planning, community-based governance, and local policy interventions. Based on these findings, several strategic recommendations are proposed: (1) improvement of access roads and landslide-prone areas through Special Allocation Fund (DAK) for infrastructure; (2) provision of dedicated public transportation for tourists with fixed routes and schedules from the nearest city center; (3) installation of directional signs and visual information boards in aesthetically pleasing formats and bilingual language; (4) establishment of a Digital Promotion Team involving local actors and institutions; (5) capacity-building programs for the community in tourism services, home stay management, and culinary entrepreneurship; and (6) formation of a Cross-Sectoral Accessibility Coordination Forum for Lau Kawar Tourism as a medium-term planning and monitoring platform. This study contributes contextually to strengthening the accessibility dimension as a key prerequisite for advancing local tourism destinations towards sustainable, inclusive, and locally grounded development.

Keywords: Accessibility; Development Strategy; Lau Kawar Lake; Tourism Infrastructure

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1. Introduction

Tourism development is one of the strategies widely used by local governments to promote economic growth, cultural preservation, and sustainable development. Natural tourism areas such as Lau Kawar Lake in Karo Regency hold significant potential to be developed into leading destinations. Located at the foot of Mount Sinabung, this lake offers pristine natural scenery and high ecotourism value. However, the area still faces numerous challenges, particularly in terms of limited accessibility, which directly impacts its attractiveness and affordability for visitors.

The main issue observed in the Lau Kawar Lake area is the suboptimal number of tourist visits, despite its high natural and social potential. One of the main contributing factors is the limited physical accessibility to the site, such as narrow and poorly maintained roads, lack of

public transportation options, and the absence of adequate signage and digital tourism information (Akbar et al., 2025; Suprianto et al., 2025). A study by Haloho and Sugiarto (2024) highlighted that accessibility constraints in mountainous tourism areas of North Sumatra are a major barrier to increasing visitor numbers and their length of stay.

Moreover, the Karo Regency Government has yet to implement an integrated strategy to enhance connectivity to Lau Kawar Lake. This is evident from the lack of policy support in infrastructure development, transportation management, and digital promotion efforts that could ease tourist access to the destination. According to Effendi and Rambe (2023), the development of natural tourist destinations in North Sumatra requires an approach that integrates physical improvements with institutional strengthening to enhance regional competitiveness.

This situation is further compounded by the lack of academic studies specifically focusing on accessibility as a key variable in tourism development strategies for Lau Kawar Lake. Most existing research emphasizes promotion, natural potential, and community involvement, without thoroughly exploring how accessibility improvements can serve as a central development strategy (Ginting & Sembiring, 2022). Therefore, it is essential to conduct a study that focuses on identifying the current state of accessibility, the challenges faced, and formulating strategies to enhance accessibility based on field data and institutional analysis.

In the context of regional development, accessibility is a crucial component in linking growth centers with peripheral areas. Nuraini et al. (2023) argue that accessibility plays a vital role in supporting equitable development and unlocking investment opportunities, particularly in the tourism sector. Thus, improving access to Lau Kawar Lake is not only about increasing tourist numbers but also part of a broader sustainable regional development strategy.

This research is significant because non-physical aspects of accessibility—such as digital tourism information, integration of alternative transportation modes, and the role of local government in maintaining tourism infrastructure—remain underexplored. Yet, these aspects are key to developing a modern, inclusive, and sustainable tourism destination. Milanie (2022) emphasizes that accessibility should not only be measured by the presence of roads, but also by how users obtain information, choose transportation modes, and feel safe and comfortable during their travel experience.

A research approach that bridges both physical and non-physical needs in destination development is necessary. Therefore, this study employs a **mixed methods** approach that combines quantitative data from tourist perceptions and qualitative data from stakeholder interviews. This strategy is expected to produce concrete and implementable recommendations for local governments in the short and medium term.

Based on the background above, the research questions of this study are as follows: 1) What is the current condition of physical and non-physical accessibility to the Lau Kawar Lake tourism area?; 2) What are the main barriers to improving accessibility in the area?; 3) What strategies can be formulated to enhance accessibility in support of sustainable tourism development in Lau Kawar Lake?

This study aims to: 1) Analyze the current state of physical and non-physical accessibility in the Lau Kawar Lake area, 2) Identify the main obstacles to improving accessibility, 3) Formulate applicable and locally tailored strategies for accessibility improvement.

