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THE JURIDICAL-SPATIAL ASPECTS OF POST-DISASTER SPATIAL PLANNING: AN ANALYSIS OF ENVIRONMENTAL LAW ENFORCEMENT IN THE BATANG TORU ECOSYSTEM AREA, GAROGA VILLAGE, SOUTH TAPANULI

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Abstract

Spatial planning in environmentally sensitive areas requires an integrated approach that considers legal certainty, environmental carrying capacity, disaster risk, and the conformity of land utilization with spatial-planning regulations. This study examines the Juridical-Spatial approach to spatial governance and disaster-risk reduction in the Batang Toru–Garoga landscape of South Tapanuli, North Sumatra, with particular attention to the relationship between land-use change, environmental vulnerability, spatial-planning compliance, and administrative enforcement. This study employs a normative-juridical research method supported by secondary spatial, statistical, and disaster-related data. The research applies a Statute Approach and a Case Approach to examine the legal framework governing spatial planning, environmental protection, disaster mitigation, licensing, and administrative sanctions. The findings indicate that the vulnerability of the Batang Toru–Garoga landscape is influenced by the interaction of mountainous topography, hydrological sensitivity, land-use change, forest degradation, and anthropogenic activities. The study further identifies a gap between legally designated spatial functions and actual land utilization, demonstrating the need to integrate disaster-risk maps, environmental carrying-capacity assessments, land-use information, and spatial-planning documents into administrative decision-making. The Juridical-Spatial approach provides a framework for connecting geospatial evidence with legal evaluation, particularly in assessing the conformity of Forest Utilization Business Licenses (PBPH) and other land-use activities with spatial-planning and environmental requirements. Administrative sanctions, including suspension and permit revocation, should be implemented based on verifiable violations, spatial audits, environmental assessments, licensing-compliance evaluations, and transparent procedures. The study concludes that spatial planning should be strengthened as a preventive instrument for environmental protection and disaster-risk reduction. Periodic environmental audits, integrated spatial information, institutional coordination, and legally accountable enforcement are necessary to promote sustainable spatial governance and spatial justice in the Batang Toru–Garoga landscape.

Keywords: Juridical-Spatial Approach; Spatial Planning; Disaster Risk Reduction; Batang Toru; Garoga; Environmental Governance; Administrative Sanctions; PBPH.

INTRODUCTION

Geographically, Indonesia is situated within the “Ring of Fire” and possesses complex hydrometeorological characteristics that generate significant exposure to geological and climate-related hazards. In mountainous areas of Indonesia, landslide susceptibility is strongly associated with the interaction of slope, rainfall intensity, geological conditions, fault structures, land cover, and human activities. The integration of land-use and climatic information is particularly important because changes in land cover can modify surface runoff and increase flood inundation in watershed areas (Ardiansyah, 2022). Similarly, research on watershed land-use dynamics in Indonesia has demonstrated that continuous land-use change can reduce watershed carrying capacity and increase both the frequency and spatial extent of flooding (Haryani, 2023). The importance of land-use regulation is further supported by research on spatial modeling of land-use change, which demonstrates that biophysical characteristics can be used

to identify and project regional land-use dynamics (Setiawan & Yoshino, 2020). These findings establish an important scientific basis for incorporating disaster risk into spatial planning before 2024. In North Sumatra, particularly the South Tapanuli region encompassing the Garoga corridor and the Batang Toru Ecosystem Area, the combination of mountainous topography, forest ecosystems, hydrological sensitivity, and the geological influence of the Sumatran Fault creates substantial environmental vulnerability. Previous studies have shown that slope, rainfall, geological conditions, land cover, and human activities are important determinants of landslide and flood risks (Kuswanda, 2021; Laurance, 2020; Martha, 2017; Nasution, 2020). The Batang Toru landscape is also ecologically significant as the restricted habitat of the critically endangered Tapanuli orangutan (Pongo tapanuliensis), with habitat fragmentation and infrastructure development identified as important conservation concerns (Meijaard, 2021). Land-use changes in Indonesian watersheds have likewise been associated with increased runoff, altered hydrological responses, reduced watershed carrying capacity, and greater flood vulnerability (Ardiansyah, 2022; Atharinafi & Wijaya, 2021; Dharma, 2021; Haryani, 2023; Umar, 2021). More broadly, research on the political economy of land use in Indonesia highlights the governance challenges associated with the utilization of natural forests, indicating that economic interests in land and forest resources may create pressures that need to be addressed through stronger spatial and environmental governance (Soedomo, 2022).

