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The Dark Side of Palm Oil Licensing: Environmental Degradation and Social Inequality in Sumatra

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***Abstract**: The opening of oil palm land in Sumatra represents a phenomenon with significant economic implications but also generates various social and environmental issues; although it is normatively regulated through various regulations such as the Basic Agrarian Law, the Plantation Law, the Environmental Protection and Management Law, as well as licensing policies and environmental instruments like Environmental Impact Assessment (EIA), in practice there are still various problems in implementation and supervision. This study aims to analyze the regulatory framework for oil palm land opening permits, examine the applicable licensing procedures, and identify the social, economic, and environmental impacts on communities in Sumatra, using a qualitative descriptive method and a literature review. Data were obtained from laws and regulations, government policies, academic journal articles, scholarly books, and relevant research reports, and were then analyzed qualitatively by examining, comparing, and synthesizing these sources to identify patterns, relationships, and key issues. The findings indicate that although the regulatory framework for oil palm land opening permits in Indonesia is relatively comprehensive, its effectiveness remains weak due to policy overlap, weak supervision, and inconsistent law enforcement, and the impacts that emerge are multidimensional, including agrarian conflicts, changes in livelihoods, environmental degradation, and increased disaster risks such as flooding; therefore, there is a need to strengthen regulatory implementation, enhance effective supervision, and integrate policies that are more oriented toward environmental sustainability and community protection.*

***Keywords**: oil palm licensing, environmental regulation, land opening, socio-environmental impacts, Sumatra.*

Introduction

Indonesia is a country with natural resources and biodiversity that are fundamental to the global ecosystem. Indonesia's forests are not just a collection of trees, but also a buffer for climate stability and a habitat for millions of species. Normatively, the state has protected this wealth through Law No. 41 of 1999 on Forestry and Law No. 32 of 2009 on Environmental Protection and Management (PPLH). These two regulations emphasise that forests must be managed sustainably to maintain their ecological functions (Mukau, 2016).

However, the irony is evident on the ground. Despite occupying the third-largest tropical forest area in the world, Indonesia's forests are experiencing alarming degradation (Sutoyo, 2010). According to data from the Directorate General of PKTL KLHK in 2019, Indonesia has 94.1 million hectares of forest, but this figure continues to be eroded by deforestation. Based on the latest data, Indonesia ranks fifth among countries with the highest deforestation rates in the world, losing 1.4 million hectares of forest land at its peak in 2023.

One of the main causes of this reduction in forest area is the expansion of large-scale agricultural and plantation land, including palm oil plantations. This is where the problem

arises on the one hand, plantations are the engine of the economy, but on the other hand, they often clash with environmental interests and the rights of local communities. Land-clearing activities that do not take sustainability into account are categorised as violations of the principles of forest management under Law No. 41 of 1999. The precautionary principle mandated by the Environmental Protection and Management Law is also often ignored in land-clearing by burning and in massive land conversion (Arum et al.).

This issue becomes even more complex when we examine the administrative and legal aspects. The clearing of land for oil palm plantations involves a series of licensing procedures, ranging from Location Permits and Plantation Business Permits (IUP) to Cultivation Rights (HGU). Theoretically, these procedures serve as control instruments, but in reality, there is often overlap between company concessions and community farmland. However, the reality on the ground shows an escalation of conflict when the HGU expires, with communities demanding rights to Agrarian Reform Land (TORA) while companies seek to extend their permits or change their status to Building Use Rights (HGB) for development zones.

The impact of weak regulatory effectiveness is not only ecological, such as flooding and landslides due to the loss of water catchment areas, but also has profound socio-economic consequences. The threat of criminalisation of residents, loss of road access, and land ownership inequality are the residual effects of policies that do not fully favour small communities.

Therefore, this study aims to examine in greater depth the policies and legal instruments governing environmental management at the national and regional levels, evaluate oil palm plantation licensing procedures, and analyse the effectiveness of these regulations in mitigating the negative externalities caused. There are also common pitfalls to avoid. The introduction should not become a collection of quotations without analysis, since citations are meant to support the author's argument rather than substitute for it. It should not include excessive details that belong in the methods or results sections. And most importantly, it should not omit the research purpose, as this would leave readers uncertain about the article's focus.

