

## Efficiency Analysis of Flood Mitigation Policies in North Sumatra in 2025: An Economic Analysis of Law Perspective

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### Abstract

Flooding is one of the most frequent hydrometeorological disasters in North Sumatra Province, significantly impacting social and economic life as well as regional development. Throughout 2025, the North Sumatra Regional Disaster Management Agency (BPBD) recorded 623 disaster events, 122 of which were floods distributed across various regencies and cities. The high frequency of flooding raises questions regarding the effectiveness and efficiency of the disaster management policies implemented by the local government. This study aims to analyze the efficiency of flood management policies in North Sumatra in 2025 using the perspective of the Economic Analysis of Law. The research employs a normative-juridical method, utilizing both statutory and conceptual approaches. The findings indicate that while flood management policies in North Sumatra possess an adequate legal basis, they still face various implementation challenges—particularly concerning budget utilization efficiency, institutional coordination, and the optimization of prevention-based mitigation. From the perspective of the Economic Analysis of Law, policies oriented toward mitigation and disaster risk reduction are more efficient than those focusing solely on post-disaster response. Therefore, a policy restructuring is required—one that prioritizes the principles of economic efficiency, the reduction of social costs, and the enhancement of community resilience against flooding.

### Keywords

Flood, Disaster Policy, Economic Analysis of Law, Legal Efficiency, North Sumatra



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## INTRODUCTION

Indonesia is a country with a high level of disaster vulnerability due to its complex geographic, geological, climatological, and hydrological conditions. Indonesia's location on the Ring of Fire, coupled with its tropical climate influenced by global climate change, makes various regions in Indonesia vulnerable to natural disasters, both geological and hydrometeorological. One of the most frequent disasters, with a significant impact on people's lives, is flooding. Floods not only

cause physical damage to infrastructure and the environment, but also have a broad impact on economic activity, social stability, public services, and sustainable regional development.

North Sumatra Province is one of the regions with a high level of vulnerability to hydrometeorological disasters, particularly flooding. Diverse topography, high rainfall, land use changes, watershed degradation, and increasing development pressures have led to repeated flooding in various regions of North Sumatra. This phenomenon demonstrates that flooding is no longer simply a natural event but has evolved into a public policy issue requiring a multidisciplinary approach, including legal and economic perspectives. Data from the North Sumatra Provincial Disaster Management Agency (BPBD) indicates that 623 natural disasters will occur across 33 regencies/cities throughout 2025. Of these, 122 floods were recorded, while extreme weather events accounted for 153 and landslides for 107. This data demonstrates that hydrometeorological disasters continue to dominate the disaster landscape in North Sumatra and pose a serious threat to regional development.

The high frequency of flooding in 2025 is closely linked to the increased rainfall intensity in various regions of North Sumatra. The Meteorology, Climatology, and Geophysics Agency (BMKG) noted that throughout 2025, there was a significant increase in hydrometeorological disasters, more than doubling compared to the previous year. This increase correlates with the extreme weather phenomena that occur almost year-round and impact various regions in North Sumatra. In addition to meteorological factors, various studies indicate that the increasing incidence of flooding is also influenced by ongoing environmental degradation. Land conversion, forest destruction, declining watershed capacity, and weak spatial planning control have reduced the environment's ability to absorb and retain rainwater. As a result, heavy rainfall quickly turns into surface runoff, potentially causing flooding and landslides. Various disaster analyses even indicate that damage to upstream river ecosystems is a major factor increasing the risk of flooding in Sumatra, including North Sumatra.

The impact of the 2025 floods in North Sumatra will be significant, both in humanitarian and economic terms. The North Sumatra Regional Disaster Management Agency (BPBD) recorded that disasters throughout 2025 resulted in 380 deaths, 231 injuries, and 66 people missing. Furthermore, more than 1.9 million people were affected, and over 209,000 residents were displaced. Physical damage was also extensive, with more than 11,000 homes severely damaged and hundreds of thousands more affected by flooding..

The magnitude of these impacts demonstrates that flooding is not only a humanitarian issue but also an economic one, resulting in increased social costs. From an economic perspective, losses from disasters include damage to community assets, loss of income, disruption of trade activities, decreased productivity in the agricultural and industrial sectors, costs of relocation of residents, infrastructure rehabilitation, and costs of socio-economic recovery. The greater the losses, the greater the fiscal burden borne by local and central governments.