These findings provide a scientific basis for establishing a pre-2024 environmental baseline for the Batang Toru–Garoga landscape. Previous research demonstrates that changes in forest cover, land utilization, erosion, and hydrological characteristics can substantially influence flood and landslide vulnerability, while spatial planning can function as an important non-structural disaster-mitigation instrument (Astuty & Wibowo, 2023; Masrizal et al., 2023; Nursaputra, 2023; Widowati, 2022). More broadly, research on the political economy of land use in Indonesia highlights the governance challenges associated with the utilization of natural forests, indicating that economic interests in land and forest resources may create pressures that need to be addressed through stronger spatial and environmental governance (Soedomo, 2022). Accordingly, the 2023 condition can be used as a reference for assessing subsequent changes in forest cover, critical land, flood frequency, infrastructure damage, population exposure, and agricultural productivity following the 2025–2026 disaster events. The integration of ecological, hydrological, geological, and spatial-planning evidence therefore provides an appropriate foundation for the proposed Juridical-Spatial approach to disaster-risk reduction and environmental governance in South Tapanuli.
The combination of geological, topographical, hydrological, and ecological characteristics therefore makes the region highly sensitive to landslides, flash floods, and ecosystem degradation. The baseline conditions identified for 2023 further demonstrate the importance of integrating environmental carrying capacity and disaster-risk information into spatial planning. In this context, the proposed Juridical-Spatial perspective seeks to connect changes in environmental conditions with spatial-planning compliance, land-use regulation, and administrative law enforcement.

Over the past decade, land-use change associated with economic development has increasingly become an important factor in watershed vulnerability. Scientific studies in Indonesia demonstrate that changes in land cover can alter infiltration, surface runoff, watershed hydrological responses, and ultimately flood hazards. Similar findings have been demonstrated in other Indonesian watersheds, where expansion of built-up areas and reduction of forest cover have contributed to a shift from infiltration-dominated to runoff-dominated hydrological processes (Pratama & Suryanto, 2024). The relationship between land-use change and spatial planning compliance is also demonstrated by Pravitasari et al. (2020), who identify land-cover dynamics and spatial-plan inconsistencies as important issues in regional land management. Likewise, Amalia Tyo et al. (2020) examine the conformity of land-use changes with the Regional Spatial Plan (RTRW) following infrastructure development, demonstrating the importance of evaluating whether actual land utilization remains consistent with legally established spatial planning. These findings reinforce the importance of maintaining environmental carrying capacity as a fundamental consideration in spatial planning. Environmental carrying-capacity analysis can be used to identify the limits of land capability and to determine whether particular forms of development remain compatible with sustainable spatial utilization (Saepulloh et al., 2024).

Within the Batang Toru landscape, the pressure of economic development is particularly significant because forest utilization, infrastructure development, and other anthropogenic activities occur within an ecologically sensitive landscape. Research published in 2024 found that forest clearing and anthropocentric exploitation in the Batang Toru landscape create significant ecological pressures and threaten the long-term sustainability of the habitat of the Tapanuli orangutan (Lesmana et al., 2024). Research concerning the biodiversity of Batang Toru similarly confirms the ecological importance of maintaining the integrity of the forest landscape and its resources (Arief & Mijiarto, 2024). Moreover, recent research on Batang Toru identifies changes in temperature, rainfall, and humidity