Methods

This study employs a qualitative methodology with a descriptive research design. The objective is to provide a systematic, factual, and accurate account of various legal and policy sources concerning the establishment of oil palm plantations, their regulatory frameworks, and their subsequent social and agricultural impacts. This approach enables a comprehensive analysis of legal phenomena and policy trends as documented in written records.

This study utilizes secondary data obtained from various legal and academic sources. These encompass a range of documents, including laws, government and regional regulations, public policies, scientific journal articles, academic books, and research reports related to oil palm land clearing and environmental management. Data collection was performed using a systematic literature review. This involved searching for and selecting relevant publications from academic databases, official collections of national and regional legislation, and other authoritative sources. The literature selection process was guided by key criteria: relevance to the research topic, depth of discussion, and source credibility.

Data analysis in this study used a descriptive qualitative approach. The process involved reading the data sources in depth, comparing existing documents, and synthesising their contents to identify patterns, concepts, and key findings. The analysis focused on several key aspects, such as licensing, regulation, environmental impact, causal factors, and the effectiveness of policies related to oil palm land clearing. The

results of this analysis were then compiled and presented narratively, with the aim of providing a comprehensive overview and answering all the research questions set out in the study.

Results and Discussion

Regulatory Frameworks for Oil Palm Land Clearing and Environmental Management: National and Regional Perspectives

The management and clearing of oil palm plantation land in Indonesia are strictly regulated activities due to their significant implications for the environment, spatial planning, and socio-economic dynamics. Therefore, the state has established comprehensive regulatory frameworks, policies, and legal instruments to ensure that plantation activities are conducted in a legal, orderly, and sustainable manner. These regulations encompass business licensing, land acquisition and tenure, environmental conservation, and the mandated oversight and supervision role of local governments.

At the national level, the primary legal foundation for oil palm land management and clearing is the Basic Agrarian Law (Law No. 5 of 1960), commonly referred to as UUPA. This law mandates state control and the utilization of land for the greatest prosperity of the people. Within the framework of oil palm plantations, the UUPA serves as the basis for granting land titles, specifically the Right to Cultivate (Hak Guna Usaha or HGU). This title is a mandatory requirement for plantation companies to establish legal tenure. Without valid land rights, oil palm land-clearing activities are considered unlawful acts or legal violations.

In addition to the UUPA, oil palm plantation activities are also regulated by the Plantation Law (Law No. 29 of 1956 concerning Regulations and Measures relating to Plantation Land), which stipulates that plantation businesses must be carried out in accordance with the principles of sustainability, integration, and environmental awareness. This law regulates the obligations of plantation operators, including business licensing and land management, as well as social and environmental responsibilities. Thus, oil palm land clearing is not only viewed as an economic activity but also as one with legal and environmental implications.(Undang-Undang No. 29 Tahun 1956 Tentang Peraturan-Peraturan Dan Tindakan-Tindakan Mengenai Tanah-Tanah Perkebunan, n.d.)

The regulation of oil palm plantation licensing has undergone significant changes with the enactment of the Job Creation Law, which aims to simplify and integrate the business licensing system. Under this regime, licensing for the clearing and management of palm oil land is carried out through a risk-based business licensing system. Although the procedures have been simplified, business operators are still required to meet basic requirements, including compliance with spatial planning and environmental regulations (Undang-Undang No. 11 Tahun 2020 Tentang Cipta Kerja, n.d.).

In terms of land acquisition, palm oil companies are required to obtain location permits and ensure that the land used is not located in forest areas or protected areas that are prohibited from conversion. This provision is further regulated in various Government Regulations and Presidential Regulations governing spatial planning and land use (Peraturan Pemerintah No. 16 Tahun 2004 Tentang Penatausahaan Tanah, n.d.). Spatial planning serves as a legal instrument to control the use of space to prevent environmental damage or land-use conflicts.

Spatial planning is crucial because oil palm plantation development often overlaps with forest areas, peatlands, and customary territories (Peraturan Pemerintah No. 21 Tahun 2021 Tentang Penyelenggaraan Penataan Ruang, n.d.). Therefore, compliance with the Regional Spatial Plan (RTRW) at the national, provincial, and district/city levels is an absolute requirement before a plantation business permit is granted. If an area is not

designated for oil palm plantations, land clearing in that area may be subject to administrative and criminal sanctions.

