pantau gambut

FROM CONCESSIONS TO CONSEQUENCES

A Study on the Causes and Effects of Flood Vulnerability
in Indonesia's Peatland Hydrological Units (KHG)

2025

Pantau Gambut is a non-govermental organization that networks in nine provinces which focuses on research and advocacy, and campaigns for the peatland protection and sustainability in Indonesia.

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EXECUTIVE SUMMARY

This study highlights the destruction of peat ecosystems not only triggers forest and land fires but also recurring acid floods. This study indicates that hydrological degradation due to extractive concessions in Sumatra, Kalimantan, and Papua can increase flood vulnerability.

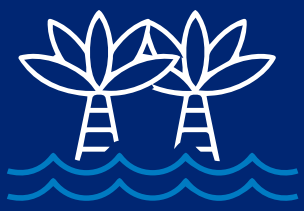
Peatland flooding, characterized by acidic water, serves as a marker of worsening ecological conditions, closely linked to land governance as well as canalization and deforestation practices.

Peatland Flooding: An Ecological and Humanitarian Disaster Caused by Landscape Changes

The narrative on peatland degradation, which has often focused solely on forest and land fires (*karhutla*), must also highlight another significant threat: **flooding**. Peatland floods are not ordinary natural phenomena. They indicate alterations in natural hydrological systems, frequently linked to land conversion by companies holding exploitation permits.

Floodwaters resulting from peatland landscape changes are acidic, potentially affecting water quality, damaging ecosystems, and inhibiting vegetation growth. The impact extends into ecological domino effects, such as greenhouse gas emissions and pollutants. This creates a dual challenge for communities, who must face the threat of forest and land fires smoke in the dry season and recurring flood-related losses in the rainy season.

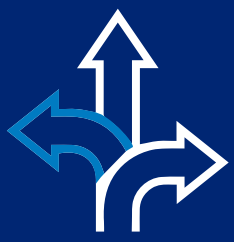
Extractive Concessions and Its Correlation on Peatland Degradation and Flood Risk



In-depth analysis reveals a strong correlation between extractive concessions, peatland degradation, and heightened disaster risks. Practices such as intensive drainage, logging, and the construction of thousands of kilometres of canals by palm oil companies with Cultivation Rights (HGU) and Industrial Plantation Forests (HTI) have systematically altered the hydrological functions of peatlands.

Our study shows that 41% of oil palm plantation HGU lands and 27% of HTI lands within Peat Hydrological Units (PHU) across Indonesia are highly flood-prone. Large corporations managing millions of hectares of PHU have been identified as significant contributors to this flood vulnerability. This confirms that corporate activities have a substantial impact on peat ecosystems.

The Economic-Political Dilemma in Peatland Protection Regulations and Legal Frameworks



Efforts to protect peatlands face serious challenges due to suboptimal regulatory frameworks and weak law enforcement. The absence of a dedicated Peatland Law leaves Government Regulations (PP) vulnerable to being overridden by higher-level laws. This has even led to interpretations that may permit activities in protected peat areas, as stipulated in the Job Creation Law/Omnibus Law.

Meanwhile, the lack of criminal sanctions at the PP level risks limiting the effectiveness of preventive law enforcement. This situation reflects the tension between legal-political considerations for peatland conservation and economic demands. Such an approach risks accommodating corporate extractive activities, which could contribute to peatland degradation and pose long-term risks to both the environment and communities.

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1. BACKGROUND

Peat ecosystem degradation in Indonesia has often been discussed in the context of forest and land fires. This narrative has become a central element in restoration agendas, management policies, and from national to international legal frameworks. While the urgency of forest and land fires induced damage is indeed critical, an excessive focus on it may divert attention from another equally serious ecological threat: flooding.

In the context of peatlands, floods are not merely seasonal hydrometeorological phenomena but rather indicators of disruptions to natural water regulation systems, with far reaching impacts on ecosystems and hydrological cycles.

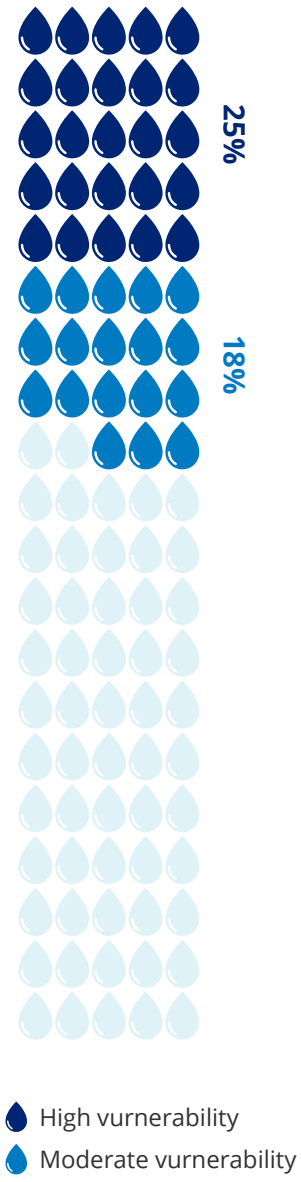
A prior study by Pantau Gambut (2025), titled "Drowned Peatland" found that the degradation of peat's hydrological function is the primary driver of flooding, particularly in areas that have undergone large scale land conversion. The study also revealed that 25% of all Peat Hydrological Unit (PHU) areas in Indonesia fall under the high flood vulnerability category, while 18% are moderately vulnerable.[1]

This study will focus on mapping the distribution and impacts of flooding in PHU areas caused by ecosystem degradation within concession zones.

Flooding problems are intrinsically linked to large-scale land management practices by corporations with full access to capital and government granted permits for exploitation activities.

This information serves to highlight peat ecosystems' essential function as guardians of life for present and coming generations.

Figure 1 Flood Vulnerability in Indonesian Peatland Hydrological Units (KHG)



Source: Pantau Gambut (2025)

1 Pantau Gambut. *Tenggelamnya Lahan Basah: Studi Kerentanan Banjir di Kesatuan Hidrologis Gambut*. 2025. Pantau Gambut.

1.1. Peatland Ecosystem Flooding

Flooding caused by peatland degradation possesses distinct characteristics that differentiate it from flooding in other ecosystems, primarily due to peat soil's unique properties. The key feature is the high concentration of organic acids and phenolic compounds in floodwaters. These substances originate from incompletely decomposed organic material in peat layers.

When excessively accumulated during floods, these compounds can inhibit plant growth and disrupt aquatic ecosystems.[2] This contrasts with flooding in mineral soil ecosystems (e.g., along major rivers or urban areas), where floodwaters are relatively pH-neutral and lack high concentrations of toxic compounds.

The causative factors and mitigation strategies differ fundamentally between these ecosystems. Flooding in mineral soil ecosystems primarily results from heavy rainfall, surface runoff, and poor drainage. Such floods typically recede quickly and are comparatively easier to manage than peatland floods. Standard mitigation measures include river normalization, drainage system improvements, and watershed reforestation, none of which require the prolonged restoration efforts needed to rehabilitate degraded peatland functions.

