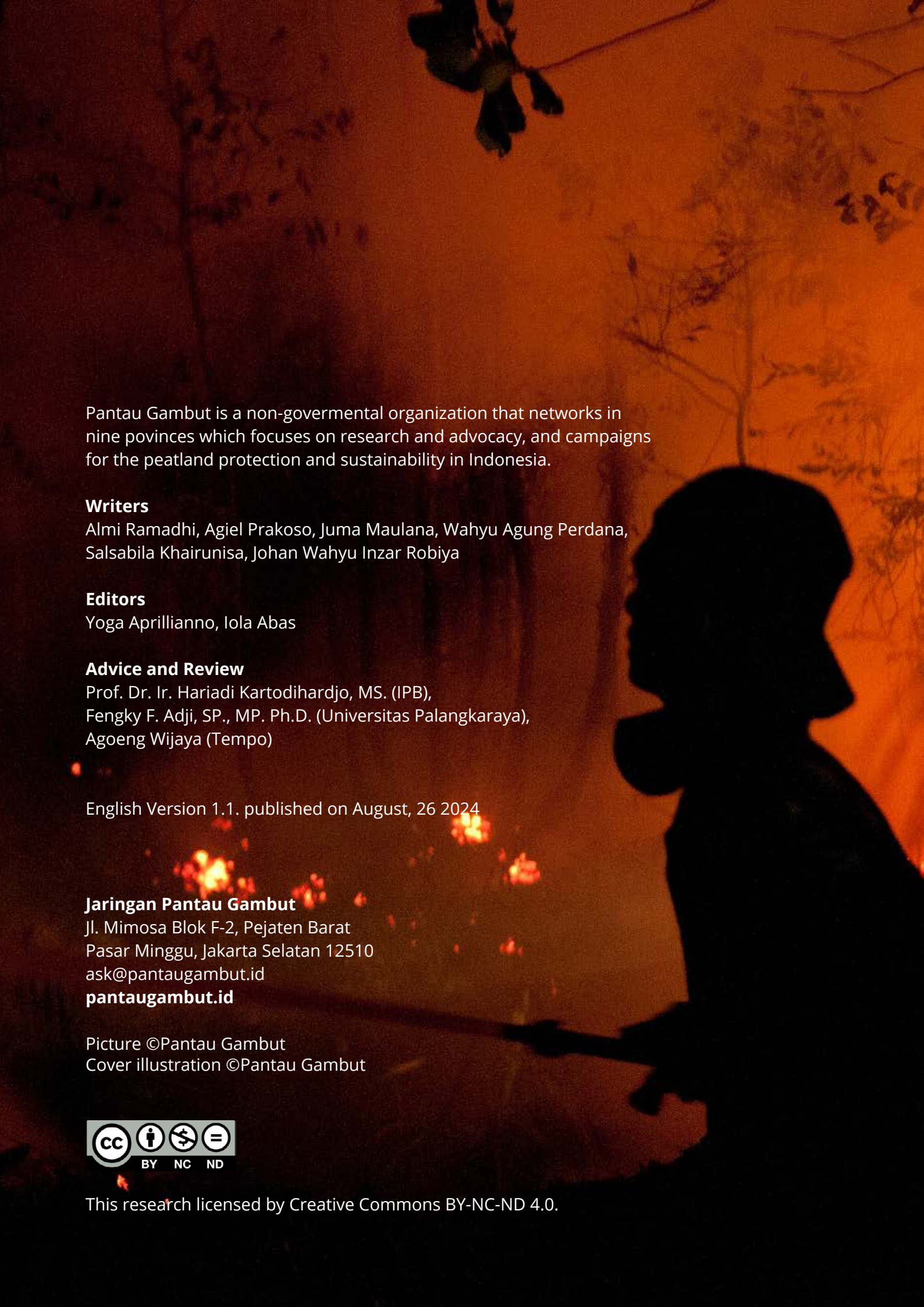
pantau gambut

Dread in Wetland Bed

Corporations, Government, and All Their Peatland Restoration Empty Commitments.

2024



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

Writers
Almi Ramadhi, Agiel Prakoso, Juma Maulana, Wahyu Agung Perdana, Salsabila Khairunisa, Johan Wahyu Inzar Robiya

Editors
Yoga Aprillianno, Iola Abas

Advice and Review
Prof. Dr. Ir. Hariadi Kartodihardjo, MS. (IPB),
Fengky F. Adji, SP., MP. Ph.D. (Universitas Palangkaraya),
Agoeng Wijaya (Tempo)

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Jaringan Pantau Gambut
Jl. Mimosa Blok F-2, Pejaten Barat
Pasar Minggu, Jakarta Selatan 12510
ask@pantaugambut.id
pantaugambut.id

We dedicate this research to

Prof. Dr. Ir. Hariadi Kartodiharjo, MS. (Prof. Haka)
(1958–2024)

for his courage in standing at the forefront of environmental protection, forests, and especially peatland ecosystems. It is an honor for Pantau Gambut to be able to continue the legacy of his struggle.

EXECUTIVE SUMMARY

> As the country with the largest tropical peatland in the world, Indonesia must accept the fact that only 16% of its peatland area is in good condition.

The restoration of peatlands has become crucial due to the multifaceted impacts of peatland forest and land fires: water pollution, loss of biodiversity, social conflict, and exacerbation of global warming. The costs will escalate in line with the worsening climate change and the increasing risk of ecological disasters.

To monitor the restoration efforts and protection of peatland ecosystems in Indonesia, Pantau Gambut conducted a study through satellite imagery observations and field monitoring. This study utilized four main variables: peat soil conditions (biophysical), hydrological conditions, restoration infrastructure and peatland fires, and socio-economic conditions and government-issued policies.

The research locations were selected based on two types of areas: concession and non-concession areas. Restoration of peatlands in concession areas is the responsibility of the companies, while in non-concession areas, it falls under the government's purview. The study sample areas are spread across seven provinces: Aceh, Riau, Jambi, South Sumatra, West Kalimantan, East Kalimantan, and West Papua.

Despite ongoing restoration efforts, much of the peatland restoration infrastructure does not meet standards, both in concession and non-concession areas. Many rewetting infrastructures, such as canal blocks and bore wells, are damaged. In some observed sample points, dry peat was found with a Groundwater Table Level (GTL) above 40 cm.

It was recorded that 95% of the 289 sample peatland points in government restoration areas that had burned area (BA) and tree cover loss (TCL) transformed into dryland plantations and shrubs. The effort to revert the land back to forest received little attention and was only observed in 3% of the peatland sample areas. This is despite the obligation to restore damaged peatlands back to forest as mandated by Government Regulation No. 57 of 2016 in conjunction with Government Regulation No. 71 of 2014 on the Protection and Management of Peatland Ecosystems.

The situation is even more concerning in corporate concession areas. Only 1% of the 240 sample points in concession areas that had burned and lost tree cover reverted back to forest. Ironically, this condition exists in several company areas, such as PT Mayawana Persada (MP) in West Kalimantan and PT Bumi Mekar Hijau (BMH) in South Sumatra, which also frequently have social conflict issues.

The restoration of damaged peatlands is an absolute responsibility imposed on both the government and corporations. The government is mandated to restore peatlands according

Preparation of plantation land in protected areas that have lost tree cover at PT Bumi Sriwijaya Sentosa, South Sumatra Province.

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> Negligence in peatland restoration indicates a lack of concern for environmental crises and community rights. Consistent law enforcement must be carried out as both a preventive and repressive measure against peatland destroyers to avert worse disasters, both now and in the future.
>
> ***Iola Abas***
> *National Coordinator of Pantau Gambut*

to Article 2 of Law No. 32 of 2009 on Environmental Protection and Management. Meanwhile, the obligation for companies is stipulated in Article 6 of Ministry of Environment and Forestry Regulation No. P.16 of 2017 on Technical Guidelines for Peatland Ecosystem Function Restoration. The government's responsibility includes the obligation to bear all policies and actions that have been taken (prospective) as well as those that will be taken (retrospective).

The implementation of this responsibility is not only in response to forest and land fires but also as a preventive measure. The rights of the community are at stake with every neglect of law enforcement. Therefore, the restoration of peatland ecosystems due to past mismanagement must be carried out earnestly.

Companies are not exempt from responsibility. Law enforcement against concession holders should focus on fulfilling the obligation of peatland ecosystem restoration. Law enforcement should not wait for forest and land fires to occur but should be initiated immediately upon finding indications of peatland ecosystem damage, such as the presence of canals and non-standard Groundwater Table Level (GTL). Companies must comply with the restoration obligations set forth by the prevailing regulations.

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1. LATAR BELAKANG

Damage to peatlands is only recognized when forest and land fires occur, while the underlying issue of peatland hydrological ecosystem damage remains unaddressed.

Indonesia, as the country with the largest tropical peatlands in the world, faces significant challenges in preserving its peatland ecosystems. Only about 16% of the total peatland area is in good condition.[1] Without intervention, the drying of peatlands poses multi-dimensional problems that threaten all living beings within these ecosystems. The disrupted ecosystem cycle will impact water and food sources, further diminish biodiversity, create social conflicts, and exacerbate global warming.

Peatlands are considered degraded when the soil loses its capacity to store water and carbon, thereby reducing its environmental functionality. Human activities are the primary cause of peatland ecosystem damage, driven by economic motives. Excessive conversion of peatlands forces them to dry out, making it easier to process the land for large-scale plantations. On the other hand, dried peat increases the vulnerability to ecological disasters.

One often overlooked benefit of peatlands is their ability to store large amounts of carbon (C). The drying and exploitation of peatlands can release carbon into the atmosphere, and this issue is further exacerbated when peatlands catch fire. The most severe forest and land fires recorded in Indonesia's history occurred during the 2014–2015 period.[2]

An analysis of peatland fire vulnerability, taking into account the history of severe forest fires in 2015 and 2019, shows that 54% of the total 3.8 million hectares of Peat Hydrological Units (PHU) with high fire risk are located in concession areas and their buffer zones.[3]

The man-made disaster has driven the Indonesian

1 Raden Ariyo Wicaksono, "Gambut Rusak Sangat Berat di Indonesia Luasnya 206.935 Hektare," Betahita, https://betahita.id/news/detail/7805/gambut-rusak-sangat-berat-di-indonesia-luasnya-206-935-hektare.html?v=1658709796

2 Topan Yuniarto, "Jejak Kebakaran Hutan dan Lahan di Indonesia," Kompaspedia, https://kompaspedia.kompas.id/baca/paparan-topik/jejak-kebakaran-hutan-dan-lahan-di-indonesia

3 Pantau Gambut. 2023. Kerentanan Kebakaran Hutan dan Lahan (Karhutla) pada Area Kesatuan Hidrologis Gambut (KHG) Tahun 2023.

government to take more active measures in addressing damaged peatlands. The Indonesian government established the Peat Restoration Agency (Badan Restorasi Gambut/BRG) as a rapid-response ad-hoc institution. The BRG was mandated by the president to restore over 2 million hectares of degraded peatland in seven provinces (Riau, Jambi, South Sumatra, Central Kalimantan, South Kalimantan, West Kalimantan, and Papua).[4] However, by the end of the first operational period in 2020, the restoration achievements only reached 55%.[5] The biggest failure was the lack of effective supervision of restoration activities in concession areas as mandated.

A year later, the Indonesian government initiated a target to reduce greenhouse gas emissions from the forestry and land-use sector by 2030 (FOLU Net Sink). One of the indicators for achieving this goal is the restoration and protection of peatlands. Unfortunately, there is no clear information regarding the implementation of the peatland ecosystem protection commitment. The government has not provided concrete evidence of the impact and outcomes of their stated actions and targets.

The public is questioning the sustainability commitment promoted by the government, especially following the enactment of Law No. 6 of 2023 concerning the Stipulation of Government Regulation in Lieu of Law (Perppu) No. 2 of 2022 on Job Creation into Law. This law has been widely criticized for potentially reducing many regulatory provisions related to environmental protection and conservation, particularly peatland ecosystems.[6]

Nearly ten years have passed since the major fires of 2015, and the forest and land fire crisis continues to haunt the Indonesian people. There was hope that the 2024 General Election would bring forth leaders who could introduce new breakthroughs in more environmentally friendly peatland management. Unfortunately, this election proved to be no different from previous ones. The election became a battleground for officials surrounded by patrons from the extractive industries—both palm oil and mining.[7]

Collusion and nepotism still dominate this 'democratic festivity'.[8] The suboptimal election process makes it impossible to evaluate the government's performance in protecting and conserving peatland ecosystems over the past decade.[9] This is despite the fact that the right to a good and healthy environment is guaranteed under Article 28H of the 1945 Constitution. The public should no longer live in fear of haze caused by land clearing and drying.

Based on this reality, Pantau Gambut has been monitoring the efforts to restore and protect peatland ecosystems in seven provinces in Indonesia. This monitoring is conducted in collaboration with the Simpul Jaringan (SJ) of Pantau Gambut in each region, as a form of civil society oversight of the government's responsibility to fulfill the people's right to a good and healthy environment.

4 BRGM. 2023. Status Restorasi Gambut 2016–2023.

5 BRG. 2020. Laporan Tahunan Badan Restorasi Gambut 2020.

6 Pradipta Pandu, "UU Cipta Kerja Dapat Mengancam Sekaligus Memperbaiki Tata Kelola Hutan," Kompas.id, 9 Maret 2023, diakses pada 19 Juni 2024, https://www.kompas.id/baca/humaniora/2023/03/09/uu-cipta-kerja-dapat-mengancam-sekaligus-memperbaiki-tata-kelola-hutan.

7 Pradipta Pandu, "Pendanaan Politik dari Industri Kotor," Kompas.id, 24 Oktober 2023, diakses pada 19 Juni 2024, https://www.kompas.id/baca/humaniora/2023/10/24/masih-ada-ruang-pendanaan-politik-dari-industri-kotor.

8 Tempo, "Mengapa Hakim Konstitusi Tak Melihat Sengketa Pilpres dari Sudut Pandang Keadilan," majalah.tempo.co, 28 April 2024, diakses pada 19 Juni 2024, https://majalah.tempo.co/read/laporan-utama/171375/sengketa-pilpres-mahkamah-konstitusi.

9 Pantau Gambut. 2023. Melihat Rekam Jejak Sikap Partai Pendukung Calon Presiden.

95% of the 289 sample points in non-concession areas that were previously burned and had lost tree cover have not been replanted with native or peatland-friendly species.

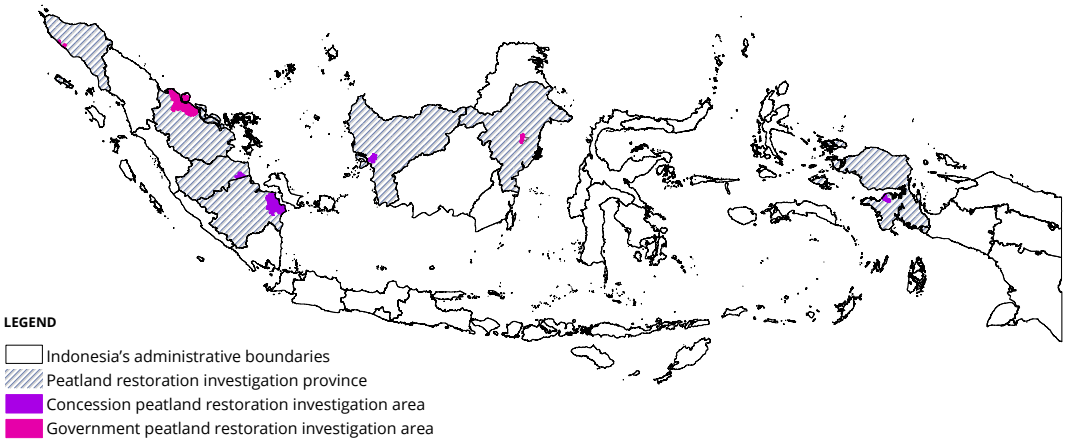
This study reveals the current conditions in priority restoration areas managed by the government and concession-holding corporations. The findings serve as material for reflecting on commitments and encouraging all actors to strengthen peatland governance. In the long term, this study provides a basis for considering the future of peatland ecosystem management in Indonesia.