The management and clearing of oil palm plantation land are regulated not only by land and business licensing but also by environmental protection and management. This is important because oil palm plantation activities have the potential to cause significant environmental impacts, including changes to the landscape, deterioration of soil quality, disruption of water resources, and social impacts on surrounding communities. Therefore, environmental law is an important instrument for controlling and supervising oil palm land-clearing activities.

One of the main legal instruments in environmental management is the Environmental Impact Assessment (EIA). The EIA is a planning process used to predict, analyse and evaluate the significant impacts of a business plan or activity on the environment. In the context of oil palm plantations, EIA serves as a preventive control tool to ensure that land clearing and management activities do not cause permanent environmental damage and harm the public interest.

Legally, the obligation to conduct an EIA is based on Law No. 32 of 2009 concerning Environmental Protection and Management, which establishes the EIA as one of the instruments for preventing pollution and environmental damage (Undang-Undang Nomor 32 Tahun 2009 Tentang Perlindungan Dan Pengelolaan Lingkungan Hidup, n.d.). The law stipulates that every business and activity that has a significant impact on the environment must have an AMDAL as a condition for obtaining environmental approval. Without an AMDAL, an environmental permit cannot be issued, leaving plantation businesses without a legal basis to operate.

Oil palm plantations are explicitly categorised as businesses that must undergo an Environmental Impact Assessment (EIA), especially for activities of a certain scale. This is confirmed in Regulation of the Minister of Environment and Forestry No. 4 of 2021, which states that oil palm cultivation of a certain size must be accompanied by an EIA because it has the potential to cause significant changes to the environment, such as changes to the landscape, disruption to water sources, and changes to soil quality (Peraturan Menteri Lingkungan Hidup Dan Kehutanan Nomor 4 Tahun 2021, n.d.).

In addition to being an administrative requirement, the AMDAL also has a substantive function as a basis for decision-making in the licensing of oil palm land clearing. The AMDAL document provides a comprehensive assessment of environmental factors, including physical, chemical, biological, socio-economic, and socio-cultural aspects. Thus, the AMDAL not only assesses ecological impacts but also considers social impacts arising from oil palm plantation land clearing (Sentot, 2018).

The preparation of an EIA is carried out by the business initiator at the activity planning stage and must go through several stages, including screening, scoping, preparation of terms of reference, environmental impact analysis, and preparation of environmental management and monitoring efforts. These stages demonstrate that the EIA is a systematic and scientific instrument, and an integral part of the licensing process for oil palm plantation businesses.

The relationship between AMDAL and spatial planning is also very important in oil palm land clearing. The location of the planned plantation must comply with the regional spatial plan. If the proposed location does not comply with the spatial designation, the AMDAL document cannot be assessed and must be returned to the initiator. This provision aims to prevent oil palm land clearing in protected areas or areas not designated for plantation activities.

Thus, the EIA serves as a legal instrument that links licensing, spatial planning, and environmental protection aspects in the management and clearing of oil palm plantation land. The existence of the EIA emphasises that oil palm plantation activities cannot be

carried out solely on the basis of economic interests, but must take into account environmental sustainability and ecological justice as part of the legal responsibility of business actors and the state.

Licensing Procedures for Opening Palm Oil Plantations, Including Location Permits, Mining Permits, Land Use Rights, and Environmental Management Requirements.

Land clearing for oil palm plantations in Indonesia must comply with a licensing system established by law. This regulation aims to create legal certainty, maintain administrative order, and control land ownership and utilisation in accordance with plantation development plans. Through the licensing mechanism, the state exercises its supervisory function to ensure that plantation activities do not cause agrarian conflicts or irregularities in spatial utilisation.

The initial stage in the licensing process begins with the submission of a location permit application. The location permit serves as the legal basis for business operators to acquire and use land in accordance with their plantation activity plans. This permit is granted by the local government based on its authority, taking into account the compatibility of the business plan with the regional spatial plan. In addition, at the location permit stage, companies are required to respect the rights of other parties to the land, including local communities and customary law communities, to prevent future disputes.

