Local Wisdom as the Basis for Infrastructure Management in the Tangkahan Ecotourism Area

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Abstract

The management of ecotourism areas cannot be separated from the availability of infrastructure that supports tourism activities, environmental conservation, and local community livelihoods. However, technocratic approaches to infrastructure management often fail to align with the socio-cultural and ecological characteristics of nature-based tourism areas. Tangkahan Ecotourism Area represents a conservation-based tourism destination that has developed through community participation and local wisdom. This study aims to examine the role of local wisdom as the foundation for infrastructure management in ecotourism areas using a conceptual and normative perspective. The research employs a qualitative descriptive approach through literature review and document analysis, drawing on national and international academic publications as well as relevant policy documents related to ecotourism management. Data analysis was conducted through the synthesis of findings from previous studies to identify key patterns, principles, and concepts of local wisdom-based infrastructure management. The results indicate that local wisdom serves as both a normative and operational foundation in managing infrastructure within ecotourism areas, guiding planning, utilization, and maintenance processes to remain aligned with environmental carrying capacity and local social structures. Local wisdom-based infrastructure management also contributes to the ecological, social, and economic sustainability of ecotourism areas. This study highlights the importance of integrating local wisdom into infrastructure management as a relevant and applicable approach for supporting the sustainability of community-based ecotourism destinations.

Keywords: Local Wisdom, Infrastructure Management, Ecotourism, Sustainable Tourism, Tangkahan

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Introduction

The development of ecotourism areas in Indonesia faces increasingly complex challenges as demands on the quality of tourism services and environmental sustainability increase. In many cases, the management of tourism area infrastructure is still dominated by physical and technical approaches that do not consider the socio-cultural dimensions of the local community. In fact, infrastructure not only functions as a means of supporting tourism activities, but also plays a role in shaping interactions between people, the environment, and the local values that live in it. The insynchronization between infrastructure development and local wisdom has the potential to cause pressure on the environment, conflicts of interest, and weakening the role of the community in the management of tourist areas [1], [2].

The Tangkahan Ecotourism Area in Langkat Regency is one of the natural tourism areas that is developing with a conservation-based approach and community participation. Since the beginning of its management, local communities have played an active role in preserving forests, rivers, and wildlife, while managing tourism activities collectively. The values of local wisdom are the basis for decision-making related to the use of space, the use of natural resources, and the regulation of tourism activities. However, the development of the region and the increasing number of tourist visits demand the provision and management of more adequate infrastructure, such as accessibility, supporting facilities, and basic utilities. This condition raises new challenges related to how infrastructure management can be carried out without ignoring the principles of local wisdom that have been the foundation of regional sustainability.

A number of studies show that infrastructure management that involves the community and is based on local values tends to be more adaptive to local environmental and social conditions [3], [4]. Local wisdom functions as a knowledge system that regulates the relationship between humans and their environment, including in determining the limits of resource utilization and forms of infrastructure that are in accordance with the carrying capacity of the region [5]. In the context of planning and managing tourist areas, this approach allows infrastructure not only to meet functional needs, but also to strengthen the identity of the area and the sense of belonging of the local community.

On the other hand, some research on tourism area planning still places infrastructure as a neutral and technocratic element, so it does not consider the cultural aspects and social practices of the local community [6]. This kind of approach risks resulting in infrastructure that is out of context and difficult to maintain in the long term. Development policy studies also show that the success of regional management is greatly influenced by the alignment between public policies, community capacity, and the local character of the region concerned [7]. These findings are in line with international studies that confirm that the integration of local wisdom in ecotourism management is a key factor in achieving sustainable tourism, especially in naturebased and conservation areas [8], [9].

Based on this phenomenon, this study was prepared to conceptually examine the role of local wisdom as the basis for infrastructure management in ecotourism areas, in the context of the Tangkahan Ecotourism Area. This research is carried out through literature studies and document studies, without involving primary data collection or field verification, so that the focus of the study is directed to normative and descriptive analysis of relevant concepts, policies, and findings of previous research. The main purpose of writing this article is to formulate a theoretical understanding of the relationship between local wisdom and the management of ecotourism area infrastructure, as well as identify principles that can be used as a reference in the planning and management of community-based tourism areas.