2. METHODOLOGY

2.1. Research Methodology

Pantau Gambut conducted monitoring of Peat Hydrological Units (PHU) across seven provinces: **Aceh, Riau, Jambi, South Sumatra, West Kalimantan, East Kalimantan, and West Papua**. The study was carried out from December 2023 to March 2024.

Map of Peatland Restoration Investigation Area



In general, Pantau Gambut divided the study locus into two monitoring areas: concession and non-concession areas. This separation was made to allocate the restoration responsibility in accordance with the Ministry of Environment and Forestry Regulation No. P.16 of 2017 concerning Technical Guidelines for the Restoration of Peat Ecosystem Functions.

Both central and local governments are responsible for protecting and restoring peatlands in non-concession areas, which are categorized into: 1) protected forest areas, 2) production forest areas, 3) grand forest parks, and 4) other land uses. The focus on government restoration areas was conducted in three provinces, namely Aceh, Riau, and East Kalimantan.

Research Locus Table

Research Locus	Person in Charge	Research Locus Province
Concession	Corporation	Jambi, South Sumatera, West Kalimantan, and West Papua
Non-concession	Government (central and local)	Aceh, Riau, and East Kalimantan

Similarly, companies are also obligated to protect and restore peatlands within their concession areas. Field monitoring was carried out in four provinces, namely Jambi, South Sumatra, West Kalimantan, and West Papua.

Pantau Gambut employed four variables, each consisting of several parameters, to evaluate the parties responsible for restoration. The sampling method for the peatland condition variable (biophysical) was based on random sampling and spatial clustering methods, while other variables were based on purposive sampling methods.

Field Data Collection Variable Table

Variable	Parameter	Sampling Method
Peatland soil condition (biophysical)	• Land cover condition • Soil acidity level (pH) • Peatland canalization	• Random sampling • Spatial clustering sampling
Peatland hydrology	Groundwater Table Level (GTL) in peatlands with canals	Purposive sampling
Social, economic, and policy	• Social and economic conditions of communities around the PHU area • Local and central government policies and programs	
Peatland restoration and forest and land fire infrastructure	• Physical condition of canal block • Physical condition of borehole • Physical condition of GTL measuring device • Physical condition of fire tower	

The use of random sampling and spatial clustering methods ensures that all selected locations have an equal opportunity for data collection, thereby yielding data results representative of the homogeneous spatial group characteristics. Meanwhile, the purposive sampling method was used for data collection that meets the specific sample requirements for certain characteristics.

2.2. Criteria for Determining Study Locations in Peatland Hydrological Units (PHU)

There are two categories of criteria for selecting PHUs as study sample locations: PHUs with a history of fires (burned area/BA) and PHUs with the largest tree cover loss (TCL) from 2015 to 2020. In corporate concession areas, sample areas are distinguished into two types: all PHU areas with fire scars and protected peatland areas within PHUs that have experienced tree cover loss. In monitoring the restoration of non-concession peatland areas, sample areas are divided into three types: former fire areas in protected peatlands, cultivation areas, and areas with tree cover loss in protected peatlands.

Research Locus Table

Research Locus	Criteria	Restoration Liability Area
Concession	Burned area	Entire PHU area
	Tree cover loss	Protected peatland within PHU
Non-concession	Burned area	Protected peatland within PHU
		Cultivated peatland within PHU
	Tree cover loss	Protected peatland within PHU

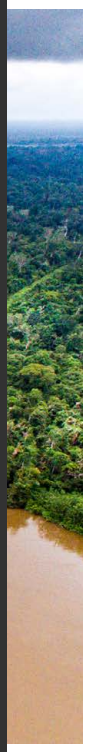
Kesatuan Hidrologis Gambut ©CIFOR

Peatland Hydrological Units (PHU)

Water imbalance due to peatland drainage is the initial stage of peatland degradation. To prevent further deterioration, water management must be implemented.

However, the complexity of water circulation within a peatland ecosystem makes partial water management ineffective. Therefore, water management in efforts to restore peatlands will be more effective if conducted using a landscape-based approach known as Peat Hydrological Units (PHU).

PHU is a concept of peatland ecosystem landscape recognized in regulations. Geographically, PHUs are located between two rivers, a river and the sea, or a river and a swamp. Land management pattern within one PHU will influence the conditions of other areas within the unit.



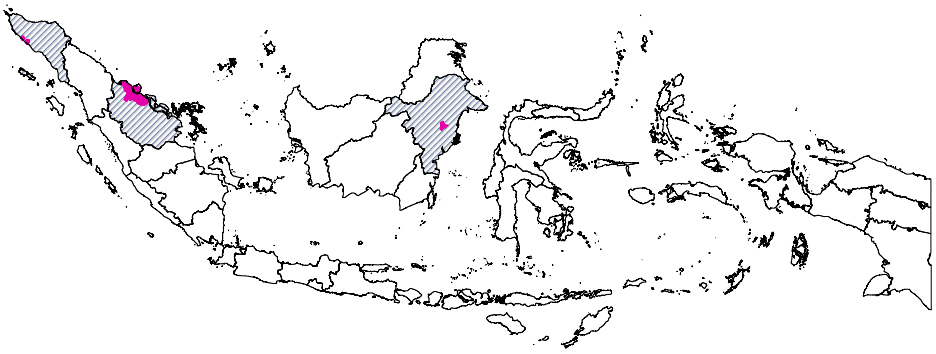
2.3. Research Limitation

The dimensions within the peatland ecosystem are diverse and interconnected. This complexity impacts the study's ability to capture every phenomenon present. However, these limitations also present opportunities for further development in other studies. Some key limitations that readers should be aware of include:

- The identification and selection of non-concession restoration areas are based on reports, letters, and other documents indicating government-led programs implemented in the respective Peatland Hydrological Units (PHUs).
- The identification and selection of concession restoration areas also consider the history of conflicts involving relevant stakeholders. The information gathered is derived from observations conducted by Pantau Gambut's Simpul Jaringan (SJ Pantau Gambut).
- The focus of observations in concession areas is on oil palm and acacia concessions.
- The analysis in this research prioritizes a restoration approach focused on the condition of peat soil. Social, economic, and policy variables serve as components for verifying field data findings.

3. RESEARCH DISCOVERY

3.1. Condition of Government's Peatland Restoration Areas (Non-concession)



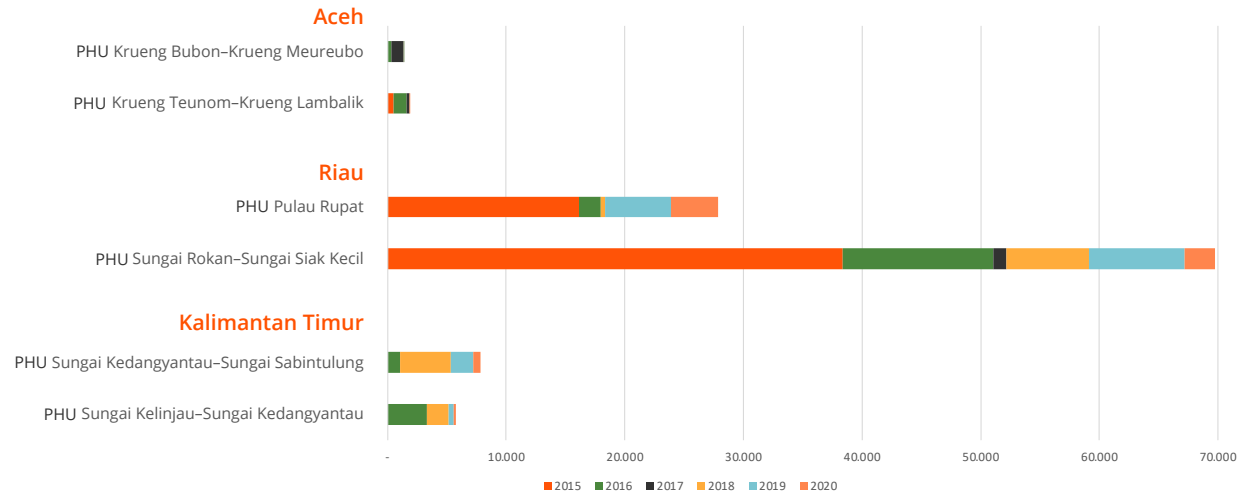
Map of The Government's Peatland Restoration Investigation Area

LEGEND

- Indonesia's administrative boundaries
- Peatland restoration investigation province
- Government peatland restoration investigation area

The monitoring sample locations under the responsibility of the Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan/KLHK) and the Peat and Mangrove Restoration Agency (Badan Restorasi Gambut dan Mangrove/BRGM) are distributed across three provinces: Aceh, Riau, and East Kalimantan. Monitoring was conducted in two Peatland Hydrological Units (PHUs) in each province that experienced the most severe degradation from 2015 to 2020. Degradation parameters were assessed based on the history of forest and land fires as well as the loss of tree cover in these PHUs.

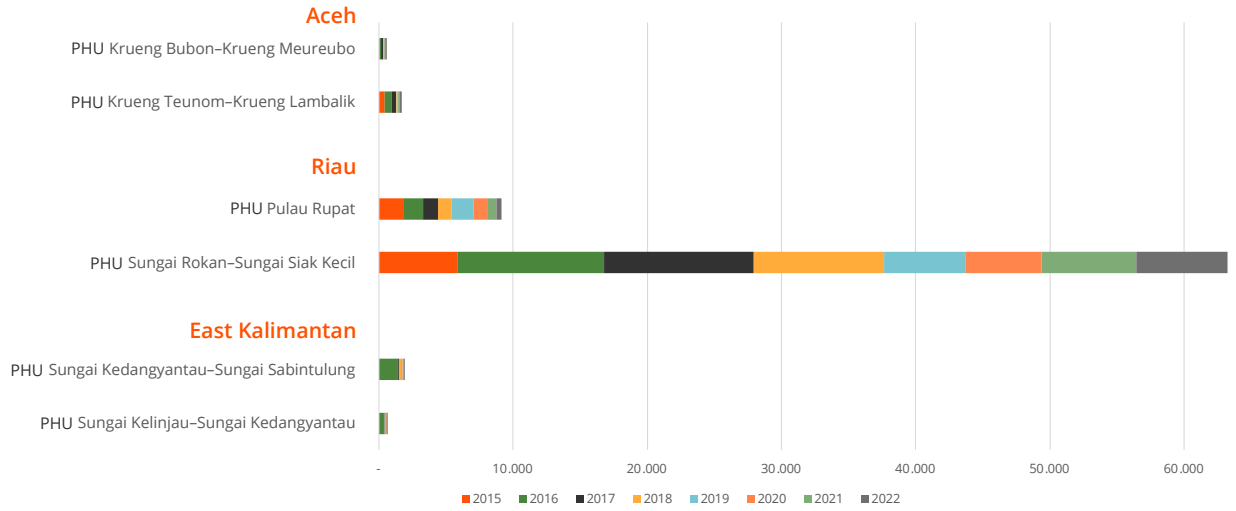
Land and Forest Fires Historical Diagram (Ha)



	Aceh		Riau		East Kalimantan	
	PHU Krueng Bubon–Krueng Meureubo	PHU Krueng Teunom–Krueng Lambaik	PHU Pulau Rupat	PHU Sungai Rokan–Sungai Siak Kecil	PHU Sungai Kedayantau–Sungai Sabintulung	PHU Sungai Kelinjau–Sungai Kedangyantau
2015	-	476	16.124	38.380	-	-
2016	326	1.137	1.857	12.699	1.055	3.302
2017	1.008	254	-	1.118	-	-

2018	9	-	358	6.955	4.256	1.854
2019	82	-	5.566	8.057	1.923	447
2020	-	22	3.975	2.535	580	161
Total	1.425	1.889	27.880	69.744	7.814	5.764

Tree Cover Loss Historical Diagram (Ha)



	Aceh		Riau		East Kalimantan	
	PHU Krueng Bubon–Krueng Meureubo	PHU Krueng Teunom–Krueng Lambaik	PHU Pulau Rupat	PHU Sungai Rokan–Sungai Siak Kecil	PHU Sungai Kedayantau–Sungai Sabintulung	PHU Sungai Kelinjau–Sungai Kedangyantau
2015	68	446	1.815	5.853	-	-
2016	91	524	1.463	10.920	1.398	399
2017	163	296	1.151	11.133	85	15
2018	63	65	990	9.745	151	24
2019	41	50	1.636	6.066	144	110
2020	23	50	1.071	5.674	60	39
2021	39	99	627	7.029	10	23
2022	83	164	358	6.791	22	43
Total	571	1.694	9.111	63.211	1.870	653

Based on the four variables referenced by Pantau Gambut and the Simpul Jaringan for independent monitoring, the findings are summarized in the Table of Monitoring Data Summary for Government Peatland Restoration Areas.

Government Peatland Restoration Monitoring Data Summary Table

Parameter	Description		
	Aceh	Riau	East Kalimantan
Peatland Condition			
Sample amount	100 spots	90 spots	99 spots
Land cover type	Dryland crops, shrubs	Dryland crops, shrubs	Shrubs
Dryland crops dominance	Oil palm	Oil palm, acacia	-
Sample pH class dominance	pH 5–5,99	pH 5–5,99 and 6–6,99	pH 6–6,99
Canalized sampel percentage	53%	93%	18%

Peat Hydrological Conditions			
Sample Amount	48 spots	No measurements were taken	48 spots
GTL Average	51 cm	-	55 cm
Canal Blocks Infrastructure			
Number of Findings	5 canal blocks	70 canal blocks	2 canal blocks
Infrastructure Construction Initiator	KLHK	KLHK, BRGM	Corporation
Dominant Canal Blockage Type	Wood/board/burlap (temporary)	Wood/board/burlap (temporary)	Wood/board/burlap (temporary) and backfilling
GTL Average	31 cm	48 cm	20 cm
Percentage of Damaged Canal Blockage Samples	60%	70%	100%
Bore Wells Infrastructure			
Number of Findings	Not founded	6 bore wells	Not founded
Infrastructure Construction Initiator	-	BRGM	-
Bore Wells Material	-	Plastic pipe/PVC (temporary)	-
Damaged Bore Wells Percentage	-	0% (all in good condition)	-
GTL Measuring Instrument			
Number of Findings	Not founded	Not founded	Not founded
Infrastructure Construction Initiator	-	-	-
GTL Measuring Instrument Material	-	-	-
Functionality and Activity of the Instrument	-	-	-
Physical Condition of the GTL Measuring Instrument	-	-	-

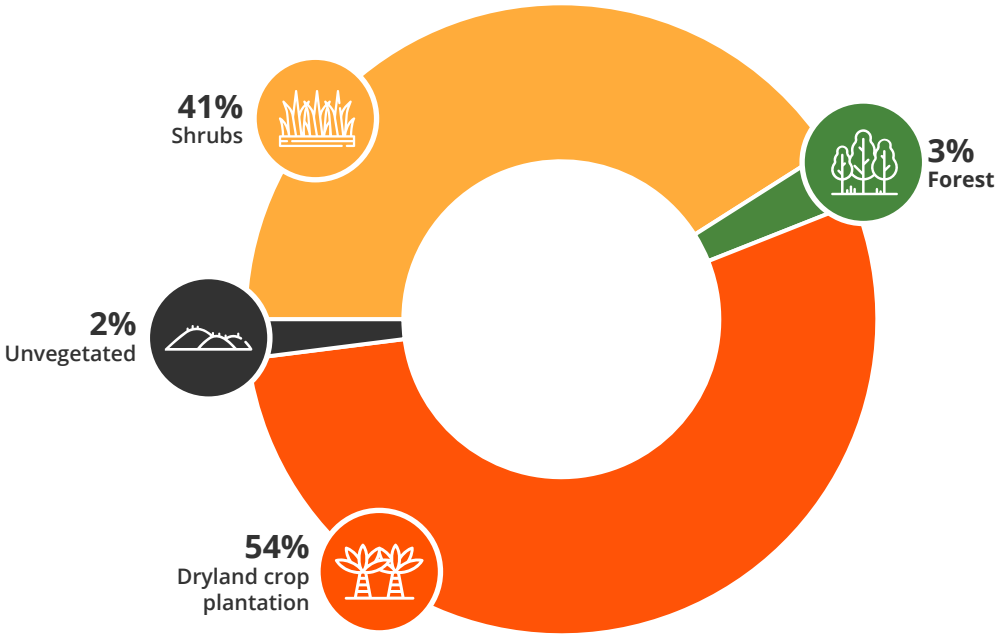
3.1.a.

