Singapore Institute of International Affairs

HAZE OUTLOOK 2026

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The Haze Outlook 2026 report provides a risk assessment of the probability of a severe transboundary haze incident affecting Brunei, 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 eighth edition of the Haze Outlook. The Haze Outlook 2026, as in previous years, was directed by Simon Tay, Chairman, SIIA. The authors are Khor Yu-Leng and Aaron Choo, respectively Associate Director (Sustainability) and Senior Assistant Director (Special Projects and Sustainability), SIIA, with Nithiyah Tamilwanan, Visiting Research Associate, Segi Enam Advisors, Camelia Gunawan, Senior Policy Analyst, Policy Programmes, SIIA, and Evelyn Tan, Assistant Director, Policy Programmes, SIIA. All views expressed in the report are those of the report director and 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.

In particular, the authors would like to thank the following for their insights over the past year (in alphabetical order) on the haze, conservation, climate, food security, agribusiness, and biofuels topics addressed in this report: ASEAN Specialised Meteorological Centre (ASMC), Asia Pacific Resources International Limited (APRIL) Group, Asia Pulp & Paper (APP) Group, Bumitama Agri, Centre for Nature-based Climate Solutions (CNCS), CNA, Council of Palm Oil Producing Countries (CPOPC), Glenauk Economics, Golden Philantropies, Greenpeace Southeast Asia, Grow Asia, IPB University, Institute of Strategic & International Studies (ISIS) Malaysia, KEHATI Foundation, Kuala Lumpur Kepong Berhad (KLK), Lingkar Temu Kabupaten Lestari (LTKL), Musim Mas, Mitsubishi Corporation, National University of Singapore (NUS), Permian Global, Philanthropy Asia Alliance (PAA), Philippine Institute for Development Studies (PIDS), PM.Haze, Proforest, PwC Malaysia, Resource Stewardship Consultants, Roundtable on Sustainable Palm Oil (RSPO), SD Guthrie, S. Rajaratnam School of International Studies (RSIS), Thailand Environment Institute (TEI), Transport & Environment, Universiti Malaya, United Overseas Bank (UOB), Wahana Lingkugan Hidup Indonesia (WALHI), World Resources Institute (WRI) Indonesia, WWF Indonesia, WWF Singapore, Yara International. 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. Executive Summary

Risk of a Transboundary Haze Event in 2026:

Red

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

There is a red or high risk of a severe transboundary haze event affecting Brunei, Indonesia, Malaysia, and Singapore in 2026, on a scale of green, amber, and red.

The return of El Niño is expected to create a longer and stronger dry season at a time when fire preparedness could be adversely affected by economic uncertainty. Energy disruptions are also creating higher demand for agricultural output in the form of biofuels. In the short term, rising input prices could hold back agricultural development. However, there is a danger that some growers, especially small and medium-sized operators, could resort to unsustainable expansion and the use of fire to save costs.

Our Haze Outlook is a risk analysis intended to highlight the danger of haze. It is not a prediction or forecast. On several occasions, our Amber risk assessments have provided operational feedback and helped avert actual haze. We only issue Red ratings sparingly. The only other time we have issued a Red rating was in 2023, and increased haze incidents were experienced that year.

Our risk assessment is based on engagement with governments, businesses, think tanks, and NGOs.

Weather – Hotter and Drier Season: The haze results from fires in the region, typically in the dry season. For Indonesia, Malaysia, and Singapore, the dry season runs from around June to September. 2026 is an El Niño year, and there is a 63 per cent chance of a strong event, informally called a "Godzilla" El Niño by media commentators. The "positive" phase of the Indian Ocean Dipole (IOD) could also coincide with El Niño this year, bringing even hotter and drier conditions. The most recent times both a strong El Niño and "positive" IOD have occurred were in 2015 and 2023, though the effects in 2023 were weaker than in 2015. These natural phenomena cannot be fully forecast, with data only available closer to their arrival.

Policies – Stress Test for Preparedness: Given the weather outlook, government and private sector efforts are crucial to keeping fires and haze under control. Fire and land management has improved over the years. However, this year's high-risk season comes at a time when budgets are stretched due to cost-cutting amid global economic uncertainty. For Indonesia, this is the first high risk dry season faced by President Prabowo Subianto's administration. President Prabowo's predecessor, President Joko Widodo, treated the haze as a high-priority issue, threatening to remove police chiefs for failing to enforce anti-burning laws. President Prabowo has been pushing for greater oversight of the country's land use sectors, investigating alleged environmental violations by companies and centralising control of commodity exports. While this has made some investors wary, tighter governance could have positive outcomes for haze prevention.

Markets – Economic Uncertainties Ahead: While weather is a key factor this year, the fires that cause the haze are largely man-made. What needs to be factored in is how much the markets will drive surges in agricultural activity. Plantations are still expanding year-on-year, though at a slower rate than a decade ago. However, fertilizer and energy price spikes caused by the Strait of Hormuz closure are likely to persist for months even after seaborne trade resumes, adding pressure on agricultural growers and increasing the risk that some may use fire for land clearing or waste disposal as a cost-saving measure. Fossil fuel supply issues have also led to a higher demand for biofuels, with Indonesia, Malaysia, and Thailand stepping up biodiesel mandates. Growers will need to meet demands for both food and fuel, increasing the risk that some might resort to expansion using unsustainable methods.