The benefits of this study are expected to make an academic contribution in enriching the literature on ecotourism infrastructure management based on local wisdom, as well as providing a conceptual reference for planners, area managers, and policymakers in formulating infrastructure management strategies that are more contextual, sustainable, and in line with local values of the community.

Literature Review Local Wisdom in Area and Infrastructure Management

Local wisdom is understood as a set of social values, norms, and practices that develop from generation to generation in society as a form of adaptation to its natural and social environment. In the context of area management, local wisdom serves as an unwritten guideline that regulates how communities use space, natural resources, and life-supporting facilities in a balanced manner. Nuraini explained that local wisdom has a strategic role in shaping spatial patterns and environmental management that are in harmony with local physical and cultural conditions [2]. These values are an important basis in maintaining the sustainability of the region, especially in areas with high ecological sensitivity.

In infrastructure management, local wisdom contributes to determining the scale, shape, and layout of infrastructure to suit the real needs of the community and not exceed the carrying capacity of the environment. This approach places infrastructure not solely as a physical element, but as part of the socio-cultural system inherent in the lives of local communities. Nuraini and colleagues emphasized that neglect of local values in infrastructure development often leads to low levels of community acceptance and weak sustainability of facility management [5].

Participatory and Local Context-Based Infrastructure Management

Regional infrastructure management based on community participation is one of the approaches that is widely discussed in the sustainable development literature. Milanie showed that community involvement in infrastructure management can increase the effectiveness of infrastructure functions while strengthening the sense of collective responsibility for facility maintenance [1]. This approach is relevant to ecotourism areas that rely on a balance between conservation interests and community economic activities.

Milanie and colleagues add that community-based infrastructure management allows for continuous adaptation to changing environmental needs and conditions [3]. Infrastructure managed by involving local communities tends to be more flexible and adaptive because management decisions are made based on first-hand experience and local knowledge. In the context of ecotourism areas, this approach is important to maintain a consistency between the intensity of area utilization and environmental capacity.

Ecotourism and the Principles of Regional Sustainability

Ecotourism is a form of tourism that emphasizes environmental conservation, local community empowerment, and environmental education for visitors. In this framework, infrastructure management plays an important role as a support for tourism activities as well as an instrument for controlling environmental impacts. Sugiarto and colleagues explained that infrastructure in natural tourism areas needs to be designed and managed by taking into account the character of the ecosystem and the social structure of the community so as not to cause excessive pressure on the environment [6].

Research by regional and urban planning students shows that the success of the development of tourist areas is not only determined by the completeness of facilities, but also by the suitability between infrastructure, local character, and regional management patterns. These studies confirm that amenities and accessibility designed without considering local values have the potential to reduce the attractiveness of the area and disrupt the environmental balance, especially in conservation-based ecotourism areas.

Regional Management Policy and the Role of Local Wisdom

From a policy perspective, regional infrastructure management cannot be separated from the applicable governance and regulatory framework. Development policy studies show that effective policies must be able to accommodate socio-cultural conditions and the capacity of local communities so that their implementation runs optimally [7]. In the context of naturebased

tourism areas, policies that are sensitive to local wisdom tend to be better able to encourage sustainable and inclusive management of the area.

The international literature reinforces the view that the integration of local wisdom in ecotourism management policies is a key factor in maintaining the sustainability of the region. De Rozari and colleagues show that ecotourism development models based on local wisdom are able to create a balance between conservation interests, local economy, and social sustainability [8]. Rizka and colleagues also emphasized that the internalization of local values in the management of tourist areas contributes to increasing community capacity and the sustainability of regional management in the long term [9].

Research Position in a Theoretical Framework

Based on the literature review, it can be concluded that local wisdom has a central position in the management of ecotourism area infrastructure. Local wisdom serves as a value framework that directs infrastructure management decision-making to be in harmony with the character of the environment and the social structure of the community. This research places local wisdom not as a complementary element, but as a conceptual basis in understanding and formulating infrastructure management in the Tangkahan Ecotourism Area so that this study has theoretical and practical relevance in the development of the concept of community-based ecotourism area management.

Research Conceptual Framework

The conceptual framework of this research was prepared to explain the relationship between local wisdom, infrastructure management, and characteristics of ecotourism areas in the context of the Tangkahan Ecotourism Area. This study departs from the assumption that the sustainability of ecotourism areas is not only determined by the existence of physical infrastructure, but also by how the infrastructure is planned and managed based on the sociocultural values of the local community.

