Singapore Institute of International Affairs

# HAZE OUTLOOK 2024

July 2024

# Contents



## About the Haze Outlook 2024

The Haze Outlook 2024 report provides a risk assessment of the probability of a transboundary haze incident affecting Indonesia, Malaysia, and Singapore for the year ahead. This is based on research conducted by the Singapore Institute of International Affairs (SIIA), a leading think tank in the region.

This is the 6th edition of the Haze Outlook, and it has emerged as a leading report on this important issue. The Haze Outlook 2024 was directed by Simon Tay, Chairman, SIIA and Associate Professor, Faculty of Law, National University of Singapore. The authors are Aaron Choo, Khor Yu-Leng, and Nithiyah Tamilwanan, who are respectively Senior Assistant Director (Special Projects and Sustainability), Associate Director (Sustainability) at the SIIA, and Research Associate at Segi Enam Advisors. All views expressed in the report are those of the authors, unless otherwise credited.


Our research includes quantitative information on weather factors, the impact of fires, and commodity prices. We also qualitatively consider government policies and private sector practices. These assessments are based on the SIIA's engagement with sustainability stakeholders in the region, including government bodies, businesses, non-governmental organisations (NGOs), and academics. In particular, the authors would like to thank the following for their assistance and insights over the past year (in alphabetical order):

Agridence, ASEAN Specialised Meteorological Centre (ASMC), Asia Pacific Resources International Limited (APRIL) Group, Asia Pulp and Paper (APP), Austindo Nusantara Jaya (ANJ), Bumitama Agri, CERAH Malaysia, CIFOR-ICRAF, Council of Palm Oil Producing Countries (CPOPC), FratiniVergano, French Agricultural Research Centre for International Development (CIRAD), Glenauk Economics, Global Platform for Sustainable Natural Rubber (GPSNR), Golden Agri-Resources (GAR), Goodyear Orient Company (Private) Limited, Global Environment Centre (GEC), Greenpeace Southeast Asia, Indonesian Palm Oil Association (GAPKI), Indonesian Business Council (IBC), Institut Pertanian Bogor (IPB) University, Institute of Strategic & International Studies (ISIS) Malaysia, IOI Corporation Berhad, Koltiva, Kuala Lumpur Kepong (KLK) Berhad, Landscape Indonesia, Malaysian Palm Oil Certification Council (MPOCC), Musim Mas, PM Haze, Proforest Indonesia, Roundtable on Sustainable Palm Oil (RSPO), Sharpfokus Research Indonesia, Sime Darby Plantation, Sustainable Districts Association (LTKL), Triputra Agro Persada (TAP) Group, Thailand Environment Institute (TEI), Unilever, Universiti Malaya, World Resources Institute (WRI) Indonesia, World Wide Fund for Nature (WWF) Indonesia, WWF Malaysia. We are also grateful to government officials of the region who have engaged with the SIIA for our sustainability programme.


Established in 1962, the SIIA is a non-profit and independent think tank committed to fostering in-depth dialogues around politics, economic policy, and sustainability in ASEAN and the wider region. In the field of sustainability and especially on the haze, the SIIA has been an early analyst and advocate. The SIIA has championed the fight against the transboundary haze since 1997, when we organised Singapore's first haze dialogue in partnership with the Singapore Environment Council. Following the severe transboundary haze in 2013, the SIIA established the Singapore Dialogue on Sustainable World Resources (SWR) in 2014 which has since become a leading platform for discussion in the region about key sustainability challenges including the haze.

# 1. Foreword

Since 1997, ASEAN has been contending with the recurring haze issue – clouds of smoke resulting from forest and land fires in the region. Last year saw the return of the haze to our skies, amidst severe drought conditions that drastically increased fire risk. But the smoke and fires in 2023 were minor compared to previous haze years, due to effective fire prevention measures by the Indonesian government, local communities, NGOs, and the private sector.

This gives us reason to hope that Southeast Asia has finally turned a corner in addressing the region's haze problem.

Our Haze Outlook rates the likelihood of a transboundary haze incident on a scale of Green, Amber, and Red. **Our rating for this year's Haze Outlook is Green**, indicating a low risk of the haze affecting Indonesia, Malaysia, and Singapore during the peak fire risk months of September to October 2024.

This is the second time we have given a Green rating since the Haze Outlook began in 2019, reflecting our positive evaluation of the improving fire management and sustainability efforts in Indonesia and ASEAN.

The short-term forecast is Green. What of the long term?

Much will depend on the continuity of policy between Indonesian President Joko Widodo and his successor President-elect Prabowo Subianto, when Mr Prabowo takes office in October.

Mr Prabowo has pledged to continue Mr Jokowi's successful environmental and land management initiatives. At the same time, Mr Prabowo has set a target of achieving eight per cent economic growth within the first three years of his term, which will depend in large part on further development in Indonesia's plantation and forestry sectors. Mr Prabowo is equally committed to achieving Indonesia's carbon emissions reduction goals. However, he has said this will involve stepping up Indonesia's production of biofuels, using palm oil as a feedstock, which will also put more pressure on land use in the country.

Businesses, analysts, and NGOs will be watching to see if these goals can be met by increasing output from existing plantation area, or whether there will be inadvertent pressure to open more land for agricultural use. Indonesia's policymakers are fully aware of these tensions. The hope is that the Prabowo administration will continue the good work that has been done by the Jokowi administration in both sustainably developing Indonesia's economy and working together with ASEAN in haze prevention, so that Indonesia and the region can continue to grow in all senses of the word.

With this in mind, our Haze Outlook also looks at new ways in which the region's resource sector companies and government agencies are using emerging technologies to prevent fires, strengthen supply chain traceability, and increase efficiency in production. There are promising developments that could be adopted and scaled up across the region with the right investment and partnerships.

For the coming months in 2024, the region will be able to breathe easy. Continued effort and cooperation is needed to ensure that our skies remain clear in the years to come.

**Simon Tay**
Chairman
Singapore Institute of International Affairs

# 2. Executive Summary

## Risk of a Transboundary Haze Event in 2024:

* **Green:** Low risk **Amber:** Medium risk **Red:** High risk

**Green***

**There is a Green or low risk of a transboundary haze event affecting Indonesia, Malaysia, and Singapore in 2024.** Looking beyond 2024, it will be important to watch the policies of the incoming Prabowo administration to see if further growth in the plantation and forestry sectors will be from expansion rather than increases in productivity.

Our annual Haze Outlook report provides an assessment of the likelihood of a transboundary haze incident affecting Indonesia, Malaysia, and Singapore in the latter half of 2024. Our risk assessment is based on three factors: **weather, markets, and policies**, drawing from our research and interviews with a wide range of stakeholders, including governments, agribusinesses, banks, consultancies, think tanks, and non-government organisations (NGOs).

**Weather:** Weather plays a role in exacerbating the haze. Hotter and drier weather makes it more likely that fires will spread out of control. Climate conditions in the latter half of 2024 will not be as severe as last year – we are expecting a relatively mild dry season, meaning that the 2024 haze risk from weather factors is low.

Past severe haze incidents have mostly occurred during intense drought periods corresponding to the El Niño or positive Indian Ocean Dipole (IOD) phenomena. For 2024, El Niño is tailing off and transitioning to either a neutral phase or La Niña. Rainfall will be roughly average for the key fire risk months of August, September, and October, or potentially wetter-than-normal for the period if the La Niña phenomenon occurs.

**Markets:** The haze comes from smoke released by the burning of peat and other vegetation, when fire is used to clear land for agricultural use or to dispose of agricultural waste. Our report looks at the economic factors driving commodity markets to see if increased production activity may be expected. The risk of haze from plantation expansion is currently relatively low. There are some indicators that suggest planting and replanting activity may be trending upwards, but not to a large degree.

The prices of key plantation and forestry commodities remain high compared to pre-pandemic levels but have stabilised since the initial spikes caused by the COVID-19 pandemic and Russia's invasion of Ukraine. In the case of palm oil, a leading export from Indonesia and Malaysia, trees planted in the boom period of the late 1990s to early 2000s are now due for replanting, which could lead to increased activity among growers. But it is not clear if replanting will have any impact on haze risk.

**Policies:** Effective fire prevention and fire suppression plays a crucial role in keeping the haze under control. Current fire management efforts are strong and should be up to the task of managing fires during the relatively milder dry season expected this year.

Data from 2023 proves that haze management has proven effective in many parts of Indonesia. Government and private sector efforts to rewet fire-prone peatland areas are making a difference. The soft launch of the ASEAN Coordinating Centre for Transboundary Haze Pollution Control (ACC THPC) in Indonesia in September 2023 is promising, and its establishment would potentially be a significant step in addressing fires that result in transboundary haze. Going beyond 2024, the future of haze management in Indonesia will depend on the policy directions taken by the incoming Prabowo administration, particularly when it comes to governance of the plantation and forestry sectors.

## Incoming Indonesian Government's Policies Will Be Watched

The incoming Prabowo administration is expected to maintain continuity with the Jokowi administration's environmental policies, such as the aim to make Indonesia's Forestry and Other Land Use (FOLU) sectors a net carbon sink by 2030, and the governance reforms set in motion by the Omnibus Law passed in 2020.

At the same time, President-elect Prabowo Subianto has signalled he will continue to prioritise economic growth and food security. There will therefore be caution about any plantation and farmland expansion in fire-prone areas, or areas with large amounts of untouched primary forest such as Papua.

The incoming Prabowo administration is aware of these concerns. Indications are that the new government will emphasise productivity and higher yields, increasing output from existing land use rather than expanding plantations. Businesses and NGOs are watching to see if Mr Prabowo will push forward with streamlining business licensing, resolving overlapping land title issues, and registering smallholder farmers in Indonesia so they can secure funding and certification.

## EU Deforestation Regulation Will Affect Trade Patterns and Haze Risk

A major development in 2024 that may influence future haze risk is the European Union's deforestation regulation (EUDR). The EUDR takes full effect on 30 December this year, covering seven product categories including several key exports from the ASEAN region. Businesses importing goods into the EU will need to prove that the products are not connected to any recent deforestation that has occurred after 2020.

In principle, the EUDR should be positive for haze prevention, by discouraging the expansion of plantations onto forest area via the use of fire. However, there may be unintended consequences of the regulation. Some analysts believe there will be a short-term surge in demand from European buyers, with companies stocking up on products and inputs before the EUDR takes full effect. There are also concerns that the EUDR might inadvertently undermine existing voluntary sustainability certifications if producers feel that all they need to export to Europe is EUDR compliance rather than other product labels.

Major commodity companies will not have any issues complying with the EUDR. However, it is possible that smaller businesses and smallholder farmers may be excluded from the European market. Commodity producing countries may therefore aim to increase sales to markets like China and India that currently have lower sustainability requirements, or to increase their domestic consumption. In this context, it will be important to see how Indonesia, Malaysia, and other commodity exporters in ASEAN respond.

## Tech for Sustainability and Market Access: Business and Investment Opportunities

For Indonesia and other ASEAN economies to shift away from expansion in their land use towards greater efficiency and to maintain access to global markets, research and investment is needed. This year's Haze Outlook identifies promising areas for both productivity and haze management.