patterns associated with climate change, providing an additional basis for considering climate variability in regional environmental and spatial management. Thus, environmental degradation in the upstream watershed cannot be separated from the broader interaction between land-use change, ecological carrying capacity, and changing climatic conditions. Spatial planning law—as stipulated in Law No. 26 of 2007, as amended through Law No. 6 of 2023 concerning the enactment of the Job Creation Law framework—should function not merely as an instrument for allocating development space but also as a preventive mechanism for environmental protection and disaster-risk reduction. Recent legal scholarship demonstrates that spatial planning has an important role in preventing environmental degradation and disaster risks through the control of land utilization and the enforcement of spatial regulations (Nugroho et al., 2024; Safitri, 2024). The legal dimension of land-use conformity is also reflected in research examining land rights applications in relation to existing spatial utilization, which demonstrates the importance of aligning land rights and land utilization with the applicable spatial framework (Rangkuti & Lubis, 2020). Spatial planning audits can provide an evidence-based mechanism for identifying inconsistencies between actual land utilization and legally established spatial plans, while also supporting subsequent law-enforcement measures (Safitri, 2024). Likewise, recent research on the implications of the Job Creation Law demonstrates that changes in spatial-planning regulation have created challenges in balancing investment facilitation with environmental sustainability.

The problem becomes more complex when sectoral permits issued by central authorities overlap or conflict with regional spatial plans. Recent research on spatial-planning enforcement in Indonesia indicates that effective control requires stronger coordination between governmental institutions, clearer monitoring mechanisms, and enforcement measures capable of balancing investment interests with environmental protection (Nugroho et al., 2024). The problem of fragmented spatial governance has also been identified in Indonesian spatial-management research, which highlights the challenges of achieving integrated spatial planning when regulatory and institutional responsibilities are fragmented (Widiatedja, 2021). Similarly, Demonstrate that discrepancies between actual land use and spatial-planning documents can create significant burdens for regional development planning. Against this background, this study proposes a "Juridical-Spatial" perspective that integrates legal certainty, spatial planning, environmental carrying capacity, and geospatial evidence as an approach to post-disaster governance. 2025).

Accordingly, the study examines the government's post-disaster regulatory response, including the evaluation and potential revocation of Forest Utilization Business Licenses (PBPH), as an instrument of administrative and environmental law enforcement. Such regulatory evaluation should also consider the conformity between land utilization and spatial planning instruments. Lukman et al. (2021), through an integrated assessment of land-use change, land-use observations, and spatial planning analysis, demonstrate the importance of combining spatial evidence with community and land-use information in evaluating changes in land utilization. The revocation of a permit should, however, be based on verifiable evidence of legal or environmental violations, supported by spatial audits, environmental assessments, permit-compliance evaluations, and transparent administrative procedures.

LITERATURE REVIEW

Disaster Mitigation-Based Spatial Planning Concept

Disaster mitigation-based spatial planning is a planning approach that integrates disaster risk assessment into the processes of spatial allocation, spatial utilization, and spatial-utilization control. Recent studies demonstrate that spatial planning must consider the physical characteristics and environmental carrying capacity of an area because uncontrolled land utilization may increase environmental degradation and disaster vulnerability. Safitri (2024), for example, emphasizes that spatial planning plays an important role in disaster prevention by ensuring that land use remains compatible with environmental carrying capacity, while spatial planning audits can support law enforcement through comprehensive scientific data and analysis.

From a spatial-planning perspective, environmental carrying capacity should therefore become a fundamental consideration in determining the appropriate allocation of land. Saepulloh et al. (2024) demonstrate that environmental carrying-capacity analysis based on land capability can provide an important input into spatial-planning strategies and help ensure that land allocation is consistent with the ecological capacity of an area. Thus, disaster mitigation-based spatial planning should not be limited to identifying hazard-prone locations but should also assess whether existing and proposed land uses remain within the environmental carrying capacity of the landscape. In the context of Tapanuli, the proposed "Juridical-Spatial" concept positions disaster-risk maps, land-use maps, environmental carrying-capacity assessments, and spatial-planning documents as interconnected sources of legal and scientific evidence. Digital spatial information can further strengthen this juridical-spatial approach. Widiatedja et

al. (2024) argue that digital maps of detailed spatial plans play an important role in enforcing spatial-planning regulations because they provide greater clarity regarding permissible areas and enable authorities to identify potential spatial-planning violations. Therefore, disaster hazard maps should not merely be regarded as technical attachments to planning documents; where legally incorporated into spatial-planning instruments, they can function as important evidentiary and regulatory instruments in evaluating the conformity of land utilization and licensing decisions. The juridical-spatial approach is also important because spatial planning may face tensions between investment interests and environmental protection. Nugroho et al. (2024) show that enforcement of spatial-planning violations needs to maintain a balance between investment and environmental sustainability.

