

## SWOT ANALYSIS OF REGIONAL RESILIENCE PLANNING CASE STUDY OF FLASH FLOOD IN HUMBANG HASUNDUTAN REGENCY

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### Abstract

Humbang Hasundutan Regency, North Sumatra Province, is an area with hilly topography, high rainfall, and significant land use changes. The flash floods that occurred in early 2025 in several sub-districts such as Pollung, Baktiraja, and Paranginan showed the vulnerability of this area to hydrometeorological disasters. This study aims to evaluate regional resilience planning through a SWOT analysis to determine the strengths, weaknesses, opportunities, and threats in the disaster management system in the area. The methodology used is a descriptive qualitative approach with data collection techniques through field observations, interviews with stakeholders, and review of official documents such as RTRW, RPB, and disaster reports. The results show that the existence of regional regulations and community involvement are strengths, but weak spatial planning supervision and technical capacity are major weaknesses. Opportunities such as assistance from national programs and international cooperation face threats in the form of environmental degradation and climate change. Cross-sector integration, institutional strengthening, and a participatory approach are needed to build sustainable regional resilience.

Keywords: *Regional Resilience, SWOT, Flash Flood, Spatial Planning, Humbang Hasundutan, Lake Toba*

### BACKGROUND

Geographical Conditions and Vulnerability Humbang Hasundutan Regency has an area of  $\pm 2,335$  km<sup>2</sup> with hilly contours and large rivers such as Aek Silang, Aek Sibundong, and Aek Mandosi. With an average annual rainfall of 2,800 mm, this area is very vulnerable to flash floods, especially during the rainy season. This regency is also part of the Lake Toba national strategic area (KSPN Danau Toba), which makes it have high ecological and economic value.

Land Use Changes and Their Impacts In the last two decades, the conversion of forest land into agricultural land, plantations, and settlements has increased sharply. The forest buffer zone in Pollung and Baktiraja Districts has been degraded due to uncontrolled land clearing. This change has disrupted the ecological balance, especially in the catchment area of Lake Toba which is one of the main sources of water and controllers of the regional microclimate.

Flash Flood Incident 2023, precisely in December, flash floods hit several villages in Pollung District (Hutaraja Village, Lintong Nihuta Village), Baktiraja District (Tipang Village, Simamora Village), and Paranginan District (Sosor Gonting Village). These villages are located in areas directly connected to the watershed that flows into Lake Toba. With damaged vegetation and the absence of an adequate water retention system, floodwater from upstream flowed rapidly into residential areas and finally towards the shores of Lake Toba, carrying sediment and waste. This disaster threatens the quality of the waters and the sustainability of the Lake Toba ecosystem as a whole.

Table 1. Zones and Areas Affected by Flash Floods in Humbang Hasundutan Regency

No	Subdistrict	Affected Villages	Types of Disasters	Time of Event
1	Poll	Hutaraja, Lintong Nihuta	Flash floods	Jan 2025
2	The King of Bakti	Tipang, Simamora	Flash Floods & Landslides	Jan 2025
3	The Paranginan	Gonting's Backbone	Flash floods	Jan 2025
4	Bun Dolok	Simangaronsang	Landslide	Feb 2025
5	Onan Ganjang	Sibuntuon	Landslide	Feb 2025
6	Packet	Sihas Toruan	Flash floods	Feb 2025

The Importance of Regional Resilience Evaluation Regional resilience evaluation is very important in developing a risk-based disaster management strategy. The SWOT approach is used to identify internal and external factors that influence regional preparedness and response to disasters. This is also relevant to the integrated management program of the Lake Toba area initiated by the central government.



Image. Administrative Map of Humbang Hasundutan Regency.

**Banjir Bandang di Kabupaten Humbang Hasundutan, Sumatera Utara**



## **RESEARCH METHODOLOGY**

2.1 This study uses a qualitative descriptive approach with a case study method. Primary data were obtained through in-depth interviews with various stakeholders, including local governments, non-governmental organizations, traditional leaders, and affected communities. The interview process was conducted with a semi-structured guide to obtain in-depth information about local perceptions, challenges, and practices related to flash flood mitigation.