**Fire Prevention and Suppression:** Companies are exploring the use of artificial intelligence and computer models for fire risk mapping. There is a growing interest in adapting tech and best practices from other countries that face intense fire seasons like Australia.

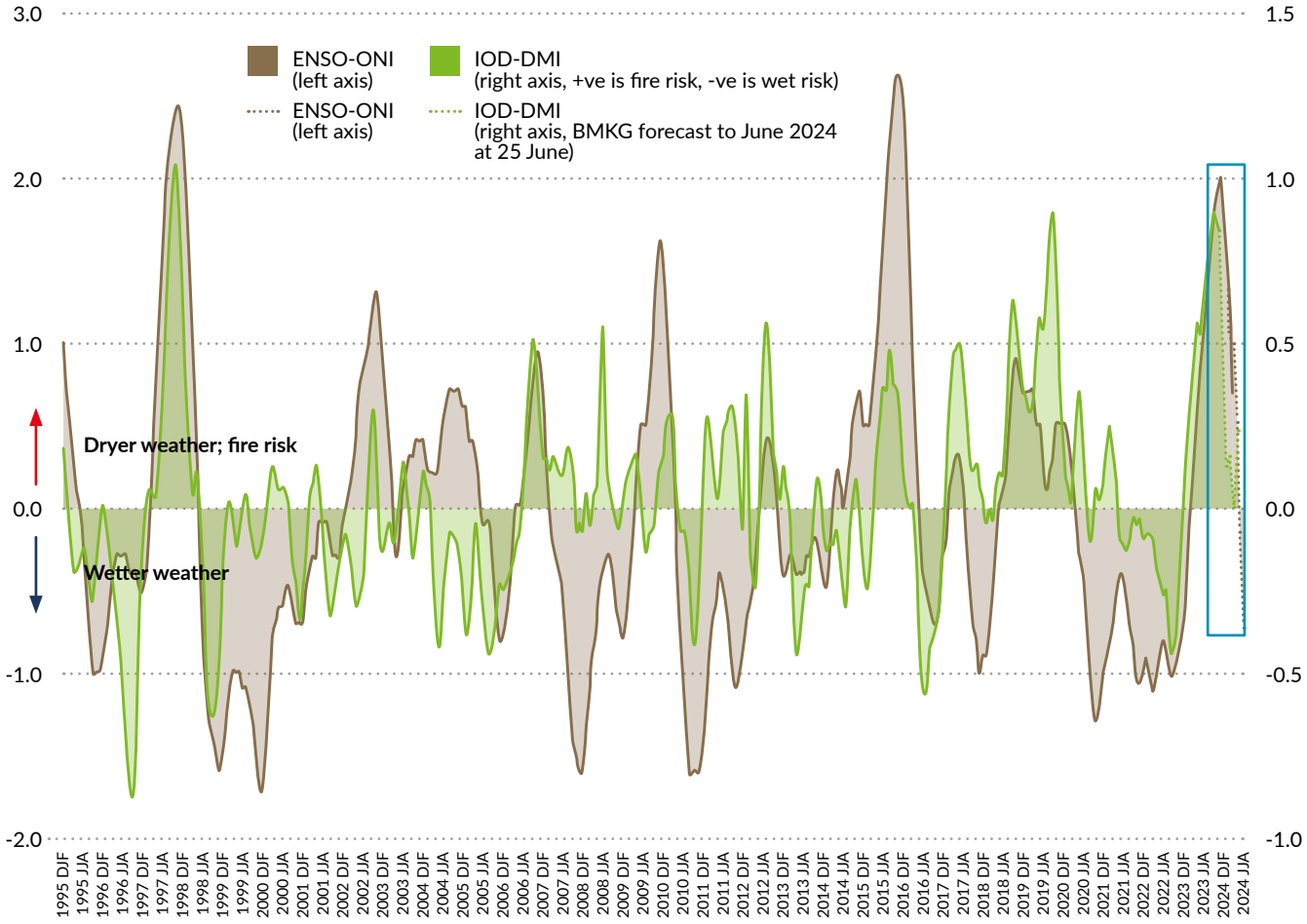
**Data and Traceability:** The past year has seen increased interest in the adoption of geolocation tools in anticipation of the EUDR, including the creation of a National Dashboard by the Indonesian government to pull together data from both smallholders and major companies. In addition to facilitating compliance with trade rules, such platforms give better information to producers, buyers, and investors, allowing for better auditing and price discovery.

**Yields and Efficiency:** Use of automation, as well as new types of planting material, fertilisers, and pest control can help increase yields and reduce the need to open new plantations. Genomic testing can ensure growers are planting the correct seeds rather than duds.

# 3. What to Watch in 2024

## 3.1 Weather: Average or Milder Dry Season with Lower Fire Risk

### Figure 1: El Niño-Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD)




*Note: El Niño-Southern Oscillation is measured with the Oceanic Niño Index (ENSO-ONI) and Indian Ocean Dipole is measured with the Dipole Mode Index (IOD-DMI). ENSO-ONI data is from 1995 to May 2024. ONI-DMI data is from 1995 to January 2024 with forecasts to June 2024 from BMKG. Blue box indicates current 2024 period.*

*Source: Khor Reports - Segi Enam Advisors (2024), based on data from the US National Oceanic and Atmospheric Administration (NOAA) and Indonesia's Meteorological, Climatological, and Geophysical Agency (BMKG)*

Past haze incidents have frequently coincided with intense drought periods corresponding to the El Niño or positive Indian Ocean Dipole (IOD) phenomena, most recently in 2015, 2019, and 2023. The El Niño phenomenon contributed to the record high temperatures seen in Asia and across the world over the first half of 2024. Fortunately, El Niño conditions have already peaked and are now rapidly declining, transitioning to either a neutral phase or La Niña. IOD is expected to be neutral.

Rainfall in 2024 will therefore be roughly average or higher-than-average for the key fire risk months of August, September, and October. The 2024 dry season will be a relatively milder one. There is less haze risk this year, as there is a lower chance that any fires in the region will spread out of control.

***The 2024 dry season will be a relatively milder one. There is a lower chance that any fires in the region will spread out of control.***

El Niño and La Niña are respectively the positive and negative phases of the El Niño–Southern Oscillation (ENSO), which refers to variations in sea-surface temperatures, rainfall, surface air pressure and atmospheric circulation occurring across the equatorial Pacific Ocean. The IOD tracks similar changes in the Indian Ocean. The effects of these phenomena differ across the world, but in the case of the ASEAN region, high or positive readings mean lesser rainfall, while low or negative readings indicate wetter weather. For 2024, the situation will be neutral or wetter.

As of April 2024, the US National Oceanic and Atmospheric Administration (NOAA) has stated that there is an 83 per cent chance of a transition from El Niño to ENSO-neutral by April-June, and a 62 per cent likelihood of La Niña developing in June-August.[1]

As of July 2024, the ASEAN Specialised Meteorological Centre (ASMC) reports that ENSO is neutral (neither El Niño nor La Niña) and is expected to remain neutral throughout the month, with a potential shift to La Niña conditions thereafter. IOD is also neutral. Above-normal rainfall is expected over most parts of southern ASEAN after July 2024, though ASMC notes there is still some risk of smoke coming from some fire-prone areas.[2]

Data from Indonesia's Meteorological, Climatological, and Geophysical Agency (*Badan Meteorologi, Klimatologi, dan Geofisika* or BMKG) concurs with the above analysis.

As mentioned in our Haze Outlook 2023 report, last year saw a "super El Niño" event occurring, with sea surface temperatures briefly reaching 2°C, a threshold that has only been breached six times on record.[3] Historically, "super El Niño" has usually been followed by La Niña, except for the 1965-1966 event where a strong El Niño was followed by neutral conditions.

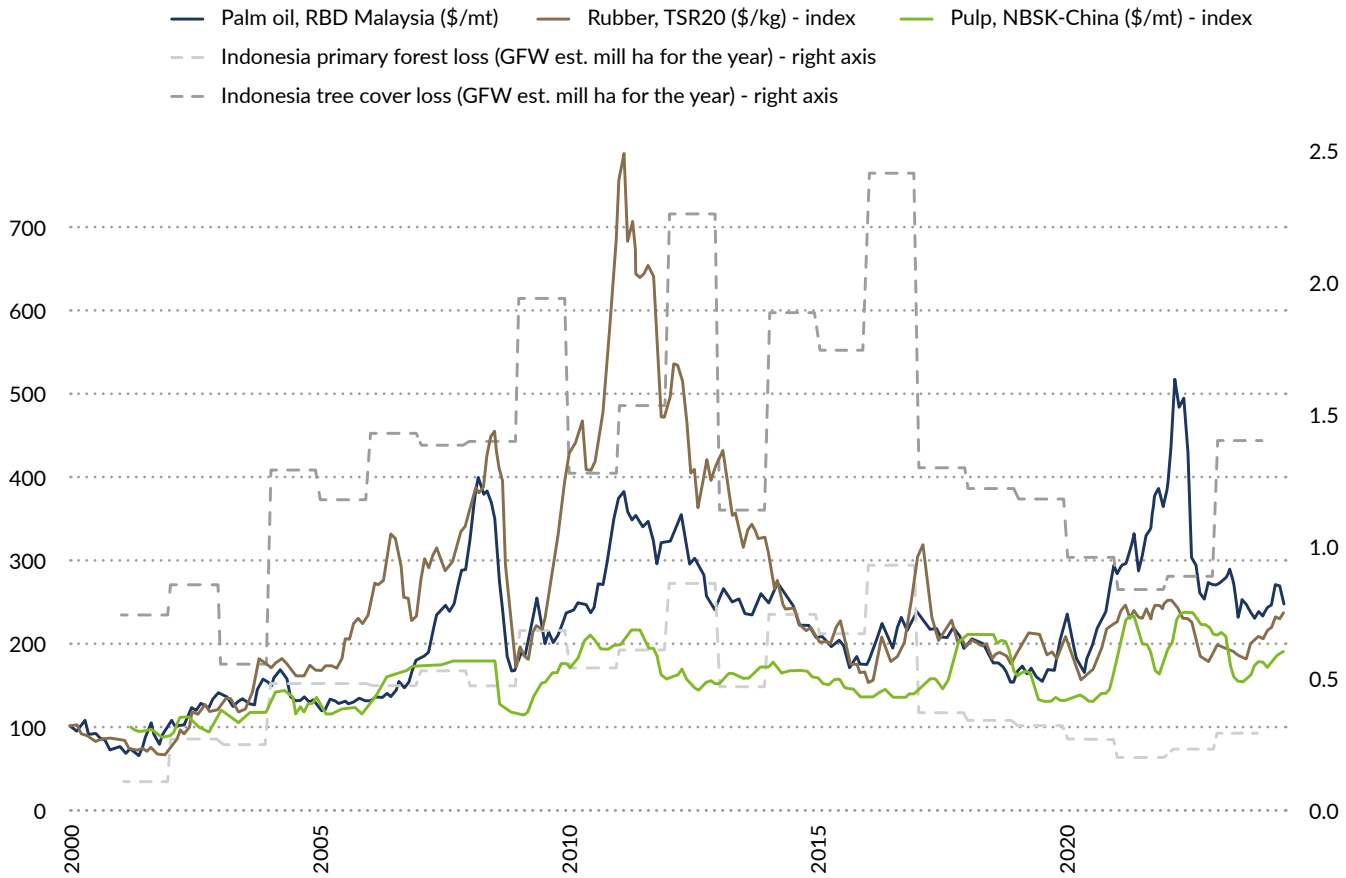
### Weather Events Increasing in Frequency and Intensity

Currently, El Niño or positive Indian Ocean Dipole (IOD) events appear to be occurring every four to five years. This suggests that another high-risk period may occur from around 2027 onwards, although the weather is not so easily predictable. Some researchers are concerned that the frequency and intensity of extreme weather events may be increasing because of climate change. If this is true, it will increase fire and haze risk in the region and put more pressure on fire management efforts.

