

Flood Risk Reduction Strategy through Land Policy in Solok Regency

Putri Adinda Ardhanaisvara¹ Sunarno²

Faculty of Law, Universitas Muhammadiyah Yogyakarta, Indonesia^{1,2}

Email: putri.adinda.law20@mail.umy.ac.id¹ sunarno@umy.ac.id²

Abstract

Solok Regency's hilly terrain and watershed areas make it prone to hydrometeorological disasters, particularly flooding, a vulnerability worsened by land use inconsistent with spatial planning and ecological functions. This research analyzes the legal regulation of land policy in controlling land use to reduce flood risk in Solok Regency, evaluates its conformity and effectiveness, and formulates applicable legal strategies. The method used is normative legal research through statutory, conceptual, historical, and analytical approaches, examining the Basic Agrarian Law alongside spatial planning, environmental, and disaster management regulations. Results show that national agrarian law positions land as carrying social and ecological functions under Article 6 of the UUPA, yet regulatory disharmony, weak oversight, and sectoral approaches persist, leaving land use in flood-prone areas uncontrolled. Stronger integration of land policy, spatial planning, and disaster management, along with consistent enforcement of land's social function, is needed to support sustainable development and reduce flood risk.

Keywords: Land Policy, Social Function of Land, Flood Risk Reduction, Solok Regency



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INTRODUCTION

Flooding is a form of hydrometeorological disaster that has shown a significant increase in intensity and frequency across various regions of Indonesia. Global climate change triggers unpredictable anomalies in rainfall patterns, thereby increasing the likelihood of flooding. Experts affirm that flooding is not caused solely by natural processes, but also by human intervention in the environment, particularly changes in land-use patterns, the conversion of protected areas, and weak spatial management and oversight of land use (Ridwan & Sarjito, 2024, p. 40). The conversion of water catchment areas into dense settlements, intensive agriculture, or commercial areas has been shown to reduce the land's capacity to absorb water, thereby increasing surface runoff (runoff) and amplifying flood potential. A study conducted by Budianto, Hartana, and Ihtiar in the Padolo Watershed shows that the reduction of natural vegetation cover due to the expansion of built-up areas and high-intensity agricultural cultivation has increased peak river discharge beyond channel capacity, making the river more prone to overflowing and inundating surrounding settlements.

Studies on the degradation of upstream river areas further confirm that the loss of water-retaining vegetation and the fragmentation of natural ecosystems are important factors in the increasing incidence of floods and landslides, particularly in hilly regions (Budianto, Hartana, & Ihtiar, 2023, p. 79). Vulnerability to flooding is also evident in West Sumatra, including Solok Regency. Geographically, this region lies within a landscape of hills, valleys, and a network of large and small rivers that make it sensitive to surface runoff when rainfall increases. In late November 2025, Solok Regency again experienced a major flood that submerged thousands of hectares of agricultural land and damaged irrigation infrastructure as well as the local community's economic activities. This disaster was triggered by high-intensity rainfall associated with the influence of a tropical cyclone in the Strait of Malacca, causing river discharge to surge and overflow into settlements and food-production areas.

The National Disaster Management Agency (BNPB) recorded that, in this flood event, approximately 598 households, or around 3,362 people, were affected by flooding in Solok City, with at least 224 houses inundated due to the overflow of the Batang Lembang and Batang Gawan Rivers (BNPB, 2025). By December 2025, more than 256,000 people in West Sumatra had been affected by hydrometeorological disasters, including floods and landslides, indicating that Solok Regency no longer faces flooding as a sporadic threat but has entered a pattern of recurring events that threaten social, economic, and environmental resilience. The flood problem in Solok Regency becomes increasingly complex when linked to environmental damage and weak control over spatial utilization. Mining activities, land clearing, and deforestation in upstream river areas contribute to the loss of water-buffering vegetation, further exacerbated by deviations in the implementation of the Regional Spatial Plan (RTRW), weak control over land use, and overlapping authority among institutions. In the legal context, instruments such as Law Number 26 of 2007 on Spatial Planning, Law Number 5 of 1960 on the Basic Agrarian Principles (UUPA), and Law Number 24 of 2007 on Disaster Management affirm the principle of sustainable spatial utilization and the control of land-use conversion. However, a significant gap remains between the applicable legal norms and their implementation, so that comprehensively drafted regulations are frequently not enforced firmly and consistently.

