

POLICY REVIEW ON LAND USE PLANNING IN THE SHORELINE AREAS OF LAKE TOBA: POTENTIAL FOR ECOTOURISM DEVELOPMENT IN MUARA DISTRICT, NORTH TAPANULI REGENCY

Abstract

This study aims to analyze the potential and challenges in developing tourism along the shores of Lake Toba in Muara District, North Tapanuli Regency, and propose strategies for sustainable ecotourism management. A qualitative descriptive approach was employed, utilizing primary data collected through field observations and in-depth interviews with local communities and businesses, as well as secondary data from planning documents. SWOT analysis was conducted to identify internal and external factors influencing tourism development. Findings indicate that Muara District holds substantial potential in the tourism sector, supported by the natural beauty of Lake Toba, the rich Batak cultural heritage, and its strategic location. However, significant challenges include insufficient tourism facilities, limited human resources, and environmental degradation risks due to inadequate integrated management. Government support through the Super Priority Destination program and the global ecotourism trend presents significant opportunities to enhance the region's competitiveness. Proposed development strategies include infrastructure improvement, local human resource training, digital-based promotion, and sustainable environmental management to maintain tourism appeal.

Keywords: SWOT, Muara, Toba, Tourism, Ecotourism

I. Introduction

Lake Toba is one of Indonesia's premier tourism destinations, designated as a National Tourism Strategic Area (KSPN) under Government Regulation No. 50 of 2011 on the Master Plan for National Tourism Development 2010–2025. As a KSPN, this area is expected to compete at both national and international levels by optimizing tourism attractions, providing infrastructure, and ensuring sustainable environmental management (Ministry of Tourism, 2022; Bappenas, 2021). However, various management and development challenges continue to hinder these goals, particularly in Muara District, North Tapanuli Regency.

Muara District boasts diverse tourism assets, including natural attractions such as Lontung Beach, Sidimpula Waterfall, and Hutaginjang Hill, which attract both domestic and international visitors. Additionally, cultural landmarks like Batak traditional houses and Tenun Villages enrich the range of tourism experiences available (Tourism Office of North Tapanuli Regency, 2023). However, the lack of supporting facilities, especially accommodation and transportation, remains a primary obstacle to attracting tourists and extending their visits (Yoeti, 2002; Nugroho, 2009).

The limitations in Muara's tourism infrastructure are further exacerbated by strict regulations regarding the shoreline areas of Lake Toba. According to Minister of Public Works Regulation No. 28/PRT/M/2015, development around the lake is

restricted to preserve the area's ecological functions, including biodiversity protection and erosion control (Ministry of Public Works, 2015). Although these regulations aim to ensure ecological balance, their implementation often lacks complementary policies to promote sustainable investment and development, slowing tourism sector growth (Sjafrizal, 2014; Fandeli, 1995).

The low number of tourist arrivals in North Tapanuli Regency also highlights weaknesses in tourism management. Data reveals fluctuating numbers of foreign tourists, with a significant decline during the COVID-19 pandemic (Tourism Office of North Tapanuli Regency, 2023). Although recovery trends began to emerge in 2022, Muara District's tourism potential remains underutilized due to these limitations (Smith, 1991; Adisasmita, 2007).

Previous studies emphasize the need for an integrated approach to tourism management, balancing environmental conservation with infrastructure development (Kasim et al., 2022; Yasintaa et al., 2022). For instance, applying water-sensitive urban design principles in tourist areas like Lake Tondano has demonstrated that environmentally focused management can enhance tourism appeal while maintaining ecological sustainability (Yasintaa et al., 2022). However, implementing similar models in Lake Toba faces regulatory and technical challenges.

Research by Junus et al. (2019) suggests that zoning strategies for shoreline utilization can address conflicts between environmental preservation and development needs. These findings are relevant to Muara District, which faces similar challenges in managing the shoreline areas of Lake Toba. However, tailored strategies are necessary to ensure these policies align with local conditions (Junus et al., 2019; Kutarga et al., 2008).