Table 1: Haze Outlook Risk Assessments and Outcomes

Year	Risk	Summary of Outlook	Outcome
2019	Amber	High risk from weather due to El Niño and IOD, plus fire prevention efforts implemented since 2015 still untested by severe dry season	Haze
2020	Amber	Low risk from weather alone, but risk was raised to Amber due to reports of COVID-19 restrictions affecting fire prevention and response	No Haze
2021	Green	Low risk from weather due to La Niña and stakeholders being able to maintain fire prevention efforts despite COVID-19	No Haze
2022	Amber	Low risk from weather alone, but rising agricultural commodity prices following Russia-Ukraine War increased concerns about land clearing	No Haze
2023	Red	High risk from weather due to El Niño and commodity prices remaining elevated, though stabilizing since 2023	Haze
2024	Green	Low risk from weather due to La Niña and efforts from Indonesia's outgoing Jokowi administration	No Haze
2025	Amber	Moderate risk from weather with conditions returning to neutral after La Niña, volatile market, lack of resources for prevention amid economic uncertainty	No Haze

Source: Previous Haze Outlook reports by SIIA

Looking Ahead: Emerging Issues

Bioenergy – Opportunities for Sustainability and Resilience: Interest in bioenergy was already increasing prior to the Strait of Hormuz closure, for both resilience and sustainability reasons. Indonesia is currently using a B40 blend of biodiesel and fossil fuel and plans to move towards B50 later this year. Malaysia is going from B10 to B15, while Thailand is rolling out B20. For now, most believe countries have sufficient agricultural capacity to support both food and fuel needs. But care must be taken to ensure that demand for biofuels does not lead to deforestation and land clearing. There is potential for ASEAN to collaborate on frameworks and standards for biofuels, encouraging circularity in feedstock procurement and reinforcing current laws against deforestation.

Land Management – Fires, Floods, and Wider Climate Risks: Driven more by wildfires than agri-burning, Singapore's brief haze from Johor fires from January to February fell outside the usual peak season. Our case study suggests any prolonged dry spell can trigger haze, especially as climate change brings hotter averages, reinforcing the need for regional sustainable land management.

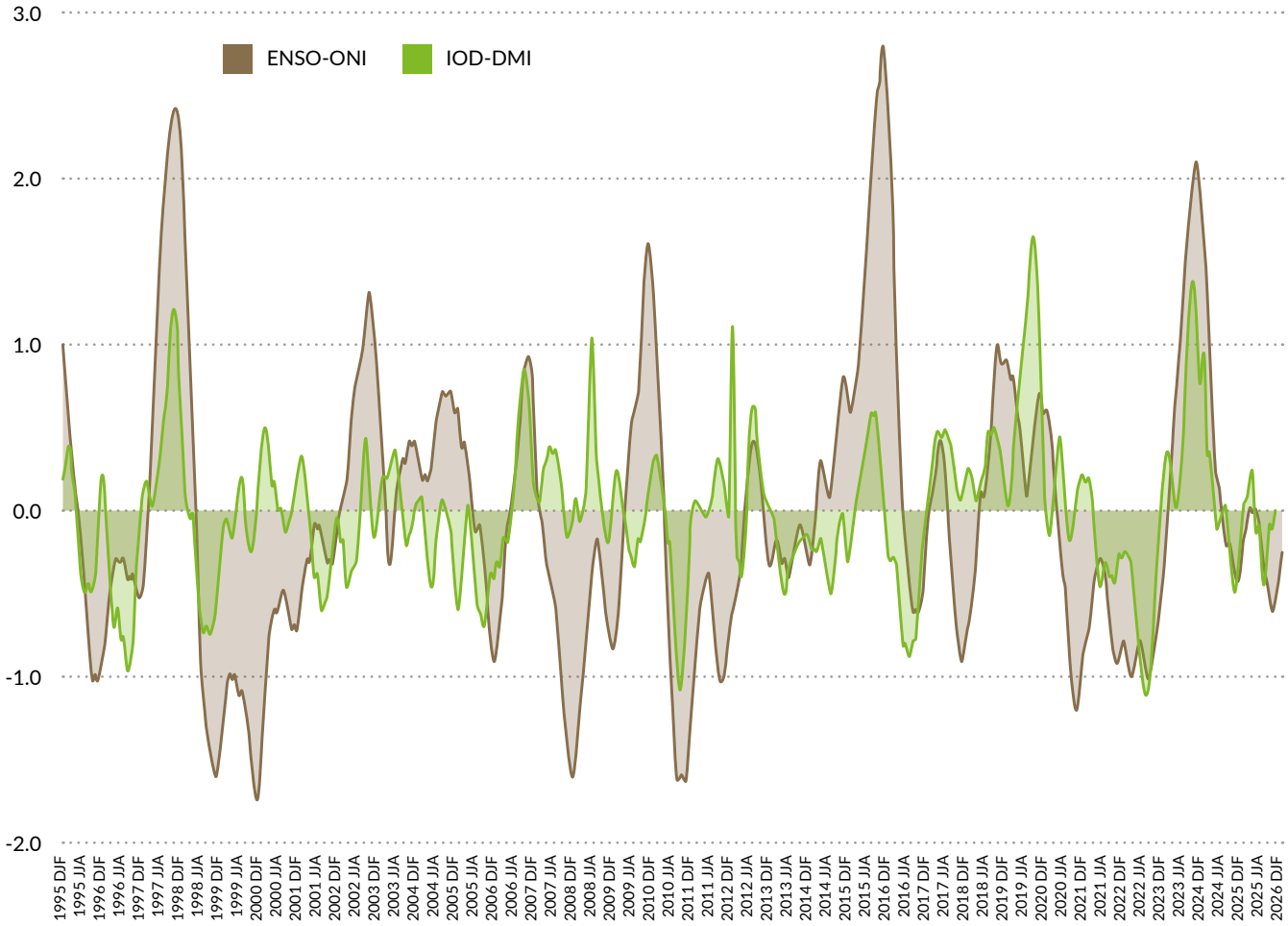
Weaknesses in land management are highlighted not only by fire but also floods. Reports from Sumatra suggest areas previously burnt by fires or deforested were less able to absorb heavy rainfall, worsening flood damage from Cyclone Senyar in November 2025. Our case study for Sumatra examines the Prabowo administration's revocation of permits for 28 plantation, mining, and hydropower companies in the wake of the late-2025 floods. Last year's floods have also revealed land management issues across other ASEAN countries.