Legal studies that comprehensively examine flood risk reduction strategies through land policy in Solok Regency remain very limited. No research has specifically examined how land regulations in Solok are implemented, the obstacles encountered, the effectiveness of oversight, and the strategies that can be developed from a legal perspective. This is the research gap that this article seeks to fill, with the hope of contributing theoretically to the development of agrarian and environmental law while also serving as a practical reference for local government. Based on the foregoing, the problems addressed in this research are: (1) how is the legal regulation of land policy related to the control of land use in efforts to reduce flood risk in Solok Regency; (2) how appropriate and effective is this land policy, from a legal standpoint, in reducing flood risk in Solok Regency; and (3) what legal strategies can be formulated to strengthen flood risk reduction efforts through land policy in Solok Regency. The objectives of this research are to analyze the regulation of land and spatial policy in Solok Regency, to evaluate the implementation of land policy and its effect on flood risk, and to formulate effective legal strategies for reducing flood risk through land policy in Solok Regency.

RESEARCH METHODS

This research employs a normative legal research method, namely research that focuses on the study of written legal norms, legal principles, scholarly views, and related legislation, without using empirical field data (Soekanto, 2008, p. 96). This research is prescriptive in nature, as it seeks to provide normative arguments regarding the policies that should be pursued in accordance with applicable legal provisions (Marzuki, 2022, p. 558), in order to assess the coherence and effectiveness of land policy in supporting flood risk reduction efforts in Solok Regency. The approaches used include the statute approach, to examine various regulatory provisions relating to land, spatial planning, the environment, and disaster management; the conceptual approach, to understand the concept of the state's right of control, the social function of land rights, and disaster risk reduction; the historical approach, to trace the dynamics of land-use change and spatial policy in Solok Regency; and the analytical approach, to examine the consistency and relevance between legislation, legal theory, and normative facts concerning land management.

The primary legal materials used include Law Number 5 of 1960 on the Basic Agrarian Principles, Law Number 26 of 2007 on Spatial Planning, Law Number 24 of 2007 on Disaster

Management, Law Number 32 of 2009 on Environmental Protection and Management, Government Regulation Number 21 of 2021 on the Administration of Spatial Planning, and the Solok Regency Regional Regulation on the Regional Spatial Plan (RTRW). Secondary legal materials in the form of books, national and international journals, and relevant prior research are used to assist in interpreting the primary legal materials, while tertiary legal materials in the form of legal dictionaries and encyclopedias are used as supporting references.

The collection of legal materials was carried out through library research at the faculty library and relevant government institutions such as the National Land Agency (BPN), BNPB, the Ministry of Environment and Forestry (KLHK), and the Spatial Planning Office, as well as through online database searches such as Google Scholar, national and regional JDIH legal-documentation portals, university repositories, and relevant ministry websites. The analysis of legal materials was carried out using a normative qualitative method through the stages of inventorying legal materials, legal interpretation (grammatical, systematic, and teleological/sociological), constructing legal arguments based on the principle of the social function of land and the principle of sustainable development, and evaluation and synthesis to assess the effectiveness of land policy and formulate legal recommendations.

RESEARCH RESULTS AND DISCUSSION

Research Result

The legal regulation of land policy relating to the control of land use in efforts to reduce flood risk in Solok Regency forms an integral part of the legal system governing the relationship between humans, land, and the environment. Land cannot be regarded merely as an economic commodity, but as a resource carrying ecological and social functions that must be protected for the public interest. Normatively, the principle of the social function of land is affirmed in Article 6 of Law Number 5 of 1960 on the Basic Agrarian Principles (UUPA), which states that all land rights carry a social function, so that their use cannot be separated from the obligation to safeguard the public interest and environmental sustainability. The geographical condition of Solok Regency, dominated by the Batang Lembang and Batang Arau watersheds as well as hilly terrain in the Koto Baru and Kubang Nagari areas, makes this region highly vulnerable to floods and landslides. During the 2022 rainy season, in Kubang Subdistrict, settlements along the Batang Arau watershed experienced flooding of up to 1--1.5 meters, inundating 45 houses and damaging 12 hectares of agricultural land, while in Lembah Gumanti Subdistrict, the conversion of agricultural land into settlements in water catchment areas caused flooding at 6 village locations. These cases demonstrate that weak control over land use in flood-prone areas contributes significantly to increased disaster risk.