Condition of Peatland Cover

The biophysical condition of peatland at sample points in the three provinces did not meet the restoration standards stipulated in Government Regulation No. 57 of 2016 jo. Government Regulation No. 71 of 2014 on the Protection and Management of Peatland Ecosystems and its technical regulations. Out of a total of 289 sample points in peatland areas that had burned and lost tree cover, 95% were not replanted with native or peat-friendly species. Meanwhile, 54% of the area had been converted into dryland crop plantations, and the remaining 41% was left as vacant land overgrown with shrubs.

> Peatland ecosystems serve as a source of life for various communities across generations. Traditions, local wisdom, and knowledge about peatland ecosystems are integral parts of this. It also includes cohabitation with biodiversity such as the endangered Mahakam Dolphin.
>
> *Ahmad Saini*
> *Nugal Institute*
> *SJ East Kalimantan*

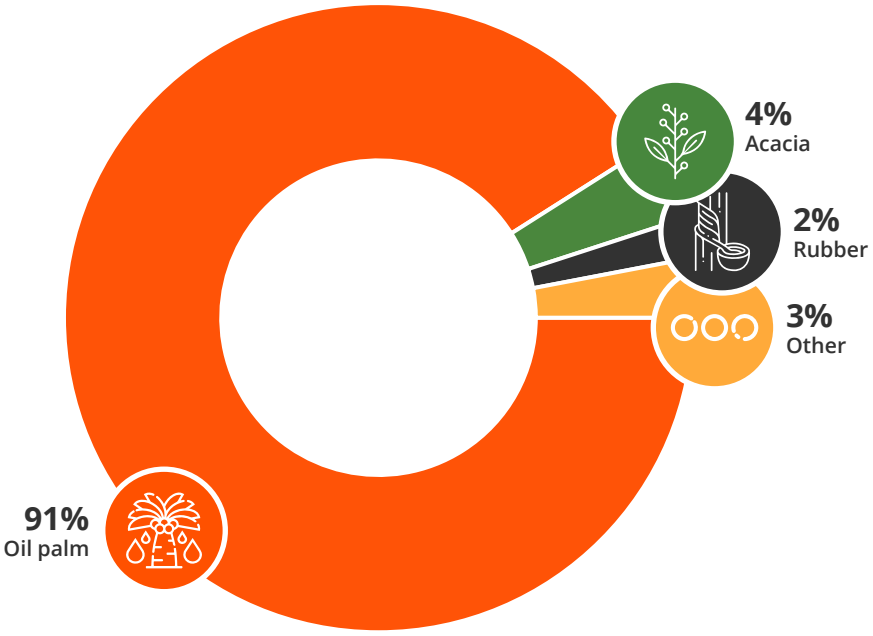
Diagram Proportion of Land Cover in Burned and Tree Cover Loss Peatland Areas



Dominance of Oil Palm and Shrubs in Burned Areas

Peatlands are unsuitable for cultivating plants that require land drainage, such as oil palm and acacia. Forcing their growth on a large scale is a maladaptive practice—deviating from local norms and negatively impacting the environment and social well-being. The negative impacts of large-scale oil palm cultivation far outweigh any positive outcomes for the peatland ecosystem.

Diagram Proportion of Dryland Crop Types in Burned and Tree Cover Loss Peatland Areas



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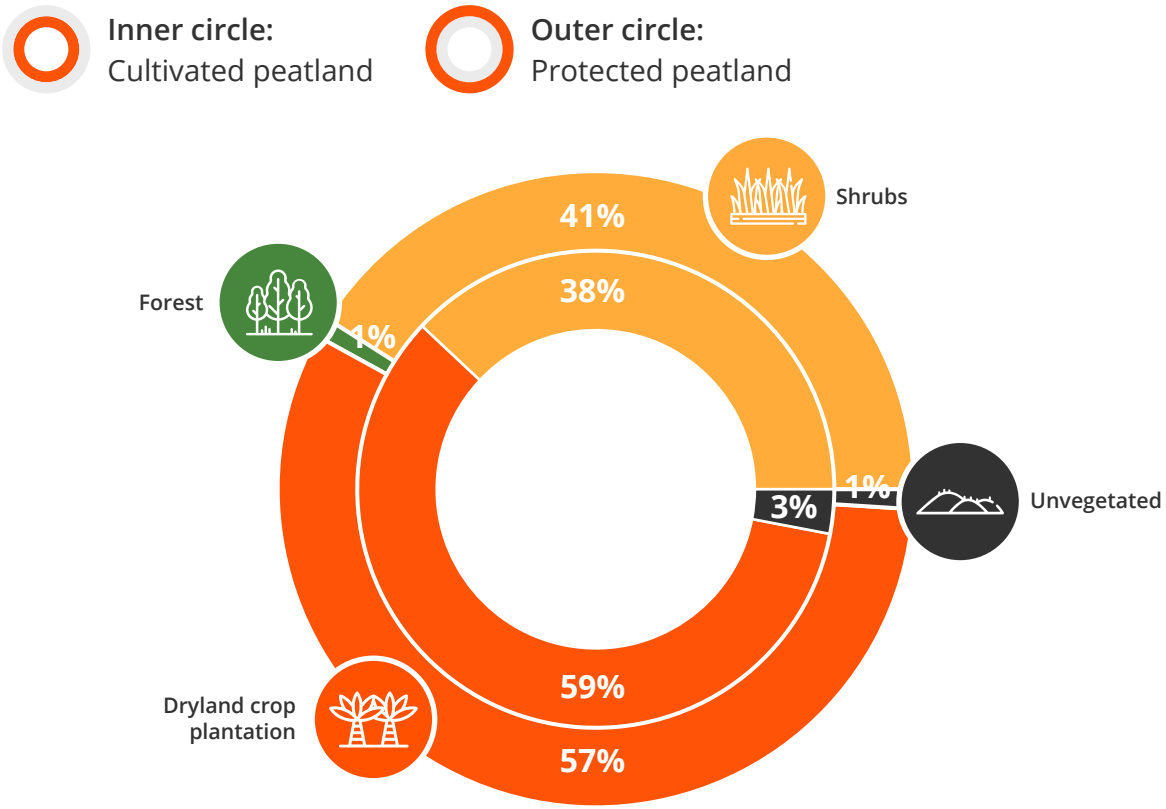
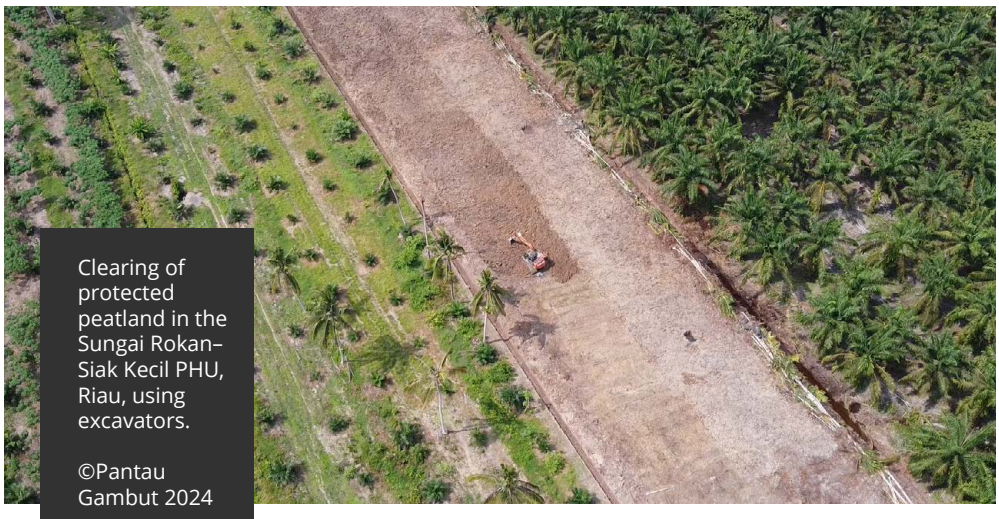
Out of 155 sample points, it was found that 91% of non-concession PHUs had been converted into oil palm plantations.

Diagram Proportion of Burned Area



This contradicts Article 14 of Ministry of Environment and Forestry Regulation No. P.16 of 2017 on Technical Guidelines for Peatland Ecosystem Function Restoration. All burned peatland areas should be replanted (revegetation) with native and/or peatland-friendly species without exception. It is incorrect to assume that oil palm trees can replace the function of peatland forests, which can harbor diverse biodiversity within them.

Pantau Gambut found that 57% of all protected peatland areas monitored for government restoration on burned area had been filled with dryland crop species such as oil palm. This clearly violates Article 26 of Government Regulation No. 57 of 2016 *jo.* Government Regulation No. 71 of 2014, which explicitly prohibits land clearing in protected peatland ecosystems.



Clearing of protected peatland in the Sungai Rokan–Siak Kecil PHU, Riau, using excavators.

> What is wrong with peatland restoration? Despite significant state expenditure, it has had no impact on the ecosystem, either economically for the community or environmentally. This contradicts the claimed success.
>
> ***Tengku Ibrahim***
> *Kaliptra Andalas*
> *SJ Riau*

(Left) Conversion of peatland function to oil palm in the Pulau Rupat PHU, Riau Province (Right) Burning of peatland in the Pulau Rupat PHU, Riau Province.

The proliferation of shrubs increases the potential for peatland fire spread.

In 41% of the samples from protected peatland areas that were previously burned, then abandoned and overtaken by shrub growth, restoration efforts should have been undertaken to convert these areas back into forests to reduce the risk of recurrent fires. Uncontrolled shrubbery serves as highly flammable material that can easily ignite and spread fires rapidly, especially when the vegetation is dry and has low moisture content.[10]

The emergence of shrubs in peatland hydrological unit (PHU) areas after a fire is a hallmark of degraded peatland and indicates a concerning problem. The proliferation of shrubs is the result of new land clearing, often conducted illegally, without immediate revegetation.[11] The government is obligated to play a role in restoring peatland in such areas.

Following the loss of forest cover, peatland degradation gradually ensues, accompanied by a loss of biodiversity. On the ground, the hydrological functions of peatlands are disrupted, and the risk of forest fires increases dramatically. On a broader scale, forest and land fires will emit large amounts of greenhouse gases.

Land conversion is also occurring in protected peatland areas that have been previously burned. Instead of being restored and preserved, these areas are being targeted for the expansion of oil palm, acacia, and other dryland crop plantations.

10 Ikhwan, M. (2016). Pemetaan daerah rawan kebakaran hutan dan lahan di Kabupaten Rokan Hilir. Wahana Forestra: Jurnal Kehutanan, 11(1), 57-66.

11 Wahyunto, W., & Dariah, A. (2014). Degradasi lahan di Indonesia: Kondisi existing, karakteristik, dan penyeragaman definisi mendukung gerakan menuju satu peta. Jurnal Sumberdaya Lahan, 8(2), 132467.

Case Study

The Loss of Livelihoods in the Sungai Kedangyantau–Sabintulung PHU

Not all PHU areas are within forest regions. Some are in Other Use Areas (OUA), where management authority is held by the permit holders. This management right restricts the Environment and Forestry Department (Dinas Lingkungan Hidup dan Kehutanan/DLHK) and the The Ministry of Environment and Forestry Technical Implementation Unit (Unit Pelaksana Teknis/UPT) from direct activities at the location. Consequently, monitoring functions do not work as they should, as found in the Sungai Kedangyantau–Sabintulung PHU, East Kalimantan Province.

Initially, the government through DLHK Kutai Kartanegara prepared this PHU as a Grand Forest Park area. During the process, the plan to designate the PHU as Tahura changed to OUA. Land control then transferred to several oil palm plantation companies. PT Sawit Kaltim Lestari (SKL) controls approximately 12,000 hectares, while PT Agrojaya Tirta Kencana (ATK) claims around 20,000 hectares.

Clearing of protected peatland for oil palm plantations in the Sungai Kedangyantau–Sabintulung PHU, East Kalimantan

After becoming OUA, peatland restoration should have been independently conducted by the permit-holding companies. In reality, when Pantau Gambut conducted observations, the damaged land cover at the location had turned into oil palm plantations, and parts of it were abandoned with overgrown shrubs.

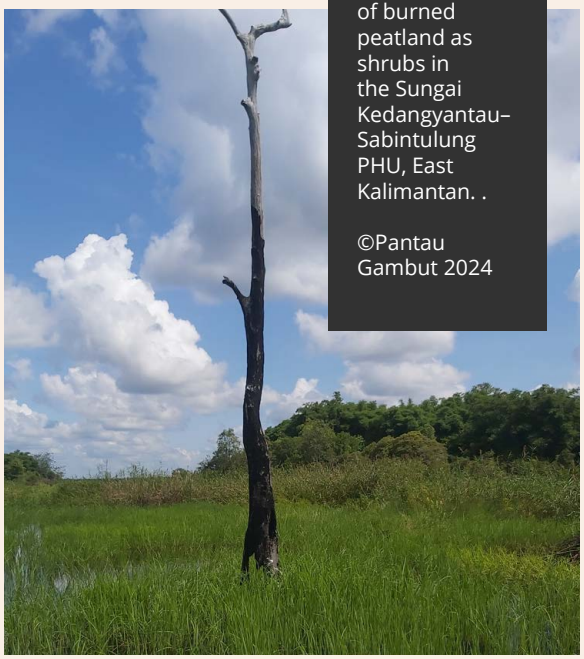
The community living around PT Agrojaya Tirta Kencana began to suspect the concession granting process. The area of Liang Buaya Village changed when several oil palm companies received permits almost simultaneously in September 2004. The villagers believed the permit granting favored corporations.

> *"They (PT ATK) secretly took our land. They entered through Puan Cepak Village and Sedulang Village, taking about 1,900 hectares. They claimed to have paid compensation and received approval from the village head, but we knew nothing about the permit signing. Suddenly, our area decreased; it was reduced by 6,000 hectares before, now by 1,900 hectares," (Mr. Li, Liang Buaya Village resident).*

The shrinking living space of the villagers reduced their livelihood options. The peatlands they

once relied on with the rivers in them no longer provided enough fish for everyone. Their livelihoods gradually shifted and depended on the plantation sector created by the companies. Their subsistence was no longer just to meet living needs but also to meet all the targets set by the companies.

The PHU area, which should have been a government restoration priority area protected in terms of vegetation, hydrology, and the economy for the surrounding community, was continually released for corporate use and dryland crop cultivation.



Abandonment of burned peatland as shrubs in the Sungai Kedangyantau–Sabintulung PHU, East Kalimantan. .

©Pantau Gambut 2024

3.1.b. Drainage Through Canals

Canals serve as the primary medium for draining peatlands. Through canals, water from the peat is channeled out, preventing the land from remaining submerged. The purpose is to ensure that dryland crops do not rot. It should be noted that non-endemic peat plants will wither or even die without peatland engineering, one method of which is drainage. The construction of canals in peat ecosystems, or canalization, is commonly found in areas of dryland crop plantations.

Canals are classified into three categories: primary, secondary, and tertiary. This classification is based on the width of the canal. The critical role of canals in plantation activities is evident from findings showing that out of 289 sample points, 54% of the peatland had canals and was undergoing drainage.