***The frequency and intensity of extreme weather events may be increasing due to the effects of climate change.***

## 3.2 Markets: Prices High But No Clear Link to Deforestation

### Figure 2: Comparing commodity futures prices to deforestation in Indonesia




*Note: Benchmark futures prices used are Refined, Bleached and Deodorised (RBD) palm olein traded on Bursa Malaysia, Technically Specified Rubber (TSR), and Northern Bleached Softwood Kraft (NBSK) in China. Futures price data is from Jan 2000 to May 2024, indexed relative to Jan 2000 as 100. Primary forest and tree cover loss estimates are from 2021 to 2023, in millions of hectares, indicated as dashed lines.*

*Source: Khor Reports – Segi Enam Advisors (2023), based on data from the World Bank for palm olein and rubber futures, FastMarkets for pulp, and Global Forest Watch for primary forest and tree cover loss estimates*

The risk of haze from plantation expansion is currently relatively low. There are some indicators that suggest planting and replanting activity is trending upwards, but not to a high degree.

Prior to the serious 2015 haze incident, increases in international commodity futures prices were usually followed in subsequent years with spikes in tree cover loss and primary forest loss in Indonesia. Producers responded to demand signals by converting forest area to plantations, thereby contributing to haze pollution in the region. The severe fires and haze in 2015 were a wake-up call for both global markets and Indonesian policymakers. In the wake of the 2015 haze, deforestation in Indonesia has generally trended downward despite price shifts.

In recent years, commodity prices have gone up following the global COVID-19 pandemic and Russia's invasion of Ukraine. In particular, the price of palm oil briefly hit record levels in 2022. Prices have since stabilised but remain higher than they were in 2019. In 2023, amidst a strong El Niño, high temperatures, and lower rainfall, there has been an increase in tree cover loss in Indonesia. But it is difficult to say if this represents a shift in activity among producers in response to prices and a return to the previous trend.

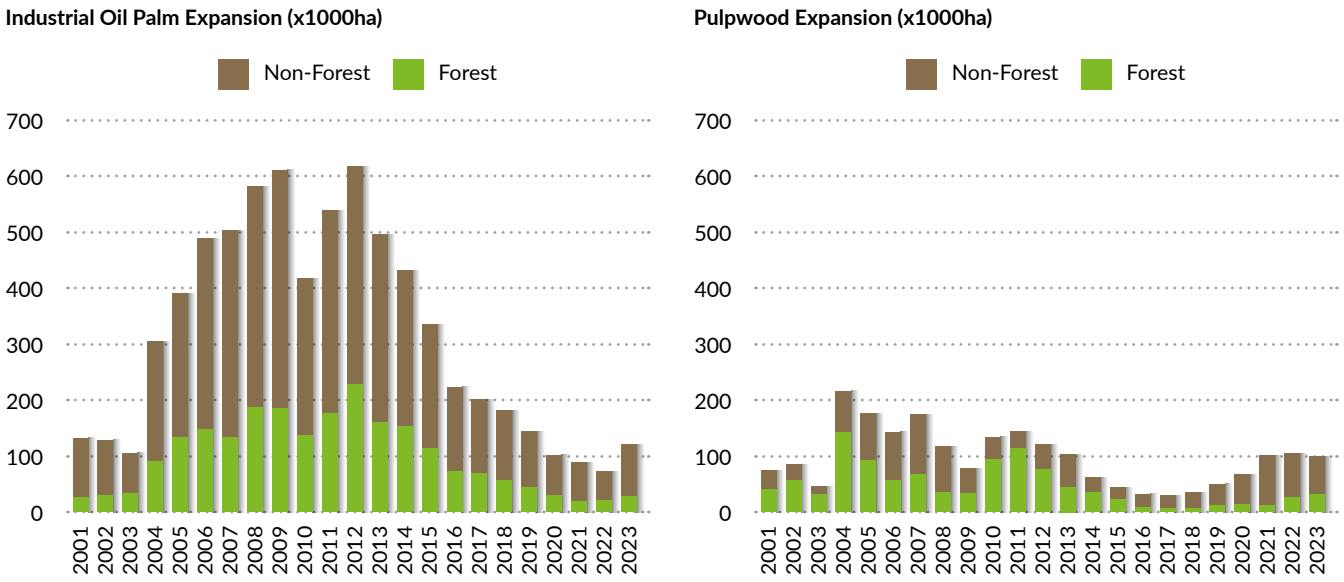
***In 2023, there was an increase in tree cover loss in Indonesia. But it is difficult to say if this represents a change in activity among producers.***

Notably, the change in primary forest loss in 2023 has been significantly lower than tree cover loss. Tree cover data includes both natural ecosystems as well as plantation areas. Primary forest refers solely to natural ecosystems, which have not been as heavily affected. It is possible that some of the tree cover loss figure reflects the conversion of one kind of plantation to another, with cultivated trees being replaced with other kinds of crop. Such conversion would not contribute to deforestation.

Reports indicate that there has been some increase in plantation area in Indonesia, particularly in Central Kalimantan, West Kalimantan and West Papua. The Indonesian government says most of this expansion was on concession areas granted prior to 2014, before the Jokowi administration took office.[4] Indonesia's central government has also been conducting an audit of the palm oil sector over the past two years, which has revealed that there is more planted area in the country than was previously believed. Some of the apparent increase in plantation area reflected in official figures may not be actual year-on-year expansion, but merely more accurate accounting of existing area.[5]

***Most of this expansion was on concession areas granted prior to 2014, before the Jokowi administration took office.***

**Figure 3: Industrial oil palm and pulpwood expansion in Indonesia**




*Note: Estimates are for company plantation expansion and do not include smallholder expansion*

*Source: TheTreeMap (2023), based on data from Landsat and Sentinel-2 Time-series*

Figure 3 depicts data on plantation expansion from environmental consultancy The TreeMap, which operates the Nusantara Atlas platform. This data suggests that there has been an uptick in oil palm plantation expansion in Indonesia in 2023, after an almost decade-long decline.[6] Plantation area in the pulpwood industry has also been increasing since 2019. The 2023 expansion figure for the pulp industry is about five times that of 2017, when it was at its lowest point in the past two decades.

The TreeMap's analysis is that most plantation expansion has not been on forest areas, and therefore may not reflect any deforestation risk. The estimated expansion on forest areas is still significant in absolute terms. The oil palm plantation expansion on forest land in 2023 was about 30,000 hectares, or around 40 per cent the size of Singapore. But the amount of expansion on forest is far less than the levels seen in the early 2000s to the mid-2010s, particularly in the palm oil sector.

Industry experts have suggested that estimates of plantation expansion may in fact be registering replanting of existing areas rather than new expansion. Oil palm trees have an approximately 25-year commercial lifespan, and trees planted during the palm oil industry's boom period of the late 1990s to early 2000s are now due or overdue for replacement.

***Trees planted during the palm oil industry's boom period of the late 1990s to early 2000s are now due for replacement.***

130.1 million oil palm seeds were sold in 2022, the highest level of sales in nearly a decade, according to agricultural commodities advisory firm Glenauk Economics. However, 123.8 million seeds were sold in 2023, down from the amount sold in 2022, suggesting that the peak of replanting may have already passed.

It is not clear to what extent oil palm replanting will contribute to haze risk. Major plantation companies have already been practicing phased replanting to avoid having to replace trees en masse in the same year. If there is any haze risk from replanting, it is more likely to come from smaller growers who could use fire in the clearing and disposal of old trees. The present need for replanting may also drive up palm oil prices over the next year due to diminished supply. Old plantation areas which are overdue for replanting will gradually become less productive, and freshly replanted areas will require two to three years before they start producing fruits again.

### Plantation Sector is Profitable, But Some Still Struggling

Industry experts say the current price of palm oil is about two or three times the actual cost of production from growers. Due to this, many growers are thought to be well above break-even levels. The largest and most efficient companies are therefore cash-rich and in a good economic position. For such companies, it would be logical, under the present circumstances, to invest in fire management as well as other aspects of sustainability such as emissions reduction, keeping long-term net zero commitments in mind.

However, the situation may be different for smallholder farmers who are less efficient in their output, and for some small to medium-sized companies that may also be struggling even amidst the current prices. While the price of palm oil is high, the price of inputs and operating costs have also increased. Businesses may have existing debt burdens or be locked into unfavourable contracts. It is possible that some growers may still be facing economic pressures that could lead them to unsustainable practices.

***The largest companies are cash-rich and in a good position. However, the situation may be different for small to medium-sized producers.***

### EU Deforestation Regulation Will Affect Trade Patterns and Haze Risk

A major development in 2024 that may influence future haze risk is the European Union's deforestation regulation (EUDR). The EUDR takes full effect on 30 December 2024 for large companies, covering seven product categories – palm oil, soy, wood, cocoa, coffee, cattle, and natural rubber. ASEAN economies are major exporters of most of these commodities except for soy and cattle. Under the regulation, businesses importing goods into the EU will need to prove that the products are not connected to any recent deforestation, defined as deforestation that has occurred after 31 December 2020. Companies that fail to meet the requirements will be subject to checks and potentially fines or bans from the EU market. Micro, small, and medium enterprises will have a longer grace period, but must still comply by June 2025.

There have been calls from EU member states to delay the implementation of the EUDR, as EU governments and businesses are not yet ready for the administrative and data burdens needed for compliance.[7] Following the European Parliament elections on 9 June, it is possible a decision on the EUDR could be made by the new Parliament in the coming months. However, many businesses in the plantation and forestry sectors are anticipating that the EU will still stick to the original timeline, and even if there is a delay, it will not be a lengthy one.

In principle, the EUDR should be positive for haze prevention. The aim of the regulation is to guarantee that consumption in the EU does not contribute to deforestation worldwide. The EU has been working with commodity producing countries to ensure successful transitions to deforestation-free supply chains. In practice, the EUDR is just the latest in a series of European environmental regulations that have an impact on trade, and concerns have been raised by the EU's trade partners in ASEAN about their impact on the region's producers.[i] The regulation is seen as potentially excluding smallholder farmers from the European market, as many will not be able to meet the reporting requirements needed to prove they are not responsible for deforestation.