Figure 2 Comparison of Flood Events in Peatland Ecosystems and Mineral Soil Ecosystems

	Peat Soil Ecosystem	Mineral Soil Ecosystem
Characteristics	Floodwaters have a high acidity level and become hydrophobic when damaged	Floodwaters have a relatively neutral acidity level and their properties remain relatively unchanged
Causes	Land conversion, excessive land exploitation, runoff, high rainfall	High rainfall, runoff, poor drainage, and land conversion
Threats	Inhibits or kills plant growth in flooded areas, severely disrupts aquatic ecosystems, endangers fish and other aquatic organisms	Physical damage to infrastructure, soil erosion, and sedimentation in rivers or settlement
Countermeasures	Peat ecosystem restoration	River normalization, drainage system improvement, upstream and downstream reforestation

In contrast, floods in peatlands generally occur due to land allocation errors by companies that obtain exploitation permits from the government. These mistakes are often followed by excessive canal construction which leads to land subsidence, peat drying, and ultimately

2 Handayani, W. P., Anshari, G. Z., & Indrawati, U. S. Y. V. 2023. *Studi Bakteri Pendegradasi Fenol pada Lapisan Acrotelm dan Catotelm Di Hutan Rawa Gambut*. Pedontropika Jurnal Ilmu Tanah Dan Sumber Daya Lahan, 9(2), 80–88. https://doi.org/10.26418/pedontropika.v9i2.63974

triggers forest and land fires and floods.

Furthermore, the nature of damaged peat soil becomes hydrophobic. As a result, water that should be stored by the peat instead flows freely, creating runoff floods to surrounding areas that should not be affected.

The threat of exploitation by companies continues to endanger peat ecosystems. The impacts are not only on the ecosystems themselves, but also extend to the lives of communities that don't even have direct contact.[3] They will experience prolonged flooding during the rainy season, while forest and land fires smoke just waits its turn to appear when the dry season comes. This problem frequently occurs in several regions of Indonesia such as Kapuas Regency and Pulang Pisau Regency in Central Kalimantan Province, as well as Ogan Komering Ilir Regency in South Sumatra Province

1.2. Not A Seasonal Event

Flooding in peatlands is not part of the natural hydrological cycle but rather an ecological consequence of human activity. This phenomenon results from changes in landscape management, including the government's role in issuing permits followed by extractive corporate activities. Some cases even show flooding can occur without being preceded by heavy rainfall. The alteration of coastal peat soil composition is the primary reason for this occurrence.

Figure 3 Tidal Flood in Dumai Regency, Riau, September 2024

Source: Riau Pos

It is important to remember that peat ecosystems are not only found inland. Many of Indonesia's Peat Hydrological Units (PHU) extend to coastal areas. When coastal peatlands experience land subsidence, seawater more easily intrudes into the land, contaminating freshwater sources. Additionally, the degraded land structure can no longer hold back tidal surges.[4]

3 Forest Digest. *Sulitnya memulihkan gambut rusak*. https://www.forestdigest.com/detail/1193/sulitnya-memulihkan-gambut-rusak

4 Pantau Gambut. *Tenggelamnya Lahan Basah: Studi Kerentanan Banjir di Kesatuan Hidrologis Gambut*. 2025. Pantau Gambut.

The tidal floods in Dumai City and Kepulauan Meranti Regency, Riau Province, serve as clear examples of this impact. Peatland subsidence directly contributes to tidal flooding, which immediately affects local communities. Seawater inundation in urban areas damages vehicles and other metal objects while disrupting traffic flow.

1.3. The Domino Effect of Ecological Damage

Peat ecosystems are naturally formed systems. Therefore, changes in one hydrological unit will create a domino effect on surrounding areas. Highly acidic floodwaters will flow into lower-lying areas, including settlements, larger river systems, or mineral wetlands with more neutral acidity levels.

Although these ecosystems are naturally waterlogged, repeated and prolonged flooding beyond their natural capacity disrupts peat hydrological balance. Flooding caused by degradation also triggers anaerobic decomposition, a process where plant matter decays without oxygen. This process releases harmful greenhouse gases like methane (CH_4), along with various acidic and toxic substances into the water.

Peat that dries out after flooding becomes highly susceptible to fires. These fires produce haze that can spread widely, potentially increasing cases of acute respiratory infections (ARI) and disrupting economic activities such as transportation and tourism. The smoke also contributes to massive carbon emissions into the atmosphere.[5] Beyond accelerating climate change, flooding in degraded peatlands carries sediments, pollutants, and heavy metals that damage soil structure. This may lead to reduced soil fertility due to nutrient leaching (eutrophication) and toxic buildup.

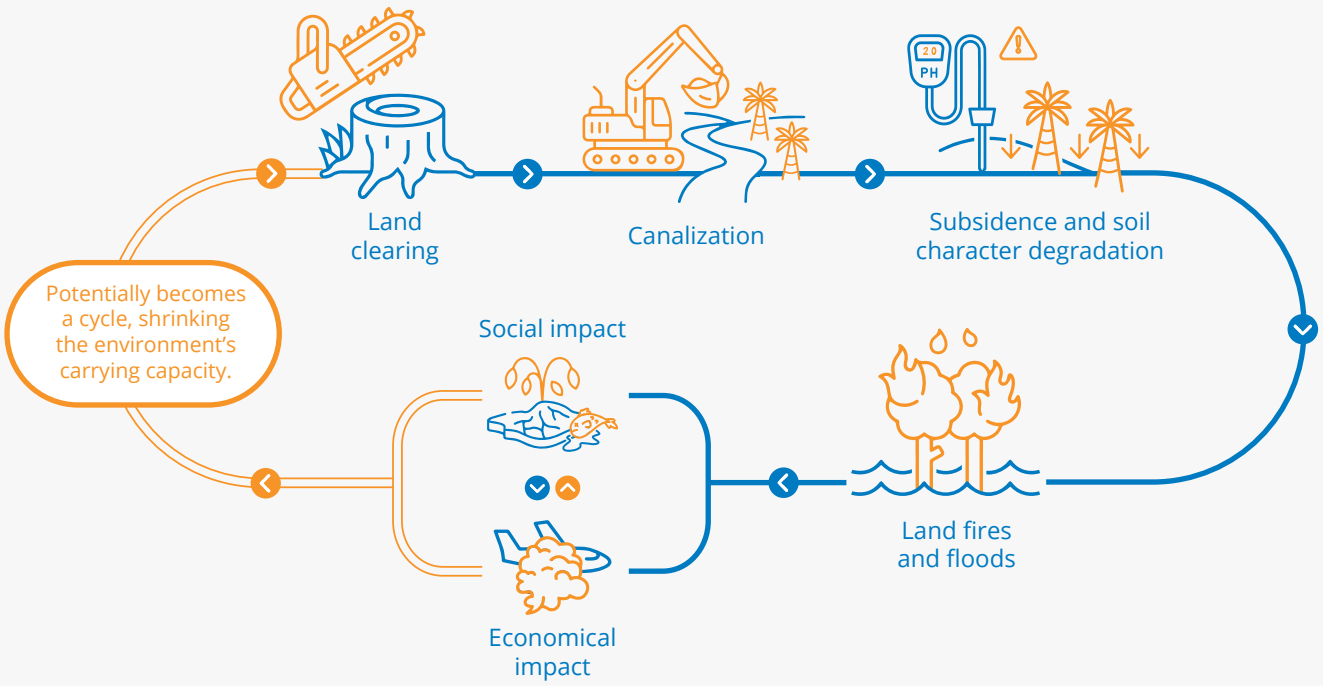
The intrusion of acidic water into ecosystems unsuited to such conditions disrupts aquatic life and surrounding vegetation. Fish, amphibians, aquatic insects, microorganisms, and plants sensitive to these changes face potential extinctions. For example, the 187 km of canals dug during the Mega Rice Project (MRP) or Peatland Development Project (PDP) caused mass fish deaths in the Mangkatip River and Barito tributaries in 1997. This occurred when exposed pyrite layers reacted with air and water, producing toxic acids.