Diagram Proportion of Canalization in Peatland Areas

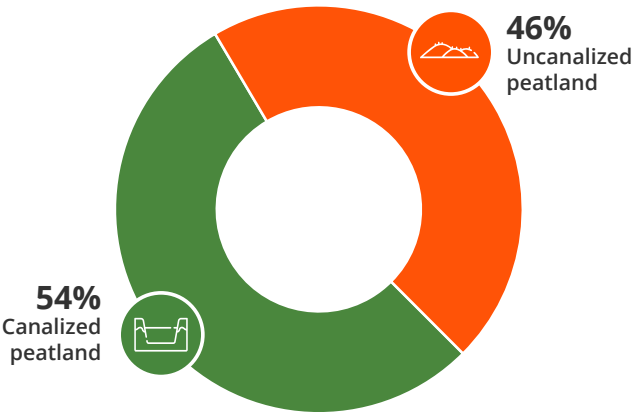
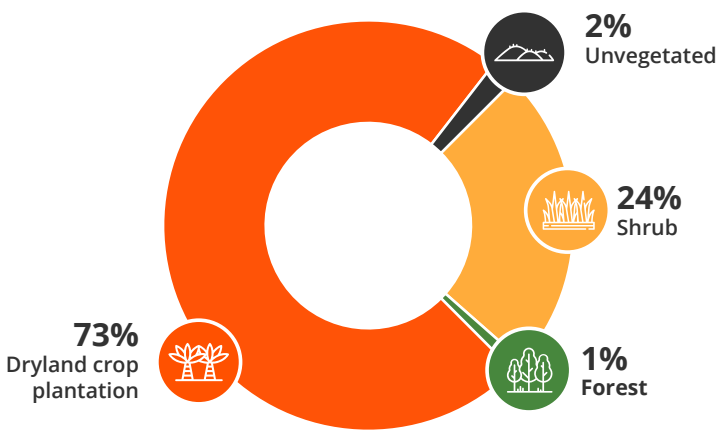


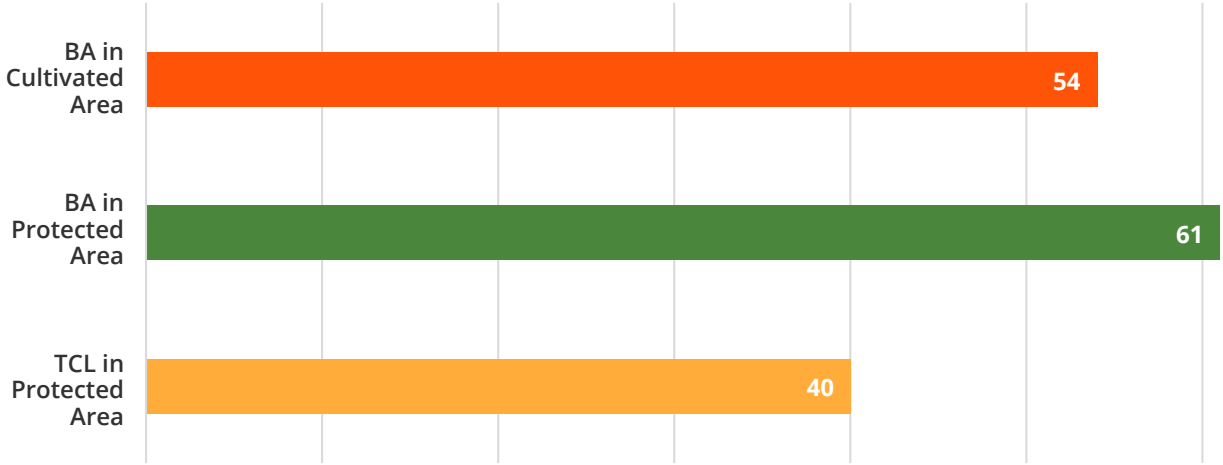
Diagram Proportion of Canalization by Peatland Land Cover Type



An analysis of 155 sample points with canals revealed that 67% were secondary canals, 30% were tertiary, and the remainder were primary canals. The prevalence of secondary canals indicates extensive plantation irrigation activities. Secondary canals function to channel large quantities of peat water over a wide area, which is then directed to primary canals, rivers, and ultimately the sea.

Drainage is carried out to lower the Groundwater Table Level (GTL). By lowering the GTL, peatland becomes easier to cultivate for plants that are not tolerant of high water content. However, this practice has serious ecological consequences. Lowering the water level makes the peat more prone to drying out. Once dried, peat loses its water retention capacity drastically, making it susceptible to catching fire from even the smallest spark.

Diagram of Sample Point Distribution with Canals



Canals are also predominantly found in peat ecosystems with protective functions. Based on monitoring results, canalization of peat ecosystems was found at 61 sample points in burned areas with protective functions, 40 sample points in areas with tree cover loss and protective functions, and 54 sample points in burned areas designated for cultivation.

According to Article 23, Paragraph (2) of Government Regulation No. 57 of 2016 in conjunction with Government Regulation No. 41 of 2017, artificial drainage (canals) is an indicator of damage in peat ecosystems with protective functions and thus requires restoration.

3.1.c. Hydrological Conditions

Groundwater Table Level (GTL) is one of the key indicators of restoration effectiveness in assessing the wetness level of a peatland area. The greater the distance between the GTL and the ground surface, the drier the area becomes, increasing the fire risk. The standard GTL has been regulated through Government Regulation No. 57 of 2016 to be no more than 40 cm below the ground surface. This means that when measured from the ground surface, water should be found at 40 cm or less below.

> Protecting peatland is equivalent to protecting life, as peatlands are a home for water. When that home is destroyed, water disappears, leaving behind an ecological disaster.
>
> ***Muh. Nasir***
> *WALHI Aceh*
> *SJ Aceh*

GTL Measurement at the Krueng Bubon-Krueng Meureubo PHU, Aceh Province

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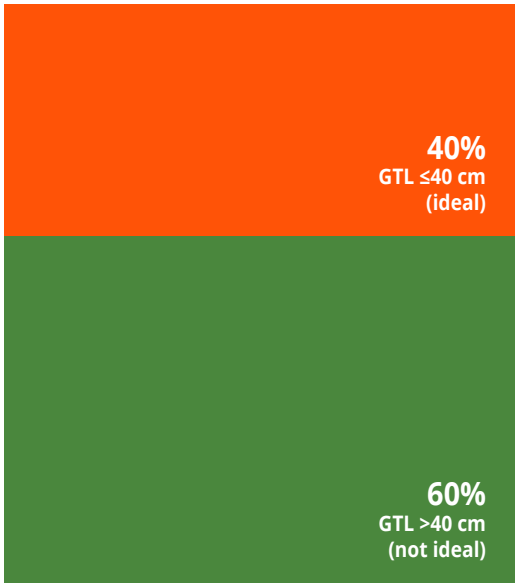
GTL Proportional Diagram



Measuring the GTL is crucial for understanding the hydrological dynamics of vulnerable peat ecosystems. Regular monitoring of GTL changes can be used to identify potential fire risks, assess the impact of logging or land conversion, and evaluate the effectiveness of restoration efforts. The findings then serve as a basis for determining which areas require more focused restoration efforts.

In a healthy and natural state, peatland should always remain wet. However, the reality shows that 60% of the 96 sample points within government intervention areas do not meet the GTL standard of >40 cm. Even more concerning, 11 sample points were found with a GTL exceeding 1 meter. The likelihood of forest and land fires will increase significantly compared to the standard GTL, which is already vulnerable to fires.

The clearing of land for dryland crop plantations has once again become a source of problems in meeting the GTL standard. This is evident from the GTL in the Krueng Bubon–Krueng Meureubo PHU, which is 71 cm below the ground surface. After the fire, the area, which should have been replanted by the government with forest cover suitable for peat characteristics, was instead filled with eucalyptus trees. These field findings reflect the absence of government-led restoration in its intervention areas, both in terms of vegetation and hydrology.

When compared with the success indicators for peat ecosystem restoration, where the GTL should not exceed 40 cm, these field findings demonstrate that the government has failed to fulfill its obligations in restoring the hydrological conditions of degraded peat ecosystems, whether due to fire or loss of tree cover. Serious efforts are needed to restore the hydrological conditions of peatlands by implementing peatland rewetting infrastructure such as canal blocks and bore wells.

Case Study

Release of Pyrite and Loss of Water Access in Krueng Teunom–Krueng Lambalik PHU

Rivers serve as the lifeblood of peatland communities. Along their flow, they provide invaluable resources for the residents. Beyond being a means of transportation, rivers offer a source of food through freshwater fish. Any disruption to the river's flow or contamination of its water will severely impact the livelihood of those who depend on it.

As the area under cultivation expands, the pressure on peatlands increases significantly. One of the consequences of the expansion of oil palm plantations in protected peatlands is the loss of water access for the local population. In Krueng Teunom–Krueng Lambalik PHU, Aceh Province, residents are unable to access clean water for daily use.

According to local accounts, the expansion of oil palm plantations has led to a significant decline in the quality of river water in Krueng Teunom–Krueng Lambalik PHU. One of the primary causes is the release of pyrite (FeS_2). Pyrite is a mineral commonly found in peat soils, rich in sulfur. When peatlands are drained, pyrite binds with oxygen in the air (oxidation), producing sulfuric acid (H_2SO_4), which subsequently dissolves heavy metals in the peat soil, such as iron (Fe), aluminum (Al), and manganese (Mn).

The release of pyrite due to peat degradation not only deteriorates the quality of the peat and river water but also diminishes the quality of life for the community. The threat of skin and digestive diseases becomes increasingly difficult to avoid.[12] It is strongly suspected that 14 water pollution are resulted from the release of pyrite from the peat soil, which spreads to community water sources through the canals built for plantations.

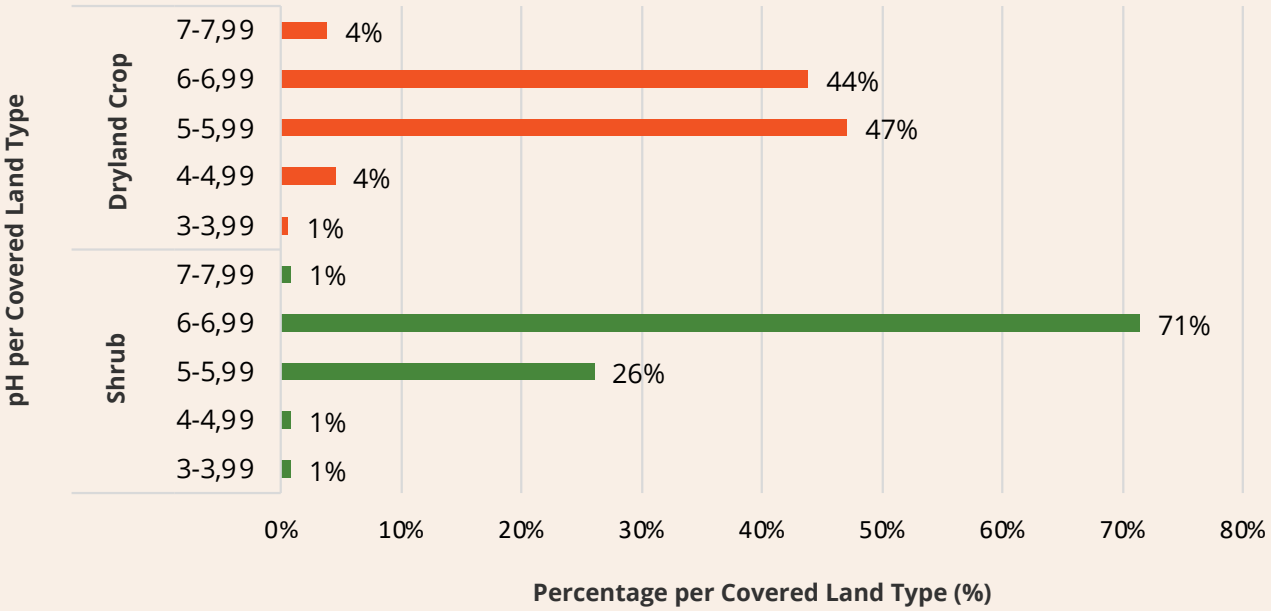
One easy method to detect pyrite contamination in peatlands is through soil acidity (pH) measurements. Field findings indicate that the pH of peat in plantations with dryland crops predominantly falls at 5, including the location of this case study—even lower at some points with a pH of 4. In several other areas, even lower pH levels were found. This

Land clearing of protected peatland on Krueng Teunom-Krueng Lambalik PHU, Aceh Province.

12 Sri Najiyati, "Mengenal Perilaku Lahan Gambut", Wetlands International-Indonesia Programme Hutan.

suggests that the acidity of the peat has become significantly higher than normal, contaminating surrounding water bodies.

Diagram of pH Proportion on Shrub Land Cover and Dryland Crop Types



In its natural state, peatland should have a pH range of 3–4[13], provided it is still forested and undisturbed. Peat that has been cleared should generally have a higher pH[14]. However, in reality, some areas that have been converted exhibit even more acidic pH levels, indicating the release of pyrite layers.

Pyrite cannot easily spread on its own. If peatland degradation occurs in the upper layers, the pyrite layer becomes exposed to oxygen, mixing with canal water, and eventually flowing towards the river. Pyrite contamination entering the river stream then affects the river ecosystem.

Some fish die from poisoning due to the high acidity of the river water. The impact does not stop there. Communities that consume fish from the river now face a situation where these fish can no longer be consumed due to pyrite poisoning.

While the presence of oil palm plantations in the community is considered economically beneficial due to the market value of palm oil, this does not outweigh the extensive damage that occurs. Ultimately, the community bears the brunt of the consequences of these unsustainable practices.

13 Mintari, Dwi Astiani, dan Togar Fernando Manurung, "Beberapa Sifat Fisik dan Kimia Tanah Gambut Terbakar dan Tidak Terbakar di Desa Sungai Besar Kabupaten Ketapang", Jurnal Hutan Lestari, Vol. 7 No. 2, 2019, hal. 947 – 955.

14 Agus C et al., "The Effect of Tropical Peat Land-Use Changes on Plant Diversity and Soil Properties", International Journal of Environmental Science and Technology, Vol. 17, 2020, hal. 1703–1712.

3.1.d.

Peatland Restoration Infrastructure Conditions

Canal Blocks Conditions

The more water that flows out of peatland areas through canals, the higher the risk of forest and land fires. To minimize potential disasters resulting from canal construction, restoration infrastructure, such as canal blocks or backfilling, must be implemented to ensure that the peat remains wet throughout the year.

Canal blocks can be seen as "guards" regulating the water levels within the peatland hydrological system. They function to retain water when water levels drop, especially during dry seasons, ensuring that peat remains wet. The condition and effectiveness of canal blocks not only support sustainable peatland management but also provide a solid foundation for responsible and evidence-based decision-making.

There are two types of canal blocks constructed based on need and capability: temporary and permanent canal blocks. Temporary canal blocks made from wood/boards/sacks are generally used for a specific period, such as to control water flow during the dry season. Permanent canal blocks made of concrete or iron are typically used for long-term purposes. In some cases, canals are not only blocked but also filled in. Canal filling involves piling soil around the canal to prevent water flow out of the peatland area permanently.

Field monitoring by Pantau Gambut identified 77 canal blocks in government restoration areas. Among these, 71 were temporary canal blocks made from wood/boards/sacks, 4 were permanent canal blocks made from concrete/iron, and 2 were filled canals.

Diagram Proportion of Canal Block Types

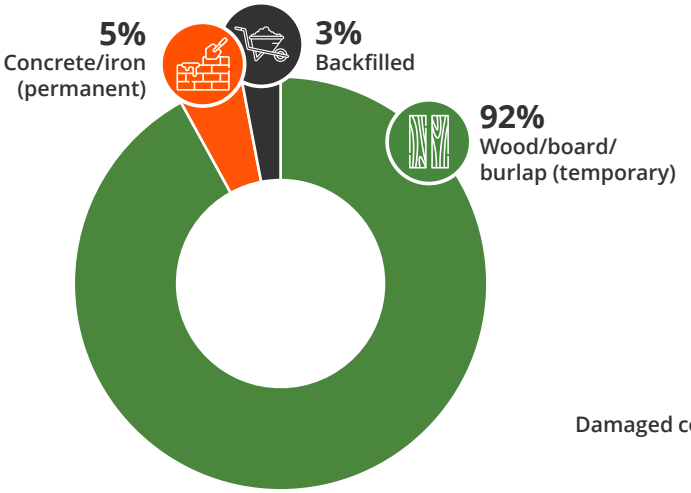
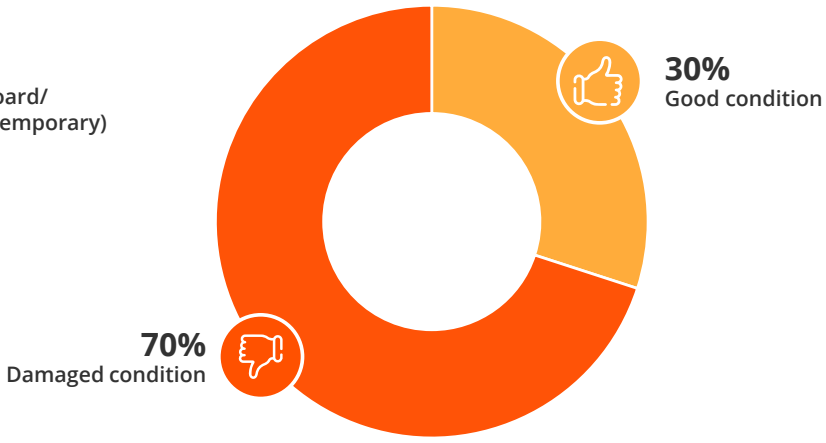


Diagram Proportion of Canal Block Physical Conditions



The number of canal blocks in a region indicates the extent of the peatland area, the level of deforestation, the degree of drainage, and peatland management policies in that area. Based on field studies in sampled areas, the largest number of canal blocks was found in Riau, with 70 canal blocks, mostly built by BRGM and KLHK.