Theory of Repressive Administrative Sanctions

Repressive administrative sanctions constitute an important instrument of administrative law enforcement because they are intended to terminate unlawful conduct, restore legal compliance, and prevent continuing environmental harm. In the environmental-law context, administrative enforcement may involve a progressive range of measures, including written warnings, government coercion, suspension or freezing of permits, administrative fines, and permit revocation. Recent research by Wawo (2024) confirms that administrative sanctions for environmental violations may include written warnings, government coercion, freezing of environmental permits, permit revocation, and administrative fines, and that such measures may be imposed by the government in response to administrative violations.

Permit revocation represents a particularly serious form of administrative enforcement and should therefore be applied on the basis of clearly established violations and legally prescribed procedures. Sangki (2024), examining the revocation of mining business permits, explains that violations capable of leading to permit revocation may include environmental damage and administrative violations and that revocation requires stages of violation identification, notification and response, case examination, decision-making, and issuance of the revocation decision. This demonstrates that revocation should not be understood as an arbitrary punitive action but as a legally structured administrative measure.

In the context of environmental and spatial governance, the justification for strong administrative measures becomes more significant when licensed activities generate substantial environmental risks or conflict with spatial-planning requirements. Nugroho et al. (2024) emphasize the importance of enforcing spatial-planning regulations to maintain environmental sustainability, while Safitri (2024) demonstrates that spatial audits can provide scientific evidence supporting enforcement actions. Thus, a decision to suspend or revoke a permit should ideally be supported by spatial audits, environmental assessments, licensing-compliance evaluations, and reliable geospatial evidence. The principle Salus Populi Suprema Lex Esto—understood as the protection of public safety and welfare as a fundamental consideration of governance—can provide a normative foundation for prioritizing public safety and environmental protection when administrative authorities respond to serious environmental risks. Nevertheless, the application of this principle must remain consistent with legality, proportionality, due process, legal certainty, and good governance. The objective of administrative sanctions should therefore extend beyond punishment to include the cessation of violations, restoration of environmental functions, prevention of further damage, and protection of the public interest.

Accordingly, the Juridical-Spatial approach proposed in this study integrates disaster-risk information, spatial-planning conformity, environmental carrying capacity, and administrative-law enforcement into a single analytical framework. Spatial data can identify areas of elevated disaster and environmental risk; spatial-planning analysis can determine whether land utilization conforms to legally established functions; and administrative law can provide corrective and repressive measures when violations are identified. The approach therefore provides a conceptual basis for evaluating whether the suspension, restriction, or revocation of a Forest Utilization Business License (PBPH) is legally and scientifically justified in the context of ecosystem protection and disaster-risk reduction in the Batang Toru landscape.

METHOD

This study employs a normative-juridical legal research method supported by secondary spatial and statistical data. The normative-juridical approach is used to examine the legal framework governing spatial planning, environmental protection, disaster mitigation, and administrative sanctions in Indonesia. The principal legal materials consist of legislation, implementing regulations, and relevant legal doctrines concerning spatial utilization and environmental governance. The research applies two principal approaches: the Statute Approach and the Case Approach. The Statute Approach is employed to examine the provisions of Law No. 26 of 2007 on Spatial Planning, as amended through the regulatory framework established by Law No. 6 of 2023 concerning the Stipulation of

Government Regulation in Lieu of Law No. 2 of 2022 on Job Creation into Law, together with relevant implementing regulations governing spatial utilization, environmental protection, licensing, and administrative sanctions. The analysis focuses particularly on the legal relationship between spatial planning, environmental carrying capacity, disaster mitigation, and government authority to impose administrative sanctions, including the suspension or revocation of business licenses where legally justified.

