

# Revisiting Deforestation and the Challenges of Social Welfare in the Flood Disaster Discourse in Sumatra: A Literature Review from a Social Ecology Perspective

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## ABSTRACT

Flood disasters that repeatedly affect Sumatra show that hydrometeorological hazards cannot be understood solely as natural phenomena. They are closely linked to environmental degradation, land-use governance, and the social vulnerability of affected communities. This study aims to examine how deforestation is discussed in the literature as part of the discourse on flood disasters in Sumatra, and how the literature addresses its implications for social welfare, especially among vulnerable groups. The study employs a qualitative approach through a literature review of journal articles, government reports, international organization publications, and data-based national reporting. The analysis is conducted descriptively and analytically using Bronfenbrenner's social ecology perspective as the main conceptual framework.

The review shows that the literature consistently positions deforestation as a structural factor that intensifies flood risk and magnifies disaster impacts. However, discussions of social impacts, particularly on poor households, women, children, older persons, and other vulnerable groups, often remain detached from environmental analyses. Most social responses discussed in the literature are still reactive and short-term, emphasizing emergency aid rather than integrating social protection with environmental recovery and disaster risk reduction. This study argues that a social-ecological approach is necessary to connect environmental degradation with the social welfare consequences of flooding in Sumatra. Such an approach is important for developing more holistic, inclusive, and sustainable disaster policies.

**Keywords:** deforestation, floods, Sumatra, social welfare, social ecology, literature review

## ABSTRAK

Bencana banjir yang berulang di Sumatra menunjukkan bahwa bencana hidrometeorologis tidak dapat dipahami semata-mata sebagai fenomena alam. Bencana ini berkaitan erat dengan degradasi lingkungan, tata kelola pemanfaatan lahan, dan kerentanan sosial masyarakat terdampak. Penelitian ini bertujuan menelaah bagaimana isu deforestasi dibahas dalam literatur sebagai bagian dari diskursus bencana banjir di Sumatra, serta bagaimana literatur tersebut mengulas implikasinya terhadap kesejahteraan sosial masyarakat, khususnya kelompok rentan. Penelitian menggunakan pendekatan kualitatif melalui metode kajian literatur terhadap artikel jurnal, laporan lembaga pemerintah, publikasi organisasi internasional, dan pemberitaan nasional berbasis data. Analisis dilakukan secara deskriptif-analitis dengan menggunakan perspektif ekologi sosial Bronfenbrenner sebagai kerangka konseptual utama.

Hasil kajian menunjukkan bahwa literatur secara konsisten menempatkan deforestasi sebagai faktor struktural yang memperbesar risiko banjir sekaligus memperluas dampak bencana. Namun, pembahasan mengenai dampak sosial, terutama terhadap rumah tangga miskin, perempuan, anak-anak, lansia, dan kelompok rentan lainnya, masih sering terpisah dari analisis lingkungan. Sebagian besar respons sosial yang dibahas dalam literatur masih bersifat reaktif dan jangka pendek, dengan penekanan pada bantuan darurat, dan belum mengintegrasikan perlindungan sosial dengan pemulihan lingkungan dan pengurangan risiko bencana. Kajian ini menegaskan pentingnya pendekatan ekologi sosial untuk menghubungkan degradasi lingkungan dengan konsekuensi kesejahteraan sosial akibat banjir di Sumatra. Pendekatan tersebut penting sebagai dasar perumusan kebijakan kebencanaan yang lebih holistik, inklusif, dan berkelanjutan.

**Kata kunci:** deforestasi, banjir, Sumatra, kesejahteraan sosial, ekologi sosial, kajian literatur

## Introduction

Floods and landslides that struck a number of regions in Sumatra towards the end of 2025 revealed an exceptionally large scale of impact. The BNPB emergency dashboard for Aceh, North Sumatra, and West Sumatra recorded 53 affected regencies and municipalities, 1,207 deaths, 138 missing persons, 4,595 displaced households, and 175,050 damaged houses. These figures suggest that the disaster was not merely an episode of extreme weather, but a socio-ecological crisis affecting the lives of communities on a broad scale (BNPB, 2025).