Unfortunately, as one of the priority areas for peatland restoration, 70% of the 77 canal blocks found were damaged. This indicates that the canal blocks already constructed are neither

Canal blocks in Krueng Bubon–Krueng Meureubo PHU, Aceh Province: (left) in good condition and (right) overgrown with shrubs.

monitored nor maintained by the government to ensure they remain in good condition. Additionally, some of the damage is due to deliberate vandalism.

Field information suggests that the damage was caused by local communities because the construction of the canal blocks did not consider social impacts. Communities were affected by floods, blocked transportation routes, and other issues. This highlights the need for the government to conduct more thorough assessments when determining the location of canal block construction. The government's role in educating the community about the benefits of canal blocks remains a priority task.

Furthermore, many canal blocks were overgrown with shrubs, indicating that this infrastructure was not maintained. About 52% of canal blocks had groundwater table level (GTL) exceeding 40 cm from the ground surface. This shows that the canal blocks found were ineffective in retaining water, particularly in preventing peatland drying and land and forest fire.

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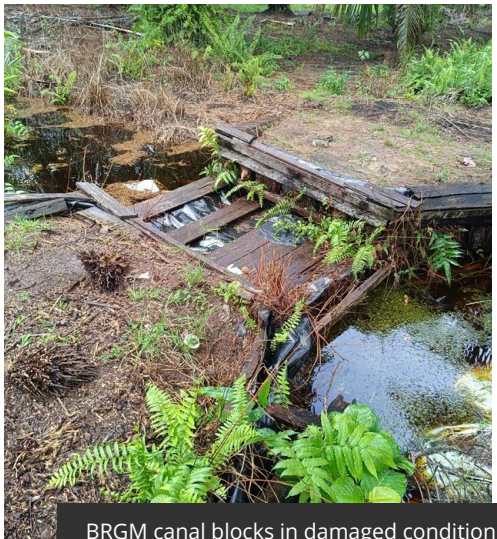


BRGM canal blocks in damaged condition found in (left) PHU Pulau Rupat and (right) Sungai Rokan–Sungai Siak Kecil PHU, Riau Province.

BRGM bore well pipes clogged with soil in Sungai Rokan PHU, Riau Province.

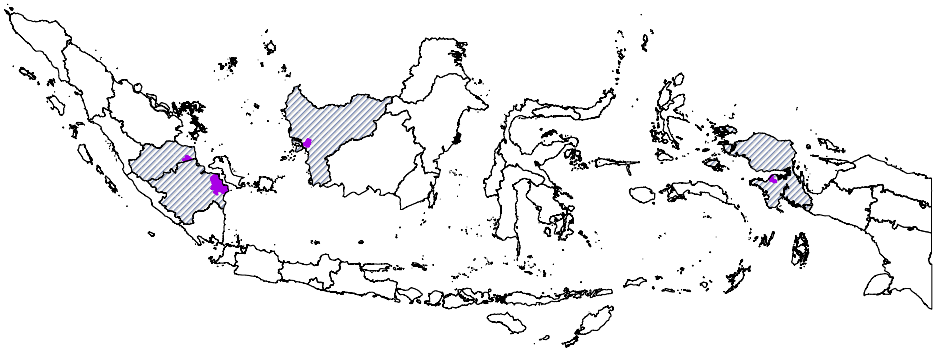
Bore Well Conditions

Unlike the canal blocks in Sungai Rokan–Sungai Siak Kecil PHU, Riau Province, the condition of bore wells in this PHU is relatively better. Of the six bore wells found by Pantau Gambut, all remain operational. However, there are still common issues that need to be addressed by the Peatland and Mangrove Restoration Agency (previously BRG) as the institution responsible for this infrastructure: the poor maintenance of bore well structures.

Pantau Gambut discovered bore wells clogged with soil. These bore wells, made from plastic/PVC pipes, are designed to draw water from natural sources such as groundwater beneath the peat layer, rivers, or lakes. If the bore wells are clogged, water cannot be drawn to wet the dry or burned peatland surface, rendering the wetting function ineffective.

The process of peatland restoration must be viewed as a long-term commitment involving all stakeholders, especially the government. With the capacity and authority they possess, all levels of government—both regional and central—must actively play their roles in restoring the hydrological functions of peatlands in accordance with their core duties and functions. The government must avoid repeating the same mistakes by neglecting and continuing to permit the conversion of protected areas into dryland crop plantations.

3.2.
Condition of Corporate Peatland Restoration Areas (Concessions)



Map of The Concession's Peatland Restoration Investigation Area

LEGEND

- Indonesia's administrative boundaries
- Peatland restoration investigation province
- Concession peatland restoration investigation area

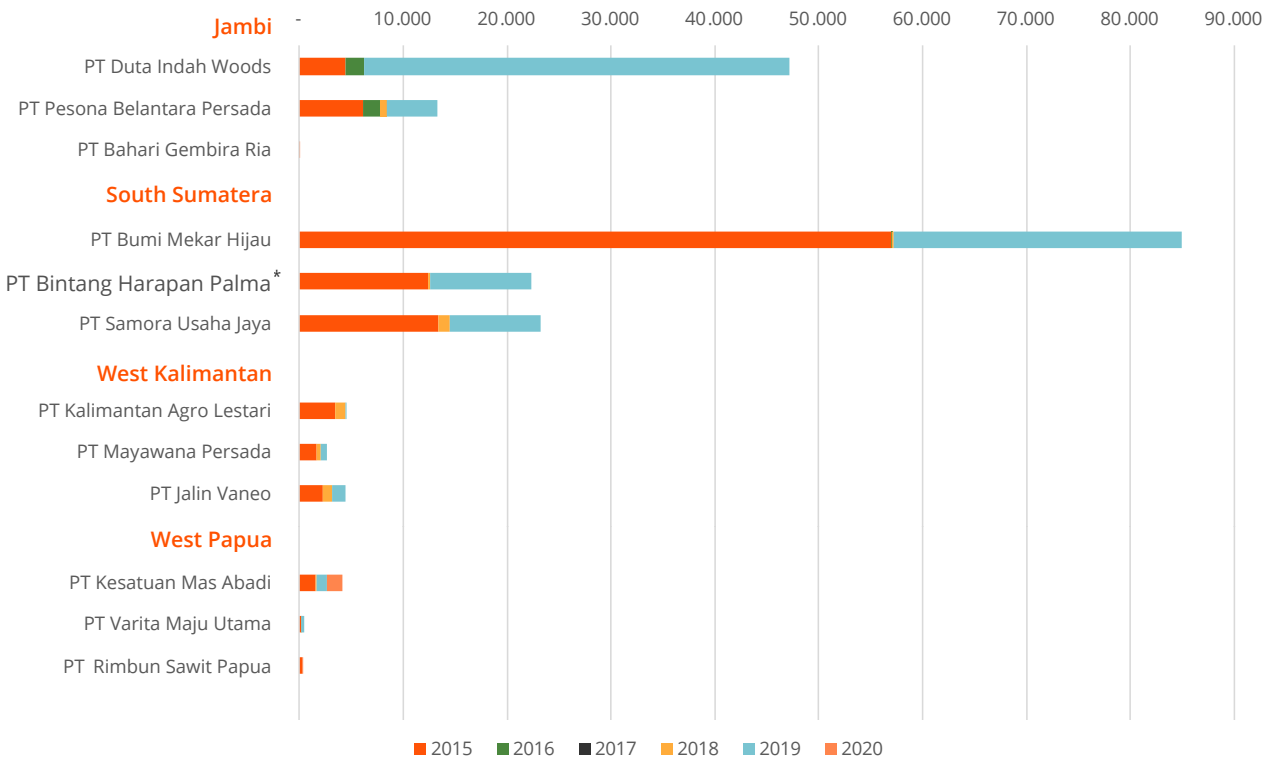
The degradation of peatlands is prevalent in concession areas. Corporations often fail to adhere to environmentally friendly peatland management regulations, resulting in neglected land. Shrubbery and dryland crops dominate these areas instead of forest cover.

Pantau Gambut conducted investigations in four provinces—Jambi, South Sumatra, West Kalimantan, and South Papua—to monitor the performance of concession holders in restoring peatlands. This investigation focused on three concessions in each province, selecting the most degraded peatland hydrological units (PHU) to determine if the degradation was correlated with concession activities.

The selection of concession locations was based on the analysis of forest and land fire parameters and the loss of tree cover from 2015 to 2020. The chosen locations were those that historically suffered significant damage or severe degradation based on these two parameters.

GTL measurement on tertiary canals in a former peatland clearance area at PT Mayawana Persada, Eest Kalimantan Province.

Burned Ares Historical Diagram (Ha)



*PT Bintang Harapan Palma (BHP) is the new name that replaced PT Bumi Sriwijaya Sentosa (BSS) in 2018 because the Ministry of Environment and Forestry sealed their operations.

Province	PHU Name	Concession	Type	2015	2016	2017	2018	2019	2020	Total
Jambi	PHU Sungai Batanghari–Sungai Air Hitam Laut	PT Duta Indah Woods	IUPHHK-HA	4.427	1.842	-	-	40.885	-	47.154
		PT Pesona Belantara Persada	IUPHHK-HA	6.172	1.687	-	611	4.785	-	13.255
		PT Bahari Gembira Ria	HGU	82	-	-	-	-	-	82
South Sumatera	PHU Sungai Sugihan–Sungai Lumpur	PT Bumi Mekar Hijau	IUPHHK-HTI	56.984	66	-	132	27.793	-	84.975
		PT Bintang Harapan Palma	HGU	12.365	-	-	227	9.768	-	22.360
		PT Samora Usaha Jaya	HGU	13.422	-	-	1.037	8.780	-	23.239
West Kalimantan	PHU Sungai Durian–Sungai Kualan	PT Kalimantan Agro Lestari	HGU	3.495	-	-	944	75	-	4.514
		PT Mayawana Persada	IUPHHK-HTI	1.670	-	-	402	592	-	2.664
		PT Jalin Vaneo	HGU	2.288	-	-	818	1.311	-	4.417
West Papua	PHU Sungai Otoweri–Sungai Saengga	PT Kesatuan Mas Abadi	IUPHHK-HTI	1.539	-	-	130	1.010	1.501	4.180
		PT Varita Maju Utama	HGU	154	-	-	47	296	-	497
		PT Rimbun Sawit Papua	HGU	253	-	-	-	-	75	328

> Peatland restoration in Papua has been minimal due to a lack of government agencies "interested" in monitoring this issue. Restoration activities are also absent, even though all deep peat ecosystems within the monitored concession areas are degraded.
>
> ***Sulfianto***
> *Panah Papua*
> *SJ West Papua*

Location of protected peatland clearance at PT Mayawana Persada, West Kalimantan Province, already planted with eucalyptus seedlings.

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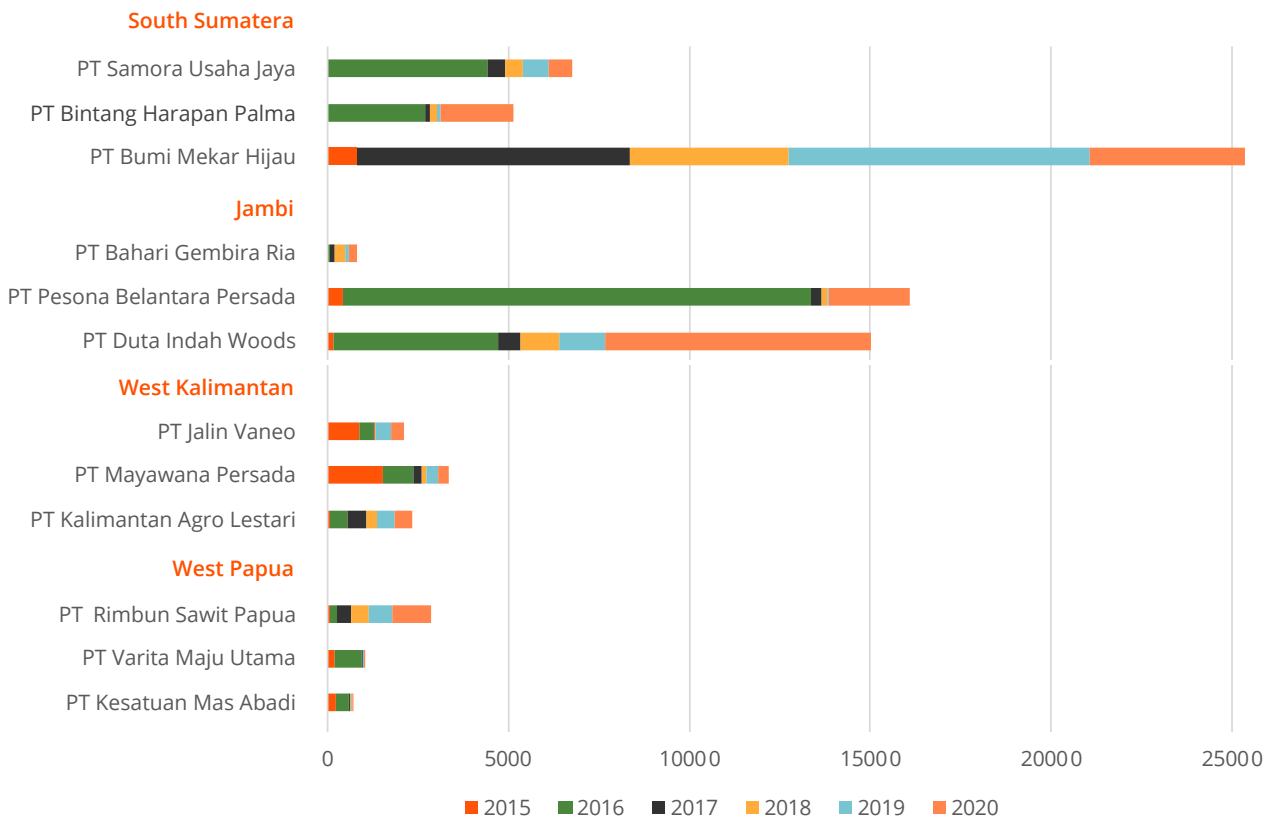
Tree Cover Loss Historical Diagram (Ha)



*PT Bintang Harapan Palma (BHP) is the new name that replaced PT Bumi Sriwijaya Sentosa (BSS) in 2018 because the Ministry of Environment and Forestry sealed their operations.

Province	PHU Name	Concession	Type	2015	2016	2017	2018	2019	2020	Total
Jambi	PHU Sungai Batanghari–Sungai Air Hitam Laut	PT Duta Indah Woods	IUPHHK-HA	143	4.569	622	1.065	1.255	7.355	15.009
		PT Pesona Belantara Persada	IUPHHK-HA	409	12.954	286	179	2	2.246	16.076
		PT Bahari Gembira Ria	HGU	-	53	151	276	94	218	792
South Sumatera	PHU Sungai Sugihan–Sungai Lumpur	PT Bumi Mekar Hijau	IUPHHK-HTI	823	-	7.526	4.396	8.325	4.292	25.362
		PT Bintang Harapan Palma	HGU	-	2.687	134	199	94	2.005	5.119
		PT Samora Usaha Jaya	HGU	-	4.418	491	481	703	661	6.754
West Kalimantan	PHU Sungai Durian–Sungai Kualan	PT Kalimantan Agro Lestari	HGU	60	472	534	279	507	498	2.350
		PT Mayawana Persada	IUPHHK-HTI	1.529	843	211	129	338	292	3.342
		PT Jalin Vaneo	HGU	861	393	55	10	432	360	2.111
West Papua	PHU Sungai Otoweri–Sungai Saengga	PT Kesatuan Mas Abadi	IUPHHK-HTI	212	370	33	22	29	29	695
		PT Varita Maju Utama	HGU	201	728	44	10	20	16	1.019
		PT Rimbun Sawit Papua	HGU	49	209	385	482	660	1.075	2.860

Since the transition of BRG to BRGM (Peat and Mangrove Restoration Agency) in 2020, corporate operations on peatlands have increasingly gone unchecked. The enactment of Presidential Regulation No. 120 of 2020 has stripped BRGM of the authority to supervise the construction, operation, and maintenance of infrastructure in concession areas. This loss of authority has increased the likelihood of corporations neglecting to conduct their activities in accordance with peat-friendly principles. The general findings from field interventions in concession areas can be summarized in the following table.