***In principle, the EUDR should be positive for haze prevention. In practice, there may be unintended consequences.***

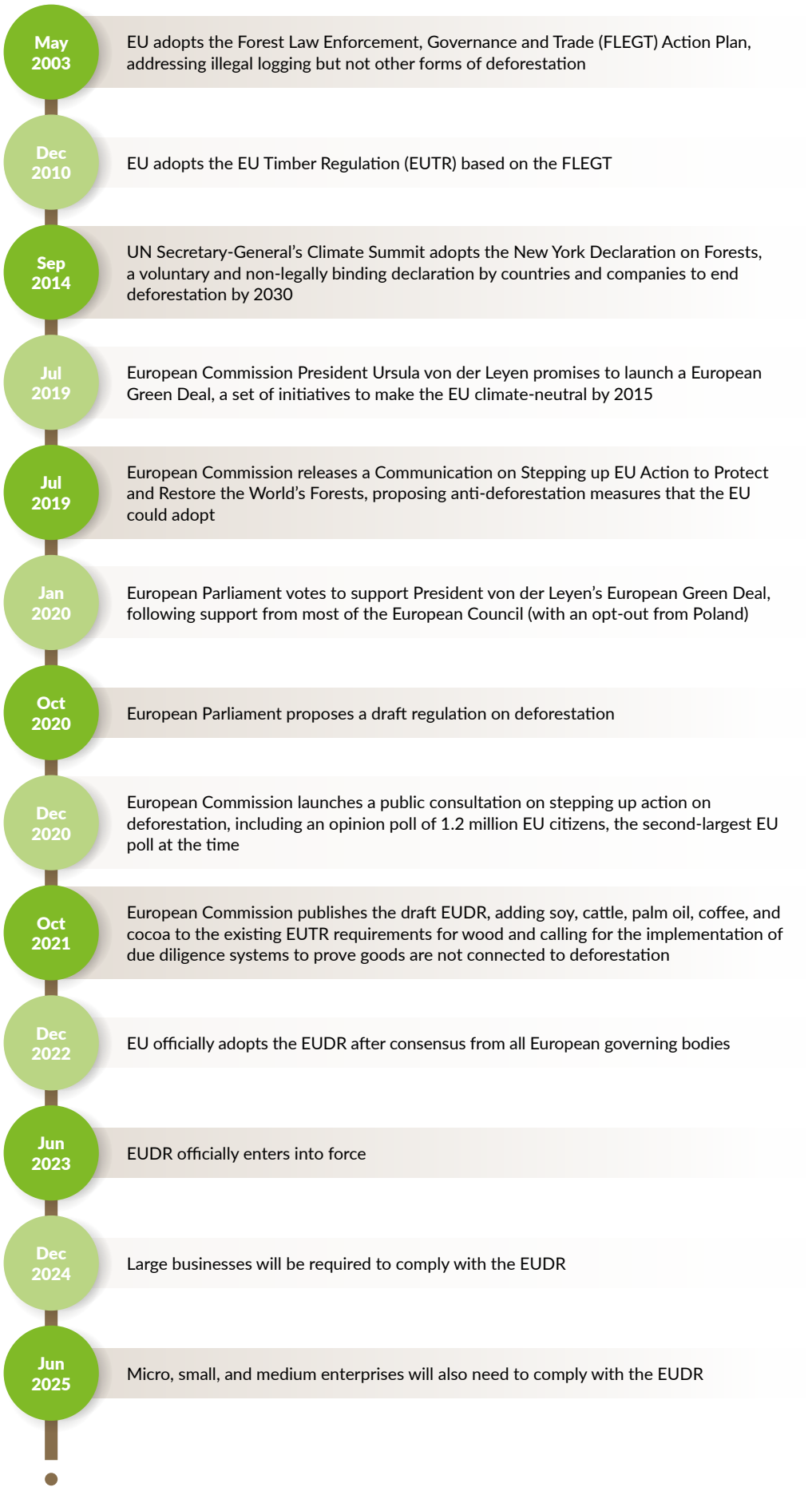
The EU, Indonesia, and Malaysia have convened an Ad Hoc Joint Task Force on the EUDR. The task force has met twice since its establishment in August 2023 and will meet again in September 2024. Indonesia and Malaysia have acknowledged the EU's right to implement the EUDR but have highlighted challenges in aligning these regulations with the situation in their countries and other unintended consequences of the regulation.

Some analysts believe there will be a short-term surge in purchases of affected commodities by European buyers, with companies stocking up on less-perishable products and inputs before the EUDR takes full effect. It is also possible that producing countries may aim to increase exports to markets like China and India, that currently have lower sustainability requirements, or boost domestic consumption. In addition, as EUDR compliance will become the main requirement for imports to the EU, it may inadvertently undermine existing voluntary certifications, especially if they are more costly to acquire.

The EU is the first major economy to implement such stringent anti-deforestation trade regulations, but other economies may eventually follow suit. Over the past three years, the US has been debating similar legislation under the FOREST Act[8], and it is possible China may consider comparable regulations under its national Beautiful China or Green China initiative. In this context, it will be important to see how Indonesia, Malaysia, and other commodity exporters in ASEAN respond to the changing circumstances. Indonesia is launching a National Dashboard data platform in September 2024 that will consolidate geolocation and supply chain data for both companies and smallholder producers, intended to help businesses meet the requirements of the EUDR and any comparable import requirements that other countries may introduce.

[i] *In March 2024, a World Trade Organization (WTO) panel ruled on a dispute brought by Malaysia against measures taken by the EU under its Renewable Energy Directive II (RED II). RED II called for limits on the use of biofuels seen as contributing to "indirect land-use change", including palm oil-based fuels. The WTO panel upheld the EU's ability to take climate-based action under RED II, but agreed that aspects of the EU Delegated Act to implement RED II were inconsistent with WTO rules. The EU has been ordered to change these aspects to comply with WTO rules, but this does not guarantee market access for Malaysian palm oil-based biofuels going forward.*

## Figure 4: Timeline of the EU Deforestation Regulation (EUDR)



## 3.3 Policies: Continuity and Questions on Future Directions

The 2023 dry season has proven that fire and haze management initiatives undertaken by the Jokowi administration, provincial and district authorities, as well as local communities and companies have been effective. There was an El Niño coinciding with a positive Indian Ocean Dipole (IOD) in 2023, and thus the dry season was more severe than normal. Despite the unfavourable weather, there were fewer fires in 2023 compared to previous El Niño and IOD years.

### Good Fire Management Has Led to Fewer and Less Intense Fires

The number of hotspots detected by satellites in Indonesia has progressively fallen between haze incidents over the last few years, halving from 23,662 hotspots detected during the peak fire period of September to October 2015 to 12,246 hotspots during the same period in 2019, and then halving again to only 5,606 hotspots in 2023. Hotspots are not a perfect representation of the number of fires on the ground, as they only indicate when high temperatures have been detected, which may or may not correspond to actual fires. Nevertheless, the hotspot figures do give a general sense of the fire situation in each year.

***The number of hotspots detected by satellites in Indonesia has progressively fallen between haze incidents.***

Another indicator used to measure the extent of fires is estimates of burned area based on satellite imagery and reports from the ground. Almost 1.2 million hectares of forests and peatlands in Indonesia were affected by fires in 2023, according to Indonesia's Ministry of Environment and Forestry (*Kementrian Lingkungan Hidup dan Kehutanan* or KLHK). While this is still large in absolute terms, representing an area about 16 times the size of Singapore, the burned area calculation for 2023 was far below the 2.6 million hectares affected by fire in 2015 and the 1.6 million hectares of land affected in 2019.[9]

Greenhouse gas (GHG) emission calculations show an even more pronounced difference between 2023 and the previous two haze years. The 2023 fires released an estimated 183 million tonnes of carbon dioxide equivalent ($CO_2e$), a large decline compared to the nearly 1 billion tonnes of emissions estimated to have been released in the 2015 haze, and the 624 million tonnes estimated for the 2019 haze.[10]

### Peatland Restoration Efforts Have Proven Effective

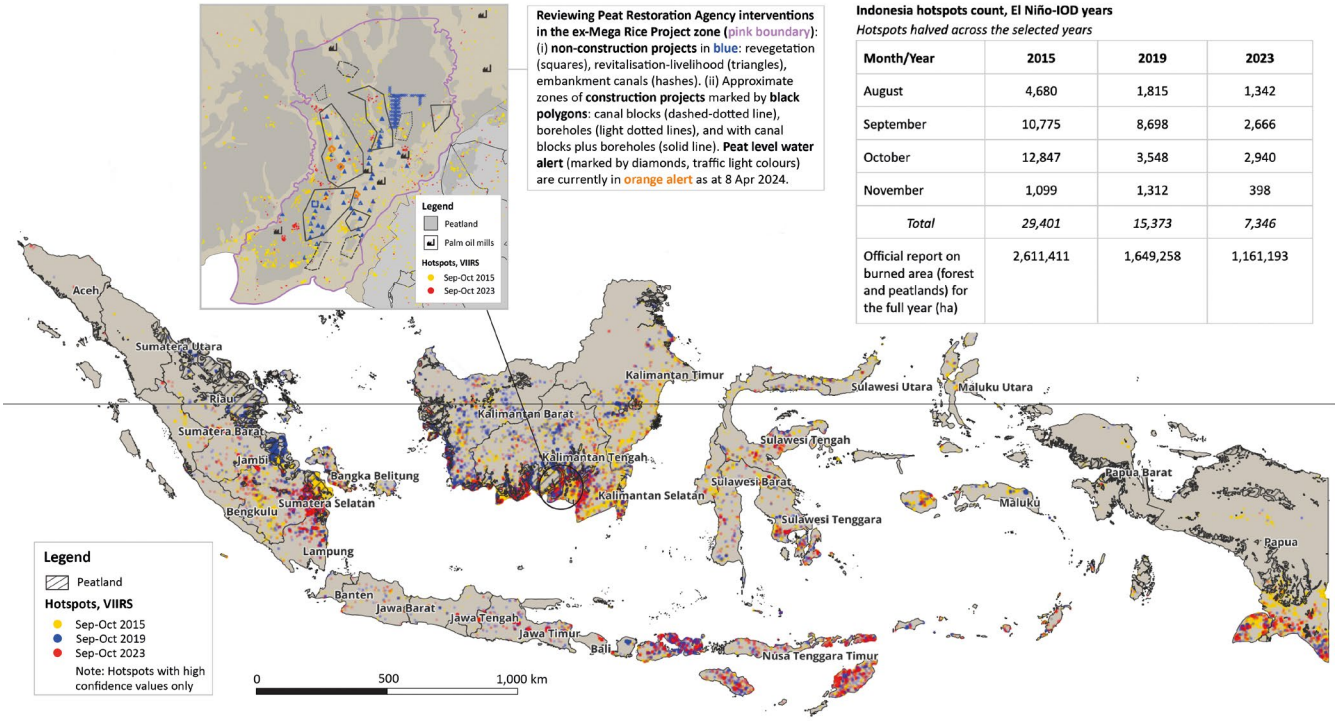
In addition to fire monitoring and suppression efforts, the Jokowi administration has also prioritised restoring vulnerable fire-prone ecosystems in Indonesia, for instance rewetting degraded peatland areas that were previously drained for agricultural purposes and restoring them to a naturally moist state. Restoration work has been carried out by KLHK as well as the Peatland and Mangrove Restoration Agency (BRGM).