This study aims to analyze the physical and policy aspects influencing the management of Lake Toba's shoreline areas in Muara District. It also evaluates the social and economic impacts of these policies on local communities. Through a data-driven approach, the findings are expected to provide strategic recommendations that support tourism development while preserving environmental sustainability (Fandeli, 1995; Medlik, 1980).

By conducting this analysis, this article contributes to the literature on tourism management by offering evidence-based policy guidance for shoreline development. It also addresses gaps in previous research, which has often relied on general approaches without considering specific local contexts, such as those in Muara District, North Tapanuli Regency (Djarmiko et al., 2023; Peters & Bryden, 2004).

II. Research Methodology

2.1 Research Location and Duration

This research was conducted in Muara District, North Tapanuli Regency, North Sumatra Province. The area was selected due to its significant yet underutilized tourism potential, particularly in the shoreline areas of Lake Toba. The research was scheduled from May 2024 to August 2024.

North Tapanuli Regency spans 251,765.93 hectares, located at coordinates 1°20'–2°41' North Latitude and 98°05'–99°16' East Longitude. The regency borders Toba Regency to the north, Labuhan Batu Utara Regency to the east, South Tapanuli

Regency to the south, and Humbang Hasundutan and Central Tapanuli Regencies to the west.

The research focuses on villages directly connected to Lake Toba's shoreline, such as Huta Lontung, Bariba Niaek, Silali Toruan, Unte Mungkur, Hutanagodang, and Batu Binumbun, among others. These locations were selected for their diverse tourism attractions, which require further planning and management to support sustainable tourism development.

2.2 Research Tools and Materials

Table 1-The tools and materials used in this study are summarized in below

No	Tools and Materials	Purpose
1	Microsoft Office Software	Report preparation and data processing
2	ArcGIS 10.8	Spatial processing and analysis
3	Google Earth Pro	Spatial analysis and location visualization
4	Global Positioning System (GPS)	Geographic data collection
5	Camera	Activity documentation
6	Survey and interview forms	Primary data collection

2.3 Research Type

This study employs a descriptive qualitative research approach. Descriptive research aims to depict and analyze patterns of land use and challenges in developing the Lake Toba shoreline area for tourism. The qualitative approach explores primary and secondary data in depth, focusing on phenomena observed in the field (Agung, 2004).

2.4 Data Collection Methods

2.4.1 Primary Data

Primary data were collected using the following methods:

- 1. Observation**
Direct observation of the physical conditions of Lake Toba's shoreline, including existing land use and community activities.
- 2. Documentation**
Data collection through photographs of research locations and relevant archives to visually support field condition analysis.
- 3. Interviews**
Interviews were conducted with key informants, such as local residents, tourism managers, village officials, and relevant authorities. The interviews addressed topics such as permits, land use, and challenges in managing tourism areas.

2.4.2 Secondary Data

Secondary data included planning documents, spatial data (shapefiles), satellite imagery, and supporting maps such as elevation and land-use maps. These data were sourced from government agencies and related authorities.

2.5 Data Analysis Methods

2.5.1 Qualitative Descriptive Analysis

This method was used to describe and analyze primary and secondary data by interpreting land-use patterns and mapping the potential and challenges in managing tourism areas in Muara District (Fandeli, 1995).

2.5.2 Geographic Information System (GIS) Analysis

The overlay method in GIS was applied to analyze land characteristics and align them with potential tourism activities in the research area. The resulting maps provide recommendations for land use and tourism development.