Strengthen ASEAN and Multistakeholder Collaboration

Over the past decade, ASEAN has stepped up cooperation on haze issues. The ASEAN Coordinating Centre for Transboundary Haze Pollution Control (ACC THPC), recently inaugurated in Jakarta, aims to strengthen policy coordination on haze mitigation, complementing monitoring and assessment of land and forest fires, as well as the provision of early warnings for transboundary haze by the ASEAN Specialized Meteorological Centre (ASMC) in Singapore. But more financing is needed to realise the Second ASEAN Haze-Free Roadmap (2023-2030). The ASEAN Transboundary Haze Pollution Control Fund is small and sustained through voluntary contributions by ASEAN member states. The ASEAN Investment Framework for Haze-Free Sustainable Land Management (AIF-HFSLM) has called for mobilising US$1.5 billion, but this relies on funding by bilateral donors and international organisations. Haze needs to be addressed as a cross-cutting issue bridging land management and development, involving government, private sector, and civil society stakeholders.

2. Weather: Hotter and Drier Season

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



Note: Oceanic Niño Index (ONI, brown) measures ENSO, while Dipole Mode Index (DMI, green) measures IOD; positive numbers over zero mean drier weather for ASEAN, negative numbers below zero mean wetter weather. Meteorologists measure seasons in three-month blocks, the labelled intervals are for Dec, Jan, Feb (DJF) and Jun, Jul, Aug (JJA).

Source: Khor Reports - Segi Enam Advisors (2026), based on data from the US National Oceanic and Atmospheric Administration (NOAA) for 1995 to March 2026 (ENSO-ONI and IOD-DMI)

Past haze incidents have usually coincided with intense drought periods. Weather conditions in the remaining months of 2026 could potentially be one of the hottest and driest dry seasons on record, increasing the danger that land fires could spread out of control.

El Niño conditions are under way as of June 2026, and the US National Oceanic and Atmospheric Administration (NOAA) estimates a 63 per cent chance of a strong El Niño.[1] Media reports have been calling this a "Godzilla" or "super" El Niño, though these are not scientific terms. The development of El Niño, along with the long-term trend of global warming, increases the chance that 2027 will be the hottest year on record.[2]

The Indian Ocean Dipole (IOD), another phenomenon that affects weather in our region, is harder to predict and there is no agreed probability estimate of its phases – but scientists warn that the "positive" phase of IOD could coincide with El Niño in 2026, making conditions even hotter and drier.

How El Niño and IOD Affect Haze Risk

The El Niño–Southern Oscillation (ENSO) is the collective name El Niño and its counterpart La Niña, a phenomenon that shapes weather and rainfall. ENSO is measured by tracking fluctuations in sea-surface temperatures (SST) across the eastern and central Pacific Ocean. When SST is warmer or below average by 0.5 to 0.8°C, over a sustained period of time, it is indicative that El Niño has occurred. A strong El Niño refers to temperatures reaching 2°C or more above the long-term average. IOD is a similar phenomenon, but for the Indian Ocean rather than Pacific Ocean.

The effects of ENSO and IOD vary by geographic location and time of year. For ASEAN countries, sustained "positive" values above 0.5 to 0.8°C for El Niño or 0.4°C for IOD lead to a higher chance of reduced rainfall and drier conditions. Sustained "negative" values below -0.5 to -0.8°C for La Niña or -0.4°C for negative IOD lead to a higher chance of wetter conditions. Historically, the most serious haze incidents have occurred when El Niño and "positive" IOD have coincided, such as in 1997-1998, 2015, and 2023. Either phenomenon alone may be enough to cause a haze incident, such as the 2019 haze which was driven by "positive" IOD. Some haze incidents have occurred when no El Niño or "positive" IOD was present, but this has been rare.

With 2026 seeing the return of El Niño and a possible "positive" IOD, preparedness, early detection, rapid response, and sustained fire prevention efforts are more important than ever.

3. Policies: Stress Test for Preparedness

Government and private sector efforts are crucial to keeping fires and haze under control, and in ensuring that forests and plantations are sustainably managed. The Haze Outlook explores government policies and private sector practices to understand the implications for haze risk. Lessons have been learned since the last major El Niño and haze events in 1997-1998 and again in 2015-2016. But the potentially severe dry season in 2026 will be a stress test for fire prevention and land management measures.