If this floodwater enters agricultural areas, farmers will face real consequences, not only environmentally but also socially and economically. Peat water carrying phenolic compounds and other organic materials is corrosive to agricultural soil. This disrupts the function of soil microorganisms that are essential for fertility, such as decomposing bacteria and nitrogen-fixing bacteria. As a result, agricultural crops may lack essential nutrients needed for growth, and communities that depend on peatlands for agriculture and plantations will face declining productivity due to soil damage and repeated flooding.[6]

5 Lu, X., Zhang, X., Li, F., Gao, L., Graham, L., Vetrita, Y., Saharjo, B. H., & Cochrane, M. A. 2021. *Drainage canal impacts on smoke aerosol emissions for Indonesian peatland and non-peatland fires*. Environmental Research Letters, 16(9), 095008. https://doi.org/10.1088/1748-9326/ac2011

6 Hein, L., Sumarga, E., Quiñones, M., & Suwarno, A. 2022. *Effects of soil subsidence on plantation agriculture in Indonesian peatlands*. Regional Environmental Change, 22(4). https://doi.org/10.1007/s10113-022-01979-z

Figure 4 The Flow of Peatland Ecosystem Damage from Extractive Activities



When this occurs, farmers potentially experience significant financial losses. In addition to crop failure, they must also bear costs to restore soil conditions, for example by spreading dolomite lime. However, financial problems for farmers in Indonesia are not easily resolved.

For farmers with access to capital, this may not be a major issue. But for smallholder farmers, this problem can become a new trap that pushes them to change livelihoods and become dependent on extractive companies. This creates a new vicious cycle of dependency.

The capacity of the environment to support human needs has its limits. Continuous degradation potentially reaches a critical point. When soil becomes increasingly infertile, water gets polluted, and natural disaster intensity increases, agricultural resources will become increasingly depleted. This condition has the potential to trigger increased resource-related conflicts and create broader humanitarian challenges, extending beyond just economic impacts.

As an example, in South Kalimantan, floods caused by peat ecosystem damage in 2021 inundated 226,905 hectares of land. This disaster caused economic losses reaching Rp1.34 trillion and forced 39,000 people to evacuate.[7] Satellite image analysis showed that the flooded areas were within Peat Hydrological Units (PHU) that had been controlled by mining and palm oil concessions.

7 Bioresita, F., Ngurawan, M. G. R., & Hayati, N. 2022. *Identifikasi Sebaran Spasial Genangan Banjir Memanfaatkan Citra Sentinel-1 dan Google Earth Engine (Studi Kasus: Banjir Kalimantan Selatan)*. Geoid, 17(1), 108. https://doi.org/10.12962/j24423998.v17i1.10383

2. FINDINGS

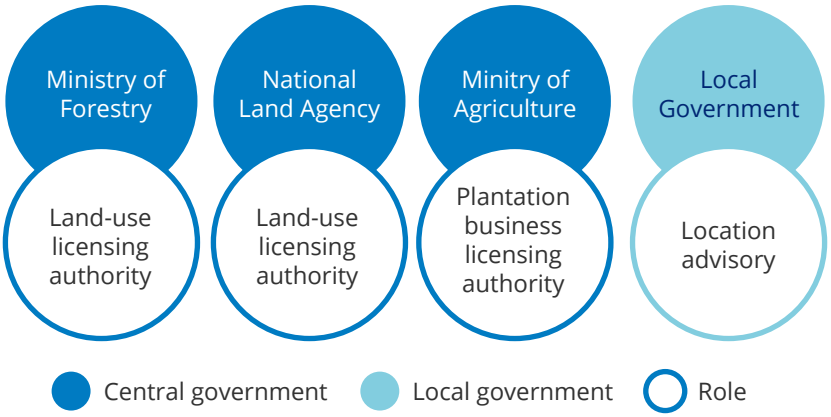
Although occurring in two different seasons, forest/land fires and floods are two interrelated phenomena. In fact, peatlands that experience repeated fires are highly vulnerable to peatland subsidence. Additionally, the water absorption capacity of peat continues to diminish. As a result, the more degraded the peat becomes, the greater the likelihood of more severe flooding in the future.

To illustrate, Pantau Gambut recorded that from 2015 to 2023, a total of 3 million hectares out of 24 million hectares of Peat Hydrological Unit (PHU) areas across Indonesia had burned. This area is equivalent to 45 times the size of Jakarta Province. These large-scale fires occurred primarily during El Niño years, such as 2015, 2019, and 2023. This presents a profound irony for environmental sustainability and livelihoods in Indonesia, given the persistent threats of haze and flooding.

2.1. Concessions as a Source of Flooding

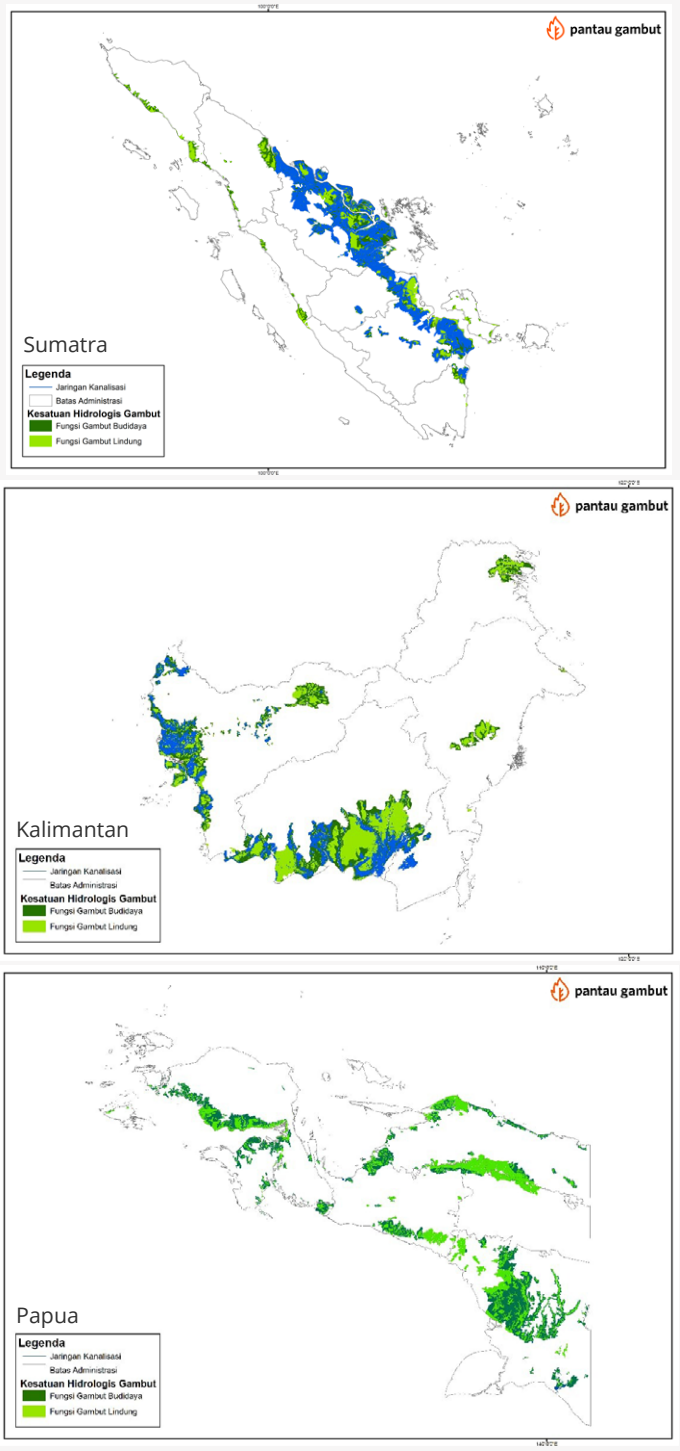
Extractive concessions in peatlands require intensive drainage to dry the land before cultivation. This exploitation process begins with the issuance of concessions granted by the government, involving the Ministry of Forestry (previously the Ministry of Environment and Forestry/MOEF) and the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN), which are responsible for issuing land-use permits. Meanwhile, the Ministry of Agriculture has the authority to issue plantation business permits and the Indonesian Sustainable Palm Oil (ISPO) standards applied to oil palm plantations.