2.5.3 SWOT Analysis

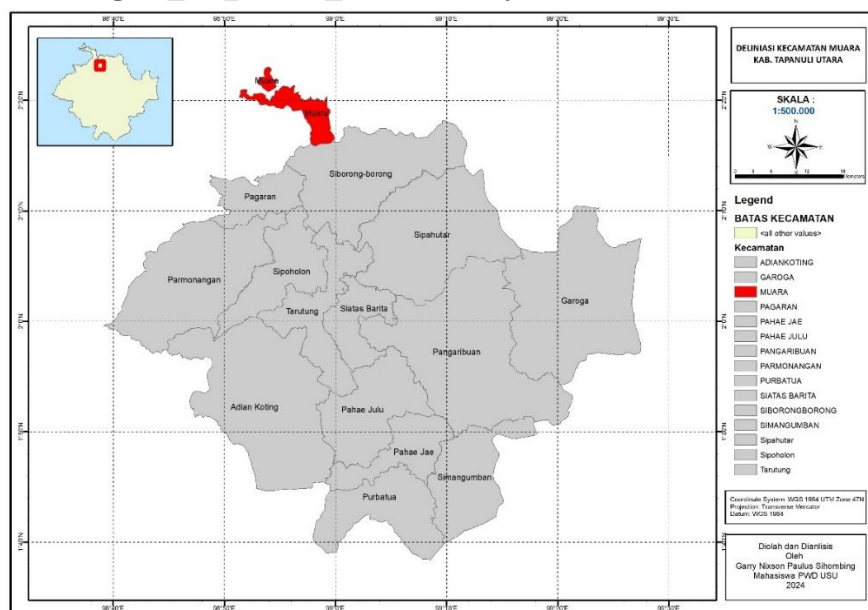
SWOT analysis was conducted to evaluate the strengths, weaknesses, opportunities, and threats in the Lake Toba shoreline area. A SWOT matrix was used to develop strategies for sustainable, environmentally-based tourism management (Dess et al., 2009).

III. Results and Discussion

3.1 General Overview of the Study Area

Muara District, located in North Tapanuli Regency, covers an area of 79.75 km², accounting for 2.10% of the total area of the regency. Positioned along the shores of Lake Toba—one of the world's largest volcanic lakes—Muara District boasts significant tourism potential. Its hilly and undulating topography makes it ideal for ecotourism and nature-based activities.

Figure 1. Delineation of Priority Areas in Muara



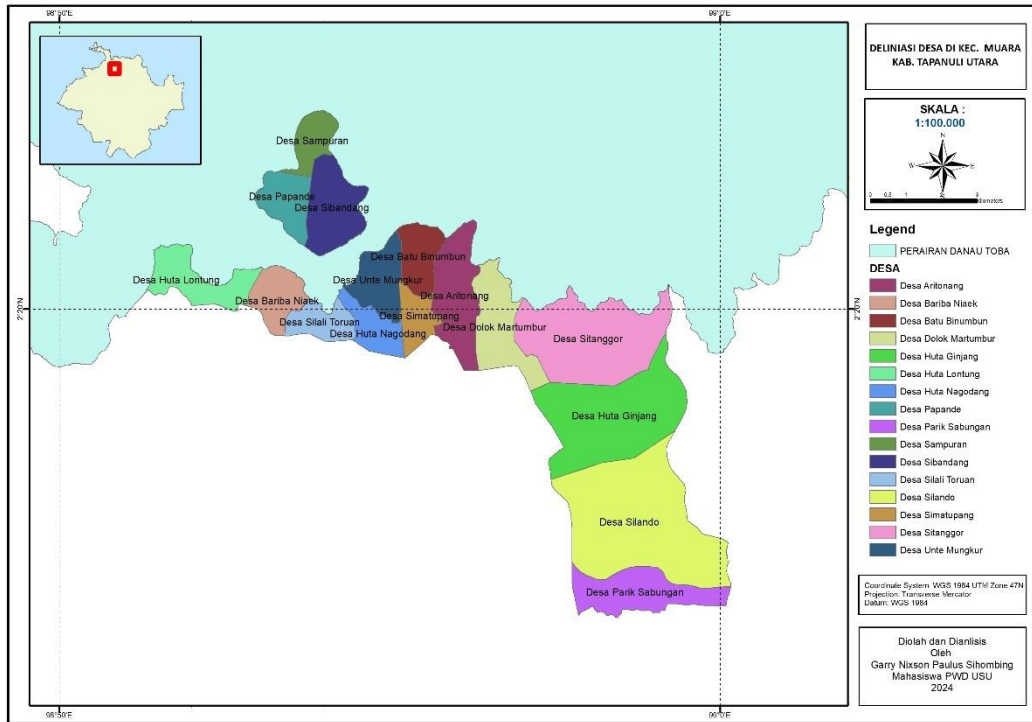
Source: Author's Documentation (ArcMap)