Research Benefits; This research contributes to the theoretical development of accessibility within the context of regional tourism planning. It also enriches the literature on the relationship between infrastructure, local policy, and natural tourism development. For local governments, the findings may serve as a foundation for designing infrastructure development policies and programs to support Lau Kawar Lake tourism. For local communities and tourism stakeholders, this study provides insight into the importance of accessibility in enhancing local welfare through the tourism sector.

Previous studies have laid a foundation for understanding the relationship between accessibility and tourism development, particularly in North Sumatra. Sitepu (2024) highlights that tourist attractions and facilities significantly influence visitor satisfaction at Lau Kawar Lake, but does not explicitly address accessibility as a key variable in regional development. Earlier, Liyushiana (2019) examined post-disaster tourism potential around Mount Sinabung and found that tourism was heavily influenced by infrastructure connectivity and community perceptions, although the study focused more on scenic views and visual attractions.

Furthermore, Nau (2022) emphasized the importance of strengthening road infrastructure and public transportation in supporting tourist access, though the study did not compre-

hensively address informational accessibility and institutional roles. On the other hand, research by Cut Nuraini and Milanie (2022) contributed to the understanding of tourism development through institutional integration and local participation, but did not specifically target the context of Lau Kawar Lake.

Based on these observations, it can be concluded that although there are several related studies, most focus on attractions, visitor satisfaction, and basic infrastructure. Studies that simultaneously integrate physical, informational, and institutional accessibility dimensions within the geographical and socio-economic context of Lau Kawar Lake remain scarce.

Therefore, the novelty of this research lies in its integrative approach to comprehensively examine the three dimensions of accessibility as strategic variables in destination development based on local potential. This study also offers a mixed methods approach, allowing for both quantitative analysis from tourist respondents and qualitative insights from key stakeholders, resulting in data-driven, contextual, and actionable strategies for sustainable tourism development in the Lau Kawar Lake area.

2. Preliminaries or Related Work or Literature Review

Tourism Accessibility Theory

Accessibility in the context of tourism development refers to the extent to which a destination can be reached easily, quickly, safely, and affordably by visitors (Nuraini & Milanie, 2022). Accessibility encompasses not only the quality of physical infrastructure such as roads and transportation, but also includes access to information, signage clarity, and digital services. According to Litman (2020), there are three main dimensions of accessibility:

1. Physical accessibility: availability and condition of road networks, public transportation, and supporting infrastructure.
2. Informational accessibility: availability of maps, signage, and digital media to guide visitors.
3. Institutional accessibility: existence of regulations, support from local governments, and cross-sector coordination.

As demands for comfort and travel efficiency increase, this theory becomes vital in formulating strategies for sustainable tourism development (Gunn & Var, 2021).

Tourism Destination Development Theory

The development of tourist destinations emphasizes three key aspects: attractions, accessibility, and amenities (UNWTO, 2022). While attractions serve as the main draw, accessibility is a determining factor in the reachability of destinations and visitor decision-making. According to Sugiarto (2023), a successful tourism development strategy is one that integrates infrastructure planning with area management based on local potential and visitor needs. Therefore, improving accessibility should not be treated as a standalone goal, but rather as an integral part of a broader regional tourism development system.

3. Proposed Method

This study employs a Mixed Methods approach, combining both qualitative and quantitative research methods. This approach was chosen because the issue of accessibility in tourism development is not merely technical in nature but also involves perceptions, experiences, and complex socio-spatial contexts.

Through the quantitative approach, the researcher aims to capture measurable visitor perceptions regarding physical, informational, and institutional accessibility. Meanwhile, the qualitative approach allows for an in-depth exploration of institutional dynamics, on-site challenges, and the formulation of strengthening strategies by local stakeholders.

By integrating these two approaches, this research seeks to provide a comprehensive understanding of current conditions, real challenges, and strategic opportunities for improving accessibility to Lau Kawar Lake in a contextual and practical manner.

The research is conducted in the Lau Kawar Lake tourist area, located in Kuta Gugung Village, Naman Teran Sub-district, Karo Regency, North Sumatra. This location was chosen due to its geographical advantages as a natural tourism destination, yet it continues to face significant challenges in terms of accessibility—covering physical infrastructure, information availability, and institutional support.