After obtaining a location permit, business operators must apply for a Plantation Business Permit (IUP). An IUP is an administrative permit that provides legitimacy to companies to conduct plantation business activities, including cultivation, processing of produce, and integrated plantation businesses. The issuance of an IUP requires the fulfilment of technical aspects, readiness of facilities and infrastructure, a business work plan, and compliance with plantation development policies at the regional and national levels. With an IUP, plantation business activities are under the direct supervision of the government.

The subsequent stage involves applying for the Right to Cultivate (Hak Guna Usaha or HGU). The HGU is a state-granted land title that authorizes plantation companies to use land for agricultural purposes for a designated period. This title is issued only upon the fulfillment of all prior licensing prerequisites, thereby establishing legal certainty concerning land tenure and utilization. Furthermore, the HGU functions as a regulatory instrument to ensure that the allocated land is utilized strictly in accordance with its intended spatial designation (Ramli, 2017).

In addition to obtaining administrative and land-use permits, clearing land for oil palm plantations also requires environmental approval. Every business plan that has the potential to impact the environment must be preceded by the preparation of environmental documents, either in the form of an Environmental Impact Assessment (EIA) or Environmental Management and Monitoring Efforts (UKL-UPL), in accordance with the scale and characteristics of the business. Environmental approval is an important prerequisite for carrying out plantation activities.

Environmental documentation serves as a pivotal legal instrument to ensure that plantation activities adhere to the principles of environmental protection and management. These documents encapsulate environmental management and monitoring plans that business operators must implement to mitigate pollution and ecological degradation. Thus, environmental approvals are not merely administrative formalities; they function as a mechanism of state regulatory oversight to control the ecological impacts of oil palm plantation activities (Rahmadian, Faris, 2020).

In practice, oil palm plantation companies are mandated to implement sustainable

environmental management practices. These obligations encompass controlling land clearing, managing production waste, protecting water resources, and preventing land and forest fires. Furthermore, companies are required to conduct regular environmental monitoring and report their findings to the relevant authorities, thereby demonstrating accountability for their operational impacts.

Beyond environmental obligations, plantation companies are mandated to fulfill social responsibilities through partnerships with local communities. These partnerships are primarily realized through smallholder scheme developments (Plasma), business collaborations, or other initiatives aimed at enhancing the welfare of communities residing in the vicinity of the plantation. Such obligations are designed to foster harmonious relations between corporations and local inhabitants while mitigating the potential for social and agrarian conflicts.

The government holds the authority to oversee the implementation of plantation licensing and environmental management. Should violations of location permits, Plantation Business Permits (IUP), Right to Cultivate (HGU), or environmental obligations be identified, the authorities may impose administrative sanctions, ranging from formal warnings to the revocation of business licenses. Thus, the oil palm licensing system functions as a vital legal instrument to ensure that plantation activities are conducted in an orderly, sustainable, and equitable manner (Runtulalo, 2023).

Socio-Economic and Environmental Implications of Oil Palm Land Clearing Economy

Land clearing for oil palm plantations in East Kalimantan is intrinsically linked to the shifting dynamics of natural resource management policies, spanning from the New Order era to the reform period (Reformasi era). During the New Order regime, large-scale forest exploitation was prevalent, driven by extensive logging export policies, colloquially known as the 'banjir kap' (flood of logs) phenomenon. This policy facilitated massive logging, particularly in the Kutai Regency. Following the 1998 monetary crisis and subsequent reform era, however, many Forest Concession Rights (Hak Pengusahaan Hutan or HPH) holders faced bankruptcy, leading to a significant decline in forestry-based economic activities (Amalia, Rizka, Hadi, Arya, Dharmawan, Lilik B., Prasetyo, Pacheco, 2019).

In response to these conditions, around 2005–2007, the East Kalimantan Provincial Government launched a million-hectare palm oil programme, opening up investment opportunities in oil palm plantations across various districts. This programme brought significant changes to the community's economic structure and livelihoods, particularly in Gunung Sari Village. Prior to the expansion of oil palm plantations, the local community depended on subsistence farming, work as loggers, rubber planters, and fishermen on the Belayan River.