On the other hand, the government has established various legal instruments to regulate disaster management. These regulations include Law Number 24 of 2007 concerning Disaster Management, Government Regulation Number 21 of 2008 concerning Disaster Management, and various other technical regulations governing mitigation, preparedness, emergency response, rehabilitation, and post-disaster reconstruction. Normatively, this legal framework provides a sufficient basis for the government to implement flood management policies. However, the high frequency and impact of flooding, which continued to occur in 2025, raises questions about the effectiveness and efficiency of implemented policies. The government has implemented various programs to develop flood control infrastructure, normalize rivers, construct retention ponds, and even develop early warning systems. However, various regions continue to experience recurring flooding, resulting in significant social and economic losses. This situation highlights the need to evaluate flood management policies not only from a legal perspective but also from the perspective of efficient use of public resources.

In this context, the theory of Economic Analysis of Law becomes relevant. This theory, developed by Richard A. Posner, views law as an instrument for achieving social efficiency. According to Posner, a legal policy is considered successful if it generates social benefits greater than the costs of implementing it. Therefore, law functions not only as a regulatory tool but also as an instrument that must minimize social costs and maximize public welfare. The application of Economic Analysis of Law in the field of disaster management provides a new perspective that the success of flood management policies is not solely measured by the amount of aid provided or the number of projects implemented, but rather by the extent to which the policy is able to reduce risks, suppress economic losses, reduce casualties, and increase community resilience in the most efficient way. From this perspective, investments in mitigation, environmental conservation, strengthening early warning systems, and controlling spatial planning can be considered more efficient than large expenditures for post-disaster rehabilitation and reconstruction.

Research on disaster law to date has generally focused on institutional aspects, government authority, disaster victim protection, or the implementation of disaster regulations. Studies integrating disaster law with an Economic Analysis of Law approach are still relatively limited, particularly in the context of flood management in North Sumatra. Therefore, this research is novel because it attempts to examine flood management policies from the perspective of legal and economic efficiency. This research can provide theoretical contributions to the development of disaster law studies and practical contributions to the formulation of more effective, efficient, and sustainable public policies. Based on this description, this study aims to analyze the efficiency of flood management policies in North Sumatra in 2025 through an Economic Analysis of Law perspective, while simultaneously formulating a more efficient policy model to reduce disaster risk and minimize socio-economic losses to the community.

## **METHODS**

This research employs a normative legal research method, which positions law as a norm or principle applicable in society. Normative legal research aims to examine and analyze various laws and regulations, legal principles, legal doctrines, and legal concepts related to flood disaster management and the efficiency of public policy from an Economic Analysis of Law perspective. This method was chosen because the focus of the research is to examine the suitability and effectiveness of flood management policies in North Sumatra in 2025 based on the applicable legal framework and to assess their efficiency through a legal economics approach.

The approaches used in this research include a statutory approach, a conceptual approach, and an analytical approach. The statutory approach is conducted by examining various regulations governing disaster management in Indonesia, particularly those related to flood mitigation and management. The regulations focused on in this study include Law Number 24 of 2007 concerning Disaster Management, Law Number 17 of 2023 concerning Health, specifically regarding disaster emergency management, Government Regulation Number 21 of 2008 concerning Disaster Management, Government Regulation Number 22 of 2008 concerning Disaster Assistance Funding and Management, and various regional regulations and government policies related to flood management in North Sumatra Province.

A conceptual approach is used to examine legal theories and doctrines related to disaster law, public policy, and the Economic Analysis of Law theory. This approach is crucial for understanding the concept of legal efficiency, as developed by Richard A. Posner, which emphasizes that law must maximize social benefits with minimized social costs. In the context of this research, this theory is used to analyze the extent to which government-implemented flood management policies deliver greater benefits than the costs incurred in their implementation. Next, an analytical approach was used to evaluate the relationship between applicable legal norms and the implementation of flood management policies in North Sumatra in 2025. The analysis examined the effectiveness of post-disaster mitigation, preparedness, emergency response, rehabilitation, and reconstruction policies, as well as their impact on disaster risk reduction and community economic losses.

The types of legal materials used in this study consisted of primary legal materials, secondary legal materials, and tertiary legal materials. Primary legal materials encompass all laws and regulations related to disaster management and flood risk management policies. Secondary legal materials consisted of scientific books, national and international legal journals, research results, scientific articles,

government agency reports, and policy documents relevant to the research theme. Tertiary legal materials included legal dictionaries, legal encyclopedias, and various other supporting sources that helped explain the concepts and terminology used in the study.

The legal materials were collected through library research, which involved tracing, inventorying, and reviewing various legal sources relevant to the research object. Furthermore, this research utilizes official data and reports from the National Disaster Management Agency (BNPB), the Regional Disaster Management Agency (BPBD) of North Sumatra Province, the Meteorology, Climatology, and Geophysics Agency (BMKG), and government policy documents related to flooding in North Sumatra throughout 2025.