Figure 5 Government's Role in Concession Issuance



Local governments also play a role by providing location permit recommendations and principle permits, including spatial planning changes. Once concessions are issued, companies proceed to drain the land by logging trees and constructing canal networks that divert water out of the hydrological area.

Figure 6 Canalization Distribution Across Three Indonesian Peatland Hydrological Unit (KHG) Regions



Source: Pantau Gambut (2025)

In intact peat ecosystems, water moves slowly through peat pores, allowing vegetation to absorb and release moisture through evapotranspiration. However, artificial canals in concessions accelerate water flow to nearby rivers, drastically reducing the time needed for water to travel from the highest to the lowest points.

Consequently, rainfall that would have been gradually absorbed now becomes large-volume surface runoff, triggering flash floods downstream.

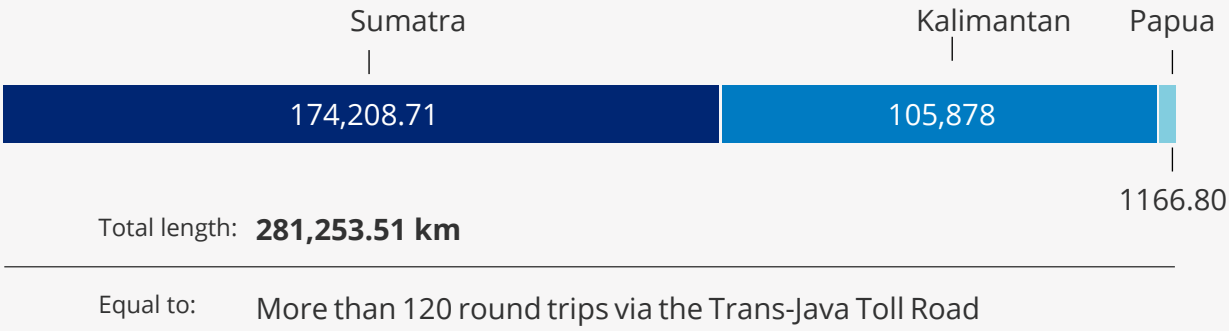
The loss of pristine peat vegetation exacerbates flooding. Natural peat forests have deep root systems and dense canopies that effectively retain rainwater (interception) and release moisture into the atmosphere through transpiration. When companies convert peat forests into monoculture plantations (e.g., oil palm or acacia), this capacity sharply declines.

A study by Jauhiainen et al. (2016) revealed that the evapotranspiration process in oil palm plantations occurs much faster.[8] This means more rainwater flows directly over the ground surface rather than being absorbed by vegetation or peat. Additionally, the shallow roots of monoculture plants cannot stabilize peat structure, accelerating erosion and sediment accumulation that clogs rivers.

In this study, Pantau Gambut recorded that canalization practices by companies continue. We found canal networks spanning 281,253.51 km across Sumatra, Kalimantan, and Papua regions. This number is equivalent to making more than 120 round trips between Banyuwangi and Merak via the Trans-Java Toll Road.

8 Treby, S., Jayasekara, C., Idrus, N., Ningsih, S. N. A., Graham, L. L. B., Hutley, L., Beringer, J., & Grover, S. 2024. *Evapo-transpiration from a drained tropical peatland undergoing restoration*. Authorea (Authorea). https://doi.org/10.22541/au.173400323.34938181/v1

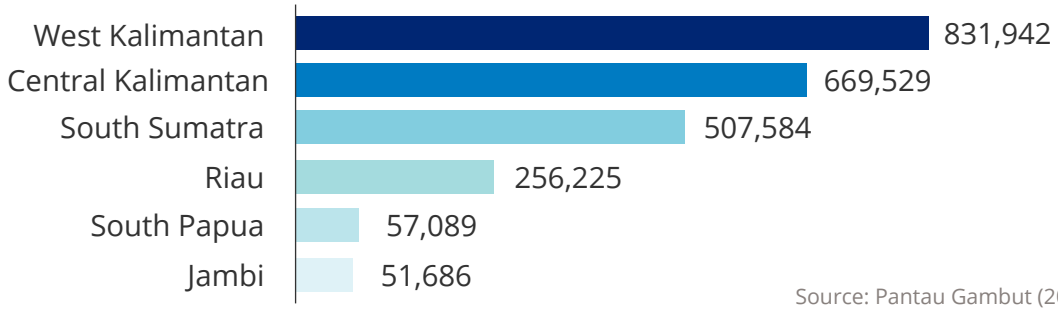
Figure 7 Length of Canal Networks in Indonesian KHGs (km)



Sumber: Pantau Gambut (2021)

This massive canal construction strongly correlates with damage caused by concessions. We identified several palm oil concession holders and Industrial Plantation Forest (HTI) concession holders suspected of causing peat damage. These companies were found to increase flood vulnerability in several PHUs in Indonesia, especially priority PHUs like Sugihan-Lumpur River (South Sumatra) and Kapuas-Barito River (Central Kalimantan). The flooded area in Sugihan-Lumpur River PHU alone reached 427,759 hectares, making it one of Indonesia's highest flood-risk PHUs.

Figure 8 The Six Provinces with the Largest Areas of Flood Vulnerability Caused by Peatland Degradation



Source: Pantau Gambut (2025)

Due to corporate control of peatlands through various permits, floods have now become annual occurrences in several regions. Provinces like West Kalimantan, Central Kalimantan, South Sumatra, Riau, South Papua, and Jambi are examples of areas with very high flood vulnerability due to peat damage from corporate activities.