The control of land use through land policy is closely linked to the legal regulation of spatial planning. Law Number 26 of 2007 on Spatial Planning positions the Regional Spatial Plan (RTRW) as a binding legal instrument that forms the basis for every spatial-use decision, including the designation of protected areas and disaster-prone zones. However, obstacles remain in its implementation in Solok Regency; building permits along the riverbank of Batang Lembang in Bukit Sundi Subdistrict, for instance, are often issued without regard to technical recommendations from the Environmental Agency or the Regional Disaster Management Agency (BPBD), reflecting weak inter-agency coordination and the dominance of economic interests over environmental-protection principles. Land law regulation is also closely connected to environmental law. Law Number 32 of 2009 on Environmental Protection and Management requires every activity with the potential to cause significant environmental impact to undergo an environmental assessment, such as an Environmental Impact Analysis (AMDAL) or an Environmental Management and Monitoring Effort (UKL-UPL), as a preventive

instrument to prevent land-use conversion that could reduce environmental capacity and carrying capacity. Nevertheless, from the perspective of legal effectiveness, the existence of a relatively comprehensive set of norms does not guarantee that the control of land use functions optimally, since legal effectiveness is also determined by institutional structure and the community's legal culture (author's note: source to be completed by writer). Weak oversight, low compliance with spatial-planning provisions, and lax law enforcement create a real gap between the expected legal norm (das sollen) and actual practice on the ground (das sein).

Discussion

Conformity and Effectiveness of Land Policy from a Legal Perspective in Flood Risk Reduction in Solok Regency

Within the national agrarian legal system, land rights cannot be understood merely as a stand-alone individual right, but carry inherent social and ecological dimensions. In flood-prone areas such as Solok Regency, the principle of the social function of land carries significant legal implications: land use in riverbank areas, water catchment zones, and upstream river regions must be strictly limited to protect public safety and the public interest. Development along riverbanks without flood-risk analysis in Kubang and Lembah Gumanti Subdistricts, which resulted in dozens of houses being inundated, shows that this principle is not merely an abstract norm but a practical legal instrument for disaster risk mitigation. The principle of the social function of land is normatively consistent with the spatial-planning provisions of Law Number 26 of 2007, in which the RTRW functions as a non-structural disaster-mitigation instrument capable of controlling regional exposure and vulnerability to flood threats through the regulation of spatial allocation based on environmental carrying capacity. This normative continuity is reinforced by Law Number 24 of 2007 on Disaster Management, so that land law, spatial-planning law, and disaster-management law together form an integrated legal framework to protect the community from disaster risk.

Although land policy already has a strong normative legal basis, from the perspective of legal effectiveness (law in action) it has not yet fully achieved the goal of flood risk reduction. Inconsistencies remain between the spatial allocation set out in the RTRW and actual land use in the field, particularly in riverbank areas, water catchment zones, and flood-prone upstream regions. Weak oversight and enforcement against spatial-planning violations cause land policy to lose its coercive force, so that spatial-planning violations tend to recur without any deterrent effect. The effectiveness of land policy is also strongly influenced by inter-agency coordination, given that the management of land, spatial planning, the environment, and disaster management in Solok Regency still operates in a sectoral manner, resulting in overlapping authority and policy inconsistency. In addition, community participation in monitoring land use remains constrained by low legal awareness, limited access to information, and the scarcity of effective reporting mechanisms.