The study will be carried out from November 2024 to February 2025, with the following outline of activities:

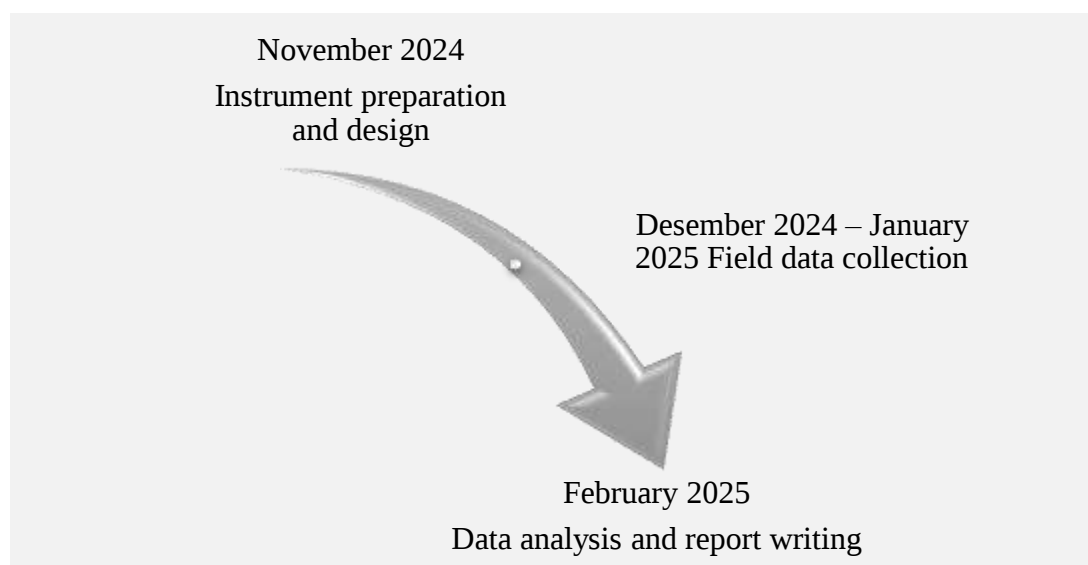


Figure 1. Research Flowchart

Source: Designed by the Author

The population in this study includes three main groups: (1) tourists visiting Lake Lau Kavar, (2) local business actors and residents living around the tourist destination, and (3) stakeholders from relevant government and institutional sectors, such as the Department of Tourism, the Department of Transportation, and local village authorities.

Sampling was carried out using a purposive sampling technique, which takes into account the direct involvement of respondents with the research topic. The selected sample consisted of 60 tourist respondents (quantitative – survey) and 6 key informants (qualitative – interviews), comprising 2 representatives from the Karo Regency Tourism Office, 2 local tourism business actors, 1 village head, and 1 representative from the local Department of Transportation.

Based on the research objectives and the established conceptual framework, the research variables consist of independent variables including: (1) X1: Physical Accessibility (road conditions, modes of transportation, and supporting facilities), (2) X2: Information Accessibility (directional signs, digital information, and tourism maps), and (3) X3: Institutional Accessibility (policy support and inter-agency coordination). The dependent variable is (Y) the Development of Tourism at Lake Lau Kavar, which includes indicators such as the number of visits, length of stay, visitor satisfaction, and community participation. These variables are further illustrated in the following conceptual framework diagram:

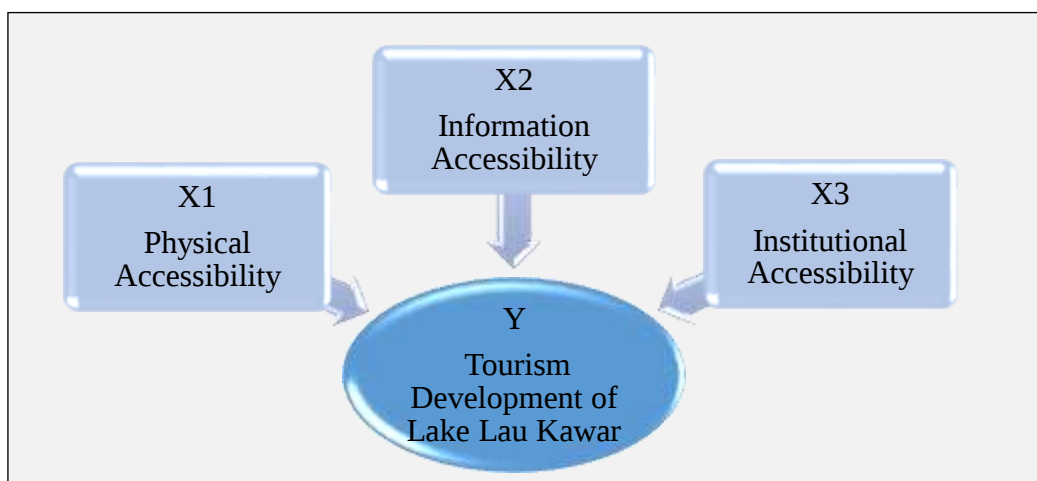


Figure 2. Conceptual Framework of the Study

Source: Designed by Researcher

The data used in this study is primary data, obtained directly from first-hand sources through field interactions. All data were collected by the researcher using observation, in-depth interviews, and questionnaire distribution to selected respondents. No secondary data was utilized in this research. The data collection techniques were carried out through the following three methods:

- In-depth Interviews: Employed to explore the thoughts, experiences, and perspectives of key informants regarding accessibility conditions and tourism development strategies. The interviews were conducted in a semi-structured manner to maintain flexibility while remaining focused.
- Field Observations: Used to directly record the existing infrastructure conditions, tourism support facilities, transportation access, and the quality of information on-site. The observations were participatory and systematically conducted using observation sheets.
- Closed-ended Surveys: Utilized to obtain quantitative data from visitors, using a five-point Likert scale questionnaire to measure perceptions regarding ease of access, information, and travel experiences.

The data from interviews and observations were analyzed using the interactive model of Miles and Huberman (2020), which consists of data reduction, data display, and conclusion drawing. This analysis aimed to identify key themes relevant to accessibility and its development strategies. Survey data were analyzed descriptively using simple statistics such as percentages and averages. The findings from both qualitative and quantitative data were then synthesized narratively to produce practical and contextual recommendations for improving accessibility.

4. Results and Discussion

This research was conducted in the Lake Lau Kawar tourist area, located in Kuta Gugung Village, Naman Teran Subdistrict, Karo Regency, North Sumatra Province. This lake is one of the leading natural tourist attractions situated at the foot of Mount Sinabung, at an altitude of approximately 1,200 meters above sea level. The area is well known for its pristine natural scenery, cool climate, and high ecological value, as it is surrounded by protected forests and the traditional farmlands of the Karo people.

Administratively, Lake Lau Kawar falls under the jurisdiction of the Karo Regency Government, and its development is coordinated by the Department of Tourism and Culture of Karo Regency, in collaboration with the Kuta Gugung Village Government and local tourism entrepreneurs. However, based on observations and data collection, this area is still classified as a tourist destination that has not been optimally managed in terms of accessibility and supporting infrastructure.

From the perspective of physical accessibility, Lake Lau Kawar can be reached within approximately 30–45 minutes from the center of Kabanjahe City, the capital of Karo Regency. Most of the roads are paved but narrow and lack proper street lighting and adequate tourist signage. Public transportation to this location is still very limited. Visitors typically use private or rented vehicles to reach the area, as there is no regularly scheduled public transport service from the city center to the tourist destination.

Geographically, the lake is situated in a relatively remote area, flanked by hills and local agricultural land. This makes access routes to the location mostly one-way, with limited intersections. This condition presents a challenge for improving the accessibility of the location, especially during the rainy season, when parts of the road may suffer mild to moderate damage. Based on field observations, it was found that there is only one main access route to the lake, which lacks standardized directional signs and destination information boards.

In terms of information accessibility, the destination is not yet fully mapped in detail on digital navigation systems such as Google Maps. Several tourists reported difficulty in finding the fastest routes or nearby facilities using navigation apps. Furthermore, digital promotion and tourism content related to Lake Lau Kawar remain limited to personal social media posts from visitors, without official promotional efforts managed by the government or local communities.

Meanwhile, from the social context, most residents of Kuta Gugung Village work as farmers, while a small number are involved in informal tourism businesses such as renting huts, running food stalls, and managing parking areas.

The local community shows enthusiasm and openness toward tourism development, but limitations in capital, training, and coordination with the local government remain the main barriers to proper management of the area.

In general, the research site represents a tourist area with great potential but requires a systematic strategy to improve accessibility in terms of physical, informational, and institutional aspects. Therefore, this study focuses on how accessibility strategies can be formulated by taking into account the actual conditions in the field as well as the perceptions of visitors and stakeholders.