The legal materials were analyzed qualitatively and descriptively, by describing, interpreting, and connecting various legal norms, legal theories, and policy data obtained to address the research questions. The analysis employed an Economic Analysis of Law perspective to assess the efficiency of flood management policies based on cost, benefit, social cost reduction, and optimization of public resource utilization in disaster mitigation and management efforts. The analysis results were then systematically compiled to produce conclusions that can contribute academically to the development of disaster law and provide policy recommendations for the government in realizing a more effective, efficient, and sustainable flood management system.

## **FINDINGS AND DISCUSSION**

### **Flood Management Policy in North Sumatra in 2025**

Floods are a type of hydrometeorological disaster with the highest frequency of occurrence in North Sumatra Province. Geographical conditions characterized by extensive river basins (DAS), high rainfall, and increasingly massive land-use changes make various regions in North Sumatra vulnerable to flooding every year. By 2025, floods will become one of the most prevalent disasters and will have a significant impact on people's lives and regional development. Normatively, disaster management in Indonesia is regulated by Law Number 24 of 2007 concerning Disaster Management. This law emphasizes that disaster management is a shared responsibility between the central government, regional governments, and the community, implemented in a planned, integrated, coordinated, and comprehensive manner. Disaster management is not limited to the time of a disaster, but also encompasses the pre-disaster, emergency response, and post-disaster stages.

In the context of North Sumatra, the 2025 flood mitigation policy was implemented through various programs involving the North Sumatra Provincial Government, the North Sumatra Regional Disaster Management Agency (BPBD), district/city governments, and other relevant agencies. These policies encompass structural and non-structural mitigation activities. Structural mitigation is carried out through the construction and repair of embankments, river normalization, drainage construction, retention ponds, and strengthening of flood control infrastructure. Meanwhile, non-structural mitigation is carried out through the development of disaster risk maps, community capacity building, disaster awareness campaigns, contingency planning, and strengthening of early warning systems.

Despite the implementation of various policies, the reality is that flooding continues to occur repeatedly in various regions of North Sumatra. This situation indicates that the implemented policies have not been fully effective in significantly reducing disaster risk levels. Several factors contributing to this situation include weak spatial planning oversight, increased land conversion, damage to upstream areas, river sedimentation, and low public awareness of the importance of environmental protection.

Furthermore, there remains a lack of synchronization between regional development policies and disaster risk reduction policies. In many cases, infrastructure and settlement development is still being carried out in areas with high flood risk. As a result, the potential for economic and social losses due to flooding continues to increase year after year. From a state administrative law perspective, this situation indicates that flood mitigation policies have not fully implemented the principles of good governance, which emphasize effectiveness, efficiency, accountability, and sustainability in government administration. Therefore, a comprehensive evaluation of implemented policies is necessary to ensure that each policy is truly capable of optimally achieving disaster risk reduction goals.

### **Efficiency Analysis of Flood Mitigation Policies in North Sumatra in 2025 from an Economic Analysis of Law Perspective**

The Economic Analysis of Law theory developed by Richard A. Posner is based on the assumption that law must be able to generate economic efficiency. From this perspective, a legal policy is considered good if it produces benefits greater than the costs incurred to implement the policy. In other words, the law must maximize social welfare through the efficient use of resources. In the context of flood mitigation in North Sumatra in 2025, an efficiency analysis can be conducted by comparing the

costs incurred by the government for mitigation activities with the costs incurred due to the disaster. Theoretically, investment in mitigation and prevention activities should be less expensive than the costs incurred for post-disaster rehabilitation and reconstruction.

However, the facts show that the majority of the disaster budget is still oriented towards emergency response and post-disaster recovery. The government tends to allocate significant funds for social assistance, rebuilding damaged infrastructure, rehabilitating public facilities, and providing assistance to disaster victims. Meanwhile, budget allocations for mitigation and disaster risk reduction remain relatively limited. From an Economic Analysis of Law perspective, this situation demonstrates policy inefficiency. When the government spends more on recovery than prevention, the social costs borne by society increase. These social costs are not only quantifiable economic losses, but also include the loss of human life, disruption to educational activities, decreased economic productivity, and the psychological impact experienced by affected communities. Richard Posner explains that the primary objective of law is to minimize social costs (social cost minimization). In the context of flooding, social costs encompass all losses caused by the disaster, both direct and indirect. Therefore, policies that emphasize prevention and mitigation are actually more in line with the principle of economic efficiency than policies that focus solely on post-disaster response.