The discourse on flooding in Sumatra cannot be separated from the continuing pressures on Indonesia's forests. The Ministry of Forestry reported that Indonesia's forested land area in 2024 stood at 95.5 million hectares, or 51.1 per cent of the country's total land area, while net deforestation in the same year still amounted to 175.4 thousand hectares. In the global context, the *State of Climate Action 2025* report shows that the world remains far from the level of progress required to halt deforestation in line with efforts to contain the climate crisis. Flooding in Sumatra, therefore, must be interpreted within a broader landscape of declining ecological carrying capacity and the continuing failure to curb forest loss (Kementerian Kehutanan, 2025; Systems Change Lab et al., 2025).

One of the areas most frequently cited in discussions of deforestation in Sumatra is Taman Nasional Tesso Nilo in Riau. Poor et al. demonstrate that Tesso Nilo is one of the protected areas with extremely low conservation effectiveness amidst the pressures of oil palm expansion and land conversion. This study is important because it shows that protected areas in Sumatra are far from immune to the political-economic pressures that drive deforestation (Poor et al., 2019a; Poor et al., 2019b).

At the same time, discussions of flooding in the literature often remain divided between

environmental analysis and social analysis. Environmental studies tend to stop at issues such as forest cover, surface runoff, sedimentation, and the disruption of watershed functions. Social studies, by contrast, focus more on displacement, housing damage, emergency aid, or the recovery of household economies. Yet a wide range of international reports emphasise that vulnerable groups—especially poor households, women, children, older persons, persons with disabilities, and marginalised communities—experience disaster impacts disproportionately because of their limited assets, mobility, access to basic services, and recovery capacities (UNFPA, 2015; UN Women, 2020; UNICEF Indonesia, 2024; World Bank, 2024).

Against this background, this article seeks to examine how deforestation is discussed in the literature as part of the discourse on flood disasters in Sumatra, and how that literature explains the social welfare challenges facing affected communities, particularly vulnerable groups. More specifically, the article addresses three central questions: first, how the literature positions deforestation within explanations of flooding in Sumatra; second, how the literature discusses the social impacts of flooding on vulnerable groups; and third, what forms of social response and policy are discussed in the literature, and to what extent those responses have been integrated with environmental protection agendas.

## Theoretical Framework

This study employs Bronfenbrenner's social ecology perspective as its principal conceptual framework. In his ecological model, Bronfenbrenner explains that human life is shaped by interconnected layers of systems, ranging from the microsystem, which includes family and immediate community, to the mesosystem, which denotes the relationships among these proximate settings, the exosystem, which encompasses institutions and policies that

indirectly influence individual lives, and the macrosystem, which contains broader values, ideologies, and development orientations (Bronfenbrenner, 1994). This framework is particularly relevant when disasters are understood not merely as physical events, but as outcomes of interaction among human beings, social structures, and the environment.

In disaster studies, Boon et al. show that Bronfenbrenner's bioecological theory can be used to model community resilience to natural disasters. This perspective is important because it clarifies that vulnerability and resilience do not arise from a single factor, but from the interweaving relationships among multiple systems. In the case of flooding in Sumatra, deforestation may be understood as a phenomenon located at the level of the exosystem and macrosystem, while loss of livelihoods, disruption of schooling, housing damage, and limitations in social protection become most visible at the micro and meso levels (Boon et al., 2012).

This framework is combined with the concept of social vulnerability. Chambers (1989) argues that vulnerability is not simply a matter of poverty, but a condition in which individuals or groups are exposed to risk while possessing a limited capacity to cope with shocks. Adger (2006) subsequently explains that vulnerability consists of three main elements: exposure, sensitivity, and adaptive capacity. In the context of flooding in Sumatra, vulnerable groups not only live under the threat of floods, but also face constraints in protecting assets, accessing services, recovering incomes, and rebuilding their lives.