Summary Table of Corporate Peatland Restoration Monitoring Data

Parameter	Description			
	Jambi	South Sumatera	West Kalimantan	West Papua
Peatland Condition				
Sample amount	50 spots	66 spots	60 spots	64 spots
Land Cover Type	Dryland crops, shrubs	Dryland crops, shrubs	Dryland crops, shrubs	Shrubs
Dominant Dryland Crop Type	Oil palm, acacia	Acacia, eucalyptus	Oil palm	-
Dominant pH Class of Samples	pH 5–5,99	pH 4-4,99 and 5-5,99	pH 6–6,99	pH 6–6,99
Percentage of Canal Samples	44%	79%	33%	2%
Peat Hydrological Condition				
Number of Samples	36 spots	36 spots	37 spots	47 spots
Average GTL	58 cm	59 cm	33 cm	3 cm
Canal Blocks Infrastructure				
Number of Findings	5 canal blocks	Not founded	1 canal blocks	Not founded
Infrastructure Construction Initiator	Corporation	-	Not identified	-
Dominant Canal Blockage Type	Wood/board/burlap (temporary) and backfilling	-	Wood/board/burlap (temporary)	-
Average GTL	64 cm	-	10 cm	-
Percentage of Damaged Canal Blockage Samples	0%	-	0%	-
Bore Wells Infrastructure				
Number of Findings	-	-	-	-
Infrastructure Construction Initiator	-	-	-	-
Bore Well Material	-	-	-	-
Percentage of Damaged Bore Wells Samples	-	-	-	-
GTL Measurement Tool				
Number of Findings	1 tool	3 tool	Not founded	Not founded
Infrastructure Construction Initiator	Corporation	Corporation	-	-
GTL Measurement Material	Manual (wood)	Manual (wood and concrete)	-	-
Function and Activity of the Tool	Functioned	Functioned	-	-
Physical Condition of GTL Measurement Tool Structure	Good	Good	-	-
Fire Tower Infrastructure				
Number of Findings	6 fire tower	1 fire tower	Not founded	Not founded
Construction Material	Iron, wood	Iron	-	-

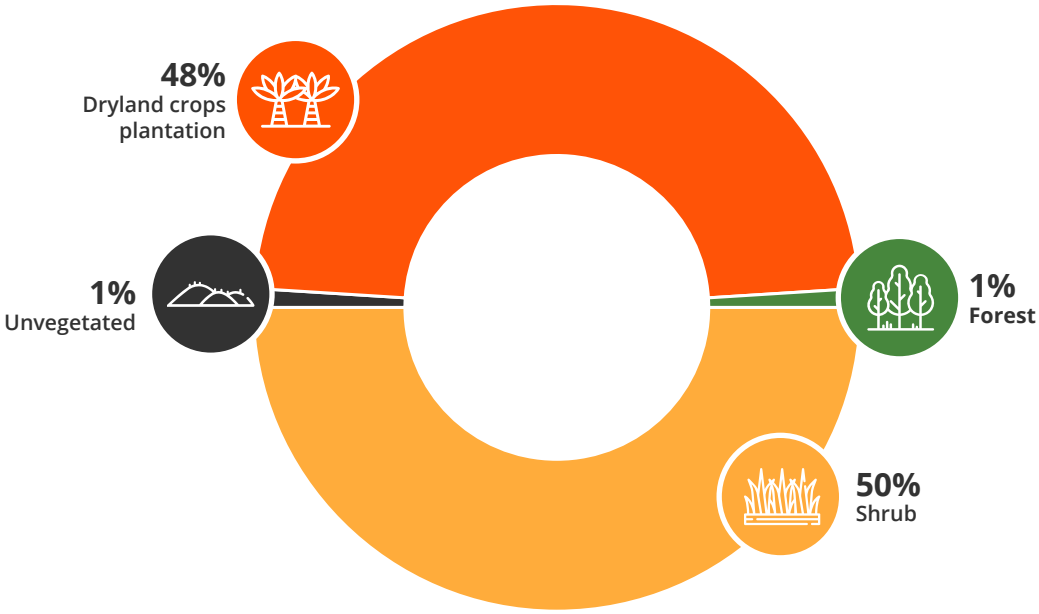
3.2.a. Condition of Peatland Land Cover

Similar to non-concession areas that should receive government intervention, damaged peatlands within concession areas also do not receive adequate attention. In addition to geographic distribution, Pantau Gambut also categorized the peat ecosystem functions when

assessing land cover conditions in concession areas: the protected function of peat ecosystems in areas with a history of tree cover loss, the cultivated function of peat ecosystems in areas with a history of burned area and the protected function of peat ecosystems in areas with a history of burned area.

Of the 240 peatland sample points that had burned area and tree cover loss, the proportion of shrubbery (50%) and dryland crop plantations (48%) was evenly distributed. Only a very small fraction (1%) of the areas that had burned and lost tree cover were able to regenerate into forests.

Diagram of Land Cover Proportions on Burned Peatland Areas with Tree Cover Loss



> Peatland recovery to prevent ecological disasters will not succeed as long as the state continues to accommodate the interests of extractive industrial activities, such as forest plantations and oil palm plantations, in South Sumatra Province within a single peatland landscape (PHU).
>
> *Muhammad Hairul Sobri*
> *Rawang.id*
> *SJ South Sumatera*

The unsustainable activities of corporations that lead to peat degradation are evident from field observations. Nearly 81% of the 69 sample points of tree cover loss in protected peatland areas were dominated by dryland crop plantations. Burned area within peatland corporate's areas have not been legally addressed. This is indicated by the finding that of the 171 sample points in burned areas, whether protected or cultivated, 64% were left to become shrubland, while the remaining areas were converted into monoculture commodity production.

Peatlands, as sensitive ecosystems, are being cleared and burned, then abandoned as shrubland. This increases the risk of

Neglected Burned Protected Peatland in the PT Bumi Sriwijaya Sentosa Area, South Sumatra Province.

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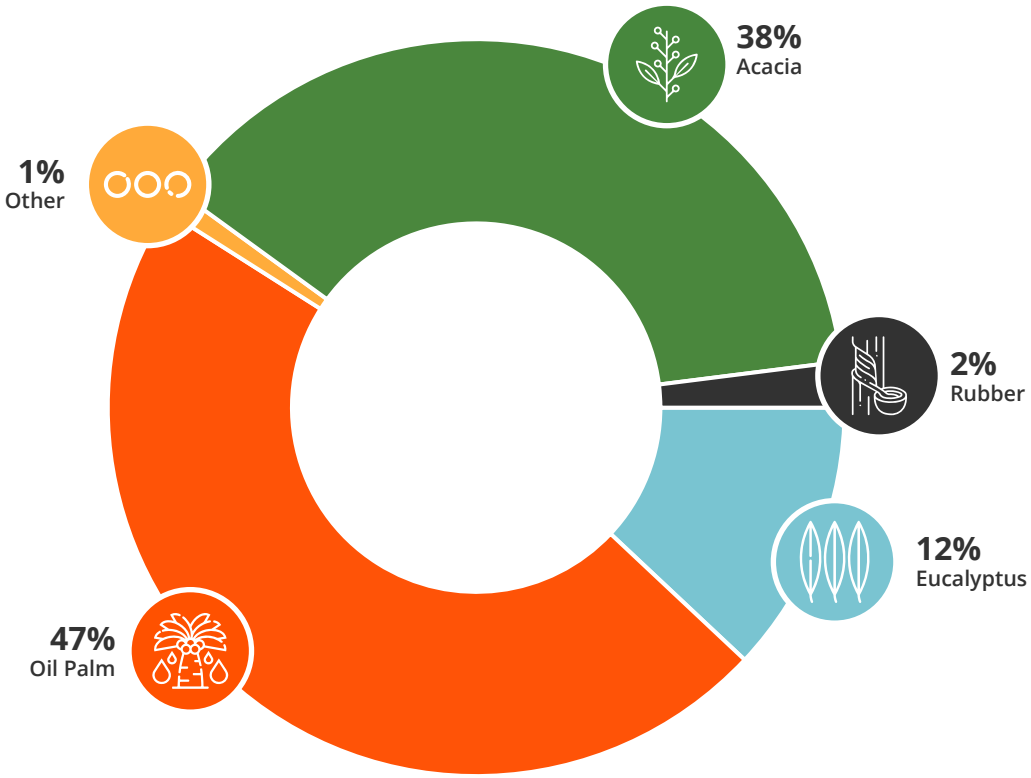
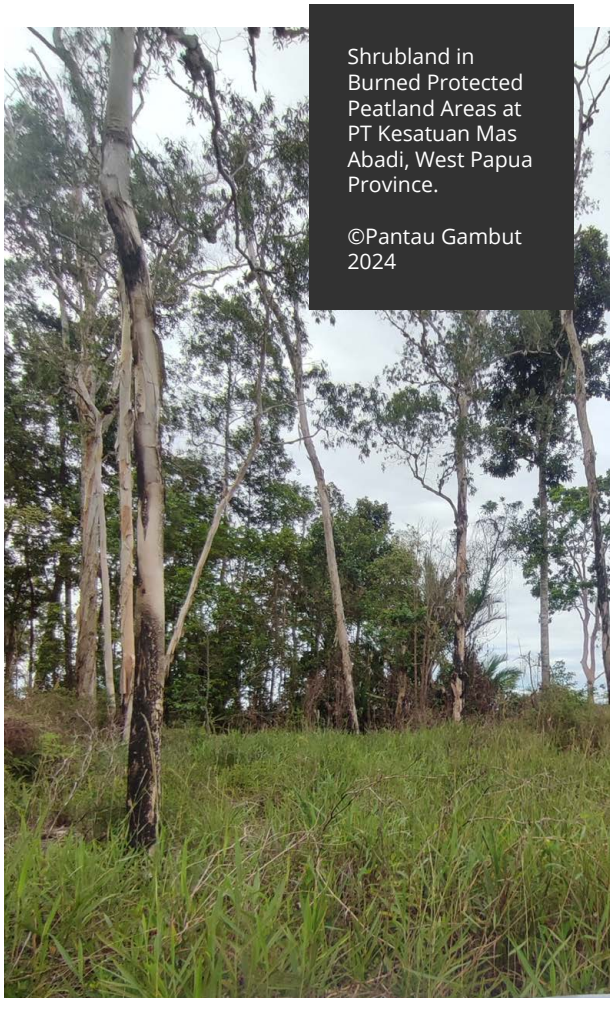
Diagram of Dryland Crop Proportions on Burned Peatland Areas with Tree Cover Loss



peatland damage, such as carbon release, forest fires, loss of hydrological function, and more widespread pollution. Furthermore, of the 115 monoculture commodity sample points, 47% of the burned and vegetation-lost peatlands were covered by oil palm, and 38% by acacia.

In fact, referring to Article 21 of Government Regulation No. 57 of 2016 *jo.* Government Regulation No. 71 of 2014, extractive plantation activities are not a permissible form of utilization within protected peat ecosystems. Additionally, Article 14 of the Ministry of Environment and Forestry Regulation No. P.16 of 2017 concerning Technical Guidelines for the Restoration of Peat Ecosystem Functions stipulates that on burned and deforested areas, whether for protection or cultivation purposes, replanting (revegetation) with native and/or peat-friendly species is required, rather than planting dryland crops such as oil palm and acacia, which require ecosystem



Shrubland in Burned Protected Peatland Areas at PT Kesatuan Mas Abadi, West Papua Province.

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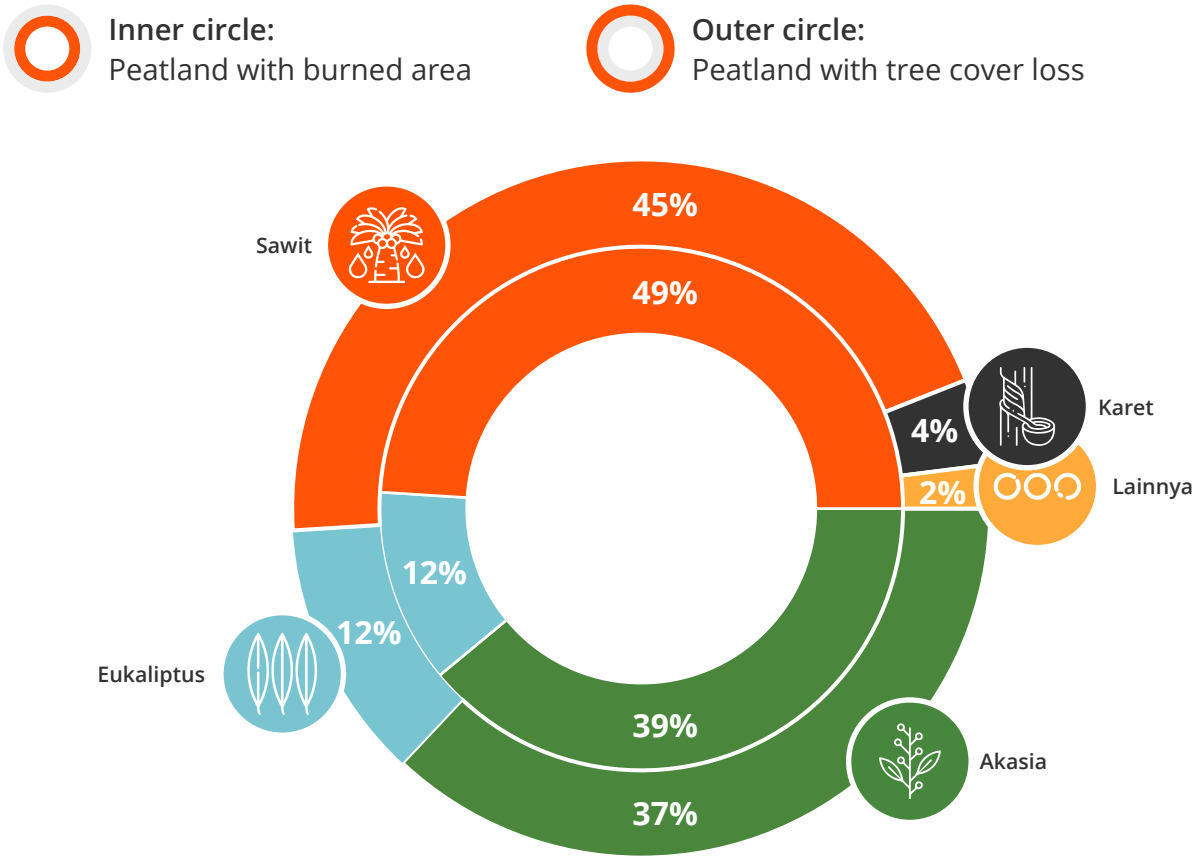
engineering, primarily through canalization.