Local wisdom in this study is understood as a system of local values and knowledge that regulates the wise use of resources and maintains a balance between social, economic, and ecological interests [2], [5]. Regional infrastructure management is positioned as an element influenced by these values through community participation patterns, facility utilization arrangements, and regional management policies [1], [3]. Infrastructure that is in harmony with the character of ecotourism areas is able to strengthen the conservation function and socioeconomic sustainability of local communities.

Regional policies and governance are supporting factors that mediate the application of local wisdom values in infrastructure management. Policies that are sensitive to local values allow for the more effective application of regional sustainability principles [7], in line with international findings that affirm the importance of integrating local values in ecotourism management [8], [9].

To clarify the relationship between concepts in this study, the conceptual framework can be described in the form of a relationship flow as follows:

Local Wisdom → Regional Infrastructure Management → Sustainability of Ecotourism Areas

With the support of policy factors and regional governance as a reinforcement of implementation. The flow of the relationship is then visualized in the form of a conceptual framework of research that describes how local wisdom becomes the basis for the management of ecotourism area infrastructure so that it has an impact on the sustainability of the region.

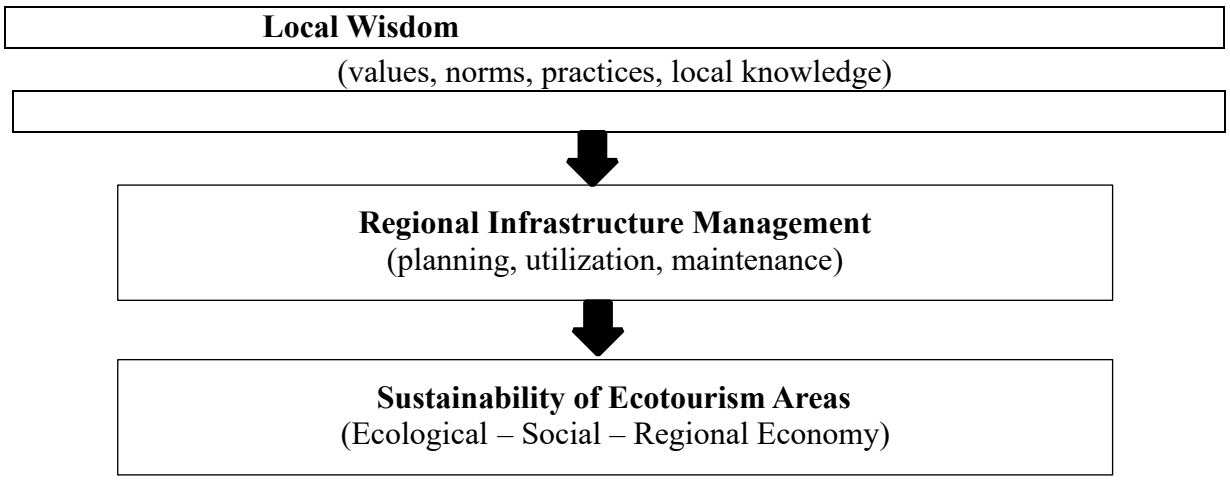


Figure 1. Research Conceptual Framework
Source: Author, 2026

The conceptual framework image shows that local wisdom is the main foundation that influences the management of regional infrastructure through community participation mechanisms and regional management policies. Infrastructure managed based on local values then contributes to the sustainability of ecotourism areas, both from an ecological, social, and economic perspective. This framework is in line with the research objectives that place local wisdom as a conceptual basis in formulating infrastructure management in the Tangkahan Ecotourism Area.

Research Methodology

This study uses a qualitative descriptive approach with the character of conceptual and normative studies. This approach was chosen to deeply understand the role of local wisdom as the basis for infrastructure management in ecotourism areas through the study of relevant theories, policies, and previous research results. A descriptive qualitative approach allows researchers to understand social phenomena contextually and deeply without relying on numerical measurements [10]. The research is not directed to test causal relationships or measure specific impacts, but rather to describe and interpret the concepts and principles of infrastructure management in the context of ecotourism areas.

The data source in this study is entirely derived from secondary data obtained through literature studies and document studies. Literature studies include scientific journal articles, academic books, research results, and other scientific publications that discuss local wisdom, infrastructure management, ecotourism, and sustainable tourism. The document study was carried out by examining policy documents, reports, and publications related to the management of ecotourism areas that are relevant to the research context. The use of secondary data through literature studies is a commonly used approach in conceptual studies to obtain a comprehensive understanding of a phenomenon [11].