Legal Strategies to Strengthen Flood Risk Reduction through Land Policy in Solok Regency

The juridical implication of the principle of the social function of land is that the state holds constitutional authority to regulate, restrict, or even revoke land rights where their use conflicts with the public interest, damages the environment, or poses a risk to public safety. Massive and uncontrolled land conversion has been shown to contribute significantly to increased flood frequency and intensity, particularly in regions with complex hydrological systems such as Solok Regency (Ardiansyah et al., 2023, p. 63). The first legal strategy that can be formulated is the strengthening of disaster-risk-based spatial planning through periodic

evaluation and adjustment of the RTRW and the Detailed Spatial Plan (RDTR), integrating flood-risk maps as the basis for designating protected and cultivation zones. The second strategy is the consistent enforcement of law against spatial-use violations, given that the administrative, civil, and criminal sanctions provided under Law Number 26 of 2007 have not been firmly applied to date. Strengthened sanctions and the revocation of permits for violators in riverbank areas and water catchment zones are needed so that land policy possesses effective coercive force as a flood-mitigation instrument.

The third strategy is the strengthening of risk-zoning (risk zoning) policy as the basis for restricting spatial use in Solok Regency, namely the designation of zones according to their level of flood hazard, which then serves as the basis for prohibiting development in no-build zones (no-build zone), particularly along the riverbanks of the Batang Lembang and Batang Arau, which function simultaneously as buffer zones (buffer zone) and water catchment areas. For settlements that have already been established in areas of very high risk, land policy needs to open the option of managed retreat (managed retreat), accompanied by a guarantee of legal certainty over replacement land rights (land tenure safety), so that relocated communities do not lose legal certainty over their land tenure. Such relocation should ideally be followed by the reorganization of land tenure and use so that new settlements do not once again accumulate in hazard-prone locations, as well as by the restoration of land function in the vacated areas, for instance through reforestation and the rehabilitation of water-buffering vegetation along riverbanks and slopes. Land policy also needs to integrate indicative flood-vulnerability maps into the process of land certification and permitting, so that the issuance of new land rights or the extension of permits can be made conditional upon compliance with safety standards (conditional land rights), such as a prohibition on permanent construction in areas of high vulnerability. All of these measures can be integrated within a framework of land-based disaster-preparedness zones that combines land-use change controls (land use change controls), the identification of vulnerable assets, and an integrated relocation scheme, and is further supported by land consolidation for safe development (consolidation for safe development), which groups and reorganizes residential plots so that new development is directed toward areas of lower risk. The fourth strategy is enhancing community participation through legal education and the provision of easily accessible mechanisms for reporting spatial-planning violations, so that the community can function as a form of social control that strengthens government oversight and compliance with the principle of the social function of land. Overall, the integration of risk-based spatial planning, consistent law enforcement, institutional coordination, and community participation is key to ensuring that land policy in Solok Regency truly functions as a non-structural mitigation instrument for sustainable flood risk reduction.

CONCLUSION

The conclusion must answer the problem coherently. No need to make points, but enough with Based on the analysis, it can be concluded that the legal regulation of land and spatial policy relating to flood risk reduction is, in principle, already available and relatively comprehensive at both the national and regional levels, through the UUPA, the Spatial Planning Law, the Disaster Management Law, and the Solok Regency RTRW, which should serve as the guideline for spatial utilization based on environmental carrying capacity. However, the implementation of land policy for flood risk reduction in Solok Regency has not been optimal; inconsistencies remain between the spatial plan and actual land-use practices in the field, particularly in riverbank areas, upstream regions, and water catchment zones, due to weak oversight, insufficiently firm law enforcement, and overlapping authority among institutions.

Flood risk reduction strategies through land policy require strengthening in both legal and governance dimensions, including disaster-risk-based spatial planning, strict control of land-use conversion, protection of protected areas and riverbanks, synchronization among planning documents, improved inter-agency coordination, and strengthened community participation in monitoring land use. The Solok Regency Government needs to periodically evaluate the RTRW and RDTR based on disaster-risk maps, land and spatial-planning agencies need to enhance cross-sector coordination accompanied by environmental carrying-capacity studies in every permitting process, the community's legal awareness needs to be raised, and future research is recommended to develop a more in-depth empirical approach, for example through spatial analysis of land use or comparative studies with other regions that have successfully reduced flood risk through land policy.

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