From a social welfare perspective, Indonesia's legal framework also provides a strong foundation. UU No. 24 Tahun 2007 affirms that disaster management is the responsibility of both central and local governments and that vulnerable groups must be prioritised in rescue, evacuation, protection, and recovery.

Meanwhile, UU No. 11 Tahun 2009 tentang Kesejahteraan Sosial places social protection, social rehabilitation, and social empowerment as essential components in addressing social problems. This means that floods cannot be addressed through an emergency-response logic alone, but must also be understood as a social welfare problem that requires multi-layered intervention (Pemerintah Republik Indonesia, 2007; Pemerintah Republik Indonesia, 2009).

## Research Method

This study adopts a qualitative approach using a literature review method. This approach was chosen because the aim of the study is not to test causal relationships statistically, but to examine discursive patterns, thematic tendencies, and conceptual relations among deforestation, flooding, and social welfare across relevant written sources. Snyder (2019) argues that a literature review can function as a legitimate research methodology when employed systematically to map knowledge, identify gaps, and generate conceptual synthesis.

The sources of data consist of secondary materials drawn from four principal categories: (1) scholarly journal articles and academic books; (2) official government reports, particularly from the Ministry of Forestry and BNPB; (3) publications by international organisations such as UNICEF, UNFPA, UN Women, and the World Bank; and (4) selective use of data-driven national reporting to capture developments in public discourse. Sources were identified through databases and institutional websites using keywords such as *deforestation*, *floods*, *Sumatra*, *social welfare*, *vulnerable groups*, *social protection*, and *social ecology*.

The analysis proceeded in three stages. First, literature was selected and classified according to thematic focus: deforestation, flood impacts, vulnerable groups, and social response. Second, the sources were read critically in order to identify principal arguments, thematic patterns,

and the interconnections among issues. Third, a descriptive-analytical synthesis was conducted to map how the literature links—or indeed separates—environmental analysis and social welfare analysis. The findings were then interpreted through a social ecology lens in order to illuminate inter-systemic relationships more comprehensively.

## Findings and Discussion

### *Deforestation as a Structural Factor in the Flood Discourse in Sumatra*

The literature analysed reveals a fairly consistent pattern: deforestation is discussed as one of the structural factors that intensify flood risk in Sumatra. The Ministry of Forestry states that although Indonesia still had 95.5 million hectares of forested land in 2024, net deforestation still amounted to 175.4 thousand hectares. At the same time, the *State of Climate Action 2025* report emphasises that global progress towards halting deforestation remains far below what climate action requires. This is significant because, in the disaster literature, floods in forested regions are no longer understood solely as the result of extreme rainfall, but as the cumulative consequence of ecosystem degradation, land-cover change, and weak landscape governance (Kementerian Kehutanan, 2025; Systems Change Lab et al., 2025).

In the Sumatran context, Tesso Nilo frequently appears as one of the clearest examples of deforestation as a structural process. Poor et al. (2019a) show that Tesso Nilo is one of the conservation areas with the lowest effectiveness in preventing deforestation within an oil palm-dominated landscape. Poor et al. (2019b) further estimate that, if current forest loss trends continue, nearly all forest in Tesso Nilo could disappear by the middle of this century. These findings matter not only for conservation, but also for explaining why upstream areas and forested landscapes in Sumatra are increasingly losing their hydrological function as flood

buffers.

**Figure 1.** Summary of the Impacts of Flood and Landslide Disasters in the Provinces of Aceh, North Sumatra, and West Sumatra, 2025



**Source:** Badan Nasional Penanggulangan Bencana (BNPB), *Dashboard Penanganan Darurat Banjir dan Longsor, 2025*.

BNPB's emergency data on the 2025 floods and landslides in Sumatra show that the social consequences were immense: 53 affected regencies and municipalities, 1,207 deaths, 138 missing persons, 4,595 displaced households, and 175,050 damaged houses. In addition, the dashboard records damage to health facilities, educational facilities, places of worship, and basic infrastructure. The scale of these impacts demonstrates that flooding can no longer be read merely as a temporary hydrological event, but as a crisis that binds together environmental degradation, territorial exposure, and the high socio-economic sensitivity of affected communities.