The inset map in Figure 4 shows the extent of BRGM interventions since 2016 in Central Kalimantan province, within the old Mega Rice Project zone. The Mega Rice Project was an initiative under the Suharto administration to convert peatlands into rice paddies. It was eventually abandoned, but the drainage work has left much of Central Kalimantan particularly fire prone. Parts of the old Mega Rice Project area are now being developed into farmland once again, as part of the Jokowi administration's food estate programme that has been overseen by President-elect Prabowo in his capacity as Defence Minister. As such, the area continues to be of interest in understanding the interplay between agricultural activity and fire risk, and the ability of ecosystem restoration works to prevent fires. While some hotspots were still detected in Central Kalimantan within peat restoration areas during the October 2023 dry

season, most hotspots in the province were outside the restoration areas, indicating that BRGM's work is having a positive effect.

Appendix A takes an in-depth look at peatland restoration initiatives carried out by BRGM in Riau province, which is close to Singapore. Riau did not suffer badly from hotspots during the dry season in 2023. The Indonesian government's peatland rewetting work appears effective in preventing fires, though NGOs and experts have noted some issues that the authorities may need to address.

### Figure 5: High confidence fire alerts in Indonesia (Oct-Sep 2015, 2019, 2023)




**Indonesia hotspots count, El Niño-IOD years**

*Hotspots halved across the selected years*

| Month/Year | 2015 | 2019 | 2023 |
|---|---|---|---|
| August | 4,680 | 1,815 | 1,342 |
| September | 10,775 | 8,698 | 2,666 |
| October | 12,847 | 3,548 | 2,940 |
| November | 1,099 | 1,312 | 398 |
| *Total* | *29,401* | *15,373* | *7,346* |
| Official report on burned area (forest and peatlands) for the full year (ha) | 2,611,411 | 1,649,258 | 1,161,193 |

*Note: The map displays locations of hotspots in Indonesia between the peak dry season from October to September in 2015 (yellow dots), 2019 (blue dots) and 2023 (red dots). The location of peatlands is indicated in diagonal areas and the grey line cutting across provinces represents the equator.*

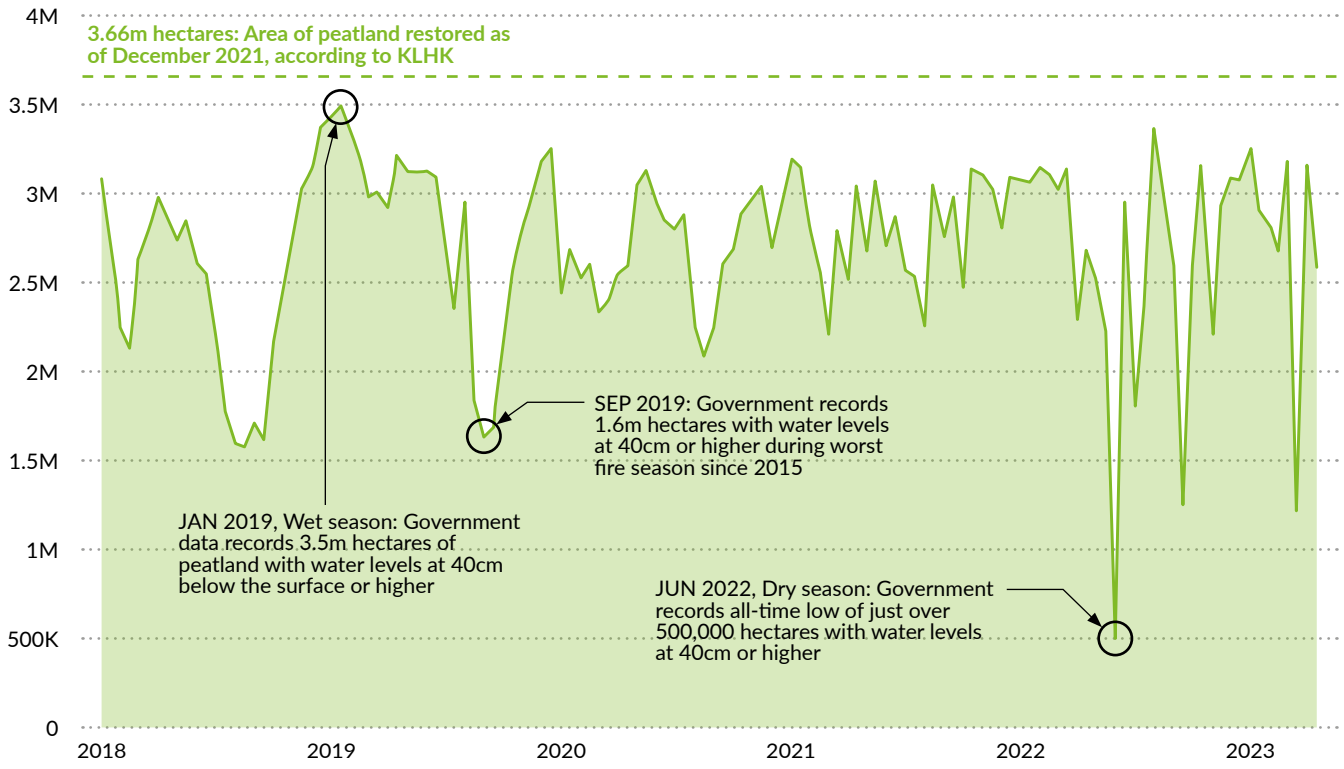
*Source: Khor Reports - Segi Enam Advisors (2024). Indonesia peatland map with hotspots is based on data from Fire Information for Resource Management System (FIRMS), peatland locations from Jiren Xu et al. (2018) and equator line from FAO - Aquaculture Management and Conservation Service (FIMA) (2006). Inset map of interventions and water levels in the ex-Mega Rice Project zone is based on data from the Peatland and Mangrove Restoration Agency (BRGM) and palm oil mills from Global Forest Watch (GFW). Official burned area figures are from the Ministry of Environment and Forestry (KLHK).*

## *The Indonesian government's peatland rewetting work appears effective in preventing fires, though NGOs have raised caveats.*

NGOs and activists have pointed out that the Indonesian government's official definition of peat restoration is the raising of groundwater levels to 40 centimetres below the surface. This is mainly focused on rewetting, rather than reintroducing plants to return peatland areas to a more natural state. BRGM is aware of the issue and has established trial areas for revegetation and paludiculture (see Appendix A). But revegetation is more of a long-term goal, whereas rewetting is immediate. For the time being, rewetting does seem to be effective in protecting peatland areas from fire and therefore is contributing to haze prevention.

Another caveat is that BRGM's work is only on government-controlled land, as public funds cannot be used on concessions held by businesses. Official data from KLHK shows that groundwater level in concessions fluctuates depending on the weather and time of year, with the water level dropping below the government-mandated 40-centimetre level in many areas during the dry season.[11] KLHK is aware of the issue, and when the Ministry detects that groundwater levels have fallen below the threshold, concession holders are asked to carry out field checks and improve or repair their water management infrastructure.

**Figure 6: Groundwater levels in private sector concession areas**




*Source: The Gecko Project (2023), based on Ministry of Environment and Forestry (KLHK) data*

## *The Prabowo administration is expected to maintain continuity with the Jokowi administration's policies.*

### Continuity and New Directions in Indonesian Policy

The incoming Prabowo administration is expected to maintain continuity with the Jokowi administration's environmental policies. In addition to Indonesia's peatland restoration and fire management efforts, there are several policy directions that the Jokowi administration has initiated that could be taken further and elevated by the new government—ones that would have a lasting impact on haze prevention.

### Net Zero and Green Economy

Mr Prabowo aims to achieve eight per cent economic growth within the first two or three years of his presidency, concentrating on Indonesia's green economy in the agriculture, food, and energy sectors.[12] At the same time, Indonesia is also aiming to reduce GHG emissions by 29 per cent over business-as-usual by 2030, and achieve net zero emissions by 2060 or sooner. These commitments are unlikely to change as they are part of Indonesian law and included in Indonesia's Nationally Determined Contributions (NDCs) under the global Paris Agreement, meaning that growth will need to be twinned with aggressive emissions reduction.

Part of the roadmap to net zero is to make the country's Forestry and Other Land Use (FOLU) sectors a net carbon sink by 2030. Measures to achieve this will need to be undertaken by the Prabowo administration, including facilitating the generation of carbon credits from forest projects and carbon trading. Indonesia began carbon trading in 2023 for the coal-fired power sector but has not yet implemented the country's planned carbon tax.

Questions surround Indonesia's biofuels mandate. Mr Prabowo aims to progressively raise the palm oil content in biodiesel from the current 35 per cent (B35) to 40 per cent (B40) as early as 2025, potentially reaching 50 per cent (B50) by 2029.[13] This would increase domestic consumption of palm oil, which would either require more output or a reduction in exports. Some estimates suggest that going from B35 to B40 could require nearly fifteen per cent of Indonesia's current palm oil production, or a quantity roughly equal to current exports to the EU.

While some businesses prefer domestic sales to exports due to the administrative costs involved in accessing foreign markets, others view exports as more profitable. In this context, some producers might try to increase output via plantation expansion, increasing the risk of illicit deforestation. In addition to stepping up palm oil content in biodiesel, Mr Prabowo has also called for Indonesia to roll out a 10 per cent bioethanol fuel (E10) by 2029 which may put even more pressure on land use in the country. Mr Prabowo sees these targets as a necessary step to reduce Indonesia's reliance on fossil fuels, but the government will need to work together with the plantation and forestry sectors to ensure that these alternative fuels are truly sustainable.

In the long run, Mr Prabowo has said he agrees with outgoing President Joko Widodo's vision of Indonesia eventually phasing out exports of raw resources to other countries in favour of processing them into higher-value products domestically. Mr Prabowo has acknowledged that the domestic processing policy will take years to implement, but early steps may be taken towards the end of Mr Prabowo's term, accelerating in his second term should he be re-elected.

### Governance of Forestry and Other Land Use Sectors

As part of President Joko Widodo's long-term vision for Indonesia's economy, the country passed the Omnibus Law on Job Creation in October 2020, a package of reforms aimed at creating employment and streamlining the regulatory process for businesses. Regulations have been progressively rolling out from government ministries to implement the changes allowed by the law. This process will continue under the Prabowo administration.

## *Businesses are watching to see if Mr Prabowo will create enabling environments to increase yields.*

Businesses, NGOs, and analysts are watching to see if Mr Prabowo will create enabling environments to increase yields in the plantation and forestry sector, such that more output can be achieved with existing land rather than with new plantations. Key areas of interest are the possible streamlining of Indonesia's business permit system, which would help efforts to create conservation and carbon projects, and improvements in land management to resolve overlapping land title claims and land conflicts.

