

Sustainable Ecotourism Development and Land Use Planning in Muara District, North Tapanuli, Indonesia: A Policy Review for the Lake Toba Shoreline

Abstract

This study explores the potential and challenges of developing sustainable ecotourism along the Lake Toba shoreline in Muara District, North Tapanuli Regency. Muara District is known for its scenic natural beauty and the rich cultural heritage of the Batak community, offering unique opportunities for tourism growth. However, several challenges hinder its development, including inadequate infrastructure, limited supporting facilities, insufficient promotion, and poor tourism management. To address these issues, the study employs a qualitative descriptive approach, gathering data through direct field observations, stakeholder interviews, and analysis of policy documents. The study applies SWOT analysis to identify internal strengths, weaknesses, opportunities, and threats. Key findings reveal that Muara District's natural beauty and Batak cultural heritage are critical strengths, while limited tourism facilities, poor accessibility, and a lack of digital promotion are significant weaknesses. Government support through the Super Priority Destination (DPSP) program and the global trend of ecotourism present valuable opportunities. However, threats such as environmental degradation and competition from other Lake Toba destinations pose significant risks. Based on these findings, strategic recommendations are proposed. These include infrastructure development, digital promotion, capacity-building for local communities, and environmental conservation initiatives. Implementing these strategies will improve tourist accessibility, enhance the visitor experience, and support sustainable tourism development. The findings provide policymakers and stakeholders with evidence-based strategies to achieve an optimal balance between tourism development, cultural preservation, and environmental sustainability, ultimately transforming Muara District into a leading ecotourism destination.

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. Also, integrating ecotourism into the planning of coastal and marine protected areas requires a balanced approach that accommodates multiple uses while safeguarding ecological integrity (Agardy, 1993).

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 role of sustainable tourism in supporting community welfare has been echoed globally, aligning with the Sustainable Development Goals (SDGs) target to eradicate extreme poverty by 2030 (Satia Negara Lubis & Arga Abdi Rafiud Darajat Lubis, 2024).

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). Zoning, as a fundamental aspect of land-use planning, involves designating specific areas for particular land uses to regulate development and ensure sustainable resource management (Mason, 2012).

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).

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).

This manuscript offers a significant contribution to the scientific community by addressing the underutilized ecotourism potential of Muara District, particularly along the Lake Toba shoreline. By identifying key challenges such as infrastructure gaps, environmental threats, and regulatory barriers, the paper provides actionable recommendations for tourism development. The study's focus on sustainable tourism is crucial for preserving Lake Toba's natural beauty and cultural heritage, thereby ensuring the long-term viability of tourism in the region. The evidence-based policy recommendations presented in this paper serve as a reference for policymakers and researchers interested in sustainable tourism development in similar contexts worldwide.

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

Data collection involved direct observations, interviews with local stakeholders (residents, tourism operators, government officials), and document analysis of regulatory policies.

The villages of Huta Lontung, Bariba Niaek, Silali Toruan, and others were selected due to their proximity to Lake Toba's shoreline, their tourism potential, and their ecological sensitivity.

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

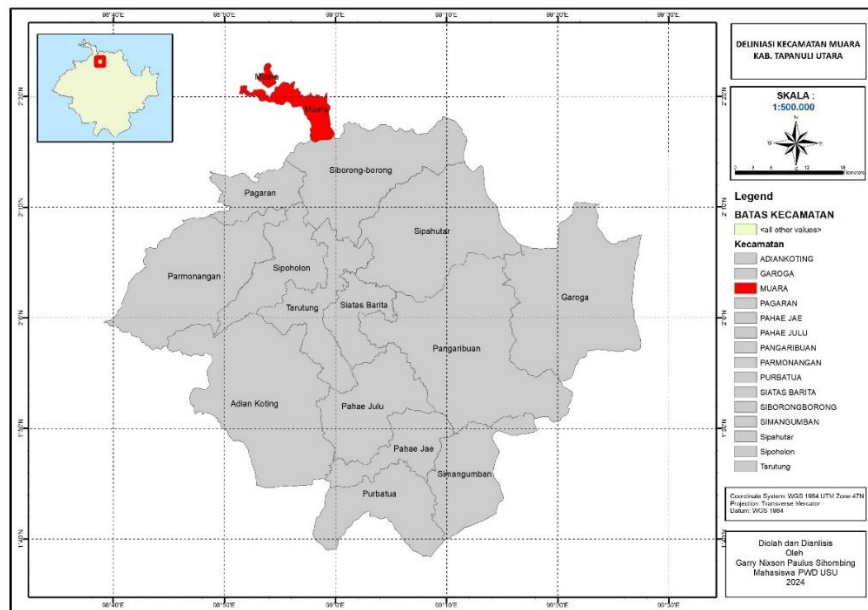
SWOT analysis was conducted to evaluate the strengths, weaknesses, opportunities, and threats in the Lake Toba shoreline area. A SWOT matrix was used to develop strategies for sustainable, environmentally-based tourism management.