Diagram of Land Cover Proportion on Burned Peatland Area



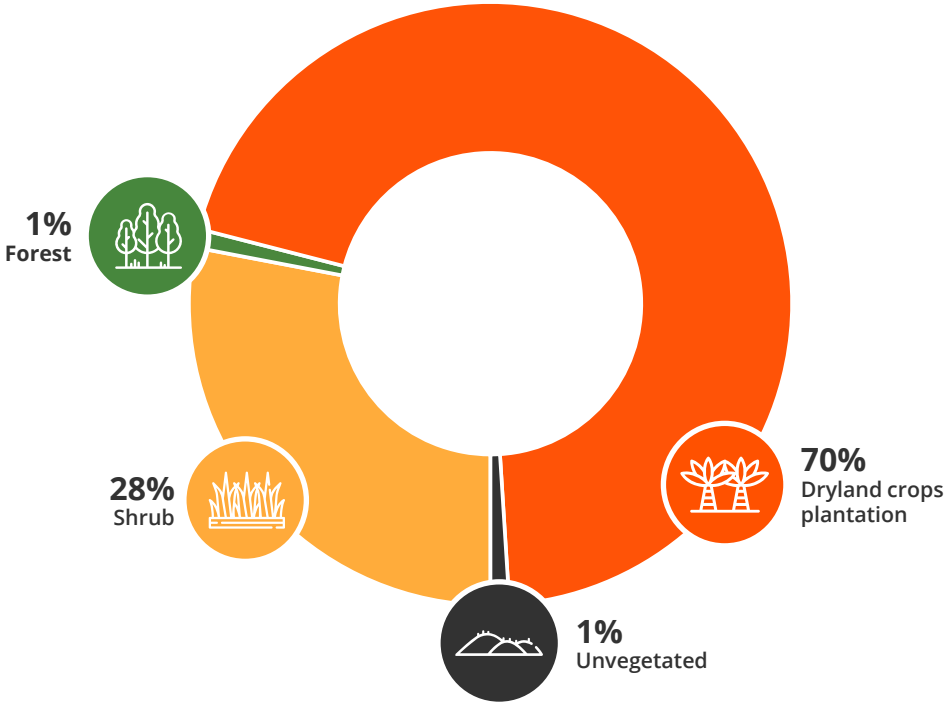
In fact, referring to Article 21 of Government Regulation No. 57 of 2016 *jo.* Government Regulation No. 71 of 2014, extractive plantation activities are not permissible within protected peat ecosystems. Additionally, Article 14 of the Ministry of Environment and Forestry Regulation No. P.16 of 2017 concerning Technical Guidelines for the Restoration of Peat Ecosystem Functions stipulates that on burned and deforested areas, whether for protection or cultivation purposes, replanting (revegetation) with native and/or peat-friendly species is required. It is not appropriate to plant dryland crops like oil palm and acacia, which necessitate ecosystem engineering, primarily through canalization.

3.2.b.
Canalization in Concession Areas

It is ironic that while peatland restoration efforts are ongoing, the practice of draining peatlands through canal construction remains prevalent, particularly in monoculture plantations such as palm oil, acacia, and other commodities. From 240 sample points, 49% of the peatland has been disrupted by canal construction, with more than half (65%) of these canals located within protected peatland areas.

The prevalence of dryland vegetation in burned peatland areas is more commonly found in regions with canals. In fact, 70% of the 117 sampled points of canalized peatland in burned areas are dominated by dryland plantations. Plants such as palm oil and acacia require relatively dry soil to thrive. Thus, there is a strong correlation between the presence of canals

Diagram of Proportion of Canalization in Various Land Cover Types in Areas of Peatland Previously Affected by Fire and Deforestation

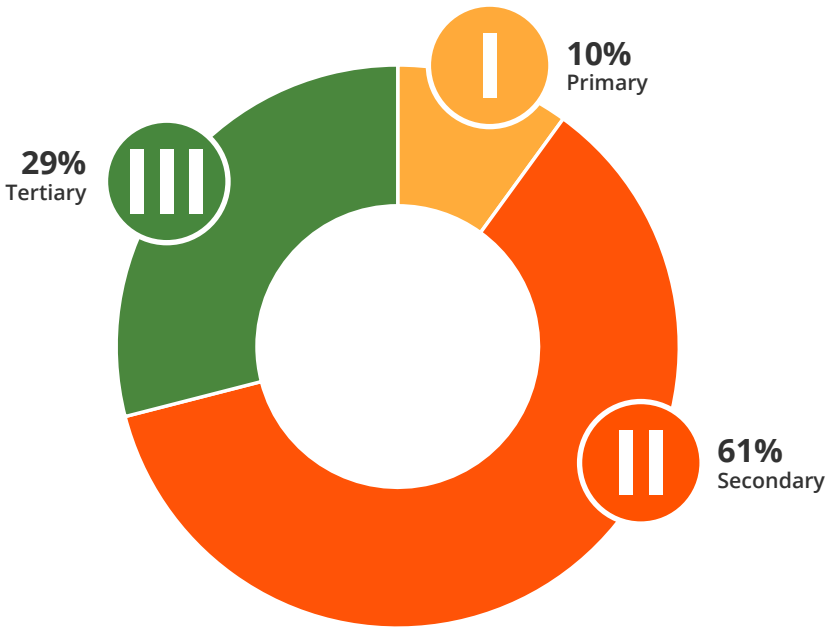


> The protective function of these peatlands is crucial for sustainability. One critical part of the ecosystem in Jambi that needs protection is the tiger habitat within the Batanghari–Air Hitam Laut Peat Hydrological Unit (PHU), which serves as a buffer zone for Berbak and Sembilang National Park.
>
> *Feri Irawan*
> *SJ Jambi*

and the intensive monoculture farming practices and the conversion of peatland for large-scale plantation purposes.

The diagram above illustrates the proportion of canal types found in peatland areas, with secondary canals being the most prevalent. The extensive presence of secondary canals in peatland areas may indicate the large scale of the plantations. This is because secondary canals can cover a larger area of peatland and connect with the primary network. The water from

Diagram of Proportion of Canal Types



Secondary canals in newly opened peatland areas in the Krueng Bubon-Krueng Meureubo Peat Hydrological Unit, Aceh Province.

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Comparison of Secondary and Tertiary Canal Widths in Areas of PT Bumi Sriwijaya Sentosa, South Sumatra Province, Experiencing Deforestation

these canals flows into primary canals and eventually into rivers, whereas tertiary canals only have a localized impact on smaller areas.

All findings related to canalization efforts in peatland ecosystems that have previously been burned indicate that concession holders have violated Article 26 of Government Regulation No. 57 of 2016 in conjunction with Government Regulation No. 71 of 2014, which explicitly prohibits the construction of drainage channels that result in peatland drying, a characteristic met by canals.

Case Study

PT Pesona Belantara Persada: Breaching Agreements for Corporate Profit

Weak law enforcement has emboldened corporations to persist in unsustainable practices, even in areas that have experienced previous fires. One such company is PT Pesona Belantara Persada (PBP), which operates in the Batanghari River–Air Hitam Laut River Peat Hydrological Unit in Jambi Province. After a fire incident, PT PBP, which holds an IUPHHK-HA permit, was found to have newly cleared land and planted acacia in protected peatland areas.

Not only did PT PBP clear protected land, but it also, along with PT Putra Duta Indah Wood, violated an agreement with a local organization. Both companies breached a peace agreement reached following a civil lawsuit filed by Walhi Jambi and avoided their responsibility to restore the land that burned in 2019. The fires and peatland damage, as identified in this study, continue unabated.

The lawsuit and legal process between PT PBP and Walhi Jambi are ongoing, with mediation and appeals still in progress. Moreover, this concession has been found to be non-compliant with timber management regulations, further demonstrating the company's disregard for environmental governance.[15]

PT Mayawana Persada: Water Drainage Leading to Pollution

The corporate challenges in peatland management are never-ending. Corporations will always seek loopholes to maximize profit, even at the expense of the environment. This is evident in the Sungai Durian–Sungai Kualan Peat Hydrological Unit in West Kalimantan Province.

Recently, PT Mayawana Persada carried out extensive deforestation and peatland drainage in the Sungai Durian–Sungai Kualan Peat Hydrological Unit. The concession, which was granted under SK.732/Menhut-II/2010, cleared over 21,000 hectares of peatland forest from 2021 to 2023.[16] Moreover, within a span of three months—from January to March 2024—the area deforested by PT Mayawana Persada reached 438.75 hectares, of which 90.83 hectares were located in protected peatland areas.[17]

15 Kementrian Lingkungan Hidup dan Kehutanan, "Pemegang HPH Diduga Langgar Aturan", http://perpustakaan.menlhk.go.id/pustaka/home/index.php?page=detail_news&newsid=860 (22 Maret 2019).

16 Auriga Nusantara, Environmental Paper Network, Greenpeace International, Woods & Wayside International, dan Rainforest Action Network, "Pembalak Anonim Deforestasi di Hutan Tropis dan Konflik Sosial yang Dipicu oleh PT Mayawana Persada di Kalimantan Barat", (2024), https://auriga.or.id/flipbooks/report/id/109.

17 Raden Ariyo Wicaksono, "Investigasi Mayawana: Pemilik Maya, Kerusakan Nyata", Betahita, https://betahita.id/news/detail/10098/investigasi-mayawana-pemilik-maya-kerusakan-nyata.html?v=1715572307.

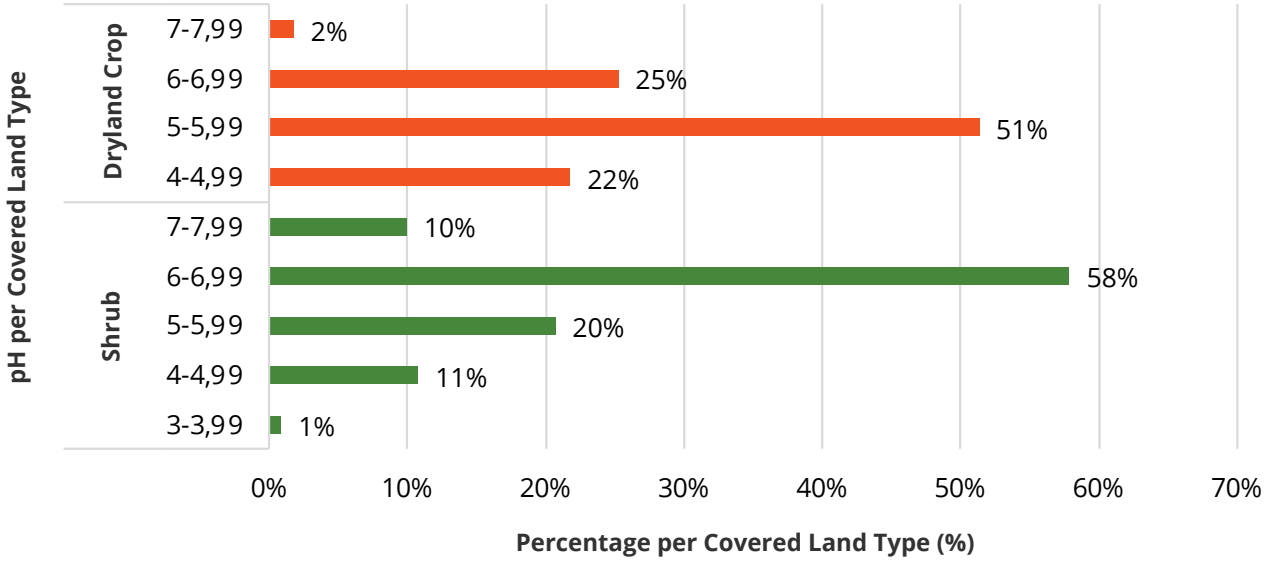
Pantau Gambut found that many peatland ecosystems had a standard pH of 4, indicating that these areas had already undergone pyrite oxidation. At least four factors influence pH variability in peatland ecosystems: peat depth, peat type (based on formation environment and maturity), the extent of land processing or land use type, and pyrite layer presence. Field observations in this study's concession areas focused on uniform peat depth, specifically on the surface layer (acrotelm), and located in inland peatland areas. Thus, it can be assumed that the pH variability in this study is primarily due to land use changes and the presence of a pyrite layer.

As previously explained regarding non-concession areas, peatland drainage with a pyrite layer risks causing pollution (see page 23). The release of pyrite impacts the high acidity levels of peat soil, which, if mixed with water channels such as rivers, poses a significant threat to the water sources of local communities.

This phenomenon is evident around PT Mayawana Persada. Samples taken by Pantau Gambut revealed a pH level of 4.5 in the company's area. As previously mentioned, peatlands that have been cleared typically have a higher pH[18], yet the field findings show increasing acidity, indicating the release of pyrite.

Additionally, there were numerous findings of peatland ecosystems with higher pH levels in concession areas, such as those in the 6-7 range. This is partly due to land burning, which produces ash that lowers peat acidity. However, it should be noted that the increase in peat soil pH after peatland degradation could be seen as an anomaly, considering that peat is generally more acidic.

Diagram of pH Proportion on Shrub Land Cover and Dryland Crop Types

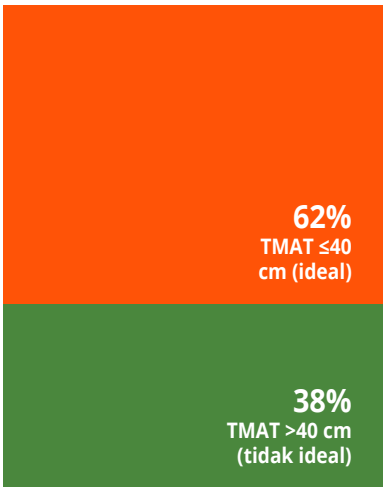


3.2.c. Hydrological Conditions

The measurement of Groundwater Table Level (GTL) is conducted to assess the hydrological conditions of peatlands within the concession area. Out of 156 GTL samples measured in peat canals, it was found that 96 samples met the standard with a GTL of less than 40 cm from the ground surface.

18 Ibid.

Diagram Proporsi TMAT



However, there remain many GTLs that do not meet the hydrological standards for peatlands, with a GTL exceeding 40 cm. Pantau Gambut discovered that 60 sample points in the concession areas failed to meet the hydrological standards for peatlands. Additionally, there were 7 locations where canals with a GTL of over 1 meter were found.

Pantau Gambut identified a GTL of approximately 140 cm from the ground surface in a canal at PT Bumi Mekar Hijau. It is no surprise that repeated peatland fires occur in the protected peatlands within this excessively dry concession area. A similar situation was observed at PT Mayawana Persada, particularly in the protected peatlands where forests were recently cleared for monoculture plantations, with a GTL of 80 cm.

These two examples illustrate the neglect of peatland protection and restoration in the concession areas. The findings indicate that the peatlands in these concession areas continue to pose a high risk for peatland fires and degradation.

This situation directly contradicts the peatland ecosystem water management policies outlined in Government Regulation No. 71 of 2014, as amended by Government Regulation No. 57 of 2016 concerning the Management of Peatland Ecosystems. The regulation stipulates that a GTL exceeding 40 cm is a criterion indicating that the peat soil has already experienced degradation. Consistent with research, a GTL exceeding 40 cm above the ground surface significantly increases the risk of fire.[19]

Land preparation for plantations in protected areas with loss of tree cover at PT Bumi Sriwijaya Sentosa, South Sumatra Province.

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3.2.d. Peatland Restoration Infrastructure Conditions

In terms of infrastructure to maintain GTL within standards, such as canal blocks and infilled canals, Pantau Gambut identified a total of 7 canal blocks. The infrastructure found consists of 2 canal blocks made of wood/planks/sacks and

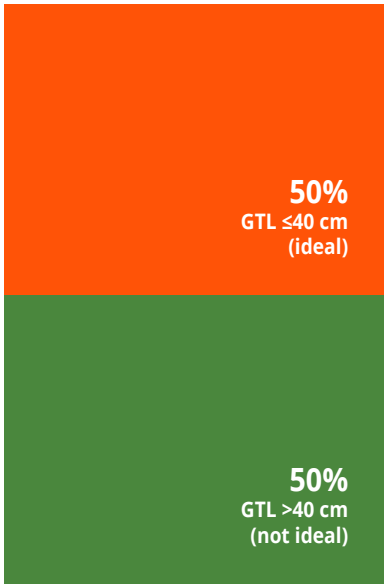
19 Erianto Indra Putra, "The Effect of The Precipitation Pattern of The Dry Season on Peat Fire Occurrence in the Mega Rice Project Area, Central Kalimantan, Indonesia", Tropics, Vol. 19 No. 4, 2011, hal. 145-156.

4 infilled canals. Five of the six canal blocks are located at PT Pesona Belantara Persada, Jambi Province, while the remaining one is at PT Kalimantan Agro Lestari, West Kalimantan Province, in the form of a temporary canal block made of wood/planks/sacks.