Table 2. Delineation of Muara District by Village Area, 2023

No	Subdistrict	District	Area (Ha)
1	Aritonang	Muara	400.52
2	Bariba Niaek	Muara	205.23
3	Batu Binumbun	Muara	193.65
4	Dolok Martumbur	Muara	360.77
5	Huta Gintang	Muara	913.88
6	Huta Lontung	Muara	294.26
7	Hutana Godang	Muara	168.88
8	Papande	Muara	207.87
9	Sampuran	Muara	149.61
10	Sibandang	Muara	337.25
11	Silali Toruan	Muara	168.80
12	Silando	Muara	1,359.76
13	Simatupang	Muara	151.94
14	Sitanggor	Muara	828.53
15	Unte Mungkur	Muara	237.63
Total			6,363.94

Source: Public Works and Spatial Planning Office, North Tapanuli Regency
The natural beauty and strategic location make Muara District a promising destination for tourism. However, its development is hindered by limited infrastructure and supporting facilities.

Figure 2. Delineation of Muara District by Village Area



Source: Author's Documentation (ArcMap)

3.2 Shoreline Boundaries in Muara District

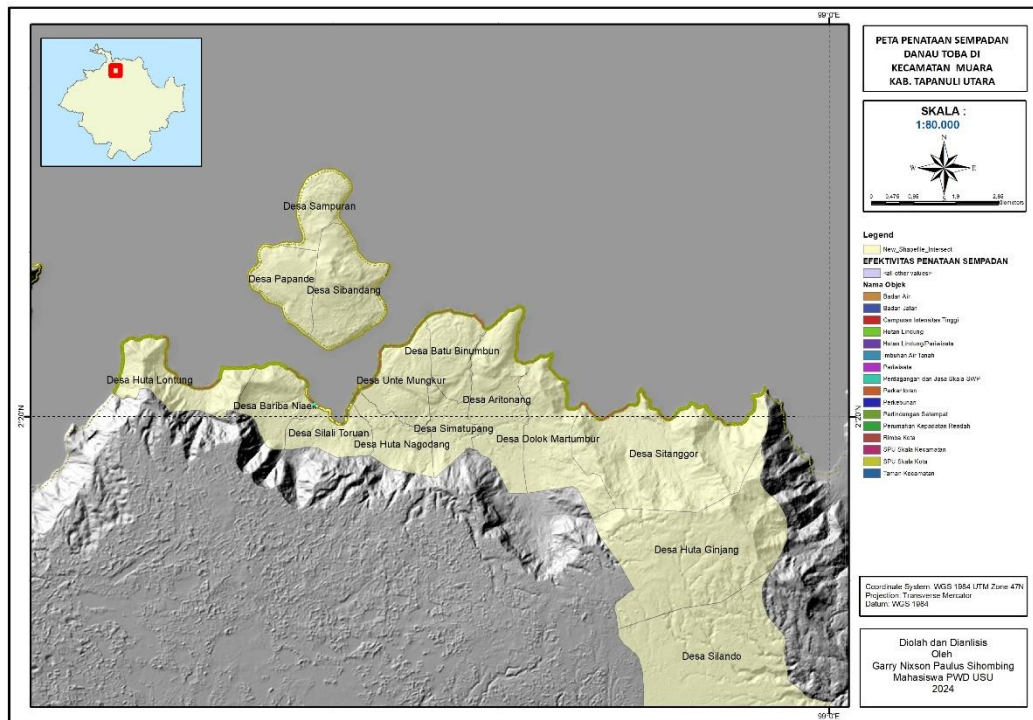
The determination of Lake Toba's shoreline boundaries, in accordance with government regulations, aims to protect the lake's ecosystem while controlling development. In Muara District, this shoreline boundary traverses 12 villages, with a total length of 78,847.67 meters.