Supporting data are obtained from Statistics Indonesia (Badan Pusat Statistik/BPS), the Regional Disaster Management Agency (Badan Penanggulangan Bencana Daerah/BPBD) of North Sumatra, relevant government spatial-planning documents, official disaster reports, and available spatial datasets. These data are used to provide empirical and geographical context for the normative legal analysis, particularly in relation to disaster occurrence, land characteristics, population exposure, infrastructure impacts, and regional vulnerability. The legal materials are analyzed qualitatively through legal interpretation and systematic analysis. Primary legal materials are interpreted using statutory, systematic, and contextual approaches, while secondary legal materials—including scientific journal articles, legal scholarship, and expert opinions—are used to develop the theoretical and conceptual framework. Spatial and statistical information is subsequently triangulated with the legal analysis to assess the conformity between land-use practices, spatial-planning provisions, disaster-risk considerations, and administrative licensing. The final analytical stage employs the proposed "Juridical-Spatial" framework, which integrates legal norms with spatial and disaster-risk evidence. Through this framework, the study evaluates whether spatial planning and licensing mechanisms have adequately functioned as preventive instruments and whether administrative measures, including potential license suspension or revocation, can be legally justified as corrective and repressive measures when violations or serious risks to public safety and environmental sustainability are established.

RESULTS AND DISCUSSION

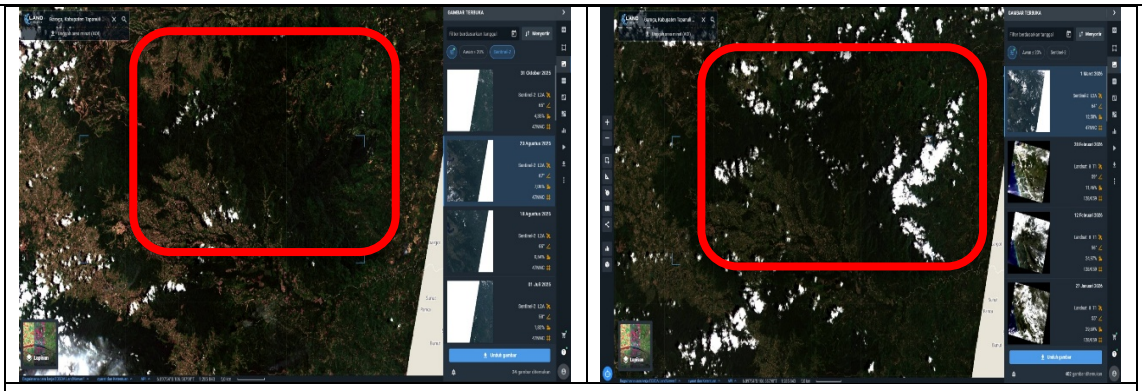
The Juridical-Spatial Dilemma in the Batang Toru Strategic Area

The Batang Toru Ecosystem Area holds a dual status as both a protected area and a target site for national strategic projects. A legal conflict arises when PBPH permits or mining licenses issued by the central government clash with land-use capacity limits established by local authorities. Spatially, concession areas often encompass steep upstream river sections. Following the 2025 disaster, it was revealed that degradation within the riparian zones of these concession areas was the primary cause of the massive volume of water surging down to Garoga.

Factual Conditions Regarding the Vulnerability of the Batang Toru Ecosystem and Garoga Village Garoga Village and the Batang Toru area are characterized by steep, hilly terrain that naturally functions as a water catchment area. However, data indicate a disconnect between the area's designated status on maps and the reality on the ground. The flash flood of December 2025, which carried woody debris, serves as tangible evidence of environmental degradation in the upstream areas.

The table below illustrates the correlation between land-use conversion and the escalation of disasters:

Environmental Indicator	Pre-Disaster Condition (2023)	Post-Disaster Condition (2025/2026)
Primary Forest Cover	±320,000 ha	±285,000 ha
Critical Land Area (Slope >40%)	15% of the area	35% of the area
Flash Flood Frequency per Year	1 event	6 events
Infrastructure Losses	IDR 12.5 billion	IDR 145.2 billion
Number of Residents Evacuated/Affected	Minimal	1,200+ people
Smallholder Agricultural Productivity	Stable	Decreased by 40



Picture 1. Spatial Analysis of Land Cover Change in Garoga Village (2023–2026)

Legal Framework for Revoking PBPH as a Corrective Measure

The revocation of the Forest Product Utilization Business Permit (PBPH) by the Ministry of Forestry—acting through the Forest Area Orderliness Task Force (PKH)—against a corporate entity in Batang Toru represents a legal breakthrough. From a legal standpoint, Article 63 of the Spatial Planning Law mandates the government to impose administrative sanctions, specifically permit revocation, on parties utilizing land in a manner inconsistent with the spatial plan. Analysis indicates that the corporation was deemed negligent in its environmental stewardship duties. This revocation serves not merely as a penalty but as a "freezing" measure intended to prevent further environmental degradation in the Garoga upstream area. The government exercised this discretionary power to restore the land's status to that of a Permanent Protection Forest.