Furthermore, the theory of Economic Analysis of Law also emphasizes the importance of cost-benefit analysis. Through this approach, every policy must be evaluated based on the benefits generated compared to the costs incurred. For example, developing a flood early warning system may require significant initial costs, but the resulting benefits in reduced casualties and economic losses far outweigh the investment costs. Similarly, forest rehabilitation and watershed conservation programs require long-term investment but can significantly reduce flood risk. From a legal economics perspective, such policies are more efficient because they generate sustainable social benefits and reduce future disaster management costs. Therefore, it can be concluded that the 2025 flood management policy in North Sumatra does not fully meet the efficiency principle as developed in the Economic Analysis of Law theory. A paradigm shift in policy from a reactive approach to a preventative approach more oriented toward disaster risk reduction is still needed.

### **Recommendations for an Efficient Flood Management Policy Model from an Economic Analysis of Law Perspective**

Based on the analysis, a policy model is needed that integrates disaster law principles with the principle of economic efficiency. The author proposes a model called the E-BANJIR Model (Economic-Based Analysis for Natural Justice and Integrated Resilience).

The E-BANJIR Model is built on five main pillars:

1. Preventive-Oriented Policy

Policies must be oriented toward disaster risk prevention and reduction. The government needs to increase investment in mitigation activities, risk mapping, public education, and strengthening early warning systems.

2. Integrated Spatial Planning

Spatial planning must be a primary instrument in flood risk reduction. Every development policy must consider disaster aspects to avoid creating new vulnerabilities.

3. Green Infrastructure Development

The development of green infrastructure, such as green open spaces, water catchment areas, forest rehabilitation, and watershed conservation, must be a top priority in regional development policies.

5. Digital Disaster Governance

The use of information technology and digital systems for weather monitoring, early flood detection, and disaster management coordination can significantly improve policy efficiency.

The E-BANJIR model essentially aims to shift policy orientation from post-disaster management to community resilience building. This approach minimizes the social costs of flooding, thereby more effectively achieving the legal objective of improving public welfare. Based on the overall analysis, it is clear that the primary problem with flood management policy in North Sumatra lies not in the lack of regulations, but rather in policy implementation and efficiency. Existing regulations provide a strong legal basis, but have not been optimally translated into policies oriented toward risk reduction. Therefore, the Economic Analysis of Law approach provides a new perspective: the success of disaster policies must be measured not only by legality but also by their ability to reduce social costs, maximize public benefits, and create sustainable community resilience. Thus, an efficient flood management policy is a policy that is able to prevent greater losses through appropriate investment in disaster risk reduction and mitigation activities.

## CONCLUSION

Based on the research results on the Efficiency Analysis of Flood Management Policy in North Sumatra in 2025: An Economic Analysis of Law Perspective, it can be concluded that flood management policy in North Sumatra has a strong legal basis, established through Law Number 24 of 2007 concerning Disaster Management and its various implementing regulations. This policy encompasses the stages of mitigation, preparedness, emergency response, rehabilitation, and reconstruction, implemented by the central government, local governments, and various relevant stakeholders. However, the high frequency of flooding and the significant socio-economic impacts resulting from 2025 indicate that the policy's implementation has not been fully effective in reducing disaster risk.

From an Economic Analysis of Law perspective, flood management policy in North Sumatra still faces efficiency issues, particularly in the allocation of public resources. The majority of the disaster budget is still oriented towards emergency response, rehabilitation, and post-disaster reconstruction activities, while investment in mitigation and prevention activities remains relatively limited. As a result, the social costs borne by the community and government remain high, reflected in infrastructure damage, disruption of economic activity, loss of livelihoods, and various other social impacts. This situation demonstrates that reactive policies have not been able to produce the economic efficiency desired by the theory developed by Richard A. Posner.

This study found that preventive policies are more efficient than those focused solely on post-disaster management. Investments in strengthening early warning systems, watershed rehabilitation, spatial planning control, flood control infrastructure development, and community capacity building have been shown to have greater potential to reduce future economic losses and social costs. Therefore, the effectiveness of flood management policies must be measured not only by the success of disaster response efforts, but also by their ability to minimize risks and losses before they occur.

As an academic contribution, this research proposes the E-BANJJIR (Economic-Based Analysis for Natural Justice and Integrated Resilience) Model, which comprises five main pillars: Preventive-Oriented Policy, Integrated Spatial Planning, Green Infrastructure Development, Community-Based Disaster Risk Reduction, and Digital Disaster Governance. This model is designed to create a more efficient, sustainable, and risk-reduction-oriented flood management system. By implementing this model, it is hoped that flood management policies in North Sumatra will be more effective in reducing social costs, increasing the efficiency of

public budget use, strengthening community resilience, and supporting sustainable and equitable regional development.

Overall, this research confirms that the success of flood management policies is determined not only by the existence of adequate regulations, but also by the government's ability to design and implement policies that are economically efficient, legally effective, and responsive to community needs. Thus, the Economic Analysis of Law approach can be an important instrument in evaluating and developing disaster policies that are more adaptive, efficient, and oriented toward community welfare..

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