### 2.2 Data Collection Techniques

- Field observations to affected villages in Pollung, Baktiraja, and Paranginan
- In-depth interviews with village officials, BPBD, and community leaders
- Review of RTRW 2022–2042 documents, RPB, and flood incident reports

2.3 Data Analysis Techniques Data were analyzed using the SWOT framework with internal and external factor classification. The SWOT matrix was used to identify strategies.

## **ANALYSIS AND DISCUSSION**

### **3. ANALYSIS AND DISCUSSION**

3.1 Existing Conditions RTRW planning and RPB documents are available, but do not accommodate disaster-prone zoning in detail. Mitigation infrastructure such as sabo dams, drainage canals, and early warning systems have not been built evenly. Community participation in emergency response training is still low. The absence of planning synergy between districts in the area around Lake Toba also exacerbates regional vulnerability.

### 3.2 SWOT Matrix

#### Strengths

- The existence of traditional institutions that play a role in environmental management and disaster mitigation based on local wisdom.
- The potential of natural resources such as forests, green areas, and the existence of DAS (River Basin Areas) which can support disaster mitigation.
- Support local communities who are active in emergency response activities, including disaster volunteers.
- Local policies that are beginning to integrate the principles of sustainable development.

#### Weaknesses

- Lack of adequate flood control infrastructure such as embankments, reservoirs and drainage channels.
- Lack of community capacity in understanding disaster risks, including mitigation and adaptation.
- Limited local government budget for comprehensive disaster management.
- Lack of coordination between local governments and other stakeholders in disaster management.

#### Opportunities

- There are national programs for disaster risk reduction, such as BNPB and the Ministry of Environment.
- Opportunities for collaboration with the private sector, non-governmental organizations, and academics in disaster risk management.
- Development of early monitoring technologies, such as sensor-based early warning systems and weather data analysis.
- Global awareness of the importance of climate change mitigation can be a momentum to strengthen local policies.

#### Threats

- Climate change is increasing the frequency and intensity of flash floods and worsening their impacts.
- Uncontrolled land conversion, such as converting forests into agricultural and residential land.
- Weak law enforcement against environmental violations, such as illegal logging.
- Long-term socio-economic impacts of disasters, such as unemployment and population migration.

### 3.3 Regional Resilience Strengthening Strategy

- Integration of disaster risk analysis in RTRW and RPJMD

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- Increasing technical capacity through HR training and recruitment
- Development of community-based early warning systems
- Revitalization and conservation of watersheds and protected areas
- Synergy in planning between districts in the Lake Toba region



Image. Map of Flash Flood Zones in Humbang Hasundutan Regency.

## DISCUSSION

The results of the SWOT analysis show that strengthening community capacity and multi-sector collaboration are key elements in building regional resilience. Local governments can utilize existing strengths, such as traditional institutions, to socialize locally-based mitigation programs. In addition, educational programs can increase public understanding of the importance of environmental conservation. Technologies such as weather data-based early warning systems can be used to minimize flood risks. Local governments also need to encourage the development of green infrastructure that includes forest rehabilitation and watershed protection. Coordination between various parties, including government, private sector, and community, is crucial to ensure the effectiveness of the designed mitigation strategies. However, challenges such as lack of funding and weak law enforcement still require special attention. Solutions can include increasing budget allocations for disaster management and strengthening regulations related to environmental conservation.

## CONCLUSION

Humbang Hasundutan Regency has sufficient basic planning documents, but its implementation has not been effective in reducing the risk of flash floods. The SWOT analysis shows the importance of synergy between institutions, communities, and risk-based technical planning. The ecological relationship between this area and the Lake Toba area requires a cross-regional and cross-sectoral approach. Key recommendations include increasing institutional capacity, integrating spatial planning with risk analysis, and utilizing funding opportunities for mitigation infrastructure and conservation of the Lake Toba area.

SWOT analysis shows that regional resilience planning in Humbang Hasundutan Regency requires a holistic approach that includes ecological, social, and economic aspects. Strategic recommendations that can be implemented include:

- Strengthening the role of traditional institutions and local communities in disaster mitigation by supporting local wisdom.
- Increasing technical capacity and funding for flood control infrastructure development.
- Development of more robust, evidence-based conservation policies.
- Promotion of early warning and disaster monitoring technology as a preventive measure.

Collaboration between the government, community and private sector is very important to realize strong and sustainable regional resilience.

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