The data collection technique is carried out through a systematic search of various sources of academic literature and national and international scientific documents. The selection of literature was carried out selectively by considering the suitability of the topic, the credibility of the source, and its relevance to the focus of the study on local wisdom and the management of the infrastructure of the ecotourism area. This approach allows researchers to identify the development of conceptual thinking and practices of community-based and sustainable area management [12].

Data analysis is carried out in a qualitative descriptive manner through the process of grouping, interpreting, and synthesizing the main concepts and findings obtained from the

literature studied. Each source is analyzed to identify the principles of local wisdom, infrastructure management patterns, and policy approaches relevant to the management of ecotourism areas. The results of the analysis were then compiled in the form of a conceptual description that explained the relationship between local wisdom and infrastructure management in the context of the Tangkahan Ecotourism Area. Qualitative descriptive analysis allows the preparation of interpretations that emphasize the contextual meaning of phenomena [10].

In this study, the analysis is not based on research variables in a quantitative sense, but on the concepts and themes of analysis used to understand the phenomenon of infrastructure management in ecotourism areas in a contextual and comprehensive manner. This approach allows the study to focus on the meaning, relevance of concepts, and relevance of policies without relying on numerical measurement or field verification as is commonly done in literature-based qualitative research [11].

Results

Based on the analysis of the literature used in this study, the results of the research were obtained from the synthesis of the findings of a number of national and international studies that directly discussed local wisdom, infrastructure management, and ecotourism areas. The results of this study do not represent new field findings, but rather summarize the main findings patterns that have consistently emerged in previous research.

To facilitate the understanding of the findings obtained, the results of the literature synthesis are summarized in Table 1.

Table 1. Synthesis of Findings of Previous Research

Yes	Researcher	Study Focus	Key Findings	Implications for Infrastructure
1	Resorts [2], [5]	Local wisdom & spatial planning	Local values govern the use of space and the environment	Infrastructure must adapt to the character of the environment and culture
2	Milanie [1]; Milanie et al. [3]	Communitybased infrastructure	Community participation increases the sustainability of facilities	Infrastructure is effective if managed with the community
3	Sugiarto et al. [6]	Natural tourism infrastructure	Infrastructure must consider the carrying capacity of the environment	A purely technical approach risks damaging the region
4	PWK Student Study	Communitybased tourism management	Citizen involvement improves the sustainability of the area	Facilities are more adaptive to local needs
5	Policy review [7]	Regional development policy	Policies must be aligned with the local character	Regulations need to support local practices
6	de Rozari et al. [8]; Rizka et al. [9]	Locally-based ecotourism	The integration of local values supports the sustainability of the region	Local value is relevant in global management

Source : Author Summary, 2026

The results of the study show that local wisdom is positioned as a value system that regulates the use of environmental space and resources socially and culturally [2], [5]. In the context of nature-based areas, local wisdom serves as a normative guideline that limits the form and intensity of development, including the provision of infrastructure. This shows that local wisdom has direct implications for the way communities determine the location, scale, and function of infrastructure to remain in harmony with the character of the local environment and culture.

Other findings suggest that infrastructure management that involves local communities and is based on local knowledge tends to be more effective and sustainable [1], [3]. Communitybased managed infrastructure not only fulfills technical functions, but also strengthens the regional management system through a sense of community collective ownership.

Studies on infrastructure in natural tourism areas also show that infrastructure must function as a balance between tourism needs and environmental carrying capacity [6]. Infrastructure designed without considering the local context has the potential to cause ecological and social pressures, so the management of ecotourism areas needs to depart from the environmental character and social system of the community.

Research by regional and urban planning students also shows that the success of tourism area management is greatly influenced by community involvement in the management of regional facilities. Amenities and accessibility that are managed in a participatory manner are easier to adapt to local conditions and regional needs, so that local communities become the main actors in the management of ecotourism area infrastructure.

From a policy perspective, research shows that development policies that are not aligned with local socio-cultural conditions tend to face implementation constraints [7]. Therefore, local wisdom needs to be the basis for the formulation of policies for the management of infrastructure in ecotourism areas.