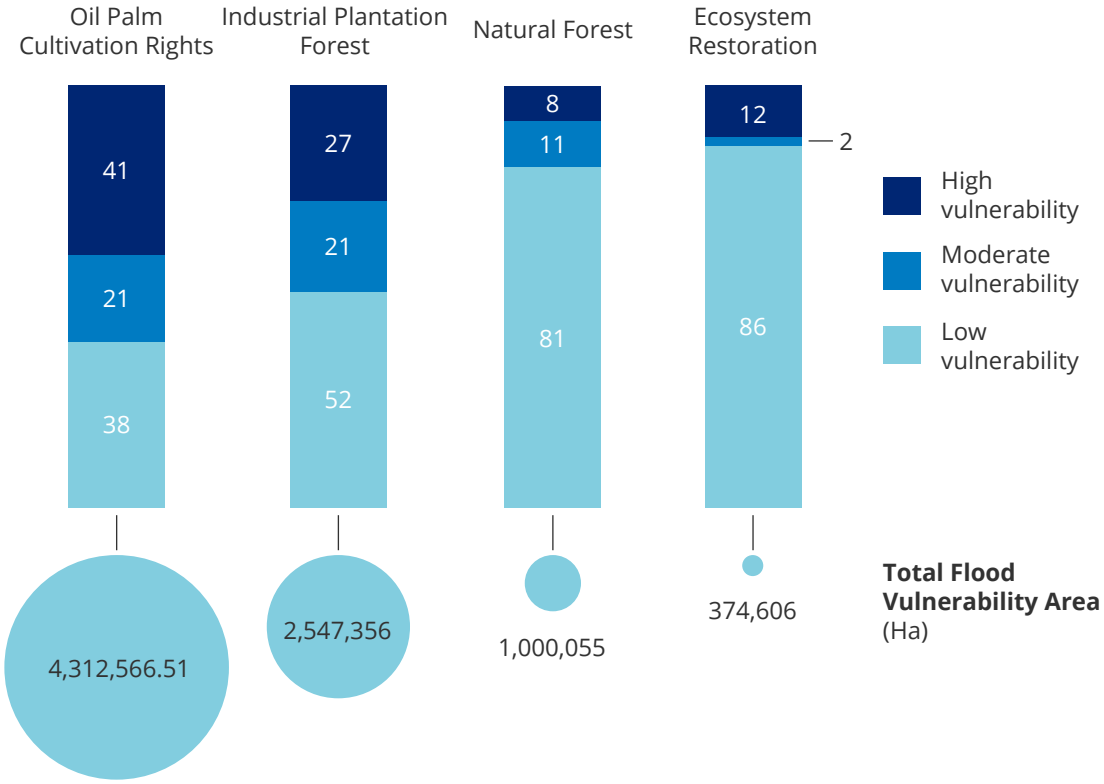
One concrete example is Kubu Raya Regency, West Kalimantan. Floods have now become almost an annual routine in this regency that directly borders Pontianak City. Most of Kubu Raya consists of peat areas that have now been altered by corporate activities. Peatland damage here is marked by land drying due to canalization, and expanding burned areas every year due to land-clearing activities.

2.2. Scale and Distribution of Flood Vulnerability Within Concessions

The findings of Pantau Gambut show that all types of concessions in PHU, both oil palm Cultivation Rights (HGU) and Industrial Plantation Forests (HTI), have widespread and systemic flood vulnerability. As of July 2025, Pantau Gambut recorded control of 8.3 million hectares of KHG by 936 concessions, consisting of Cultivation Rights (HGU), Industrial Plantation Forests (HTI), Natural Forests (HA), and Ecosystem Restoration (RE) concessions. All are spread across three main regions: Sumatra, Kalimantan, and Papua.

More concerning, 41% of oil palm HGU lands and 27% of HTI lands in PHU have high flood vulnerability. These findings strengthen the suspicion that the presence of companies converting peat landscapes into monoculture agricultural lands triggers existing damage.

Gambar 9 Percentage of Flood Vulnerability Area by Concession Type (%)



Source: Pantau Gambut (2025)

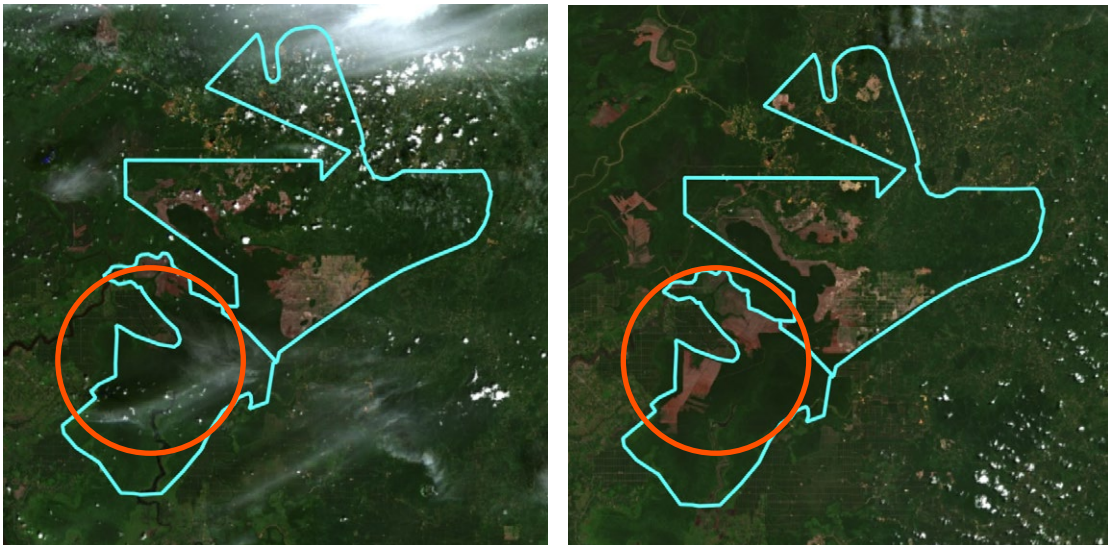
Oil palm HGU concessions dominate the flood vulnerability map across an area exceeding 4.4 million hectares. The monoculture oil palm production model and intensive drainage are the main causes of declining peat absorption function. This system not only drains water out of planting blocks through canals but also significantly lowers groundwater tables, drying peat layers and eliminating their absorption capacity.[9] A similar situation occurs in 2.5 million hectares of HTI concessions typically planted with Acacia and Eucalyptus trees.

The high flood vulnerability in these areas is caused by uncontained water volume due to

9 Wösten, J., Clymans, E., Page, S., Rieley, J., & Limin, S. 2007. Peat–water interrelationships in a tropical peatland ecosystem in Southeast Asia. CATENA, 73(2), 212–224. https://doi.org/10.1016/j.catena.2007.07.010

lost buffer ecosystem functions. This condition confirms that draining peatlands for HTI worsens the area's vulnerability to prolonged inundation, especially during high rainfall and coastal tidal fluctuations.[10]

Figure 10 Comparative Analysis of the Land Before and After Clearing by PT Mayawana Persada

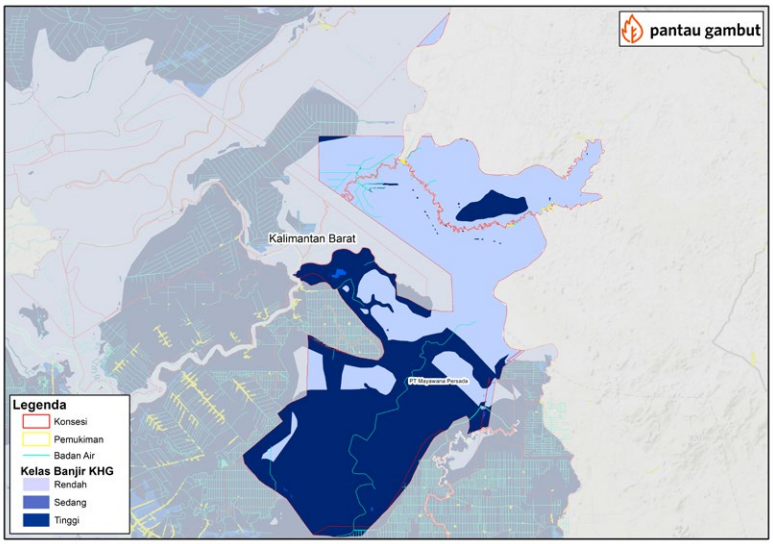


22 November 2022 29 August 2023

PT Mayawana Persada Area Land-cleared area with an approximate peat depth of 3 meters