Table 3. Length of Lake Toba Shoreline Boundaries in Muara District, 2023

Village	Length (Meter)	Percentage (%)
Aritonang	5,197.05	6.60
Bariba Niaek	4,055.61	5.15
Batu Binumbun	3,491.26	4.42
Dolok Martumbur	5,197.46	6.60
Hutalontung	11,483.67	14.56
Hutana Godang	975.17	1.23
Papande	7,743.20	9.82
Sampuran	8,610.82	10.92
Sibandang	10,463.48	13.27
Silali Toruan	3,312.46	4.20
Sitanggor	12,559.12	15.92
Unte Mungkur	5,758.37	7.30
Total	78,847.67	100.00

Source: Public Works and Spatial Planning Office, North Tapanuli Regency

Figure 3. Map of Shoreline Development in Lake Toba's Muara District



The establishment of these boundaries restricts development activities around the lake, but it also creates opportunities for developing eco-friendly tourism that aligns with environmental conservation principles.

3.3 Effectiveness of Tourism Area Management

Based on interviews with various stakeholders, including tourists, local residents, and business operators, several key challenges and opportunities were identified in the management of the Lake Toba shoreline in Muara District. The following summarizes the results relevant to assessing the effectiveness of tourism area management:

1. Natural and Cultural Attractions

- **Natural Beauty:** Tourists, such as Martua Lumbangaol and Jojo Hutauruk, described the panoramic views of Lake Toba as one of the best attractions, offering vast lake scenery, fresh air, and a tranquil atmosphere.
- **Cultural Attractions:** Cultural elements, such as the Sigalegale Statue, traditional Batak music, and local markets, provide unique experiences. Jojo Hutauruk emphasized that these attractions add value, especially for tourists interested in local culture.

2. Infrastructure and Accessibility

- **Road Conditions:** Several tourist locations in Muara District have poor road conditions, including narrow roads, limited lighting, or unpaved pathways. This poses significant challenges for tourists, particularly those using private vehicles (Jojo Hutauruk, Monica Theresia).

- **Public Transportation:** The lack of public transportation connecting tourist destinations in the area forces visitors to rely on private vehicles, creating barriers for tourists from outside the region (Pellni Ompusunggu, Ain Simanungkalit).

3. Facilities and Services

- **Lack of Supporting Facilities:** Tourists such as Pellni Ompusunggu and Ain Simanungkalit highlighted the lack of public facilities, such as clean restrooms, information centers, parking spaces, and adequate accommodations.
- **Pricing and Service Quality:** The cost of food and accommodations often does not match the quality of service provided. Monica Theresia shared her experience of staying at an expensive accommodation that did not meet her comfort expectations.

4. Promotion and Information

- **Limited Tourism Information:** Tourists frequently encounter difficulties obtaining information about tourist sites, facilities, or attractions in the area. Available information is often limited and unreliable, relying on local residents who may not provide accurate details (Martua Lumbangaol, Pellni Ompusunggu).
- **Digital Promotion:** The use of digital media and tourism platforms for promotion is still underutilized, limiting the region's visibility to international tourists.

5. Environmental Awareness

- **Unsustainable Activities:** Improper waste disposal and unsustainable natural resource management pose significant threats to the preservation of the area. Parlindungan Simanungkalit stressed the need for community-based conservation programs to maintain Lake Toba's ecosystem.