However, as palm oil plantation companies began operating, the community's livelihoods underwent a transformation. The people of Gunung Sari Village gradually converted their scrubland, fields, and gardens into oil palm plantations. This land conversion process became more widespread after the oil palm plantation company had been operating for about 4 years, when the community began to experience more stable and promising economic benefits than in the previous sector. (Ulum, Libasul, Hamdi, 2023)

The oil palm plantation business has been proven to increase household incomes in Gunung Sari Village. This increase in income has enabled capital accumulation, which is then invested in other business sectors, such as boarding houses, swallow farming, and the rental of vehicles for transporting fresh fruit bunches (FFB). In addition to being oil palm farmers, some members of the community also work as labourers or staff in oil palm

plantation companies. This situation shows that the establishment of oil palm plantations has had an economic impact, with increased income and diversification of livelihoods, even as the community's dependence on the oil palm sector has become increasingly dominant.

Social

Beyond economic consequences, the expansion of oil palm plantations has triggered significant social ramifications, primarily manifesting as multidimensional conflicts. These social risks include disputes between independent smallholders and local communities, tensions with regional governments, and adversarial relations between farmers and plantation corporations. A prominent example is the friction between plasma farmers and nucleus companies, particularly concerning the profit-sharing schemes and the implementation of Fresh Fruit Bunch (FFB) quotas. Such disputes often stem from perceived inequities in the nucleus-plasma partnership model (Amalia, Rizka, Hadi, Arya, Dharmawan, Lilik B., Prasetyo, Pacheco, 2019).

The long-standing conflict over plasma profit sharing has prompted plasma farmers to manage and harvest their own oil palm plantations in the plasma area. The harvested palm fruit is then sold to the core plantation company using the land ID of unproductive independent plantations or even using inappropriate land IDs. This practice reflects the weak governance of the partnership between the company and the farmers, and demonstrates the perceived injustice felt by plasma farmers in the contractual relationship.

Efforts to resolve the conflict have been made by the core plantation company, with the involvement of mediators such as the Plantation and Forestry Service. However, to date, no clear and sustainable solution to the conflict has been found. This fact shows that sustainability certifications such as RSPO and ISPO have not been fully effective in preventing and resolving social conflicts at the community level. Thus, the opening of palm oil plantations not only brings economic benefits, but also causes social problems in the form of agrarian conflicts and tensions between communities, companies and the government.

Environment

(1)Fluctuations in Ambient Temperature. The conversion of forest land to oil palm plantations has led to increased direct exposure of the soil surface to sunlight. The loss of forest vegetation, which previously provided shade and regulated the microclimate, has led to higher air temperatures in areas surrounding the plantations. This condition occurs because the structure of oil palm plantations is homogeneous and cannot replace the ecological function of forests in maintaining stable air temperatures. The increase in temperature affects community comfort and indicates a decline in environmental quality. (2) Increasing Frequency of Floods. During the land-clearing stage, the forest's function as a natural water reservoir and protector of the soil from erosion is damaged. Forest cover plays an important role in retaining rainwater through the canopy of trees and a strong root system. When forest cover is removed and replaced with oil palm plantations, rainwater falls directly onto the soil surface without vegetation protection, thereby increasing the risk of soil erosion. Soil erosion carries soil material to lower areas and into river flows. As a result, river water quality declines, characterised by a change in water colour to cloudy or brown. In addition, high sedimentation causes river siltation, reducing the river's capacity to hold water. This condition contributes to increased river flooding in residential areas. In Gunung Sari Village, flooding has been reported to occur more frequently after the expansion of oil palm plantations. In 2005, a major flood caused losses to the local community. (3) Anthropogenic Impacts on Local Biodiversity and Genetic Resources. The conversion of forest land cover to monoculture oil palm plantations has led to a decline in biodiversity. Forests that were previously habitats for various plants

and animals have undergone significant changes in their functions. Various medicinal plants, forest fruits, and natural vegetables commonly used by the community are becoming increasingly difficult to find. In addition, wild animals such as deer, bears, and orangutans have declined in population due to the loss of their natural habitats. This condition shows that oil palm plantations are unable to replace the ecological function of forests as diverse and balanced ecosystems. (4) Reduction in Environmental Services. The clearing of land for oil palm plantations has also contributed to the decline in environmental services previously enjoyed by the community of Gunung Sari Village. These environmental services include the availability of forest vegetables, game animals, fruits, and fish in the river. The reduction in forest cover and the decline in the quality of the river ecosystem have led to the depletion of these natural resources. As a result, the community has difficulty meeting its food needs from the surrounding environment, thereby increasing its dependence on food sources from outside the area. This decline in environmental services demonstrates that environmental damage from oil palm land clearing directly impacts the sustainability of local communities' livelihoods.