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)

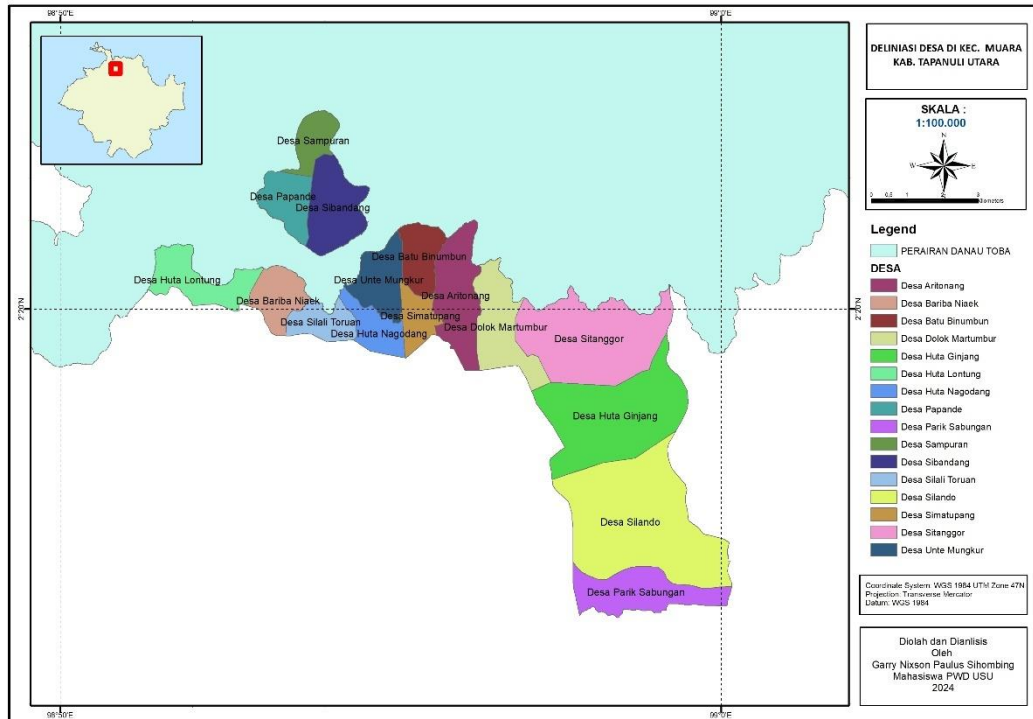
Table 2. Delineation of Muara District by Village Area, 2023

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 Ginjang	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

- **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 Jojor 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. Jojor 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 (Jojor 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. Tourism development has the potential to create employment opportunities, increase community welfare, and support cultural preservation. Community-based tourism initiatives enable local residents to benefit from the tourism economy while preserving their cultural heritage. 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

Uncontrolled tourism activities, such as improper waste disposal, deforestation, and overuse of natural resources, pose significant threats to the Lake Toba ecosystem. Implementing waste management and community-driven conservation efforts is critical to sustaining Lake Toba's natural appeal.