Source: Data Citra Sentinel 2 by Atlas Nusantara

Figure 11 Flood Vulnerability in Land-Cleared Areas of PT Mayawana Persada



Source: Pantau Gambut (2025)

Pantau Gambut assesses that peatland damage from drainage in concession areas is deeply concerning. Many peatlands, especially in Sumatra and Kalimantan regions, have been cleared and drained through canal construction. A recent example occurred in 2023-2024 when HTI company PT Mayawana Persada in West Kalimantan conducted deforestation and land drainage through canalization to convert land into monoculture plantations.[11] Ironically, this location is a habitat for orangutans and other endemic Kalimantan wildlife now under threat.[12]

10 Jaenicke, J., Wösten, H., Budiman, A., & Siegert, F. 2010. Planning hydrological restoration of peatlands in Indonesia to mitigate carbon dioxide emissions. Mitigation and Adaptation Strategies for Global Change, 15(3), 223–239. https://doi.org/10.1007/s11027-010-9214-5

11 Diadukan sebagai biang deforestasi, Mayawana terus "Oke Gas." (n.d.). betahita.id. https://betahita.id/news/detail/9949/diadukan-sebagai-biang-deforestasi-mayawana-terus-oke-gas-.html?v=1717136935

12 Investigasi: Mayawana Datang, Orangutan Jadi Gelandangan. (n.d.). betahita.id. https://betahita.id/news/detail/10259/investigasi-mayawana-datang-orangutan-jadi-gelandangan.html?v=1716929992

Through satellite imagery monitoring, we found that PT. Mayawana Persada cleared land in protected peat areas over 3 meters deep and massively built canal networks. This land clearing placed the concession area in the high flood vulnerability category and directly impacted local communities who had never experienced floods before. This confirms that even deep peat is now degraded and highly susceptible to ecological disasters.

2.3. Identity of Companies Causing Flood Vulnerability

2.3.1. Oil Palm HGU Concessions

Pantau Gambut identified 243 oil palm HGU concessions that significantly damage peat hydrological units (PHU) and have high flood vulnerability. PT Global Indo Agung Lestari (Genting Group), PT Jalin Valeo (Pasifik Agro Group), and PT Kalimantan Agro Lestari (Best Agro Group) are the three main companies causing the highest flood vulnerability in PHUs. All three have a long history of oil palm plantation expansion in peatlands. These companies' practices weaken the peats natural function as a water absorber and reservoir, making it increasingly vulnerable to hydrometeorological disasters, particularly floods.

Table 1 Top 10 HGU Concessions Exacerbating Flood Vulnerability in PHU

No	Concession Name	Province
1	PT Globalindo Agung Lestari	Central Kalimantan
2	PT Jalin Vaneo	West Kalimantan
3	PT Kalimantan Agro Lestari	West Kalimantan
4	PT Suryamas Cipta Perkasa	Central Kalimantan
5	PT Bahaur Era Sawit Tama	Central Kalimantan
6	PT Rezeki Kencana	West Kalimantan
7	PT Berkah Alam Fajarmas	Central Kalimantan
8	PT Katingan Mujur Sejahtera	Central Kalimantan
9	PT Gawi Bahandep Sawit Mekar	Central Kalimantan
10	PT Dian Agro Mandiri	Central Kalimantan

Source: Pantau Gambut (2025)

2.3.2. Industrial Plantation Forest (HTI) Concessions

Industrial timber plantation companies holding Industrial Plantation Forest (HTI) concessions also pose a serious threat. These companies are government-licensed to cultivate single or multiple tree species as raw materials for industries like pulp and paper. Our identification found at least 145 HTI concessions operating within PHU areas, totalling over 3 million hectares across Sumatra, Kalimantan, and Papua regions. These concessions not only disrupt peat's natural functions but also significantly increase flood risks.

Table 2 Top 10 HTI Concessions Exacerbating Flood Vulnerability in PHU

No	Concession Name	Province
1	PT Bumi Andalas Permai	South Sumatra
2	PT Bumi Mekar Hijau	South Sumatra
3	PT SBA Wood Industries	South Sumatra
4	PT Mayawana Persada	West Kalimantan
5	PT Wana Subur Lestari (Dh. Sari Bumi Kusuma)	West Kalimantan
6	PT Rimba Raya Conservation	Central Kalimantan
7	PT Ceria Karya Pranawa	Central Kalimantan
8	PT Rimba Hutani Mas	South Sumatra
9	PT Sumatera Riang Lestari	Riau
10	PT Damai Setiatama Timber	Papua

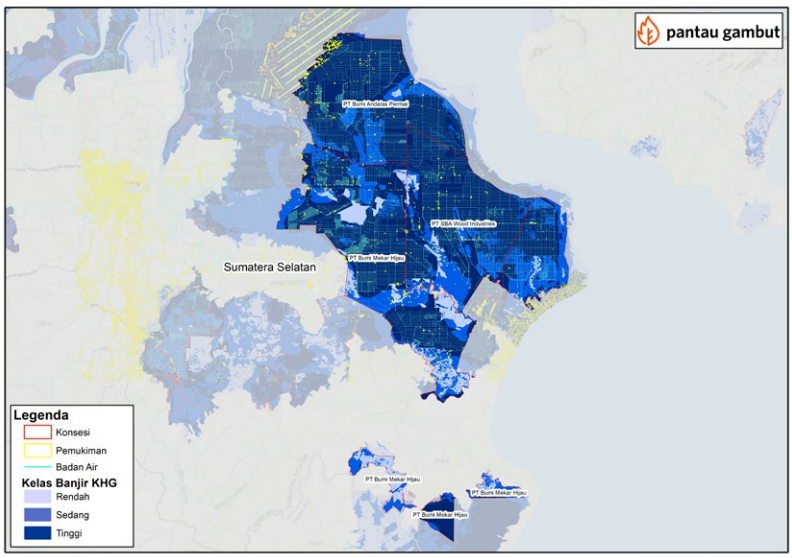
Source: Pantau Gambut (2025)

We further identified that HTI concessions with exceptionally large operational areas exacerbate flood risks in PHU zones. PT Bumi Andalas Permai (BAP), PT SBA Wood Industries, and PT Bumi Mekar Hijau (BMH) re-emerge as the trio allegedly responsible for peat damage in the Sugihan-Lumpur River PHU, South Sumatra.

These three companies have a long documented history of forest and land fires. South Sumatra residents have sued them because their concession areas consistently contribute to the forest and land fires haze during dry seasons since 2015. Annually, communities face threats of Acute Respiratory Infections (API) from the thick, toxic haze.

One plaintiff shared that their younger sibling and cousin require weekly hospital treatments for asthma. Their grandmother must keep a constant supply of *Symbicort* asthma medication at home, costing between Rp200,000 to Rp800,000 depending on dosage—a significant and ever-increasing burden if these companies continue unchecked operations.

Figure 11 Spread of Flood Vulnerability in the Sugihan–Lumpur PHU in South Sumatra, Proximal to Residential Areas



Sumber: Pantau Gambut (2025)

Beyond fire hotspots, we found these three concessions cover the most extensive flood-prone areas. During heavy rainfall, water around the Sugihan-Lumpur River PHU can no longer be absorbed or retained, overflowing to inundate settlements and farmland.

Ironically, the damage caused failed to compel the South Sumatra District Court to proceed with the lawsuit.

Source: Rawang.id (2025)

The court issued a *niet ontvankelijke* (NO) ruling, delaying or even denying justice for communities directly impacted by these companies' operations.