Factors Contributing to the Negative Impact of the Flood Tragedy in Sumatra

The recurring floods in various parts of Sumatra in recent years show that this phenomenon cannot be understood simply as the result of high rainfall alone, but rather as the result of complex interactions between natural dynamics, environmental change, spatial management, and the social capacity of communities (Adi, 2013). Analysis of official data, disaster reports, and scientific studies shows that the tragedy's negative impact was exacerbated by a number of interrelated triggering factors and vulnerabilities. The following section explains these factors in greater detail.

(1)Extreme Rainfall and Climate Anomalies as the Main Triggers. Extreme rainfall is a hydrometeorological factor that directly triggers major flooding in Sumatra. Rainfall intensity exceeding 300 mm per day, as recorded during the 2025 North Sumatra floods, is far above the capacity of most rivers in the region. This phenomenon does not occur in isolation but is linked to global atmospheric dynamics, including the presence of Tropical Cyclone Senyar, the Madden-Julian Oscillation (MJO) pattern, and sea surface temperature anomalies (UNESA, 2025). High-intensity rainfall over a short period of time can trigger a drastic increase in water discharge, leading rivers that were previously relatively stable to overflow within hours. In the context of flash floods, high rainfall intensity is a direct trigger factor because surface runoff increases rapidly before it can be absorbed by the soil, especially in areas that have undergone land use change. Therefore, extreme rainfall can be understood as a trigger factor that activates the potential for danger in fragile watershed areas.

(2) Forest Ecosystem Damage and Watershed Degradation. The upper reaches of river basins play a key role in controlling the flow of rainwater. However, in the last two decades, many upstream areas in Sumatra have experienced high anthropogenic pressure. Uncontrolled deforestation for oil palm plantations, illegal logging, and open-pit mining have removed most of the ground-cover vegetation. Forest loss is a major factor contributing to reduced soil water absorption capacity, increased surface erosion, and disrupted slope stability (Nugroho, 2025). Ecologically, forests function as water retention systems that regulate the movement of rainwater through interception, infiltration, and transpiration mechanisms. When forests are cleared, rainwater is no longer adequately retained and flows directly into rivers in large volumes. In addition, the root structure of trees that binds the soil is lost, increasing the vulnerability of landslides in the upper reaches of watersheds. Although the forest land is then converted to oil palm plantations, there are structural differences between trees and oil palms. The most striking difference is in the shape of the roots themselves. Oil palms have fibrous root

structures, which cannot impede water flow as effectively as the roots of trees in general (Sanit, M.S., Poerwati, Ir., & Annisaa Hamidah I. ST., n.d.). The combination of vegetation loss and extreme rainfall creates conditions in which almost all rainwater flows as surface runoff. As a result, flooding not only causes clean water to overflow but also carries large amounts of sediment, mud, and wood, further exacerbating the impact downstream.

(3) Landslides and the Formation of Natural Dams (Natural Dam Failure). One characteristic of flash floods in Sumatra is the occurrence of large upstream landslides that block water flow and form natural dams. This process generally occurs in hilly areas with young volcanic soil that is easily eroded. When heavy rains saturate the soil, slope stability decreases, and landslides occur. Landslide material, consisting of rocks, soil, and tree trunks, often accumulates in river channels. In the early stages, this natural dam holds back water flowing from upstream, forming a large pool behind it. However, because the dam is not structurally stable, as water pressure increases, the natural dam can suddenly burst. When it bursts, water flows at very high speed, carrying large amounts of sediment and producing destructive waves that damage everything in their path. This phenomenon has been recorded in various flash flood events in Sumatra, including the 2024 Marapi cold lava flood and the 2025 Sumatra flood. This mechanism explains why flash floods often occur suddenly, even moments after the rain has stopped (BNPB, 2024).