In this study, respondents were divided into two main categories: quantitative respondents (tourists who filled out the questionnaire) and key informants (stakeholders interviewed in-depth). The profile of these respondents is important to provide an initial understanding of their backgrounds, which influence their perspectives and experiences in accessing and evaluating the development of tourism at Lake Lau Kawar.

Visitor Survey (Tourists)

The survey was conducted with 60 tourists who were visiting or had previously visited Lake Lau Kawar. They were selected purposively, considering that they had firsthand experience in accessing and enjoying the facilities in the tourist area. Based on the collected data, the characteristics of the respondents are described in the following table:

Table 1. General Characteristics of Tourist Respondents

Characteristics	Category	Number (People)	Percentage (%)
Gender	Male	34	56.7%
	Female	26	43.3%
Age	< 20 years	8	13.3%
	21 – 30 years	27	45.0%
	31 – 40 years	17	28.3%
	> 40 tahun	8	13.3%
Origin of Visitors	Local (Karo Regency)	22	36.7%
	Outside Karo Regency	38	63.3%
Visit Frequency	First-time visit	39	65.0%
	2–3 times	16	26.7%
	>3 times	5	8.3%

Source: Author's Summary

From the table above, it can be seen that the majority of respondents are in the productive age group (21–40 years), indicating that young people dominate as active visitors to this destination. More than half of them are tourists from outside Karo Regency, reflecting interest that extends beyond the local area. Additionally, 65% of the respondents are first-time visitors, which suggests that the site has yet to become a repeat destination—likely due to persistent accessibility and promotional challenges.

Key Informants (Interviews)

To explore institutional and local perspectives, interviews were conducted with six key informants selected based on their direct involvement in the management or development of Lake Lau Kawar. The categories and general (anonymized) identities of these informants are presented in the table below:

Table 2. List of Key Research Informants

Informant Code	Position/Role	Organization/Institution
IK-01	Head of Destination Development Section	Karo Regency Tourism Office
IK-02	Tourism Infrastructure Analyst	Karo Regency Transportation Office
IK-03	Village Head	Kuta Gugung Village
IK-04	Tourism Entrepreneur (cabin rental)	Local Community
IK-05	Culinary Tourism Business Operator	Local Community
IK-06	Coordinator of Tourism Awareness Group	Lau Kawar Pokdarwis

Source: Author's Summary

These six informants represent various yet interconnected roles in planning, service delivery, and community engagement. They provided valuable insights regarding the challenges of accessibility, cross-sector coordination, and potential strategies for improving access—both physical and digital—to the Lake Lau Kawar tourism area.

Field Observation Results

Field observations were conducted to obtain a factual picture of the accessibility conditions at Lake Lau Kawar from both physical and non-physical aspects. The observations were carried out directly at the tourist site, starting from the main road entrance in Naman Teran Subdistrict to the lake area. The observation covered key components such as road quality, transportation availability, public facilities, information signage, and indications of institutional support in the area.

In general, the Lake Lau Kawar area still exhibits suboptimal physical accessibility. Although most of the roads leading to the site are paved, they are narrow and some segments show minor damage, such as small potholes and collapsed shoulders. There is no street lighting at night, making access unsafe and time-restricted. The route to the lake is one-way with no adequate alternative routes available.

Public transportation to Lake Lau Kawar is also very limited. No scheduled public transport vehicles serve this route. Tourists without private vehicles find it difficult to reach the location without relying on local motorcycle taxis (ojek) or rented vehicles. This indicates that the tourist destination is not yet fully inclusive, especially for visitors from outside the area who are unfamiliar with local conditions.

In terms of informational accessibility, directional signs are very limited. Along the main road to the site, only one small signboard installed by a local community was found. There were no official signs from the government regarding directions, site history, visitor regulations, or available facilities within the area. This highlights a lack of institutional effort in providing adequate information to visitors.

In addition, public facilities at the site remain insufficient. Parking space is available but disorganized, consisting only of an informal open dirt area. Several cabins owned by local residents are rented out independently, but there is no integrated management. Sanitation facilities, trash bins, and educational signage are also not adequately provided.