This situation starkly reveals that peat hydrological damage transcends ecological issues, manifesting as a recurring humanitarian disaster. The destructive cycle imposed by these concessions, from toxic haze in dry seasons to flood devastation in rainy seasons, perpetuates unrelenting community suffering. Legal failures like the *niet ontvankelijke* ruling only prolong this crisis, underscoring the immense challenges in restoring ecological justice.

3. Sinking in Inconsistency: Assessing the Legal Politics of Peatland Ecosystem Management

Although Indonesia has regulations concerning peatland ecosystems, its legal framework remains flawed and contains significant gaps that ultimately worsen conditions. The primary regulatory basis governing the management and protection of peat ecosystems in Indonesia is Government Regulation (PP) No. 71 of 2014, later amended by PP No. 57 of 2016. However, PP No. 71 of 2014 *jo.* PP No. 57 of 2016, despite being mandated by Law No. 32 of 2009 on Environmental Protection and Management (PPLH), suffers from fundamental limitations.

3.1. Legal-Political Analysis

The legal-political direction of peat ecosystem protection and management policies began to shift after the 2015 forest and land fires with the issuance of Government Regulation (PP) No. 57 of 2016 concerning Amendments to PP No. 71 of 2014. This amendment, as stated in the considerations, aimed to strengthen peat protection.

This change was also a response to international pressure, particularly after the 2015 Paris Climate Summit which highlighted Indonesia as one of the world's largest greenhouse gas contributors.[13] Demands for accountability from neighbouring countries like Singapore and Malaysia affected by the 2015 forest and land fires haze further pushed for this regulation,[14] especially after Indonesia ratified the ASEAN Agreement on Transboundary Haze Pollution in 2014, one year before the forest and land fires disaster occurred.

Unfortunately, Government Regulation (PP) No. 57 of 2016 did little to change the reality of peat ecosystem management and protection. The management and protection of peat ecosystems remain entangled in various normative problems, the most crucial being the absence of Law-level regulations (UU) specifically accommodating peat protection.

13 Client challenge. (n.d.). https://www.ft.com/content/f8c5b92c-6816-11e5-97d0-1456a776a4f5

14 A burning problem. (2017, July 5). New Internationalist. https://newint.org/features/2016/04/01/indonesia-palm-oil

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2009 Law No. 32 of 2009 (PPLH) became the legal umbrella and initial mandate for environmental regulations, including peat management.

2014 Government Regulation (PP) No. 71 of 2014 was issued as a derivative of the PPLH Law, regulating various aspects of peat management including administrative sanctions.

2015 Massive forest and land fires triggered international pressure and drove peat management policy reforms in Indonesia.

2016 Government Regulation (PP) No. 57 of 2016 was issued as an amendment to PP 71/2014, aiming to strengthen peat protection post-2015 forest and land fires.

2020 The Job Creation Law amended the PPLH Law through Articles 110A and 110B, operationally limiting criminal sanctions and opening legal loopholes for illegal plantations in peat forest areas.

First, the absence of Law-level regulations (UU) specifically governing the management and protection of peat hydrological units is the root of the problem. This directly results in the sidelining of several peat protection provisions. Based on the hierarchy of norms theory (stufenbau theory), Government Regulations (PP) have lower legal force than Laws. Consequently, in practice, the presence of Laws often becomes the "ultimate weapon" that annuls certain provisions in lower-level regulations.

Regulatory conflict is clearly visible in the addition of Article 110A and Article 110B to Law No. 18 of 2013 concerning Prevention and Eradication of Forest Destruction (P3H) through Article 37 of the Job Creation Law. These two articles essentially impose administrative sanctions on business activities, particularly plantations, in forest areas that did not have business permits before the enactment of the Job Creation Law.

However, Article 17 Paragraph (2) of the P3H Law has stipulated criminal sanctions for plantation activities without permits in forest areas. Although the Job Creation Law did not formally eliminate these criminal sanctions, the presence of Articles 110A and 110B operationally limits the material applicability of such criminal penalties. This ultimately creates new problems detrimental to peat ecosystem landscapes.

This regulatory inconsistency has tangible impacts on the ground. Pantau Gambut's analysis reveals that of the total 3.3 million hectares of unauthorized oil palm plantations in forest areas, 407,264 hectares (13-14%) are located within peat hydrological units (PHU).

More alarmingly, among 32 oil palm companies operating illegally in PHU areas, 84% are in protected peat ecosystem zones. These violations blatantly contravene Article 21 of PP No. 71 of 2014 *jo.* PP No. 57 of 2016, which explicitly prohibits commercial activities in such areas.

Second, the absence of Law-level regulations (UU) directly correlates with limited law enforcement against violations of peat ecosystem protection provisions. As stipulated in Article 15 of Law No. 12 of 2011 on Legislative Drafting (P3), criminal provisions can only be contained in Laws or Regional Regulations. Meanwhile, according to Article 12 of the P3 Law, the substance of Government Regulations (PP) may only contain materials to implement Laws.

Consequently, PP No. 57/2016 as the primary reference only includes administrative sanctions for law enforcement, considering that the mandate of the Environmental Protection and Management Law (PPLH) for establishing this PP was to regulate administrative sanctions, including violations of peat criteria standards (per Article 83 of the PPLH Law).

As a result, civil and criminal law enforcement against peat ecosystem destruction can only be conducted after disasters occur, such as forest/land fires, because enforcement must "attach" to other sectoral laws like the Forestry Law and/or PPLH Law. Ideally, civil and criminal enforcement should also apply to preventive provisions addressing serious threats (abnormally dangerous activities), for instance when groundwater tables (TMAT) are exceeded or pyritic sediments are exposed in peat ecosystems.

Thus, it becomes evident that PP No. 57/2016 *jo.* PP No. 71/2014 contains numerous limitations even at the normative level. These limitations are exacerbated by the economic-political situation surrounding Indonesia's peat protection and management policies.

3.2. The Swamp of Regulatory Inconsistencies in Capital Expansion

Behind every peatland protection regulation lies a thorny dilemma: choosing between preserving ecosystems or driving economic growth. This reality is evident in Article 10 Paragraph (1) of Ministerial Regulation No. P.16/MENLHK/SETJEN/KUM.1/2/2017 on Technical Guidelines for Peat Ecosystem Restoration, which states that if business actors fail to restore fire-damaged areas within their concessions within 30 days of the damage being identified, the authority to restore is transferred to a third party appointed by the Minister, Provincial Government, or District/City Government, with costs borne by the responsible business entity.

This transfer of responsibility directly contradicts Article 6 of the same regulation, which mandates that businesses must conduct restoration themselves. Here, the law functions not as an environmental safeguard but as a vessel codifying economic-political interests.[15]

15 Katharina Pistor. *The Code of Capital: How the Law Creates Wealth and Inequality*. New Jersey: Princeton University Press, p. 9.

Environmental law, including peat ecosystem protection policies, ultimately becomes a negotiation space for extractive corporations. These corporations dominate Indonesia's economic structure, controlling 33% of KHG land (6.5 million hectares). Even provisions meant to anchor peat protection are subject to political interventions by HGU and HTI businesses securing profits on the ground.

Thus, the ongoing degradation of peatlands which now submerging wetlands is enabled by a deliberately maintained "swamp" of regulatory inconsistencies that perpetuate the economic-political interests of a select few. The corporate destruction of peat ecosystems should not be viewed merely as normative violations but as the logical consequence of ambiguously crafted laws. These laws persist to ensure smooth commodity production in peatlands, which serve as frontiers of extraction fuelling capital expansion.[16]

3.3. Direction of Change and Implications for Policy Reformation

To ensure the sustainability of peat ecosystems and prevent the escalation of ecological disasters such as floods and fires, the legal-political approach must be comprehensively revised. This is important to do through:

Norm Alignment

The Government Regulation (PP) on peat protection must have enforceable provisions that do not conflict with sectoral laws.