(4) The Geomorphology of Sumatra Island that Causes Natural Vulnerability. Geomorphologically, the island of Sumatra has a series of Bukit Barisan mountains that stretch lengthwise, forming many small watersheds with steep slopes. This topography causes water to flow rapidly to the lowlands without sufficient sedimentation. Many settlements in Sumatra are located in narrow valleys or on riverbanks fed by mountain streams, making these areas highly vulnerable. Young volcanic material, which dominates the regions of West Sumatra and North Sumatra, is also highly weatherable and erodible. This makes the slopes more prone to landslides, especially when forest cover is lost. In addition, rivers in mountainous areas tend to be V-shaped with fast-flowing currents, so that when discharge increases, the water's kinetic energy increases and amplifies the destructive power of floods.

(5) Sedimentation, River Siltation, and Decreased River Channel Capacity. Deforestation upstream causes high levels of soil erosion. Sediment is then carried by water into rivers, where it settles at the bottom and causes siltation. River siltation is one factor that contributes to flooding in Sumatra, as shallow river channels are unable to drain water effectively when discharge increases. Siltation also alters river flow patterns, making them more prone to flooding even during moderate rainfall. In some cases, sand and rock deposits are carried to bridges, narrowing the flow of water and creating flood-prone areas. This phenomenon is a self-exacerbating cycle. Forest destruction increases sedimentation, sedimentation narrows rivers, and narrow rivers increase the risk of flooding.

(6) Land Use Change and Unsustainable Spatial Management. Land conversion in Sumatra is occurring at a rapid pace without adequate oversight. Many areas that were previously protected forests or water catchment areas have been converted into plantations, settlements, and industrial areas. Neglect of spatial planning regulations has led to many buildings being constructed in disaster-prone areas, such as riverbanks and foothills. When development fails to account for the environment's carrying capacity, the area's ecological functions are lost, and the risk of disasters increases. For example, infrastructure development in floodplains has reduced the space for water to overflow, so that when flooding occurs, water immediately enters residential areas. This situation is exacerbated by weak enforcement of spatial planning laws and a lack of evaluation of Environmental Impact Assessments (EIA/AMDAL).

(7) Limitations of Flood Control Infrastructure and Early Warning Systems.

Although Indonesia has various disaster mitigation policies, the implementation of flood control infrastructure in Sumatra is still minimal. Many areas are not yet equipped with sabo dams, check dams, conservation reservoirs, or sediment control canals. The existence of such infrastructure is very important, especially in river basins that are prone to cold lava or landslides. In addition, flood early warning systems (EWS) have not been installed evenly. In some locations that already have EWS, these facilities do not always function properly or are not well understood by the community. The lack of evacuation training and disaster literacy also exacerbates the situation when floods occur suddenly.

The Effectiveness of Indonesian Regulations and Policies in Preventing the Negative Impacts of Palm Oil Land Clearance in Sumatra

Clearing forests to make way for oil palm plantations in Sumatra is no easy task. This discussion covers the desire to boost a region's economy, manage natural resources, and maintain environmental balance and sustainability. In fact, the government already has several ways to address this issue, including imposing a moratorium on new permits, implementing the Indonesian Sustainable Palm Oil Certification System (ISPO), and requiring an Environmental Impact Assessment (EIA) before clearing land. However, the implementation of these regulations in the field and the prevention of violations remain unbalanced.

Pursuant to Presidential Instruction No. 8 of 2018, the government issued a moratorium on the issuance of new permits for oil palm plantations. The main objective of this policy is to slow the conversion of forests into oil palm plantations to reduce deforestation. However, field studies in Riau Province show that although this policy has formally affected land management, its implementation remains limited. This is due to a lack of enforcement and coordination among various parties at both the local and national levels. Thus, despite its regulatory potential, the moratorium has not consistently been able to curb the expansion of environmentally destructive oil palm plantations (Bahri, Usman, Rianita, Dian, Zefron, Muharni, Zuhdi, 2025).

Furthermore, upon closer examination, this moratorium also faces issues of legal uncertainty and technical weaknesses. Several critical studies have found that it is unclear exactly which types of permits are actually restricted by this policy. This ambiguity has rendered the moratorium ineffective in controlling plantation expansion and has led to varying interpretations and levels of compliance at the regional level (Christiawan, 1945). In addition, much of the literature criticises this moratorium for its administrative nature, lack of legal binding force, and weak monitoring and sanctions. Independent audit reports reveal that the lack of transparency in mapping moratorium areas, weak monitoring, and loopholes that allow permits or land-use changes to continue limit the expected positive impact on the forestry sector (Palm Oil, 2021).