Legal Sanctions Framework for Spatial Planning Violations

In addition to administrative sanctions, the discovery of logs amidst the Garoga flash floods paves the way for criminal law enforcement under Article 69 of the Spatial Planning Law. The corporation could face criminal charges if proven negligent in a manner that resulted in loss of life. Meanwhile, affected communities possess the constitutional right to file a class-action lawsuit based on the principle of strict liability. Under this principle, the burden of proof shifts to the corporation, requiring it to demonstrate that its activities did not contribute to the disaster. Spatial planning law enforcement in the flood-affected areas of North Sumatra is based on Law No. 26 of 2007 concerning Spatial Planning, as partially amended by Law No. 6 of 2023 (Job Creation Law). The following is an analysis of the applicable sanctions:

A. Administrative Sanctions (Preventive Instruments)

These sanctions serve as the "primary tool" for the North Tapanuli and South Tapanuli local governments to regulate corporations or individuals operating within the Batang Toru watershed.

- Written Warning: Issued to developers or landowners in Garoga who undertake construction without adhering to river setback lines.
- Temporary Suspension of Activities: Applied if land-clearing activities are discovered in the upstream Garoga area that do not comply with the spatial utilization permit (IPR).
- Permit Revocation & Restoration of Spatial Function: Under Article 63 of Law No. 26/2007, violators may be compelled to independently reforest land they have denuded. If the 2025 floods are proven to result from illegal land clearing, the government has the authority to permanently revoke the project's location permit.

B. Criminal Sanctions (Strict Enforcement Instruments)

In the context of the Garoga flash floods—which involved the transport of timber debris—criminal provisions become highly relevant:

- Article 69 of the Spatial Planning Law: Any person who fails to comply with established spatial planning regulations (RTRW), resulting in a change of spatial function, is liable to a maximum prison sentence of 3 years and a fine of IDR 500,000,000.
- Article 70 (Consequences Involving Disasters): If a spatial planning violation results in property loss or damage to assets (such as the flash flood that destroyed the bridge in Garoga), the maximum prison sentence increases to 8 years, and the fine rises to IDR 1.5 billion.
- Article 71 (Loss of Life): If a spatial planning violation in Batang Toru results in death, the perpetrator may face up to 15 years in prison. C. Civil Liability (Strict Liability)

Communities affected by flooding in Garoga may invoke the principle of Strict Liability, in accordance with Article 88 of Law No. 32 of 2009 concerning Environmental Protection and Management. Class Action: Garoga

residents who lost their homes due to the flood can sue the company or party responsible for damaging the upstream water catchment area without the need to prove fault through complex means, provided there is a causal link between the damage to the upstream forest and the downstream flooding.

CONCLUSION

Spatial planning failures in Tapanuli stem not from a lack of regulations, but from the disregard of spatial data in legal decision-making. Revoking PBPH (Forest Utilization Business License) permits is a first step toward ecological justice. The government's decisive action—revoking PBPH permits for corporations implicated in causing ecological disasters—is a tangible manifestation of the principle Salus Populi Suprema Lex Esto: the safety of the people is the supreme law. Regarding the Garoga and Batang Toru regions, this revocation is not merely an administrative sanction but a corrective measure addressing the failure of the Regional Spatial Plan (RTRW), which had previously been permissive toward extractive activities in vulnerable zones.

From a legal standpoint, this action affirms that forest utilization permits are not absolute rights but rather a mandate regarding land use—one that can be revoked if the holder fails to preserve the land's hydrological functions. However, permit revocation is only the beginning; the true challenge lies in the aftermath, requiring the central and regional governments to undertake massive environmental remediation to restore water absorption capacity in North Sumatra's upstream river areas. Future spatial planning laws must integrate periodic environmental audit mechanisms, shifting disaster management from a reactive approach to a systemic, preventive one. In doing so, the Batang Toru ecosystem—a strategic area—can truly serve as a protective bulwark for the people of Garoga against future flash flood threats, thereby realizing sustainable spatial justice.

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