Government Efforts

2026 will be the first high risk dry season faced by the Prabowo administration in Indonesia, if El Niño and IOD do indeed worsen weather conditions. President Prabowo Subianto's predecessor, Joko Widodo, popularly known as "Jokowi", considered the haze an "embarrassment" for Indonesia's international relations[3] and personally chaired national coordination meetings on the issue during his time in office, threatening to dismiss local police chiefs if large fires happened in their provinces.[4]

Indonesia aims to make its Forestry and Other Land Use (FOLU) sectors a net carbon sink by 2030 under its Paris Agreement Nationally Determined Contribution (NDC). Yet peatland fires can spike annual carbon emissions dramatically. A major haze event would undermine the carbon sink target and raise questions about Indonesia's climate credibility.

In 2025, President Prabowo launched a new inter-agency desk to strengthen mitigation and responses to fires, the Desk Koordinasi Penanganan Karhutla (Forest and Land Fire Coordination Desk) under the Coordinating Ministry for Political and Security Affairs, a different institutional pathway than what President Jokowi used.[5] Framing forest fires as a national security matter raises expectations that President Prabowo will take the problem seriously.

Table 2: Key Government Actors in Indonesia's Fire Response

Coordinating Ministry	Coordinating Ministry for Political and Security Affairs
Central Government	National Agency for Disaster Countermeasure (BNPB) Ministry of Forestry Indonesian Armed Forces Indonesian National Police Ministry of Environment
Local Government	Province and Regency Governments, Police Forces

Source: Ministry of Forestry, Republic of Indonesia (2025)

Speaking at the 13th Singapore Dialogue on Sustainable World Resources organised by the SIIA in May 2026, Dr. Israr Albar, Senior Adviser, International Cooperation on Forest Fire Management, Ministry of Forestry, Indonesia, said the government has strengthened fire monitoring, air surveillance, patrols, and support for community firefighting teams.

Budget Challenges

Earlier this year, Indonesia's Ministry of Forestry announced plans for at least 35 weather modification operations across the country. However, the ministry and provincial governments warn that budgets for fire management are under pressure amid cuts to public spending. Indonesia has been working to keep the national deficit below 3 per cent of GDP, though efforts have been made to preserve core services. Weather modification operations are expensive, and experts note there is limited scientific evidence to support their effectiveness.

Regional and International Contributions

Should conditions worsen, Singapore and Malaysia have a long-standing offer to assist with firefighting and technical assistance. Fire prevention has been further buttressed by monitoring technology. The ASEAN Specialised Meteorological Centre in Singapore (ASMC), together with independent platforms such as Global Forest Watch, leverage satellite data to track fires, issuing early warnings where appropriate.

Law Enforcement

Ideally, fires should be detected and suppressed before they spread out of control. But should severe fires and haze occur, law enforcement is key. In 2025, Indonesia's Ministry of Environment launched investigations into companies that were allegedly negligent in preventing fires.[6] As of May 2026, BNPB has confirmed that law enforcement agencies are investigating the causes of forest and land fires that have occurred this year.[7] Police in Riau province, close to Singapore, investigated 61 forest and land fire cases in 2025.[8] As of April 2026, the Riau police have reported 18 land fire cases, with 19 suspects facing charges.[9] Under Indonesian law, perpetrators guilty of land burning may face up to 10 years' imprisonment.

Private Sector Practices

Since the 2015 haze episode, major companies have stepped up their fire monitoring and firefighting efforts, with companies responding to blazes within several kilometres outside their concessions and engaging with villages to support community firefighting efforts while discouraging the use of fire for land clearing.

Table 3: Fire Prevention and Land Management Requirements in Palm Oil Industry

National Standard	Details
Indonesia Sustainable Palm Oil (ISPO)	• Mandate last expanded in March 2025 under Presidential Regulation No. 16/2025 to include downstream and bioenergy businesses • ISPO requires compliance with environmental laws, fire management, and forest and peatland protection
Malaysian Sustainable Palm Oil (MSPO)	• Last updated in January 2025 with MSPO 2.0 to include downstream firms, a zero-deforestation cut-off date, and stricter traceability • MSPO requires zero-burning for land clearing and replanting, fire management, forest and peatland protection

Source: ISPO, MSPO (2026)

Table 3 summarises the current mandatory standards for palm oil companies and smallholder farmers in Indonesia and Malaysia. Failure to comply can result in revocation of operating permits. In addition to these legal requirements, around 39 per cent of global palm oil producers are members of the Roundtable on Sustainable Palm Oil (RSPO). This international association sets voluntary global standards for sustainable palm oil, with member compliance independently verified through third-party audits, and fire-related incidents involving member companies are subject to independent investigation.

Other industries have similar standards. Indonesia's mandatory Sistem Verifikasi Legalitas dan Kelestarian (SVLK, Timber Legality and Sustainability Assurance System) for the timber and pulpwood industry requires fire prevention and forest management. The same is required under a voluntary Indonesian Forestry Certification Cooperation (IFCC) standard endorsed by the international Programme for the Endorsement of Forest Certification (PEFC).