Analysts have suggested that Mr Prabowo may divide the Environment and Forestry portfolios, which were combined into a single cabinet position and ministry during President Joko Widodo's first term. Companies and NGOs in Indonesia appear cautiously optimistic that this division may result in better resourcing and policymaking in each area. It has been confirmed that the total number of ministries will increase under the Prabowo administration, from the current 34 ministers in cabinet to a potential total of 40.

### Data on Indonesia's Smallholders and Commodity Companies

Under the Jokowi administration, the Ministry of Agriculture launched a programme to grant smallholder farmers a new electronic Cultivation Registration Certificate (*e-Surat Tanda Daftar Budidaya* or e-STDB). This is a form of business permit or license for farmers with a land area under 25 hectares.[14] It is important for farmers to have a stronger legal presence in government systems as this is needed for them to gain access to public funds, better planting material, and fertilisers that can improve their productivity. Registration will also help smallholders secure Indonesia's national sustainability certifications such as the Indonesia Sustainable Palm Oil (ISPO) scheme and meet the requirements of anti-deforestation import regulations from other markets such as the EUDR.

The e-STDB registration programme is still in its early stages, and currently there is a nationwide drive to get more farmers to register, which will continue through to 2025 during Mr Prabowo's first year in office. While some smallholders see the benefits of the initiative, others are not keen on registering. For instance, they might not currently be paying taxes on their land, but having a formal legal presence would mean they would need to do so going forward. The incoming Prabowo administration will need to address the concerns of smallholders to bring them on board.

The e-STDB scheme is feeding into a broader initiative spearheaded by Indonesia's Coordinating Ministry for Economic Affairs to create a National Dashboard, a digital platform which combines the Ministry of Agriculture's data on smallholder locations with comparable map information from larger companies.[15] The dashboard will help regulators verify that agricultural activity is not linked to recent deforestation. The platform will also contain transaction records so purchasers and traders can track the journey of products from farms to their final destination.

***The National Dashboard marks a significant step for Indonesia in data transparency and will benefit businesses.***

The National Dashboard marks a significant step for Indonesia in data transparency and will potentially be beneficial for businesses in the region beyond its role in meeting the immediate needs of the EUDR. The platform is set to be jointly launched by President Joko Widodo and President-elect Prabowo in September, alongside the next meeting of the Ad Hoc Joint Task Force on the EUDR involving the EU, Indonesia, and Malaysia.

### International Engagement and Indonesia's Global Standing

Mr Prabowo is expected to be more prominent on the international stage compared to his predecessor. Since winning the January 2024 election, Mr Prabowo has published opinion articles in major international publications, most recently a June commentary in Newsweek.[16] He has made overseas visits to China, Japan, Malaysia, and Singapore in the past few months in his capacity as Indonesia's Minister of Defence. He wishes to strengthen Indonesia's position in global networks and secure its geopolitical status.

Mr Prabowo is widely seen as a pragmatic politician and is aware of the need to establish Indonesia's credentials as a climate leader as part of his vision. There is reason to believe the Prabowo administration will try to find a stable equilibrium between environmental and economic priorities.

# 4. Tech for Sustainability and Market Access: Business and Investment Opportunities

There are promising new and emerging technological innovations that can help Indonesia and other ASEAN economies better manage fires and haze, as well as securing access to global markets and increasing productivity to replace expansionary land use with greener growth. With the right investment and support, these innovations could be scaled up across the region.

### Fire Prevention and Suppression

The use of satellite data to monitor hotspots is now widely understood, but the past few years have also seen greater availability of up-to-date high-resolution microsatellite photos from commercial providers. This has strengthened accountability, as plantation operators are becoming more aware that their activities are visible to public scrutiny.

Plantation and forestry companies are beginning to explore the use of artificial intelligence (AI) to anticipate which areas may be more prone to fires, based on the location of previous fires, proximity to local settlements, expected rainfall, and other factors. Such fire risk mapping is currently a manual process. There is also potential for ASEAN countries to adapt solutions developed by other countries that frequently deal with intense fire seasons, such as Australia, in areas like computer modelling to understand the spread of fires or in cloud services to better allocate firefighting resources between areas.

### Data and Traceability

The past year has seen an increased interest in the adoption of digital platforms for geolocation and supply chain traceability as the plantation and forestry sectors prepare for the implementation of the EUDR. For example, the Roundtable on Sustainable Palm Oil (RSPO) is expected to launch its new Palm Resource Information and Sustainability Management (PRISMA) end-to-end data platform by the end of 2024, created by Agridence, a Singapore company.[17] The Indonesian government is working with RSPO and private sector firms to consolidate traceability data on its National Dashboard. While there is now official endorsement from Indonesia that such data should be tracked and made available, there is still a need for investment in this technology combined with industry action to make use of such platforms more mainstream.

### Yields and Efficiency

The plantation and forestry sectors are exploring various ways to increase yields, efficiency, and output. These include automation or mechanisation at the plantation level. That said, such automation is mainly being spearheaded by Malaysia's plantation sector as it is dependent on foreign labour, and high-tech solutions at the plantation level are more suited to large businesses and not smallholder farmers.

As such, there is a need to develop solutions that can be widely adopted even by smaller producers. The seeds and seedlings distributed to growers as planting material can also be improved, not only for greater yields, but also for greater resilience against disease and extreme weather, and so they do not need as much fertiliser – as fertiliser production is very emissions intensive.

There is also potential in the use of genomic testing to ensure that growers are planting the right kinds of seeds, as at least some planting material is often contaminated due to human factors or because of natural pollination. Testing is particularly important for the palm oil sector, as there are three main varieties of oil palm, but only one is desirable for oil production. If the wrong variety is planted it may only be discovered two or three years later when the trees begin to bear fruit.

# 5. Conclusion

The Haze Outlook report is an assessment of the likelihood of a transboundary haze incident occurring in 2024, and this year's risk rating is Green on a scale of Green, Amber, and Red – indicating that there is a low chance of the haze returning this year between the peak fire danger months of September to October 2024.

***There is a low chance of the haze returning this year between the peak fire danger months of September to October 2024.***

The haze situation has been steadily improving over the past few years, from the major haze event seen in 2015 that happened shortly after President Joko Widodo took office in Indonesia, to the less severe haze in 2019, and finally the much more muted haze that happened in 2023. This is testament to the effectiveness of fire management and ecosystem restoration efforts implemented by the Jokowi administration. President-elect Prabowo has pledged to continue his predecessor's flagship sustainability policies after he takes office in October. Much will depend on the Prabowo administration's ability to take the country's green growth agenda forward.

Indonesia's haze action has been complemented by initiatives at the ASEAN regional level. In September 2023, the permanent ASEAN Coordinating Centre for Transboundary Haze Pollution Control (ACC THPC) was launched in Jakarta by President Joko Widodo, Minister for Environment and Forestry Siti Nurbaya Bakar and ASEAN Secretary-General Kao Kim Hourn. The centre will boost efforts to prevent, mitigate, and monitor the haze. As international engagement is one of Mr Prabowo's priorities, there is reason to believe he will continue his predecessor's strong commitment to ASEAN cooperation to address the recurring challenge of the haze issue, including through annual meetings of the ASEAN Agreement on Transboundary Haze Pollution (AATHP) and of the Sub-Regional Ministerial Steering Committee (MSC) on Transboundary Haze Pollution.

ASEAN is taking steps to enhance multi-stakeholder partnerships to promote sustainable land management and address the root causes of transboundary haze. At the 25th MSC on 3 July 2024 in Bangkok, Ministers and senior officials from ASEAN member states welcomed the adoption of the Second Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation (Haze-Free Roadmap) 2023-2030 and the Second ASEAN Peatland Management Strategy (APMS) 2023-2030. The grouping has also endorsed the ASEAN Investment Framework for Haze-free Sustainable Land Management developed in consultation with governments, financial institutions, think tanks, and NGOs.

The weather is favourable heading into the latter half of 2024. But in the long term, ASEAN still needs to be wary of climate change causing more frequent extreme weather events. There will likely be at least one other hot and dry year between now and 2030.

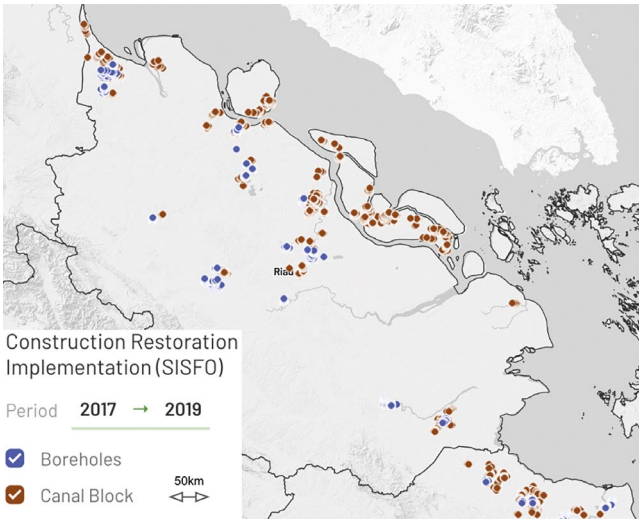
Continued effort is needed to ensure that fire management and sustainability in the region remains strong in the years to come. In this season of clear skies and clean air, governments, local communities, NGOs, and the private sector can take the opportunity to set practices in place to keep the region free from haze.

***Continued effort is needed to ensure that fire management and sustainability in the region remains strong in the years to come.***

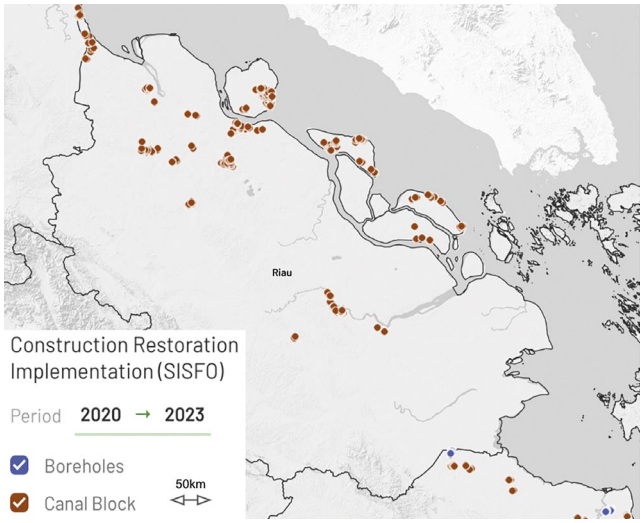
# Appendix A: Case Study - Peatland Restoration in Riau Province

This appendix examines the progress of peatland restoration or rewetting in Riau Province in Indonesia, based on data from BRGM's Peatland Restoration Information Management System (PRIMS) for restoration work on non-corporate or government-controlled land, and data from KLHK's Management and Protection of Peatland Ecosystem (SIPPEG) platform for insights into company-run concession areas.