6. Government Support and Local Human Resources

- **Government Involvement:** Business operators, such as Line Silitonga, noted the need for greater government attention in building infrastructure, improving facilities, and providing training to local communities.
- **Limited Human Resources:** Many business operators and tour guides lack professional skills. Andry Marbun highlighted the importance of training and education for local residents to improve tourism management.

The establishment of shoreline boundaries has an impact on limiting development around the lake. However, it also creates opportunities to promote eco-friendly tourism development.

3.4 Effectiveness of Tourism Area Management

Based on interviews with various stakeholders, including tourists, local residents, and business operators, several challenges and opportunities were identified in managing the Lake Toba shoreline in Muara District. Below is a summary of the relevant findings for evaluating the effectiveness of tourism area management:

1. Natural and Cultural Attractions

- **Natural Beauty:** Tourists, such as Martua Lumbangaol and Jojo Hutauruk, described Lake Toba's panoramic views as one of the most captivating attractions, with vast lake scenery, fresh air, and serene surroundings.
- **Cultural Attractions:** Cultural features, such as the Sigalegale statue, traditional Batak music, and local markets, provide a unique draw. Jojo Hutauruk emphasized that these attractions add exceptional value for tourists, especially those interested in local culture.

2. Infrastructure and Accessibility

- **Road Conditions:** Several tourist sites in Muara District face accessibility issues, including narrow roads, insufficient lighting, or unpaved pathways, creating significant challenges for visitors, especially those using private vehicles (Jojo Hutauruk, Monica Theresia).
- **Public Transport:** Limited availability of public transport connecting the region's tourist destinations forces visitors to rely on private vehicles, a constraint for travelers from outside the region (Pellni Ompusunggu, Ain Simanungkalit).

3. Facilities and Services

- **Limited Amenities:** Tourists such as Pellni Ompusunggu and Ain Simanungkalit pointed out a lack of public amenities, such as clean restrooms, information centers, parking spaces, and adequate accommodations.
- **Cost vs. Quality:** Accommodation and dining costs often fail to align with service quality. Monica Theresia shared an experience where the price of accommodation was high, but the service and comfort provided did not meet her expectations.

4. Promotion and Information

- **Lack of Tourist Information:** Visitors often struggle to obtain accurate information about tourist attractions, facilities, or activities in the area. Available information tends to be limited and sometimes unreliable, depending on local residents for guidance (Martua Lumbangaol, Pellni Ompusunggu).
- **Digital Promotion:** Digital promotion via social media and tourism platforms remains underutilized, limiting the visibility of Muara District to international tourists.

5. Environmental Awareness

- **Environmentally Unfriendly Practices:** Improper waste disposal and unsustainable resource management pose severe threats to the environment. Parlindungan Simanungkalit underscored the need for community-driven conservation programs to preserve Lake Toba's ecosystem.

6. Government Support and Human Resources

- **Government Involvement:** Local business operators, such as Line Silitonga, emphasized the importance of government support in

developing infrastructure, improving facilities, and providing training to local communities.

- **Limited Human Resource Capacity:** Many local operators and tour guides lack adequate professional skills. Andry Marbun noted that training and education are crucial for enabling the local population to better manage tourism activities.

3.5 Social and Economic Impacts of Area Management

Managing the Lake Toba shoreline in Muara District has the potential to create significant social and economic impacts on the local community. Insights from interviews with various stakeholders are summarized below:

1. Social Impacts

- **Improved Community Welfare:** Enhanced public facilities, such as urban parks and green spaces, contribute to a higher quality of life for local residents (Line Silitonga).
- **Cultural Preservation:** Incorporating cultural elements into tourism planning helps maintain local identity while educating visitors about the community's cultural heritage (Jojo Hutauruk, Ain Simanungkalit).
- **Social Interaction:** Well-designed public spaces, such as recreational paths and gathering areas, foster social interaction among community members.