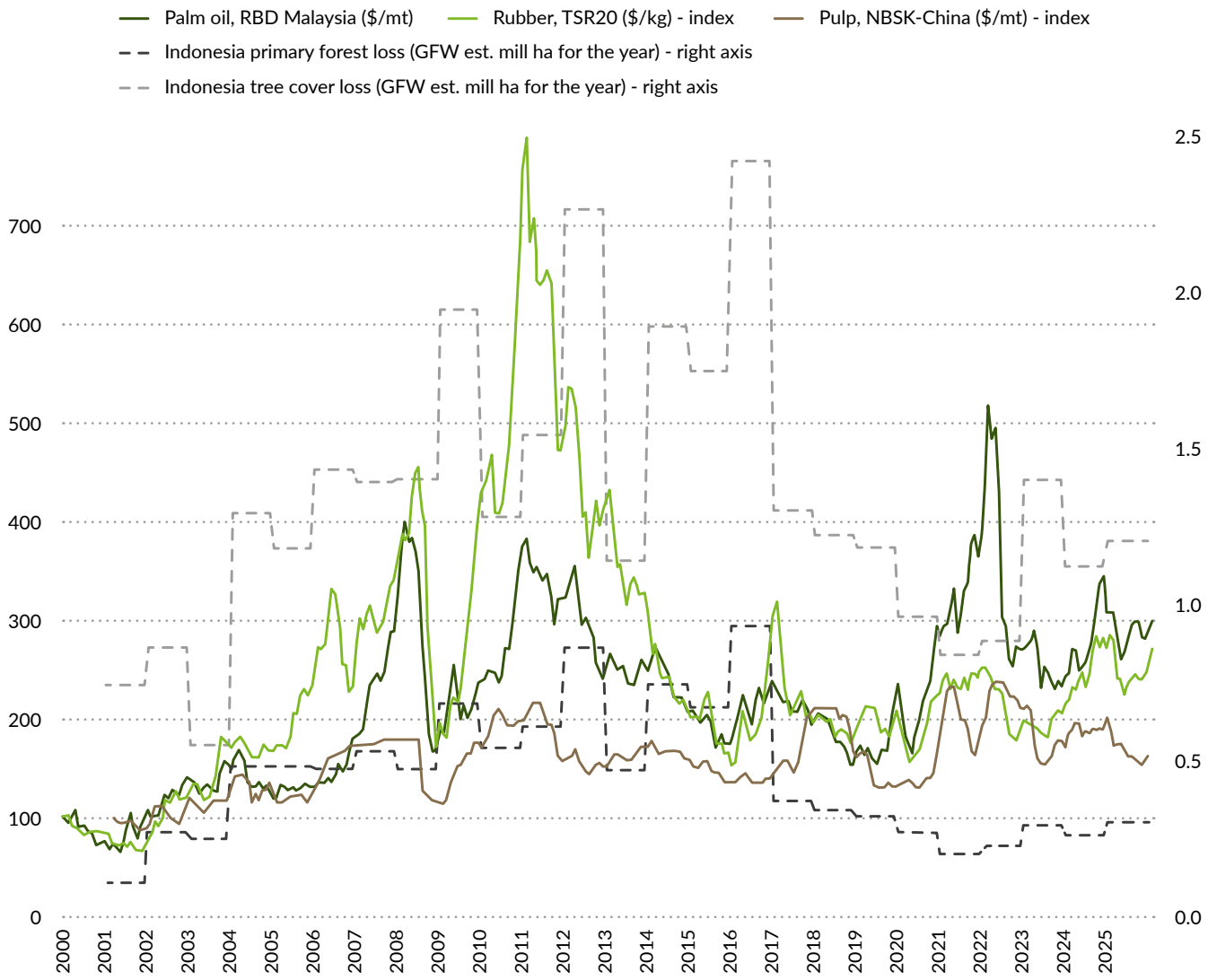
Many major plantation companies have adopted voluntary No Deforestation, No Peat, No Exploitation (NDPE) commitments that go beyond national requirements. NDPE means that companies will avoid developing on peatlands and natural forests, and respect the rights of workers, local communities, and indigenous peoples.

However, NGOs note that there is no universally agreed NDPE standard or certification, meaning that practices can vary between companies. A group of 30 companies have created the NDPE Implementation Reporting Framework (NDPE IRF)[10] but this is only a reporting format, not a certification. That said, global brands, traders, and not-for-profits are pushing for wider adoption of the NDPE IRF among upstream suppliers and mills, for example via Proforest and Daemeter's Siak Pelalawan Landscape Programme (SPLP).

In principle, national-level and international industry-level commitments on fire and land management are comprehensive. Major companies should also have the resources needed to uphold their mandatory and voluntary commitments, especially firms that have profited from high commodity prices in recent years. For them, implementation is critical. More questions remain whether rules are being followed across the supply chain, especially among small or medium-sized businesses that are running on tighter margins. While each of these firms is relatively small, they can cumulatively impact outcomes for better or worse.

4. Markets: Economic Uncertainties Ahead

Figure 2: Global Commodity Futures Prices and Deforestation in Indonesia



Note: Tree cover and primary forest loss in dashed lines (millions of hectares) on right index, compared to commodity futures price indices on the left (relative to January 2000 as 100)

Source: Khor Reports – Segi Enam Advisors (2026), based on data from the World Bank for palm oil and rubber futures, FastMarkets for pulp, and World Resources Institute (WRI) Global Forest Watch for deforestation estimates

The fires that cause the haze are predominantly man-made, decisions about supply that respond to market demand. The Haze Outlook looks at how much current market conditions will drive agricultural activity and land clearing, whether via machinery or the use of fire.