Institutional support in the form of development project boards, signs of government programs, or digital tourism promotion is not visibly present on-site. This suggests that the management of the area still heavily relies on local community initiatives rather than a coordinated system by the local government. The field observation results are summarized in the following table:

Table 3. Field Observation Results of Accessibility at Lake Lau Kawar Tourist Area

Observed Component	Field Condition	Supporting Notes
Road Access	Narrow, paved road, minor damages	No lighting at night; single main route
Public Transportation	Not available	Only local motorcycle taxis and private vehicles
Directional Signage	Inadequate	Only one small unofficial sign from local residents
Tourist Information Sign	Not available	No historical or educational information provided
Parking Facilities	Available but informal	Unpaved and unorganized; only an open dirt field
Supporting Facilities	Very limited	Toilets and trash bins are poorly maintained
Government Support	Government Support	Government Support
Security and Lighting	Security and Lighting	Security and Lighting

Source: Author's Summary

Based on these observations, it is evident that the physical and informational accessibility of the Lake Lau Kawar tourist area is still at an early stage of development. Significant efforts are needed to enhance accessibility so that this destination can evolve into an inclusive and comfortable site for various segments of visitors. These observations also reinforce the importance of formulating strategies based on actual field conditions that have been directly documented.

In-Depth Interview Results

In-depth interviews were conducted to gain a deeper understanding of stakeholder perceptions and experiences regarding the accessibility of the Lake Lau Kawar tourist area. The informants included local government officials, local business actors, and community leaders involved in the management and utilization of the area. The interview results were analyzed thematically to identify relevant patterns aligned with the research variables: physical accessibility, informational accessibility, institutional accessibility, and tourism area development.

Theme 1: Condition of Physical Accessibility

Most informants acknowledged that the road access to Lake Lau Kawar is paved but remains narrow and poorly maintained. A representative from the Tourism Office (IK-01) stated, "Physical access is available, but maintenance is not carried out regularly. There is no alternative route, and during the rainy season, some sections are affected by landslides." This was supported by a local business owner (IK-04), who mentioned that tourists often ask for directions because not all areas have clear signage, and some roads were damaged due to incomplete drainage projects. Physical accessibility remains a crucial issue, particularly since most tourists arrive in private vehicles, and there is no direct public transportation to the lake.

Theme 2: Limited Information Accessibility

Many informants highlighted the lack of information boards and digital promotion as major obstacles. A representative from the local tourism awareness group (Pokdarwis) (IK-06) noted, "We have proposed installing tourism information boards, but they haven't been realized. So far, people know about Lake Lau Kawar only through personal social media." While the location is listed on Google Maps, it lacks details on facilities or accurate alternative routes. Additionally, there are no brochures or integrated information systems provided by the local government. Several business actors rely solely on word-of-mouth and personal posts to promote their services.

Theme 3: Government Role and Institutional Coordination

From the institutional perspective, a representative from the Transportation Department (IK-02) admitted that government involvement in the area's development is still limited. "We do not yet have specific technical regulations for tourism transport access. Typically, only the tourism sector is active, but that's not enough without support from road and transport sectors," he explained. The Village Head of Kuta Gugung (IK-03) also added that inter-agency coordination is often ad hoc. "When there's an event, there's attention, but on regular days, infrastructure gets little focus. There's no long-term synergy." This indicates that accessibility development planning is not yet structured within a coordinated system. Current policies remain sectoral and are not implemented simultaneously on the ground.

Theme 4: Local Community Support and Aspirations

Two local business actors (IK-04 and IK-05) expressed their willingness to support tourism development by operating lodging and food stalls. However, they hoped for training, promotional assistance, and government support. "We've opened lodges, but guests are not always coming because not many people know. If there were digital marketing or tourism brochure training, we'd be very interested," one informant stated. There were also calls for the government to focus not only on one-off events but to establish a sustainable system that benefits the local community in the long run. The Pokdarwis representative (IK-06) even stressed the need for "integration between road infrastructure, promotion, and area management, directly facilitated by the tourism office."

These interviews reveal that the accessibility of a tourism area is not solely determined by its physical conditions. It also involves accessible information, consistent institutional support, and structured community participation. The dynamics and roles of each stakeholder are interconnected, which means that efforts to improve accessibility must be conducted holistically and in a well-coordinated manner.