2. Economic Impacts

- **Job Creation:** Expanding the tourism sector generates employment opportunities in hospitality, culinary services, and tour guiding (Andry Marbun).
- **New Business Opportunities:** Tourism management provides avenues for local residents to establish businesses, such as homestays, craft shops, and local restaurants (Pellni Ompusunggu).
- **Land Value Appreciation:** Well-managed areas with improved accessibility often see increased land values, directly benefiting landowners near the shoreline.

3. Environmental Protection

- **Ecosystem Conservation:** Planned management of the shoreline helps prevent erosion and maintain biodiversity (Parlindungan Simanungkalit).
- **Sustainable Tourism Management:** Community-driven conservation programs integrate local residents into preserving the ecosystem, balancing economic growth with environmental protection.

3.6 SWOT Analysis

A SWOT analysis was conducted to identify the strengths, weaknesses, opportunities, and threats associated with developing the Lake Toba shoreline area in Muara District. The results are summarized in the following matrix:

Table 4. SWOT Matrix for Lake Toba Shoreline Tourism Development in Muara District

Internal Factors	External Factors
Strengths (S):	Opportunities (O):
- Unique natural beauty	- Government support for priority destinations
- Rich local culture	- Growing interest in global ecotourism trends
- Strategic location	
Weaknesses (W):	Threats (T):
- Limited facilities	- Environmental degradation risks
- Insufficient skilled human resources	- Competition from neighboring tourism areas
- Inadequate digital promotion	

From an internal perspective, this tourism area boasts its primary strength in the captivating natural beauty of Lake Toba's expansive panorama, surrounded by tranquil green hills. Additionally, the rich local culture, including Batak arts and traditions, serves as a significant value-added factor that enhances the area's tourism appeal. The strategic location of Muara District along the Lake Toba tourism route further facilitates accessibility for visitors.

However, several weaknesses need to be addressed, such as the lack of supporting tourism facilities, limited human resource capacity due to inadequate training in tourism management, and suboptimal promotional efforts.

From an external perspective, significant opportunities arise from government support for the development of Lake Toba as a Super Priority Destination (DPSP) and the growing interest of tourists in global ecotourism trends. However, threats remain, including the risk of environmental degradation caused by uncontrolled tourism activities and intense competition from other well-established tourism destinations around Lake Toba.

Based on this analysis, tourism development strategies should focus on sustainable environmental management, improving facilities and local human resources, and leveraging digital promotional opportunities to attract a larger number of tourists.

3.7 Strategic Development

In developing the Lake Toba shoreline area in Muara District, several strategies have been proposed to address the identified challenges and opportunities. These strategies aim to create a sustainable and competitive tourism area:

1. Improving Facilities:

- Constructing essential infrastructure, such as clean public toilets, information centers, and digital signage to guide tourists.
- Enhancing public transportation connectivity to major tourist destinations.

2. Digital Promotion:

- Leveraging social media platforms and online tourism portals to attract a broader audience, including international tourists.

- Creating virtual tours or high-quality video content to highlight the district's unique attractions.
3. **Human Resource Development:**
- Organizing training sessions for local residents in tourism management, hospitality services, and foreign language skills to enhance communication with international visitors.
 - Providing financial and technical assistance to local entrepreneurs for developing tourism-related businesses.
4. **Environmental Preservation:**
- Implementing stricter regulations to prevent environmental degradation caused by tourism activities.
 - Encouraging the adoption of eco-friendly practices in tourism management, such as waste reduction, water conservation, and habitat restoration.

By implementing these strategies, Muara District can enhance its status as a flagship destination, boosting local economic growth while preserving its natural and cultural heritage.