Prices and Deforestation

Figure 2 traces the fluctuation in annual estimates of deforestation in Indonesia since the year 2000, compared against the futures prices of three major export commodities: palm oil, rubber, and wood pulp. The graph tracks both "primary forest" loss as a darker dashed line, which is deforestation of natural ecosystems in the commonly understood sense, was well as changes in "tree cover" as the lighter grey dashed line. Tree cover loss includes harvesting of trees on plantations and changes from one type of plantation to another. It is included in the graph to understand industry activity in response to prices but is not deforestation as such.

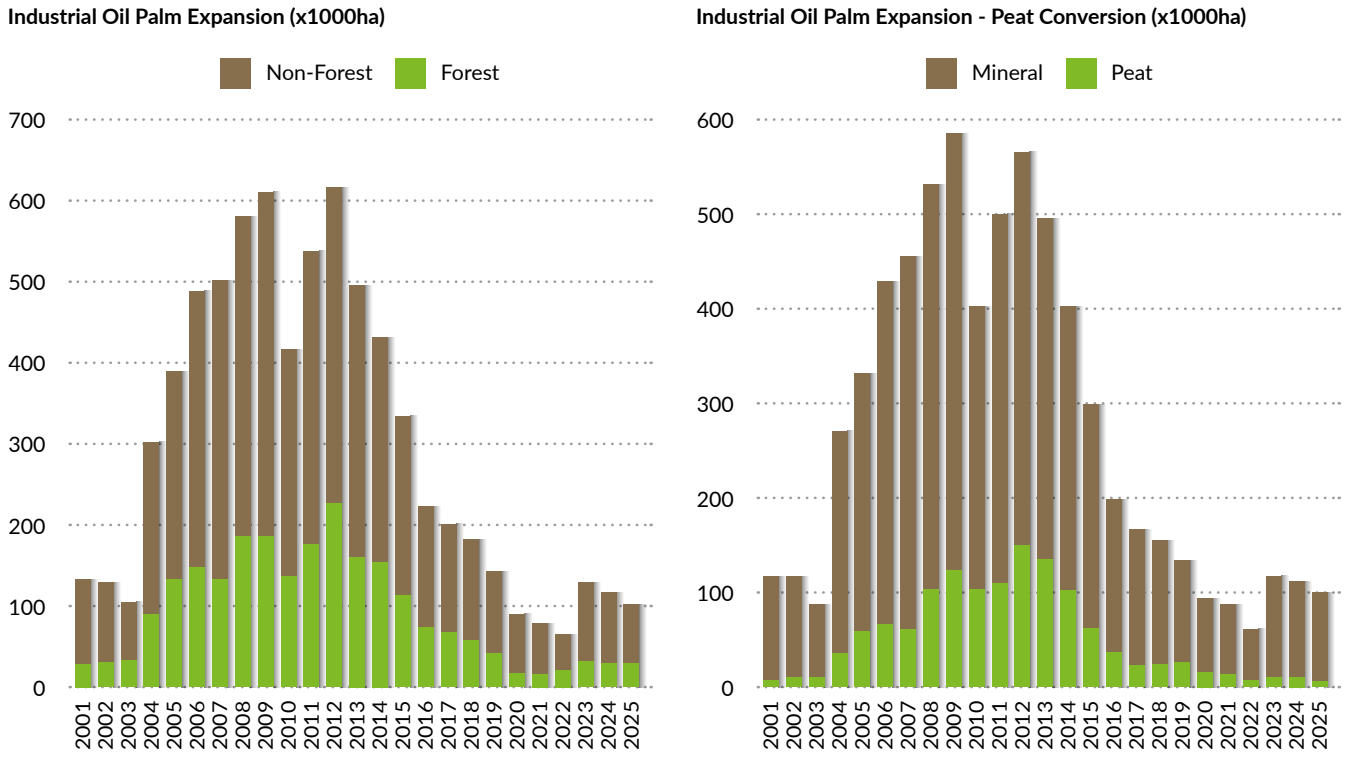
Palm oil futures prices are currently elevated, though below brief historic spikes such as the immediate aftermath of the outbreak of the Russia-Ukraine war which affected global vegetable oil supply. Rubber prices are also high, though pulp prices are not.

Deforestation has increased between 2024 and 2025. Indonesia's Minister of Forestry Raja Juli Antoni has acknowledged that deforestation in 2025 was the highest since 2019. 2025 saw around 300,000 hectares of deforestation in Indonesia, an area over four times the size of Singapore, and some NGOs have made higher estimates.[11] But this is still considerably lower than the levels seen from the early 2000s to mid-2010s.

Dr. Julian McGill, Managing Director, Glenauk Economics reports that germinated oil palm seed sales hit around 160 million sprouts in 2025, implying 800,000 hectares of planting and replanting. The surge partially reflects smallholders switching to certified seeds and possible greenfield expansion by smallholders, but the bigger driver appears to be record replanting. Malaysia posted its highest replanting on record in 2025, and Indonesia likely followed suit. Large companies are not increasing planted area. The seed sales surge signals investing in replanting, not area expansion.

Figure 3 shows corporate plantation expansion in Indonesia's palm oil sector, based on data from consultancy The TreeMap. There was a small uptick in conversion of forests to plantations from 30,956 hectares in 2024 to 31,073 hectares cleared in 2025. However, overall plantation expansion fell in 2025, and most activity was on non-forest area or mineral soil rather than degraded peatland areas with higher fire risk.

Figure 3: Industrial Oil Palm Expansion in Indonesia



Note: Data does not include smallholder expansion

Source: TheTreeMap (2026), based on data from Landsat and Sentinel-2 Time-series

New Uncertainties: Fertilizers and Fuel

Presently, there is no conclusive evidence that companies are cutting back on their fire prevention and sustainability commitments amid current economic conditions.