In fact, the temporary canal blocks all meet the physical and GTL standards. However, it was found that 3 of the infilled canal blocks were in poor condition and did not meet the standards, with GTL exceeding 40 cm.

In the context of preventing peatland fires, in addition to the construction of peatland rewetting infrastructure such as canal blocks and fire prevention infrastructure like bore wells, there is also a need for infrastructure to monitor peatlands. To monitor GTL in concession areas, GTL measuring instruments are required.

GTL Proportional Diagram



Backfilled canal at PT Pesona Belantara Persada, Jambi Province

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Pantau Gambut identified 4 manual GTL measuring instruments. Of these, 3 were found in South Sumatra at PT Samora Usaha Jaya, and 1 was found in Jambi at PT Bahari Gembira Ria. All the GTL measuring instruments identified were owned by the companies and were mostly made of wood, functioning well as intended.

Another essential fire prevention infrastructure required in concession areas, as stipulated in Minister of Agriculture Regulation No. 5 of 2018 concerning the Opening and/or Cultivation of Plantation Land Without Burning, is the fire tower. This infrastructure is a crucial part of peatland fire prevention standards. Pantau Gambut identified a total of 7 fire towers, with 6 located in Jambi Province at PT Pesona Belantara Persada and PT Putra Duta Indah Wood, and 1 fire tower in South Sumatra Province at PT Samora Usaha Jaya.

In general, the fire towers are in good condition. However, there is one fire tower at PT Putra Duta Indah Wood that poses a fire prevention risk as it is made of wood. Although the specific material used for constructing fire towers is not regulated in detail in Minister of Agriculture

A makeshift wooden fire tower at PT Putra Duta Indah Wood, Jambi Province.

Regulation No. 5 of 2018, wood is generally more vulnerable to fire.

Additionally, fire towers made of wood have lower structural strength compared to those made of metal or concrete and require regular maintenance to prevent damage from pests, fungi, and weather. This necessitates additional costs and ongoing attention, which poses a significant risk, particularly for tall structures like fire towers.

Peatland restoration infrastructure in concession areas, such as canal blocks, bore wells, infilled canals, GTL measuring instruments, and fire towers, are critical components to prevent further degradation of peatlands. Given the limited infrastructure identified, it is imperative that all concession areas pay attention to the need for adequate infrastructure, both in terms of quantity and compliance with established standards and criteria.

4. RECOMMENDATION

Based on the findings of this study, the following recommendations are provided for the government and corporations in managing peatland concession areas:

1. **The government must uphold the principle of state responsibility.**
   The government's responsibility, as represented by the state, is stipulated in Article 2 of Law No. 32 of 2009 concerning Environmental Protection and Management (PPLH Law). This obligation ensures that the government cannot neglect or delegate the protection of peatlands solely to the community. According to various theories, the definition of state responsibility encompasses the duties held by the government as a legal entity regarding its actions, policies, and obligations, both prospectively (future-oriented) and retrospectively (past-oriented).[20]

2. **The government must take preventive measures as part of law enforcement efforts.**
   In cases of environmental damage, law enforcement actions must be prioritized without waiting for forest and land fires (karhutla) to occur. This priority is particularly relevant to areas with canals and groundwater table levels (GTL) that do not meet the standards as regulated in Article 23 of Government Regulation No. 56 of 2017 *jo.* Government Regulation No. 71 of 2014. This aligns with the principle of strict liability under Article 88 of the PPLH Law, where any person whose actions pose a serious threat to the environment is held strictly liable for any resulting damage, without the need to prove fault.

3. **Corporations must assume absolute responsibility for their concession areas.**
   Corporations bear absolute responsibility for their concession areas and must promptly address any damage to the peatland ecosystem in accordance with established standards. This includes the comprehensive restoration of the ecosystem.

4. **Corporations must regularly and transparently validate their sustainability claims.**
   Sustainability claims cannot be solely based on corporate sustainability certifications. Regular and transparent environmental testing is required. Peatland restoration claims will be scrutinized if there is damage to the peatland hydrological ecosystem, such as forest fires, flooding, and a decline in groundwater table levels (GTL). Periodic and transparent environmental testing is necessary to validate these claims. In this context, a transparent and accountable complaint mechanism is a key indicator of the seriousness of peatland ecosystem protection efforts. The findings of this study, which highlight the high vulnerability to karhutla and the damage to the peatland ecosystem, show that there is no significant correlation between holding sustainability certifications and their implementation on the ground.

5. **Financial institutions must tighten environmental audits.**
   Financial institutions should impose restrictions on companies with a record of peatland ecosystem damage. Strict environmental audits must be conducted before these companies

20 Sean Reamonn Fleming, Leviathan on A Leash: A Political Theory Of State Responsibility, (Trinity Hall Cambridge, 2018).

can access new financing. The risk of peatland ecosystem damage includes potential lawsuits due to regulatory non-compliance and environmental impacts such as flooding and forest fires, which affect field operations. The latest developments in sustainable finance regulations provide room for this approach. Financing must be based on the principles of sustainable finance and Environmental, Social, and Governance (ESG) criteria. This ensures that companies demonstrate a commitment to environmental sustainability, social welfare, and good governance.

The success of peatland ecosystem restoration must be a shared goal achieved by various stakeholders, particularly the government and corporations. Therefore, continuous coordination is required to implement restoration commitments effectively. It is imperative that the success of these efforts is not merely used as a tool for global commitment image-building.

GLOSSARY

Biophysical
The condition of peatland soil that integrates biological aspects (flora and fauna) and physical aspects (soil and hydrology) within the peatland ecosystem.

Buffer zone
A protective zone extending outward from the outer boundary of a concession. In this study, the buffer zone is defined as extending 1 km beyond the outer boundary of the concession.

Burned area
An area that has been affected by forest and land fires, with a specific focus in this study on burned areas within the peatland ecosystem.

Canalization
The practice of creating water channels to direct water from one place to another.

Concession
A license granted by the government to manage specific natural resources, which in this study pertains to areas within the peatland ecosystem.

GTL
Groundwater Table Level is an indicator of peatland dryness, measured from the surface of the peatland to the level of the peatland's groundwater.

Hidrology
The science that studies water on Earth. In this study, it specifically discusses water within the peatland ecosystem.

Monoculture
The agricultural practice of cultivating a single type or species of plant in a specific expanse of land.

pH
A measure of the acidity or alkalinity of soil, representing the concentration of hydrogen ions (H^+) in a soil solution.

PHU
Peatland Hydrological Unit is a management or governance unit of an area considered as a single hydrological entity within the peatland ecosystem, regulated and designated by the government.

Purposive sampling
A sampling method in research where the researcher selects samples based on specific objectives relevant to the study.

Pyrite
A layer of sulfide minerals found in certain soil strata. In the context of peatland, this layer is located beneath the peat. When peat degrades, this layer becomes exposed, producing sulfuric acid, which is highly acidic and poses a potential risk to contaminate the peatland ecosystem.

Random sampling
A sampling method where each member of the population being studied has an equal chance of being selected as part of the sample.

Simpul Jaringan
Partners of Pantau Gambut who collaborate in monitoring commitments to protect the peatland ecosystem within the targeted area.

Spatial clustering
A sampling method where sample units are grouped within a specific geographic space or area.

TCL (Tree Cover Loss)
The loss of tree cover resulting from deforestation, illegal logging, forest fires, or other human activities leading to a significant reduction in the number of standing trees. TCL is often measured using satellite monitoring technology, which enables the tracking of changes in tree cover globally or regionally.

Appendix 1 Results of Peatland Biophysical Condition Data

Non-concession Restoration

No.	PHU Name	Province	Sample Amount	Land Cover Type (Spot Amount)								pH Sample Average	Canaled Land Amount
				Forest	Unvegetated	Shrub	Dryland Crop Plantation						
							Amount	Oil Palm	Acacia	Eucalyptus	Other		
1	PHU Krueng Bubon–Krueng Meureubo	Aceh	50	0	0	15	35	35	0	0	0	5,8	22
2	PHU Krueng Teunom–Krueng Lambalik		50	4	2	6	38	38	0	0	0	5,8	31
3	PHU Pulau Rupat	Riau	51	0	0	12	39	33	1	0	5	5,9	50
4	PHU Sungai Rokan–Sungai Siak Kecil		39	0	0	4	35	27	5	0	3	6,2	34
5	PHU Sungai Kedangyantau–Sungai Sabintulung	East Kalimantan	47	2	4	34	7	7	0	0	0	6,1	18
6	PHU Sungai Kelinjau–Sungai Kedangyantau		52	3	0	48	1	1	0	0	0	6,3	0
Total/Average (pH)			289	9	6	119	155	141	6	0	8	6.0	155

Note:
The "other" monoculture commodity type include rubber, coconut and pineapple.

Concession Restoration

No.	Concession Name	Province	Type	Sample Amount	Land Cover Type (Spot Amount)								pH Sample Average	Canaled Land Amount
					Forest	Unvegetated	Shrub	Dryland Crop Plantation						
								Amount	Oil Palm	Acacia	Eucalyptus	Other		
1	PT Bahari Gembira Ria	Jambi	HGU	26	0	0	7	19	19	0	0	0	5,5	8
2	PT Pesona Belantara Persada		HA	19	0	0	5	14	0	14	0	0	5,5	14
3	PT Putra Duta Indah Wood		HA	5	0	0	0	5	1	4	0	0	5,8	0
4	PT Bumi Mekar Hijau	South Sumatera	HTI	48	3	0	11	34	0	23	11	0	5,1	40
5	PT Bumi Sriwijaya Sentosa/ PT Bintang Harapan Palma		HGU	15	0	1	9	5	0	2	3	0	5,0	9
6	PT Samora Usaha Jaya		HGU	2	0	0	1	1	1	0	0	0	4,8	2
7	PT Jalin Vaneo	West Kalimantan	HGU	15	0	0	7	8	8	0	0	0	6,0	6
8	PT Kalimantan Agro Lestari		HGU	31	0	0	3	28	25	0	0	3	6,1	25
9	PT Mayawana Persada		HTI	15	0	0	14	1	0	1	0	0	5,7	3

10	PT Kesatuan Mas Abadi	West Papua	HTI	53	0	0	53	0	0	0	0	0	6,4	1
11	PT Rimbun Sawit Papua		HGU	2	0	0	2	0	0	0	0	0	5,4	0
12	PT Varita Majutama (Blok C)		HGU	9	0	0	9	0	0	0	0	0	6,4	9
Total/Average (pH)				240	3	1	121	115	54	44	14	3	5,7	117

Appendix 2 Hydrological Condition Data Results

GTL on Non-Concession Area

No.	PHU Name	Province	Sample Amount	GTL Hydrological on Canal (Spot Amount)		GTL Average (cm)	Lowest GTL (cm)
				Meet Standards (GTL ≤40 cm)	Does Not Meet Standards (TMAT >40 cm)		
1	PHU Krueng Bubon–Krueng Meureubo	Aceh	24	6	18	56	115
2	PHU Krueng Teunom–Krueng Lambalik		24	14	10	46	110
3	PHU Pulau Rupat	Riau	-	-	-	-	-
4	PHU Sungai Rokan–Sungai Siak Kecil		-	-	-	-	-
5	PHU Sungai Kedangyantau–Sungai Sabintulung	East Kalimantan	24	14	10	35	63
6	PHU Sungai Kelinjau–Sungai Kedangyantau		24	4	20	74	124
Total/Average			96	38	58	53	-

GTL on Concession Area

No.	Concession Name	Province	Type	Sample Amount	GTL Hydrological on Canal (Spot Amount)		GTL Average (cm)	Lowest GTL (cm)
					Meet Standards (GTL ≤40 cm)	Does Not Meet Standards (TMAT >40 cm)		
1	PT Bahari Gembira Ria	Jambi	HGU	21	7	14	46	87
2	PT Pesona Belantara Persada		HA	11	0	11	85	120
3	PT Putra Duta Indah Wood		HA	4	0	4	47	50
4	PT Bumi Mekar Hijau	South Sumatera	HTI	17	1	16	90	140
5	PT Bumi Sriwijaya Sentosa*		HGU	11	7	4	34	80
6	PT Samora Usaha Jaya		HGU	8	7	1	28	52
7	PT Jalin Vaneo	West Kalimantan	HGU	10	10	0	16	34
8	PT Kalimantan Agro Lestari		HGU	13	11	2	30	45
9	PT Mayawana Persada		HTI	14	6	8	49	73
10	PT Kesatuan Mas Abadi	West Papua	HTI	23	23	0	3	10
11	PT Rimbun Sawit Papua		HGU	12	12	0	5	13
12	PT Varita Majutama		HGU	12	12	0	1	7
Total/Average				156	96	60	36	-

*PT Bintang Harapan Palma (BHP) is the new name that replaced PT Bumi Sriwijaya Sentosa (BSS) in 2018 because the Ministry of Environment and Forestry sealed their operations.

Appendix 3 Fire Tower Data Results

Fire Tower on Concession Area

No.	Concession Name	Province	Type	Number of Findings	Documentation	Construction Material	Condition
1	PT Pesona Belantara Persada	Jambi	HA	5		Iron	Meets the standards
2	PT Putra Duta Indah Wood		HA	1		Wood	Meets the standards for height, but the shape of the building and the materials used to construct the fire tower are not suitable
3	PT Samora Usaha Jaya	South Sumatera	HGU	1		Iron	Meets the standards

Appendix 4 GTL Measurement Tool Condition Data Results

GTL Measurement on Concession Area

No.	Concession Name	Province	Type	Number of Findings	Infrastructure Construction Initiator	Infrastructure Materials	Condition
1	PT Bahari Gembira Ria	Jambi	HGU	1	Corporation	Manual (wood)	Good
2	PT Samora Usaha Jaya	South Sumatera	HGU	3	Corporation	Manual • 2 from wood • 1 from cement/ concrete	Godd

Appendix 5 Results of Data on Canal Blocks Conditions

GTL on Non-Concession Area

No.	PHU Name	Province	Number of Findings	Infrastructure Construction Initiator	Canal Blocks Type	GTL Average (cm)	Condition (%)	
							Good	Damaged
1	PHU Krueng Bubon–Krueng Meureubo	Aceh	4	KLHK	Temporary	29	2	2
2	PHU Krueng Teunom–Krueng Lambalik		1	KLHK	Temporary	40	0	1
3	PHU Pulau Rupat	Riau	44	• BRGM • KLHK • Local government	• 40 temporary • 4 permanent	52	14	30
4	PHU Sungai Rokan–Sungai Siak Kecil		26	• BRGM • KLHK	• 25 temporary • 1 backfilled	40	7	19
5	PHU Sungai Kedangyantau–Sungai Sabintulung	East Kalimantan	2	Concession	• 1 temporary • 1 backfilled	20	0	2
6	PHU Sungai Kelinjau–Sungai Kedangyantau		-	-	-	-	-	-
Total/Average			77	-	-	46	23	54

Note:
Many government-initiated canal barriers were found to be in damaged conditions such as rotten wood, leaking walls, and destroyed/collapsed buildings.

GTL on Concession Area

No.	Concession Name	Province	Type	Number of Findings	Infrastructure Construction Initiator	Canal Blocks Type	GTL Average (cm)	Condition
1	PT Bahari Gembira Ria	Jambi	HGU	1	Corporations	Temporary	40	Good, but the wood is in a rotten condition
2	PT Pesona Belantara Persada		HA	4	• Local government (forest and land fires task force) • Corporations	Backfilled	70	Good, but GTL still doesn't meet the standards
3	PT Kalimantan Agro Lestari	West Kalimantan	HGU	1	Not identified	Temporary	10	Good, but overgrown and unkempt
Total/Average				6	-	-	55	-

Appendix 6 Results of Bore Wells Condition Data

Bore Wells on Concession Area

No.	PHU Name	Province	Number of Findings	Infrastructure Construction Initiator	Bore Wells Materials	Condition
1	PHU Sungai Rokan–Sungai Siak Kecil	Riau	6	BRGM	Plastic pipe/pvc (temporary)	Good, but many found clogged well pipes

Those affected by disasters are the poor, while those who make decisions are the rich. There is no attention to the weak because the orientation of economic efficiency always leads to the rich.

Therefore, it is important to position any damage that occurs in the field against its impact on society.

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Prof. Dr. Ir. Hariadi Kartodihardjo, MS.