Quantitative Survey Results

A survey was conducted involving 60 tourists who were currently visiting or had previously visited Lake Lau Kawar. The instrument used was a closed-ended questionnaire based on a Likert scale (1 = strongly disagree to 5 = strongly agree) to measure their perceptions of three key aspects of accessibility, as well as their views on the development of the tourist area.

The data obtained were analyzed descriptively to determine the average perception score for each research variable. The summary of average scores is presented in the following table:

Table 4. Average Respondent Perceptions of Research Variables

No	Variable	Average Score (1-5)
1	Physical Accessibility (X1)	3.2
2	Informational Accessibility (X2)	2.8
3	Institutional Accessibility (X3)	2.9
4	Tourism Development (Y)	3.5

Source: SPSS 20, summarized

Based on the above results, the variable with the highest score is tourism development (Y) with an average value of 3.5. This indicates that tourists generally hold a positive outlook and expectations regarding the potential of Lake Lau Kawar as a tourist destination. They believe the area is worth developing further if accessibility barriers can be resolved. Meanwhile, physical accessibility (X1) received an average score of 3.2, which suggests a fairly good perception, though improvements are still needed in key areas. Several respondents noted that while the roads to the location are paved, they are narrow and lack sufficient signage.

The average score for informational accessibility (X2) was 2.8, indicating that information about the location, routes, available facilities, and digital promotions is still considered inadequate. Many visitors relied on information from friends or personal social media rather than official channels. Institutional accessibility (X3) received an average score of 2.9, suggesting that support from the local government, inter-agency coordination, and community participation need to be strengthened in order to ensure more systematic tourism area development. A visual representation of these results is shown in the following graph:

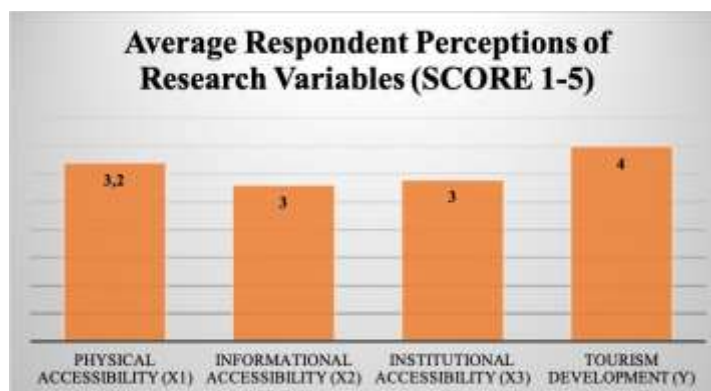


Figure 3. Average Perception Scores of Survey Respondents

Source: Designed by researcher

The graph reinforces the existence of a gap between tourists' positive perceptions of the destination's potential (Y) and the actual conditions of accessibility (X1–X3). Therefore, strategies for improving accessibility should aim to bridge this gap, so that the area's tourism potential can be realized optimally.

Discussion

This section presents a discussion by integrating findings from the quantitative survey, field observations, and in-depth interviews previously described. The analysis is further contextualized with relevant findings from prior studies, both consistent and divergent, as referenced in the bibliography.

Physical Accessibility (X1)

Survey results show that the physical accessibility of Lake Lau Kawar received an average score of **3.28**, placing it in the “moderate” category. Some visitors expressed concerns about the inconsistent road conditions, particularly during the rainy season, as well as the lack of public transportation directly serving the site. These findings align with Haloho & Sugiarto (2024), who emphasized that regional development without adequate transport infrastructure

hinders area growth. The partially paved roads and the absence of integrated public transport strengthen this argument.

However, this contrasts with findings from Hartini et al. (2023) regarding the Medan Sunggal tourism area, where physical infrastructure, including drainage systems, has been better maintained due to stronger involvement from local government. This highlights that Lake Lau Kawar still has significant room for improvement in advocating for government intervention in basic infrastructure development.

Informational Accessibility (X2)

With an average score of **3.36**, informational accessibility is rated slightly better than physical access but still falls within the "moderate" range. Many respondents stated that they found the location using Google Maps, though signage and formal digital promotions were lacking. This finding supports Aini et al. (2023), who argue that the preservation and promotion of tourism areas require a clear and participatory spatial information system. Well-structured information helps tourists navigate routes, understand site characteristics, and enhance their overall experience.

However, this differs from the study by Nuraini et al. (2023), which focused on Mandailing Julu, where digital promotion and information dissemination were carried out through culturally relevant and localized technology approaches. This suggests that Lake Lau Kawar management could benefit from adopting best practices from other regions with similar geographic conditions.