From a social ecology perspective, deforestation operates at the level of the exosystem and macrosystem. It is linked to land-use policy, plantation expansion, weak protection of conservation areas, and development orientations that continue to privilege short-term economic growth. Damage at this level then cascades into the micro and meso levels, where households lose their sense of security, livelihoods are disrupted, social networks come under strain, and communities experience dislocation. Thus, literature that identifies deforestation as a cause of flooding is in fact

moving towards a more structural explanation, even when it does not always explicitly connect that explanation to social welfare.

*Figure 2. Piles of timber accumulated around a mosque damaged by flash floods in Desa Aek Garoga, Kecamatan Batang Toru, Kabupaten Tapanuli Selatan, North Sumatra, 29 November 2025. Antara/Yudi Manar*



Source: *Tempo*

The visual in Figure 2 shows a large volume of timber piled around a mosque damaged by flash floods. The presence of timber on such a scale is an important indication that the flood did not merely bring water, but also material from upstream areas that had already experienced ecological disturbance. The image was published by *Tempo* in its archival coverage of the Tapanuli Selatan disaster and serves as a powerful visual reminder that public discourse on flooding in Sumatra cannot be separated from questions of forest destruction and the degradation of watershed carrying capacity.

### ***Flooding and the Social Welfare Challenges Faced by Affected Communities***

Although the issue of deforestation is discussed quite strongly, the literature analysed here shows that the social impacts of flooding are often described separately. Vulnerable groups—especially poor households, women, children, older persons, and persons with disabilities—are generally recognised as those most severely affected, but explanations of why they are so vulnerable are often not linked closely enough to

wider ecological and economic structures. UNICEF notes that children in Indonesia face heightened risks from climate-related crises and disasters, including flooding, because of the consequences for health, education, protection, and water and sanitation services. UNFPA and UN Women likewise emphasise that women, children, older persons, and other vulnerable groups must be prioritised in emergencies because they possess different levels of capacity, mobility, and protection from other groups (UNICEF Indonesia, 2024; UNFPA, 2015; UN Women, 2020).

From a social welfare perspective, floods do not merely damage houses and infrastructure; they also undermine households' ability to sustain a decent standard of life. Children are at risk of school dropout or interrupted learning because schools are damaged or because their families lose income. Women often bear a double burden in caregiving, household provisioning, and family protection during displacement. Older persons face mobility barriers and greater dependence on others for support. Poor households, which generally possess limited savings, can fall more deeply into poverty after losing houses, tools, livestock, or land. These realities demonstrate that flooding is not simply an environmental issue, but a social welfare issue.

Empirical literature in Indonesia reinforces this point. The study by Fitritinia and Matsuyuki (2022) shows that social protection programmes such as Program Keluarga Harapan can help poor households develop coping strategies before and after floods, but that their effectiveness depends on their connection with social, human, and physical capital. In other words, vulnerable groups require not only assistance when disaster strikes, but also adaptive systems of protection before and after disaster.

Within the social ecology framework, the unequal distribution of flood impacts is not a

social accident. It is the outcome of interactions across different system levels: ecological degradation upstream, development policy, unequal distribution of assets, and weak social protection. Vulnerable groups, therefore, are not merely “victims of nature,” but those most severely affected by the failure to integrate environmental governance and social welfare systems.

### ***Social Responses in the Literature: Predominantly Reactive and Not Yet Integrated***

The studies analysed show that social responses to flooding in Sumatra generally remain centred on emergency assistance: food distribution, clean water provision, health services, evacuation, logistics, and the restoration of basic infrastructure. Such measures are undeniably important and unavoidable during the emergency response phase. However, the literature also indicates that such responses often stop at immediate need fulfilment and are not consistently followed by the strengthening of adaptive social protection systems, livelihood recovery, or the repair of more fundamental social-ecological relations.