Conversely, the Indonesian Sustainable Palm Oil (ISPO) certification serves as a primary instrument to promote sustainable cultivation practices. Scholarly discourse acknowledges that ISPO has successfully raised awareness of Good Agricultural Practices (GAP) and bolstered the Indonesian palm oil industry's reputation in the global market. However, the efficacy of this certification remains hindered by several challenges, including inadequate field-level oversight and the phenomenon of ‘empty governance’, characterized by a significant gap between policy formulation and local enforcement. Without robust law enforcement mechanisms, ISPO continues to struggle to curb forest expansion and ensure full environmental compliance (Putri, Eka Intan Kumala, Dharmawan, Arya Hadi, Otto Hospes, Otto, 2022).

The broader challenges stem not merely from regulatory frameworks, but also from persistent economic pressures and burgeoning global demand for palm oil. This

escalating demand fuels expansion, while the existing moratorium has lacked sufficient incentives to enhance the productivity of existing land bases without area expansion. Therefore, an integrated policy approach is required, one that combines environmental mitigation strategies with economic stimulus packages targeted at both smallholders and large corporations. This balance is crucial to ensure sustainability goals are achieved without compromising essential local economic development (Suroso, Arif Imam, Alm. Pahan, Iyung, Maesaroh, 2020).

Thus, although the national regulatory framework appears robust, its operational effectiveness at the field level—particularly in Sumatra—remains suboptimal. This shortfall is primarily attributable to inconsistent implementation, fragmented coordination between central and local governments, and inadequate oversight mechanisms. Policies lacking robust enforcement and meaningful stakeholder participation risk diminishing their intended positive impacts, particularly in preventing deforestation, land degradation, and social conflict. Therefore, there is an urgent need to strengthen law enforcement, promote evidence-based governance, and foster better integration between environmental conservation and economic development policies to ensure a more comprehensive approach to impact mitigation.

Conclusion

Normatively, the licensing system, which includes Location Permits, Plantation Business Permits (IUP), Cultivation Rights (HGU), and Environmental Impact Assessment (EIA) requirements, is designed to ensure that plantation activities are orderly, sustainable, and in accordance with spatial planning. However, in practice, implementing these regulations often faces various obstacles, including overlapping policies, weak coordination among agencies, inconsistent supervision, and suboptimal law enforcement. As a result, despite instruments such as the palm oil permit moratorium and Indonesian Sustainable Palm Oil (ISPO) certification, illegal and uncontrolled palm oil land expansion continues, particularly in areas with high economic pressure.

The impact of these regulations' ineffectiveness is multidimensional and interrelated. On the one hand, oil palm plantations have made a significant economic contribution by increasing community income, creating jobs, and stimulating local business growth. However, massive land clearing, mainly through forest conversion, has caused serious environmental degradation, including deforestation, loss of biodiversity, increased microclimates, soil erosion, and river sedimentation. This situation is exacerbated by damage to the watershed's upstream ecosystem, which reduces the soil's ability to absorb rainwater and accelerates surface runoff. In the long term, this increases the region's vulnerability to hydrometeorological disasters, such as flash floods, which are becoming more frequent in Sumatra due to a combination of extreme rainfall, land-use change, and weak flood-control infrastructure.

Socially, the expansion of oil palm plantations has also triggered various conflicts, both between communities and companies, between residents, and between the government and local community groups. These conflicts generally stem from overlapping land claims, unfairness in the plasma-nucleus partnership scheme, and the loss of community access to natural resources that previously supported their livelihoods. Although efforts to resolve these conflicts have been made, the solutions are often temporary and do not address the root causes of the problems, thus creating the potential for renewed tensions in the future.

Therefore, it can be said that the sustainability of the palm oil plantation sector in Indonesia does not only depend on the perfection of regulations, but more on the ability to implement, monitor, and enforce these rules consistently and fairly. A holistic and integrated policy approach is needed, one that not only emphasises legal and formal

aspects but also strengthens community-based governance, data transparency, public accountability, and harmonisation between economic, ecological, and social interests. Without a shared commitment from the government, businesses, and the community to apply the principles of sustainability, the negative impacts of oil palm land clearing will continue to overshadow the achievement of inclusive and environmentally friendly development in Indonesia.

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