### Construction Interventions (2017-2019)



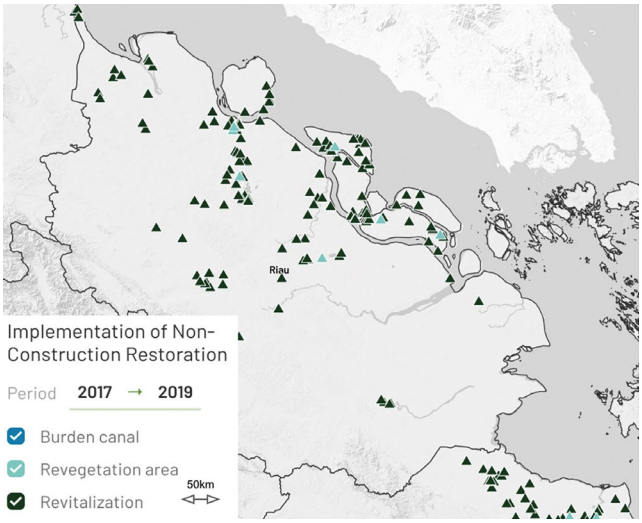

### Construction Interventions (2020-2023)




Construction interventions refer to the creation of physical infrastructure such as the building of canal blocks to close old drainage canals that were previously used to drain peatland for agricultural planting, as well as boreholes.

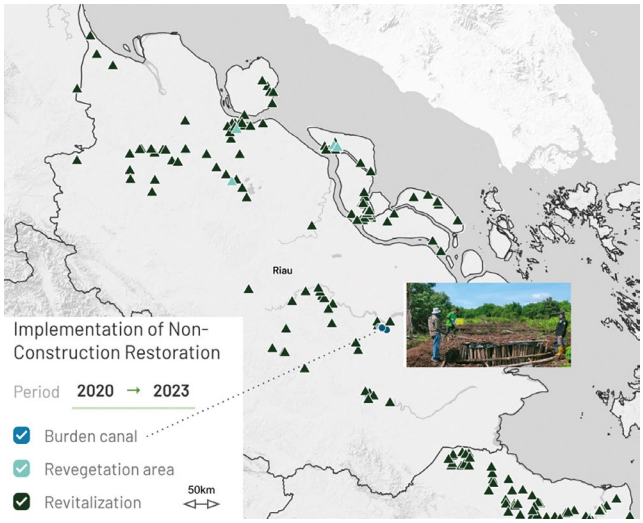
More boreholes were built in 2017 to 2019 and fewer in 2020 and 2023, but boreholes are partially for monitoring purposes. It is possible that after the initial round, further ones were not needed. Canal blocks are the main form of construction intervention and BRGM's work to build canal blocks has continued steadily, intensifying in certain areas and also covering new sites between the two project periods.

### Non-construction Interventions (2017-2019)




*Note: Revegetation sites in coastal Riau are marked in light blue or teal, these include creation of nurseries, seeding and planting, and non-active interventions such as allowing natural regeneration and seed dispersal*

### Non-construction Interventions (2020-2023)

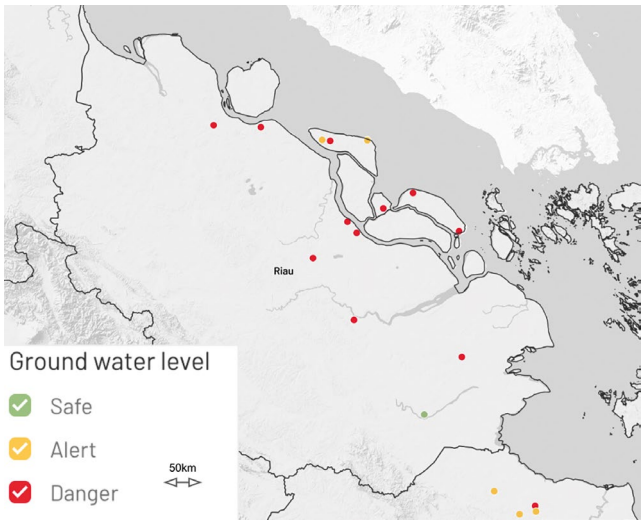



*Note: Inset image shows a burden canal or canal embankment in south Riau near the Kampar River*

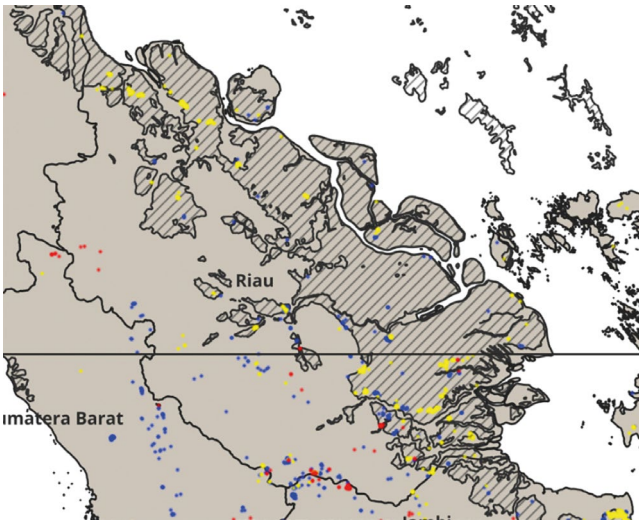
Non-construction interventions include some rewetting at burden canals or canal embankments that do not constitute canal blocks, revegetation and paludiculture projects, as well as efforts to improve community livelihoods. Implementation locations from 2020 to 2023, compared to the earlier 2017 to 2019 period, show that interventions are intensifying and also spreading to new sites.

Experts agree that the success of peat restoration depends on support from local communities, and income uncertainty among local residents is a potential driver of land degradation. This explains why BRGM's livelihood projects outnumber other interventions in terms of project sites.

### Water Level Alerts (April 2024)




### Hotspots from Sep-Oct (2015, 2019, 2023)




*Note: Sep-Oct is the peak fire risk period, blue icons are 2015 hotspots, yellow are 2019, and red are 2023. Diagonal line areas are peatlands.*

*Source: Compiled by Segi Enam from BRMG's PRIMS, KLHK's SIPPEG, NASA's FIRMS, peatland locations from Jiren Xu et al. (2018) and equator line from FAO - Aquaculture Management and Conservation Service (FIMA) (2006).*

# Appendix B: Literature Review

Expanding on our previous Haze Outlook reports, we have reviewed approximately 100 pieces of recent literature related to fire and land management in Indonesia, forests, published from 2023 to 2024. Between 2023 and 2024 half the papers we reviewed were on peatland fires, a third were on peat management and restoration, while the remainder looked at issues such as the social, political and economic impacts of peatland fires and transboundary haze.

Although there has been more focus on policymaking, private sector initiatives, and media coverage on greenhouse gas emissions (GHG) from fires and land degradation, we only found a total of 12 papers focusing on this issue, fewer than the last two years. Several papers examined factors for estimating GHG emissions from peat fires and other disturbances on peatlands (Saharjo, 2023; Lestari et. al., 2024; Krisnawati et. al., 2024). A.B. Putra & C.B. Lee (2024) calculated that Indonesia could become the largest GHG emitter in the world if emissions from degraded peat are not addressed.

Studies on peatland management and restoration suggested that efforts should centre on local communities and engagement with people living in peatland areas (S Grover et. al., 2024; DS Mendham et. al., 2024; KJ Lees et. al., 2023). H. Purnomo et. al. (2023) proposed that business models should be developed with specific jurisdictions of interventions, with an eye towards better identifying target participants and beneficiaries of environmental services.

The social, political, and economic impacts of peatland fires and the resulting haze appears to be a growing area of academic study. Y Gani et. al., (2023) found increasing societal awareness, particularly in urban cities, of the effects of air pollution and regulatory frameworks to manage the issue. M Iqbal et. al., (2023) concluded that Indonesia already has a robust institutional framework of government bodies and NGOs that are looking into fire and haze issues. K Mizuno et. al., (2023) focused on conflicts between companies and communities and the impact on peatland degradation and the ensuing fires – they describe examples of communities claiming land parcels to obtain land rights and prevent plantation expansion by companies, which the communities feel is the cause of fires, but in turn the claiming of land by communities has accelerated the degradation of peatlands and has increased fire risk.

We also reviewed articles and reports from NGOs and not-for-profit campaigns, who are continuing to scrutinise plantation and forestry businesses for links to deforestation. MightyEarth highlighted how a timber and oil palm plantation company cleared 14,000 hectares between January and August 2023, alleging that it was the biggest single deforester in Indonesia (Mighty Earth, 2024). The firm was consequently suspended by several companies that it supplied. The Gecko Project (2023a) published a report on alleged covert links between major businesses and smaller companies that have been clearing forests in Indonesia. Separately, the Gecko Project also investigated peatland restoration efforts in Indonesia (The Gecko Project, 2023b).

We reviewed reports from major environmental news websites and portals. Mongabay reported on data published by The TreeMap, the consultancy behind the Nusantara Atlas platform, which indicates that oil palm plantation area in Indonesia appears to be expanding (Mongabay, 13 February 2024). EcoBusiness reported on the climate policies expected from the incoming Prabowo administration, noting that the President-elect's emphasis on food security might put more pressure on land use and inadvertently increase the risk of deforestation (EcoBusiness, 12 March 2024).

# References

## Endnotes


[1] Climate Prediction Center (CPC). "ENSO: Recent Evolution, Current Status and Predictions". June 17, 2024. Accessed June 24, 2024. https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

[2] ASEAN Specialised Meteorological Centre (ASMC). "Seasonal Outlook". Accessed July 4, 2024. http://asmc.asean.org/asmc-seasonal-outlook/

[3] Gilbert, M. "'Super El Niño' is here, but La Niña looks likely. What's in store for the coming months". CNN, February 8, 2024. Accessed June 24, 2024. https://edition.cnn.com/2024/02/07/weather/el-nino-super-winter-climate/index.html

[4] Weisse, M. et al. "Forest Pulse: The Latest on the World's Forests". Global Forest Watch (GFW), April 4, 2024. Accessed June 24, 2024. https://research.wri.org/gfr/latest-analysis-deforestation-trends

[5] Jong, H.N. "Indonesian audit finds taxes unpaid on 22 million acres of oil palm plantations". Mongabay, May 22, 2023. Accessed June 24, 2024. https://news.mongabay.com/2023/05/indonesian-audit-finds-taxes-unpaid-on-22-million-acres-of-oil-palm-plantations/

[6] Jong, H.N. "Palm oil deforestation makes comeback in Indonesia after decade-long slump". Mongabay, February 14, 2024. Accessed June 24, 2024. https://news.mongabay.com/2024/02/palm-oil-deforestation-makes-comeback-in-indonesia-after-decade-long-slump/

[7] Manzanaro, S.S. "Austria's farming, economy ministers urge von der Leyen to delay EU anti-deforestation law". Euractiv, April 30, 2024. Accessed June 24, 2024. https://www.euractiv.com/section/agriculture-food/news/austrias-farming-economy-ministers-urge-von-der-leyen-to-delay-eu-anti-deforestation-law/