However, disruptions to shipping via the Strait of Hormuz have resulted in new pressures on the agricultural sector. Cost issues are expected to persist for months even if the Middle East conflict is resolved.

Roughly a third of the world's globally traded nitrogen fertilizers like urea and ammonia normally pass through the strait, along with liquified natural gas (LNG) used to make nitrogen fertilizers, and large volumes of sulphur similarly used as an input for phosphate fertilizers. The fertilizer price spike comes on top of rising fuel costs that are also affecting farm operations like irrigation and transport. Reports say overall production costs for agricultural producers in Southeast Asia have increased by 20 to 30 per cent.[12]

Yet selling prices for food and commodities are not increasing proportionately.[13]

Growers in relatively cash-rich industries like palm oil should be able to bear the increased costs for the time being. Palm oil prices have been elevated since the COVID-19 pandemic in 2020 and the escalation of the Russia-Ukraine conflict in 2022, with crude palm oil (CPO) trading over US$900 per tonne, up from the US$480 range prior to 2020. However, other producers like fruit and vegetable growers have slimmer margins and are facing greater difficulties.

Beyond cost, the availability of inputs themselves is a rising concern. Even if growers can pay the cost, there are worries that there is not enough fertilizer or diesel needed for operations.

This could lead to an overall reduction in activity in the agricultural sector. There is also some concern that rising costs and lack of inputs may lead to unsustainable activity, such as the use of fire rather than machinery to clear land and dispose of waste.

The fuel crisis triggered by disruptions to shipping via the Strait of Hormuz has also increased demand for biofuels, prompting Southeast Asian countries to strengthen biodiesel mandates, increasing the percentage of vegetable oil content in diesel at the pump.

For now, Indonesia and other countries have sufficient capacity to support fuel needs while continuing with food production and exports. But going forward, there is no guarantee that current biofuels production can meet rising demand. There is a danger that demand will drive plantation expansion, with the risk that some growers will resort to fire as a cheaper method of land clearing.

Stronger State Governance of Agribusiness

Since taking office, President Prabowo has significantly increased state oversight and control of Indonesia's plantation and natural resource sectors. In 2025, the government reallocated large areas of private sector concession land to the state-owned Agrinas group. Authorities also revoked permits for 28 businesses following the major flooding in Sumatra in late 2025 (see case study in Annex 2). More recently, regulators have launched investigations into natural resource companies over allegations of export under-invoicing, tax avoidance, and environmental violations.

The Prabowo administration is also moving to centralise oversight of commodity exports through Danantara Sumberdaya Indonesia (DSI), a new entity under the Danantara sovereign wealth fund, from 1 June 2026 onwards. New rules require natural resource exporters to retain their earnings in state-owned banks for 12 months. Supply chains have been redrawn, with Danantara taking what experts estimate as up to one-third of oil palm concession areas in Indonesia. Taken together, this will give the Indonesian government participation and greater visibility into commodity flows and finances.

Some businesses and investors are wary about Indonesia's shift from a more market-driven model to greater state involvement. But from a haze prevention perspective, plantation companies are now incentivized to avoid severe fire incidents in the near term. If fires spread out of control on company concessions, the government may respond with another round of permit revocations and land seizures. In the longer term, it remains to be seen whether tighter state control will serve as another layer of oversight to keep deforestation in check.

5. Bioenergy Opportunities for Sustainability and Resilience

There are two main dimensions for bioenergy, first in the use of biomass and biogas for electricity generation, and second as a "drop in" replacement for fossil fuels in transport. Bioenergy is more attractive in the short term than alternatives like hydrogen that require new technology.

Interest in bioenergy was already growing prior to the Strait of Hormuz closure. Current fuel shortage concerns have made bioenergy even more attractive from a resilience standpoint, in addition to their decarbonization benefits. The issue is whether Southeast Asia's agricultural sector can provide sufficient biomass and feedstock to meet demand for energy alongside the demand for food and other products, without resorting to further expansion of plantations onto forest and peatland areas with a corresponding risk of fires and haze.

Electricity: Waste fibre from plants is often burnt for on-site generation of heat and electricity at mills. But only around 10 per cent of Indonesia's palm oil mills feed electricity back to the grid. Mills are often located in remote areas, far from grid connections and demand centres. Indonesia's current feed-in tariff and power purchase structure also does not offer attractive premiums to encourage more mills to export electricity.

Aside from burning waste on-site to generate electricity, palm oil mills and other processing facilities can also capture biogas from wastewater and residues, purifying this into biomethane as a replacement for natural gas. Companies in Indonesia, Malaysia, and Thailand have begun producing biogas and biomethane from palm oil and other inputs, but current production and uptake volumes remain small. Present regulatory and market conditions do not yet support wider investment and offtake commitments.

Land Transport: Indonesia is currently using a B40 blend of diesel, meaning that diesel at the pump is 40 per cent palm oil-based content mixed with 60 per cent fossil fuel. In response to current global concerns over fossil fuel supply, Indonesia plans to up this ratio to B50 in 2026. Malaysia is going from B10 to B15. Thailand is at B7 and is rolling out B20.

For Indonesia to go from B40 to B50, it will need the equivalent of another four million tonnes of crude palm oil (CPO) annually, about eight per cent of its current output, roughly equivalent to Indonesia's annual palm oil exports to China or the European Union.