- **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

- **Strengths:** Natural beauty of Lake Toba, Batak cultural heritage, strategic location.
- **Weaknesses:** Limited tourism facilities, low promotion capacity, lack of skilled human resources.
- **Opportunities:** Government support as a Super Priority Destination, global interest in ecotourism, potential for community-based tourism.
- **Threats:** Environmental degradation, intense competition from neighboring tourist sites, lack of enforcement of shoreline regulations.

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 cultivation area may include limited production forests, tourism, and seasonal agriculture.

- a. The regional government has set specific requirements for development in these areas, which include:
 - a. Ensuring that construction considers and maintains environmental sustainability.
 - b. Selecting appropriate vegetation and planting patterns.
 - c. Developing eco-friendly tourism activities, such as mountain hiking and lakefront trekking.
 - d. Incorporating engineering solutions for slope stabilization and proper drainage systems.

1. Land Use and Zoning in Muara

Some notable aspects of shoreline planning for Muara District are outlined below:

1. Landscape Planning Concept:

The proposed landscape planning for the Lake Toba shoreline includes a **waterfront city concept**, intended to balance forest areas and the lake's shoreline. The cultivation zone consists of residential, agricultural, conservation, and commercial blocks. Site selection for these blocks considers accessibility and the presence of rivers. Each block is described as follows:

- i. **Residential Block:** Includes residential zones and public services.
- ii. **Commercial Block:** Focuses on trade and services.
- iii. **Conservation Block:** Features afforestation in the upstream areas, interpreted as protected zones, and downstream conservation along the shoreline.
- iv. **Agricultural Block:** Includes seasonal agriculture, such as rice paddies and maize fields.

Figure 4. Effectiveness of Shoreline Management in Muara District

- 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 holds significant potential as a tourist destination, with its captivating natural beauty, highlighted by the scenic Lake Toba, and the rich cultural heritage of the Batak community. However, the district faces several critical challenges, including inadequate infrastructure, limited supporting facilities, insufficient digital promotion, and a lack of professional tourism management. These issues negatively impact the visitor experience, particularly in terms of accessibility, service quality, and the availability of reliable tourist information. Additionally, the absence of proper environmental management threatens the sustainability of Lake Toba's ecosystem, which serves as the primary attraction for tourists.

To address these challenges, a multi-faceted strategy is required. First, infrastructure development must be prioritized to ensure better road access and the construction of essential facilities, such as information centers, clean public toilets, and quality accommodations. Providing public transport services and improving road connectivity to major tourist destinations will enhance visitor mobility, especially for international tourists unfamiliar with local transport systems.

Second, community-based tourism (CBT) must be actively promoted to foster local involvement in tourism activities. Training programs should be conducted to enhance the skills of local residents in tourism management, hospitality, and foreign language proficiency. This approach will not only improve the quality of visitor experiences but also increase local employment opportunities, stimulate the local economy, and promote the preservation of Batak cultural heritage.

Third, digital promotion and marketing efforts should be intensified to raise awareness of Muara District's tourism potential. Leveraging social media platforms, tourism websites, and mobile applications can boost the visibility of local attractions and provide tourists with accurate and up-to-date information. Creating virtual tours, promoting local events, and improving the presence of Muara District on online booking platforms will enhance the district's appeal to both domestic and international travelers.

Lastly, the importance of environmental conservation cannot be overlooked. Ecotourism initiatives that emphasize sustainable tourism practices should be implemented to protect the Lake Toba ecosystem. Local communities and tourism

stakeholders should be involved in environmental protection measures, such as waste management programs, water conservation, and habitat restoration. These efforts will ensure that tourism development in Muara District is both sustainable and environmentally responsible.

Through strong collaboration between the government, local communities, and the private sector, the vast tourism potential of Muara District can be fully realized. The Super Priority Destination (DPSP) program should be optimally leveraged to accelerate development in the area. With careful planning, enhanced facilities, digital promotion, and a focus on sustainable tourism, the Lake Toba shoreline in Muara District has the potential to become a world-class tourism destination. This will not only attract more domestic and international tourists but also generate significant economic and social benefits for local communities, contributing to long-term sustainable development.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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