International studies also show that ecotourism management models based on local wisdom are able to create a balance between environmental conservation, local economic strengthening, and social sustainability [8], [9]. These findings show that the integration of local values has broad relevance in the management of ecotourism areas globally.

Overall, the results of the study show that local wisdom functions as a normative and operational basis in the management of ecotourism area infrastructure. The similarity of the pattern of findings in various studies shows that local values are a determining factor for the sustainability of area management, including in the context of the Tangkahan Ecotourism Area.

These findings show that infrastructure management in ecotourism areas cannot be understood solely as a matter of providing physical facilities, but as part of the social and cultural system of the community that interacts directly with the regional environment. Thus, the results of this study need to be placed in the context of previous scientific studies to see their suitability with various approaches to nature-based tourism area management that are also developing in various local and global contexts [12].

Nuraini's study [2], [5] shows that local values function as a social mechanism that regulates the use of environmental space and resources. In the context of infrastructure management of ecotourism areas, the construction of facilities cannot be carried out solely based on technical considerations, but must take into account the social and ecological boundaries that have been recognized by the local community. These findings are also in line with various studies on community-based ecotourism empowerment that place local values as the basis for the sustainability of tourist areas [1], [13].

The findings of this study also reinforce the study of Milanie [1] and Milanie et al. [3] which emphasized the importance of community-based infrastructure management. Infrastructure managed through the participation of local communities tends to be better preserved because of a sense of collective ownership. Similar conditions have also been found in various studies of tourism village and community-based area management in Indonesia,

which show that the management of locally-based facilities is more adaptive to regional needs [14], [15].

From the perspective of regional planning, the results of this study are in line with the findings of Sugiarto et al. [6] who emphasized that the infrastructure of natural tourism areas needs to be designed contextually. Technocratic approaches that ignore socio-cultural conditions often result in facilities that are difficult to maintain and have the potential to degrade the quality of the region's environment. Various studies of ecotourism development in other regions also show that the success of the region is highly dependent on the compatibility between tourist facilities and the character of the local ecosystem [16], [17].

Nevertheless, not all tourism research places local values as a key factor. Some studies focus more on economic aspects and tourist demand so that infrastructure is seen mainly as an instrument to increase tourist visits. This approach is relevant in tourism economic analysis, but it is inadequate to explain conservation-based area management that requires a balance between environmental utilization and protection, as noted in various market-based tourism development studies [18].

In terms of policy, this study shows that the success of tourism area management is greatly influenced by the suitability between development policies and the socio-cultural character of the local community [7]. Policies that do not take into account local capacity and practices often face implementation constraints. Therefore, the integration of local values in regional management policies is an important factor in maintaining the sustainability of ecotourism areas, as also emphasized in the framework of global sustainable tourism development [20].

At the international level, the results of this study are in line with the findings of de Rozari et al. [8] and Rizka et al. [9] who show that the development of ecotourism based on local wisdom is able to create a balance between environmental conservation, strengthening the local economy, and social sustainability. The similarity of these findings is also strengthened by various global ecotourism studies that place local values as an important element in the sustainability of natural tourism destinations [19], so that the principles found in the Indonesian context have wider relevance in the development of international ecotourism.

Overall, this discussion emphasizes that local wisdom needs to be placed as a conceptual basis in the management of ecotourism area infrastructure so that the sustainability of the area can be maintained ecologically, socially, and economically, including in the Tangkahan Ecotourism Area as the focus of this research study.

Conclusion

Based on the results of the analysis and discussion, it can be concluded that local wisdom has an important role as the basis for managing the infrastructure of the ecotourism area, especially in the Tangkahan Ecotourism Area, because it functions as a normative and operational foundation in directing the planning, utilization, and maintenance of infrastructure to be in harmony with the environmental character, social structure of the community, and the principles of regional sustainability. Infrastructure management that departs from local values is conceptually more adaptive and contextual and able to maintain a balance between conservation interests, tourism activities, and community welfare, so local wisdom needs to be placed as the main foundation in regional management decision-making, not just a complementary element. Therefore, the values of local wisdom need to be explicitly integrated in the ecotourism area management planning and management documents, accompanied by strengthening the mechanism of community participation in the management and maintenance of infrastructure through forums or local agreements that have developed, as well as aligning local government policies with local practices and knowledge that have been running, so that regional management can be implemented applicatively without the need for complex structural changes that still support the sustainability of the region ecologically, socially, and economically.

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