Preventive Law Enforcement

Regulations should create space for law enforcement that is preventive, not merely reactive after disasters occur

Recognition of floods as damage indicators

The state needs to acknowledge that floods are equally important indicators of ecosystem damage as forest and land fires.

Ultimately, environmental law must be freed from logic that submits to short-term economic interests. Peat ecosystems are irreplaceable ecological entities. Their destruction means the loss of this nation's hydrological foundation and disaster resilience.

16 Jason Moore. 2021. *Climate, Class & the Great Frontier: From Primitive Accumulation to the Great Implosion*. World-Ecology Research Group, p. 13-14.

4. Appendix

4.1. Methodology

Pantau Gambut conducted research to analyze flood vulnerability levels in three main Peat Hydrological Unit (PHU) regions in Indonesia: Sumatra, Kalimantan, and Papua. The selection of these three regions was based on peatland distribution, topography, and climate. This division enables more detailed and accurate analysis as each region has unique environmental dynamics and risk factors.

We used the Multi-Criteria Evaluation (MCE) method to assess various factors simultaneously. MCE has proven effective in numerous studies, particularly because approximately 80% of data used by decision-makers relates to geographic aspects. In this study, we also applied the Expert Adjustment method to determine each parameter influencing flood runoff. These expert assessments were then integrated into a flood runoff prediction model using Geographic Information Systems (GIS).

This research also examined the role of concessions in peatland degradation. We identified aspects of peatland degradation such as forest/land fires, deforestation, canalization, and land cover changes. This degradation served as a key parameter for assessing the influence of concessions on increasing flood vulnerability in PHUs.

4.2. Top 20 Palm Oil HGU Concessions with the Highest Degradation

No	Oil Palm HGU Concession		Land and Forest Fire (Ha)									Canal Length (km)*
	Concession	Province	2025	2016	2017	2018	2019	2020	2021	2022	2023	
1	PT Globalindo Agung Lestari	Central Kalimantan	2986.19	129.79		1584.79	8105.37				4642.98	1494.13
2	PT Jalin Vaneo	West Kalimantan	2287.68			817.50	1378.69			5.31	1036.61	1318.27
3	PT Kalimantan Agro Lestari	West Kalimantan	3482.17			935.76	75.47			5.74	102.55	855.04
4	PT Suryamas Cipta Perkasa	Central Kalimantan	549.72			264.55	64.77	16.22			261.96	1013.92
5	PT Bahaur Era Sawit Tama	Central Kalimantan	1284.04			34.65	80.48				648.02	1044.62
6	PT Rezeki Kencana	West Kalimantan	130.93	83.10		548.14	95.48		313.14		45.49	894.09
7	PT Berkah Alam Fajarmas	Central Kalimantan	2763.76			570.97	191.54				1024.15	836.38
8	PT Katingan Mujur Sejahtera	Central Kalimantan	13099.13				1016.21				2303.32	91.65
9	PT Gawi Bahandep Sawit Mekar	Central Kalimantan					1113.65				127.73	840.06

*Data 2021

No	Oil Palm HGU Concession		Land and Forest Fire (Ha)									Canal Length (km)*
	Concession	Province	2025	2016	2017	2018	2019	2020	2021	2022	2023	
10	PT Dian Agro Mandiri	Central Kalimantan	1815.04			17.05	107.27				116.66	876.18
11	PT Bintang Mulya Sinar Agung	Central Kalimantan	81.70				98.50				88.97	743.81
12	PT Menteng Kencana Mas	Central Kalimantan	4419.12			16.81	117.45				190.47	801.09
13	PT Graha Agro Nusantara	West Kalimantan					483.81		33.96		484.07	918.50
14	PT Gerbang Benuaraya	Kalimantan Timur	3431.33			544.93	889.90		30.94	1.10		6
15	PT Persada Era Agro Kencana	West Kalimantan	58.53									
16	PT Bumi Perkasa Gemilang	Central Kalimantan	3662.05				1132.57				27.47	483.77
17	PT Rezeki Alam Semesta Raya	West Kalimantan	204.27			486.99	1246.74	2.64				720.17
18	PT Limpah Sejahtera	Central Kalimantan	1017.47	258.54		207.12	10034.29				1446.19	288.58
19	PT Agro Bukit	West Kalimantan	47.98			32.25	219.36				0.48	770.51
20	PT Globalindo Alam Perkasa	Central Kalimantan	3.86			5.50					113.21	656.93

*Data 2021

4.3. Top 20 HTI Concessions with the Highest Degradation

No	HTI Concession		Land and Forest Fire (Ha)									Canal Length (km)*
	Concession	Province	2025	2016	2017	2018	2019	2020	2021	2022	2023	
1	PT Bumi Andalas Permai	South Sumatra	82110,24	165,13			11146,03		34,28		5912,46	4331,78
2	PT Bumi Mekar Hijau	South Sumatra	56984,26	65,63		131,83	27793,22		17,14		16844,23	3986,41
3	PT SBA Wood Industries	South Sumatra	48210,86				7304,15		100,77		7773,77	2608,56
4	PT Mayawana Persada	West Kalimantan	1669,58			401,60	591,64			33,66	2883,40	34,87
5	PT Wana Subur Lestari (Dh. Sari Bumi Kusuma)	West Kalimantan							50,87		249,10	479,19
6	PT Rimba Raya Conservation	Central Kalimantan	2183,69		2,77	217,71	1069,18				6836,73	368,16
7	PT Ceria Karya Pranawa	Central Kalimantan	1325,71	79,18			1302,91				437,57	655,46
8	PT Rimba Hutani Mas	South Sumatra	9828,53				1451,93					1313,83
9	PT Sumatera Riang Lestari	Riau	8566,62	1907,19	81,68	1395,51	6274,28	979,60	326,30	124,78	6013,90	3325,56
10	PT Damai Setiatama Timber	Papua	582,81					61,89				
11	PT Daya Tani Kalbar	West Kalimantan					13,40				2498,40	500,24
12	PT Mayangkara Tanaman Industri (Sk 480)	West Kalimantan									2073,79	293,12
13	PT Wira Karya Sakti	Jambi	6786,89			2,13	1282,05		50,88	104,79	1876,25	2996,13

*Data 2021

No	HTI Concession		Land and Forest Fire (Ha)									Canal Length (km)*
	Concession	Province	2025	2016	2017	2018	2019	2020	2021	2022	2023	
14	PT Rimba Makmur Utama	Central Kalimantan	3687,51			218,11	707,23				0,45	39,92
15	PT Arara Abadi	Riau	4035,15	4315,20	1019,18	79,74	402,22	8,62	1686,04		7039,51	4100,97
16	PT Mohairson Pawan Khatulistiwa	West Kalimantan	2,86			41,07	2691,82				32,39	290,46
17	PT Rimbun Seruyan	Central Kalimantan	1299,87			219,45	1649,51				2975,60	68,30
18	PT Pesona Belantara Persada	Jambi	6171,96	1686,85		611,09	4785,01					196,46
19	PT Putra Duta Indah Wood	Jambi	4427,13	1842,18			4084,59					251,83
20	PT Muara Sungai Landak	West Kalimantan		18,52	14,49	165,63	160,45		34,23	60,67	407,33	202,12

*Data2021

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