3.8 Management of Lake Toba Shoreline in Muara District to Enhance Social and Economic Development

Land use in the Lake Toba shoreline area is still dominated by abandoned land and protected forests rather than wetland agriculture or green open spaces that could enhance tourism appeal. Given such conditions, most areas along Lake Toba's shoreline should ideally be designated as protected zones. However, forest clearing frequently occurs to convert the land into horticultural plantations. This conversion leads to various negative impacts, such as landslides and a decline in the number of flora and fauna. This issue stems from the imbalance in land management caused by population growth, particularly due to the expansion of Muara District, which pushes residents to cultivate dry, sloping lands along the shoreline, making them vulnerable to erosion (Idjudin and Marwanto, 2008).

Table 5. Land Use in Lake Toba Shoreline Area, Muara District, 2024

Land Use	Area (ha)
Settlements	2,129
Rice Fields	7,829
Places of Worship	1,643
Protected Forest	32,229
Trade and Services	0.050
Offices	0.054
Roads	12,045
Abandoned Land	67,125
Total	14,830

Efforts to manage the shoreline area in Muara District will focus on maintaining and improving spatial quality through enhanced environmental sustainability and balance. According to the Tapanuli Regency Spatial Plan (RTRW) and the Ministry of Public Works Regulation No. 22/PRT/M/2007, activities in the Muara shoreline

3.8 ABC Waterfront Concept

The **ABC Waterfront Concept** is proposed as a framework for the sustainable development of the Lake Toba shoreline area.

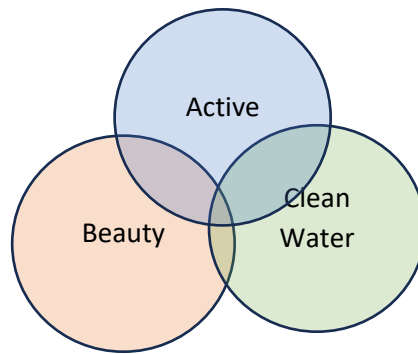


Figure 5. ABC Waterfront Concept

It encompasses three core elements:

1. **Active (A):**

- Creating spaces that encourage active engagement for both residents and tourists.
- Incorporating recreational paths, water-based activities, and public gathering areas to promote community interaction and a vibrant tourist experience.

2. **Beauty (B):**

- Enhancing the aesthetic appeal of the area by utilizing native plants and restoring ecological habitats.
- Promoting ethnobotanical gardens near residential areas to showcase local flora and create unique visual experiences.
- Rehabilitating protected forests to attract migratory birds and other wildlife, adding ecological and visual value to the landscape.

3. **Clean Water (C):**

- Implementing naturalized water management systems to reduce runoff and sedimentation into Lake Toba.
- Developing wastewater treatment systems to ensure the cleanliness of the lake and surrounding waterways.

IV. Conclusion and Recommendations

Muara District possesses immense potential as a tourist destination, characterized by the natural beauty of Lake Toba and the authentic Batak cultural heritage. However, the area faces significant challenges, including inadequate infrastructure, limited supporting facilities, and insufficient promotion and professional management. Tourists often encounter issues related to accessibility, service quality, and lack of information, all of which impact their overall travel experience. Moreover, poorly managed tourism activities risk damaging Lake Toba's ecosystem, which is the primary attraction of the region.

To address these challenges, strategic steps are required, including infrastructure improvement, community-based tourism management, and more effective digital promotion. The government and local stakeholders must enhance road access and provide facilities such as information centers, public toilets, and accommodations that meet acceptable standards. Additionally, training for local communities in tourism management and cultural preservation must be intensified to ensure that tourists have high-quality experiences. Implementing ecotourism programs that involve the local community can offer a solution to maintaining a balance between tourism development and environmental conservation.

Through strong collaboration between the government, the community, and the private sector, the vast potential of Muara District can be maximized. Support from the Super Priority Destination (DPSP) program should be optimally utilized to accelerate the development of this area. With careful planning, improved facilities, and the preservation of cultural and environmental assets, the Lake Toba shoreline in Muara District can become a sustainable tourism destination that attracts both domestic and international tourists while providing significant economic and social benefits to the local community.

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