[8] World Wide Fund for Nature (WWF). "Support the FOREST Act". Accessed June 24, 2024. https://www.worldwildlife.org/pages/forest-act

[9] SiPongi. "Rekapitulasi Luas Kebakaran Hutan dan Lahan (Ha) Per Provinsi Di Indonesia". Accessed April 10, 2024. https://sipongi.menlhk.go.id/indikasi-luas-kebakaran

[10] SiPongi. "Emisi CO2 dari Kebakaran Hutan dan Lahan (Ton CO2e)". Accessed April 10, 2024. https://sipongi.menlhk.go.id/emisi-co2

[11] The Gecko Project. "Success of Indonesian peatland restoration in doubt as fire season sets in". August 9, 2023. Accessed April 8, 2024. https://thegeckoproject.org/articles/success-of-indonesian-peatland-restoration-in-doubt-as-fire-season-sets-in/

[12] Tanamal, Y. "Prabowo promises 8% growth through downstreaming". The Jakarta Post, May 16, 2024. Accessed June 24, 2024. https://www.thejakartapost.com/indonesia/2024/05/16/prabowo-promises-8-growth-through-downstreaming.html

[13] Shofa, J.N. "Prabowo Confident on 8 Pct Growth in First 3 Years of Presidency". Jakarta Globe, May 16, 2024. Accessed June 24, 2024. https://jakartaglobe.id/business/prabowo-confident-on-8-pct-growth-in-first-3-years-of-presidency

[14] Ministry of Agriculture (Indonesia). "STDB Elektronik (e-STDB)". Pertanian.go.id. Accessed June 24, 2024. https://stdb.ditjenbun.pertanian.go.id/beranda

[15] Reuters. "Indonesia designs agricultural commodities digital tracker in sustainability push". June 5, 2024. Accessed June 24, 2024. https://www.reuters.com/markets/commodities/indonesia-designs-agricultural-commodities-digital-tracker-sustainability-push-2024-06-05/

[16] Prabowo S. "The Road Ahead for Indonesia—One of the Fastest Growing Economies in Asia". Newsweek, June 12, 2024. Accessed June 24, 2024. https://www.newsweek.com/road-ahead-indonesiaone-fastest-growing-economies-asia-opinion-1911354

[17] Roundtable on Sustainable Palm Oil (RSPO). "Introducing PRISMA: RSPO's Certification, Trade and Traceability System for Sustainable Palm Oil Management". February 22, 2024. Accessed June 24, 2024. https://rspo.org/introducing-prisma-rspos-certification-trade-and-traceability-system-for-sustainable-palm-oil-management/

## Additional References


- Badan Meteorology, Klimatologi, dan Geofisika (BMKG). "Analisis Dinamika Atmosfer Dasarian III Maret 2023". Accessed April 2, 2024. https://www.bmkg.go.id/iklim/dinamika-atmosfir.bmkg
- Badan Restorasi Gambut dan Mangrove (BRMG). "Peta Restorasi". Accessed 8 April, 2024. https://brgm.go.id/
- Directorate General of Plantations. "Buku Statistik Perkebunan Non Unggulan 2021-2023". Dec 21, 2023. Accessed April 5, 2024. https://ditjenbun.pertanian.go.id/?publikasi=buku-statistik-perkebunan-2021-2023
- Directorate General of Natural Resources and Ecosystem Conservation. "Pendampingan Pengecekan Kanal Timbun di SM Kerumutan". November 9, 2021. Accessed April 8, 2024. https://ksdae.menlhk.go.id/info/10183/pendampingan-pengecekan-kanal-timbun-di-sm-kerumutan.html
- Hicks, R. "Indonesia's peatlands are more fire-prone than official figures claim as dry season looms: study". Eco-Business, August 9, 2023. Accessed April 8, 2024. https://www.eco-business.com/news/indonesias-peatlands-are-more-fire-prone-than-official-figures-claim-as-dry-season-looms-study/
- FIMA. "Equator, Tropics & Meridian Reference". (2006). https://data.apps.fao.org/map/catalog/fonts/api/records/8f116f90-b06d-11db-8922-000d939bc5d8
- Global Forest Watch (GFW). "Universal Mill List". (2022). https://data.globalforestwatch.org/documents/gfw::universal-mill-list/about
- GFW. "Indonesia Deforestation Rates and Statistics". Accessed April 8, 2024. https://www.globalforestwatch.org/dashboards/country/IDN/
- Jiren, X., Morris, P., Liu, J., and Joseph, H. "PEATMAP: Refining estimates of global peatland distribution based on a meta-analysis". Catena, Volume 160 (2018). https://doi.org/10.1016/j.catena.2017.09.010
- NASA Fire Information for Resource Management. Archive Download. Accessed April 9, 2024. https://www.earthdata.nasa.gov/learn/find-data/near-real-time/firms
- National Oceanic and Atmospheric Administration (NOAA). "ENSO: Recent Evolution, Current Status and Predictions". Accessed April 8, 2024. https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf
- TheTreeMap. "2023 Marks a Surge in Palm Oil Expansion in Indonesia." January 25, 2024. Accessed April 10, 2024. https://nusantara-atlas.org/2023-marks-a-surge-in-palm-oil-expansion-in-indonesia/
- TheTreeMap. "2023 Deforestation by the Wood Pulp Industry in Indonesia Surges, Hits Record Highs in Kalimantan." January 26, 2024. Accessed April 10, 2024. https://nusantara-atlas.org/2023-deforestation-by-the-wood-pulp-industry-in-indonesia-surges-hits-record-highs-in-kalimantan/

## Literature Review


- Gani, Y. and Sinaga, S.P. "Air Pollution Dynamics: Insights into Current Condition of Policy Framework and Future Strategy". Journal of Governance, Volume 8(3), 2023. http://dx.doi.org/10.31506/jog.v8i3.15681

- Grover, S., Treby, S., Mendham, D., Yuwati, T.W., Sakuntaladewi, N., Langston, J.D., and Rawluk, A. "Social and Ecological Dimensions of Tropical Peatland Restoration". Mires and Peat, Volume 30, 00, 2024. http://dx.doi.org/10.19189/MaP.2023.OMB.Sc.2114019

- Iqbal, M., Sujianto, S., and Ayub, Y. "Environmental Policy Strategy and Law Enforcement of Peatland Fires: An Environmental Law Perspective". Lex Publica, Volume 10(2), 2023. https://journal.appthi.org/index.php/lexpublica/citationstylelanguage/get/harvard-cite-them-right?submissionId=203&publicationId=203

- Krisnawati, H., Adinugroho, W.C., Imanuddin, R., Budiharto. "Carbon Accounting System in Tropical Peatlands". In: Osaki, M., Tsuji, N., Kato, T., Sulaiman, A. (eds). Tropical Peatland Eco-evaluation, 2023. Springer, Singapore. https://doi.org/10.1007/978-981-99-6790-2_4

- Lees, K.J., Carmenta, R., Condliffe, I, Gray, A., Marquis, L., and Lenton, T. "Protecting peatlands requires understanding stakeholder perceptions and relational values: A case study of peatlands in the Yorkshire Dales". Ambio 52, 1282–1296, 2023. https://doi.org/10.1007/s13280-023-01850-3

- Lestari, P., Tasrifani, A.R., Suri, W.I., Wooster, M., Grosvenor, M.J., Fujii, Y., Ardiyani, V., Carboni, E., and Thomas, G. "Gaseous, particulate matter, carbonaceous compound, water-soluble ion, and trace metal emissions measured from 2019 peatland fires in Palangka Raya, Central Kalimantan". Atmospheric Environment, Volume 316, 2024. https://doi.org/10.1016/j.atmosenv.2023.120171

- Mendham, D., Sakuntaladewi, N., Ramawait, Yuwati, T.W., Budiningsih, K, Prasetyo, B.D., and Handoyo. "Facilitating new livelihoods to promote peatland restoration in Indonesia - what are the challenges for ensuring sustainable and equitable livelihood transitions?". Mires and Peat, Volume 30, 08, 2024. http://dx.doi.org/10.19189/MaP.2023.OMB.Sc.2105613

- Mizuno, K., Masuda, K., Syahza, A. "Peatland Degradation, Timber Plantations, and Land Titles in Sumatra". In: Mizuno, K., Kozan, O., Gunawan, H. (eds). (2023). Vulnerability and Transformation of Indonesian Peatlands. Global Environmental Studies. Springer, Singapore. https://doi.org/10.1007/978-981-99-0906-3_2

- Purnomo, H., Puspitaloka, D., Juniyanti, L., Kusumadewi, S.D., and Dharmawan, I.W.S. "Fire prevention and peatland restoration: Community-based action in the digital age". CIFOR, 2023. https://doi.org/10.17528/cifor-icraf/008971

- Putra, A.B. and Lee, C.B. "Indonesia's Tropical Peatlands Revisited: Area, Depth, Carbon Potential, and Their Importance". Journal of Tropical Forest Science, Vol 36, 2024. https://openurl.ebsco.com/EPDB%3Agcd%3A10%3A5887034/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A175174999&crl=c

- Saharjo, B.H. "GHG Emissions' Estimation from Peatland Fires in Indonesia—Review and Importance of Combustion Factor". In: Vadrevu, K.P., Ohara, T., Justice, C. (eds). Vegetation Fires and Pollution in Asia, 2023. Springer, Cham. https://doi.org/10.1007/978-3-031-29916-2_25

- EcoBusiness. "Bad signs of climate crisis policy from Indonesia's Prabowo-Gibran presidential pair". March 12, 2024. Accessed March 28, 2024. https://www.eco-business.com/opinion/bad-signs-of-climate-crisis-policy-from-indonesias-prabowo-gibran-presidential-pair/

- Mighty Earth. "Rapid Response Palm Oil Report 43". February 2024. Accessed April 11, 2023. https://mightyearth.org/wp-content/uploads/2024/03/RR-Report-43_final_vers_c.pdf

- The Gecko Project. "Chasing Shadows". August 9, 2023. Accessed April 8, 2024. https://thegeckoproject.org/articles/chasing-shadows/

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Within the region, the recurring transboundary haze is a stark concern for ASEAN, affecting the very air we breathe. The SIIA engages industry players and thought leaders to share best practices and galvanise action towards sustainable practices. We work closely with governments, corporations, NGOs, financial institutions, and others. For example, the recurring haze in Southeast Asia demonstrates the need for companies and smallholder farmers to recognise that fires are not only illegal in most areas but also against their interest. Consumers are also beginning to push for sustainable criteria in their purchasing, while banks, regulators, and policymakers are increasingly taking the lead in ensuring that development of the region's resource and agriculture sectors is conducted in a safe and sustainable manner. This underscores the need for an integrated approach that fosters collaboration across different stakeholder groups to achieve a sustainable future.

SINGAPORE INSTITUTE OF INTERNATIONAL AFFAIRS

For further information, contact the SIIA at:
60A Orchard Road, #04-03 Tower 1
The Atrium@Orchard, International Involvement Hub
Singapore 238890

t | +65 6734 9600
f | +65 6733 6217
e | membership@siiaonline.org
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