Fitritinia and Matsuyuki (2022) demonstrate that social protection can play an important role in building coping strategies for floods, but that programmes such as PKH need to be more strongly integrated with disaster risk management. The World Bank, in *Adaptive Social Protection, Human Capital and Climate Change*, likewise emphasises that post-shock social protection systems must be more gender-responsive, more sensitive to vulnerable groups, and capable of rapid scale-up when disaster occurs. This indicates that policy literature has begun to move towards a more adaptive approach, yet its integration with environmental agendas and disaster risk reduction remains weak.

From a social ecology perspective, effective response should operate simultaneously across

several levels. At the microsystem level, interventions should strengthen families and communities through basic services, psychosocial support, protection of vulnerable groups, and livelihood recovery. At the exosystem level, interventions should target spatial governance, forest rehabilitation, control of land conversion, and reduction of physical exposure. At the macrosystem level, development policy should integrate environmental protection and social protection at the same time. As long as social responses remain detached from environmental agendas, floods will continue to be handled as sequences of emergencies rather than as manifestations of a deeper socio-ecological crisis.

### ***The Limited Integration of Environmental and Social Welfare Analysis***

The most important finding of this review is that the literature still tends to separate two major discourses: the environmental discourse and the social welfare discourse. Environmental studies generally stop at declining forest cover, disrupted watershed functions, and increased surface runoff. Social studies, by contrast, tend to focus on housing damage, displacement, aid, and economic recovery without consistently tracing their connection to deforestation or natural resource governance.

This separation produces only a partial understanding of flooding in Sumatra. Yet it is precisely at the intersection of environmental degradation and social vulnerability that the flood problem becomes most visible. Bronfenbrenner and subsequent bioecological theorists provide a useful framework for bridging this divide. Deforestation, land concessions, forest governance, and development orientations are all part of the wider system that shapes household life at the most immediate level. When forests are degraded, flood risk increases; when flooding recurs, poor households lose assets, children lose educational continuity, women shoulder heavier

burdens, and older persons become more dependent on assistance. This is where the strength of the social ecology approach becomes apparent: it enables flooding to be understood as the outcome of systemic interaction rather than as a self-contained “natural disaster” or an isolated “social problem.”

For that reason, the literature on flooding in Sumatra needs to be pushed further towards interdisciplinary synthesis. Environmental analysis must examine its social welfare implications more explicitly, while social welfare analysis must be more willing to trace the ecological and policy roots that structurally produce vulnerability. Without such integration, public policy will continue to move along two separate tracks: extinguishing downstream social symptoms while failing to address upstream structural causes.

## Conclusion

Based on the literature reviewed, it may be concluded that deforestation is consistently positioned as a structural factor that intensifies both the risk and impact of flooding in Sumatra. The degradation of forest cover weakens the ecological functions of watersheds, increases surface runoff, and exacerbates the intensity of floods and landslides that then affect communities on a wide scale.

This review also shows that the impacts of flooding are not distributed evenly. Vulnerable groups such as poor households, women, children, older persons, persons with disabilities, and marginalised communities bear heavier social burdens because of their limited economic assets, restricted access to basic services, and low adaptive capacity. Flooding causes not only material losses, but also deepens social inequality and heightens the risk of long-term poverty.

However, the literature analysed here still reveals limitations in integrating environmental

analysis and social welfare analysis. Discussion of deforestation often stops at ecological dimensions, while social studies tend to address humanitarian impacts without sufficiently linking them to their structural roots. The social responses discussed also remain predominantly reactive and short term.

Through a social ecology perspective, this article argues that flooding in Sumatra must be understood as the product of a complex interaction among environmental degradation, development governance, and the social vulnerability of affected communities. Consequently, flood management requires a more holistic approach, one that integrates environmental rehabilitation, the strengthening of social protection, and the reform of development policy in ways that are more inclusive and sustainable.

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