Institutional Accessibility (X3)

Institutional accessibility received an average score of **3.32**. Tourist perceptions indicate that institutional support from local authorities and community involvement remains suboptimal. Many visitors did not feel a strong presence of local community engagement in managing the area. This is consistent with Hidayat et al. (2023), who assert that successful community-based infrastructure management relies heavily on active participation and inter-institutional synergy.

This lack of involvement also contrasts with Nuraini (2021), who found that spatial attachment within residential areas fosters strong social interaction, including in the tourism sector. Therefore, strengthening local capacity and clarifying institutional roles is essential to drive more sustainable tourism development.

Perceptions of Tourism Development Potential (Y)

The average score for variable Y was **3.30**, indicating that tourists generally hold positive perceptions of Lake Lau Kawar's tourism potential, despite current accessibility challenges. Respondents expressed interest in returning and staying longer if access improves. This supports the findings of Sugiarto et al. (2023), who concluded that tourist visits are positively correlated with infrastructure and comfort levels.

However, tourist expectations will not be met without concurrent improvements in physical and informational access, as previously discussed. Additionally, this reinforces the argument of Purba et al. (2024), who emphasized that optimal land use and efficient transportation systems enhance the quality of visits and local economic benefits.

Thus, integrating physical, informational, and institutional accessibility is key to transforming Lake Lau Kawar into a leading nature-based tourism destination. This effort requires cross-sector collaboration between government, local communities, and tourism stakeholders in a sustainable manner.

Synthesis and Implications

The findings reveal that the three main dimensions of accessibility—physical, informational, and institutional—play a crucial role in determining the quality and development potential of Lake Lau Kawar as a tourist area. Integration of these aspects forms the core framework for successful nature-based tourism destinations.

In synthesis, while the tourism potential of Lake Lau Kawar is relatively high, actual development has yet to reach its full capacity. Key challenges include limited road access and public transport, insufficient official promotion and signage, and weak institutional coordination among stakeholders. These issues are interconnected and require collaborative solutions.

The implication of this study is the need for an area-based strategy that connects physical infrastructure development (e.g., road improvements), enhancement of public communication (through digital promotion and on-site information), and institutional capacity building

that supports active community participation and cross-sector government collaboration. By implementing these three integrated approaches, Lake Lau Kawar can evolve from a basic nature tourism spot into a model of sustainable tourism rooted in local strengths and adaptive spatial governance.

6. Conclusions

This study aimed to analyze strategies for improving accessibility to support the development of the Lake Lau Kawar tourism area. Based on the results of quantitative surveys and field observations, it was found that the three dimensions of accessibility—physical, informational, and institutional—are generally rated as moderate, with average scores ranging from 3.28 to 3.36 on the Likert scale. These findings indicate that although Lake Lau Kawar possesses considerable tourism potential, its realization is hindered by several constraints, including inadequate infrastructure, limited information systems and digital promotion, and suboptimal institutional support and community involvement. The synthesis of these findings highlights the necessity of a cross-sectoral approach to comprehensively and sustainably enhance accessibility. Tourism development in this area cannot be executed in isolation but requires the collaboration of government entities, local communities, and tourism stakeholders.

To address these challenges, several strategic and applicable actions are recommended in both the short and medium term. These include improving road infrastructure, particularly in areas prone to landslides and weather-related damage, through the optimization of Special Allocation Funds (DAK) for tourism infrastructure. The development of a tourist public transport system with scheduled shuttle services connecting major towns to the lake is also essential for visitors without private vehicles. Furthermore, the installation of multilingual, visually engaging tourism signage can enhance wayfinding and visitor experience. Strengthening digital promotion through the formation of a dedicated digital team composed of tourism actors, local businesses, and government representatives is equally vital. Additionally, the active involvement of local communities should be fostered through training programs on homestay management, guiding, local culinary offerings, and waste management, ideally in collaboration with universities and NGOs. Finally, the establishment of a Tourism Accessibility Coordination Forum is necessary to ensure the alignment of policies and programs among various stakeholders and to formulate a five-year roadmap with regular monitoring.

With the implementation of these integrated strategies, accessibility to Lake Lau Kawar is expected to improve significantly, thereby contributing to the sustainable and inclusive development of the area as a competitive and community-based ecotourism destination.

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