Some of this volume can be made up from waste and residuals rather than CPO, but there are practical constraints on how far biofuels usage can be scaled up under current production methods. In addition to biodiesel, Indonesia is aiming to introduce a mandatory 10 per cent bioethanol blend for petrol fuel (E10) by 2027 to 2028, using sugarcane as raw material. Thailand already has a mandatory E10 blend and is promoting a transition to E20 via subsidies.

Aviation: Biofuels are especially important for the aviation industry, as electrification is not practical for large-scale air transport; current battery technology does not have sufficient energy density. Singapore is targeting a 1 per cent sustainable aviation fuel (SAF) uplift for all departing flights from Changi, with plans to increase SAF use to 3 to 5 per cent by 2030. Thailand is similarly implementing a 1 per cent mandate for SAF use, scaling up to 8 per cent by 2036. Indonesia and Malaysia are also targeting a 1 per cent mandate from 2027.

Shipping: Biomethanol is being explored as a marine fuel, though adoption is still an early stage compared to SAF in aviation. China is arguably the current leader in developing biomethanol marine bunkering, though ASEAN economies are investing in this emerging field. Singapore's Maritime and Port Authority has developed biomethanol bunkering standards and has issued licenses to operators. Indonesian and Singaporean firms are developing a pilot biomethanol facility at the Sei Mangkei Special Economic Zone in Sumatra.

Ideally, the region and world's demand for bioenergy should be met by circularity and productivity rather than further plantation expansion. Efforts should focus on using waste and residuals, such as palm oil mill effluent (POME) to produce biofuels. ASEAN can collaborate on sustainability standards, certification systems, and platforms to ensure feedstock integrity for biofuels. This could include reinforcing current laws against the use of fire to clear land. Stronger standards can reassure buyers that biofuels production will not come at the expense of ecosystems.

6. Conclusion: Strengthen ASEAN and Multistakeholder Cooperation

This Haze Outlook is Red. There is a high risk of a severe transboundary haze incident affecting Brunei, Indonesia, Malaysia, and Singapore in the remaining months of 2026, with the peak danger coming from August to September driven by the El Niño and Indian Ocean Dipole weather phenomena.

While there is no indication that major agricultural producers are cutting back on fire prevention, economic pressures on the sector are mounting. Care is needed to ensure these pressures do not lead to unsustainable expansion. Efforts to move small-and-medium sized producers to sustainable practices must continue.

National efforts remain key. However, other stakeholders matter.

Strengthening ASEAN Cooperation

Over the past decade, ASEAN has built frameworks and processes for cooperation on the haze issue, including the ASEAN Agreement on Transboundary Haze Pollution, the annual ASEAN Meeting of the Technical Working Group (TWG) and Sub-Regional Ministerial Steering Committee on Transboundary Haze Pollution (MSC) meetings, and the Committee under the Conference of Parties/Conference of Parties to the ASEAN Agreement on Transboundary Haze Pollution (COM/COP). These platforms are important for ASEAN Member States to update each other on haze preparations, evaluate technical data, and oversee haze management initiatives.

The TWG/MSC meetings are to share national plans and oversee regional responses to haze among countries in the southern ASEAN sub-region: Brunei, Indonesia, Malaysia, Singapore, and Thailand. COM/COP are annual regional haze meetings for ASEAN as a whole.

The ASEAN Coordinating Centre for Transboundary Haze Pollution Control (ACC THPC), recently inaugurated in Jakarta, aims to strengthen policy coordination on haze mitigation and land management, complementing the scientific data and satellite haze monitoring provided by the ASEAN Specialized Meteorological Centre (ASMC) based in Singapore.

NGO and Community Initiatives

NGOs in Indonesia have been active and critical on these issues and have had occasion to bring legal proceedings to courts. The efforts of regional NGOs and community groups are also important.

PM.Haze is an example of a home-grown Singapore volunteer NGO working on the haze and sustainable land management, founded in 2014 and formally registered as a charity in 2016.

While small in scale, since 2018 PM.Haze has been working with Indonesian counterparts in four villages in Riau and West Kalimantan to reduce fire and haze risks via rewetting and revegetating degraded peatland ecosystems and building local capacity for faster and safer forest fire response. Through the integration of local experience with science-based practices, frontline communities are equipped with the knowledge and technical expertise to address climate resilience challenges specific to their unique environments.

Since 2024, PM.Haze has provided learning journeys for youths in the region to learn about peatland risks first-hand from affected communities and other stakeholders. This assists in public awareness and empathy across the region.

Private Capital and Philanthropy

Private sector involvement in land management continues to evolve. In 2024, the Philanthropy Asia Alliance (PAA) announced the launch of the Sustainable Land Use Community (SLC) as part of its Communities initiative to foster collaboration, knowledge-sharing, and drive collective actions towards a portfolio of high-impact projects. The SLC currently consists of PAA, as well as Golden Philanthropies, NO. 17 Foundation, The Rockefeller Foundation, and Temasek Foundation. The SLC is launching its first grant call in the third quarter of 2026, with the aim of advancing nature-based solutions (NBS) and sustainable agriculture projects across Asia. This initiative reflects growing recognition that addressing land-use challenges requires greater mobilization of philanthropic efforts, and the role of Singapore as a hub in connecting resources with projects in the region.

While discussions and small-scale efforts are in progress, the speed and scale of commitments will need to be ramped up to support efforts to prevent fires and haze.

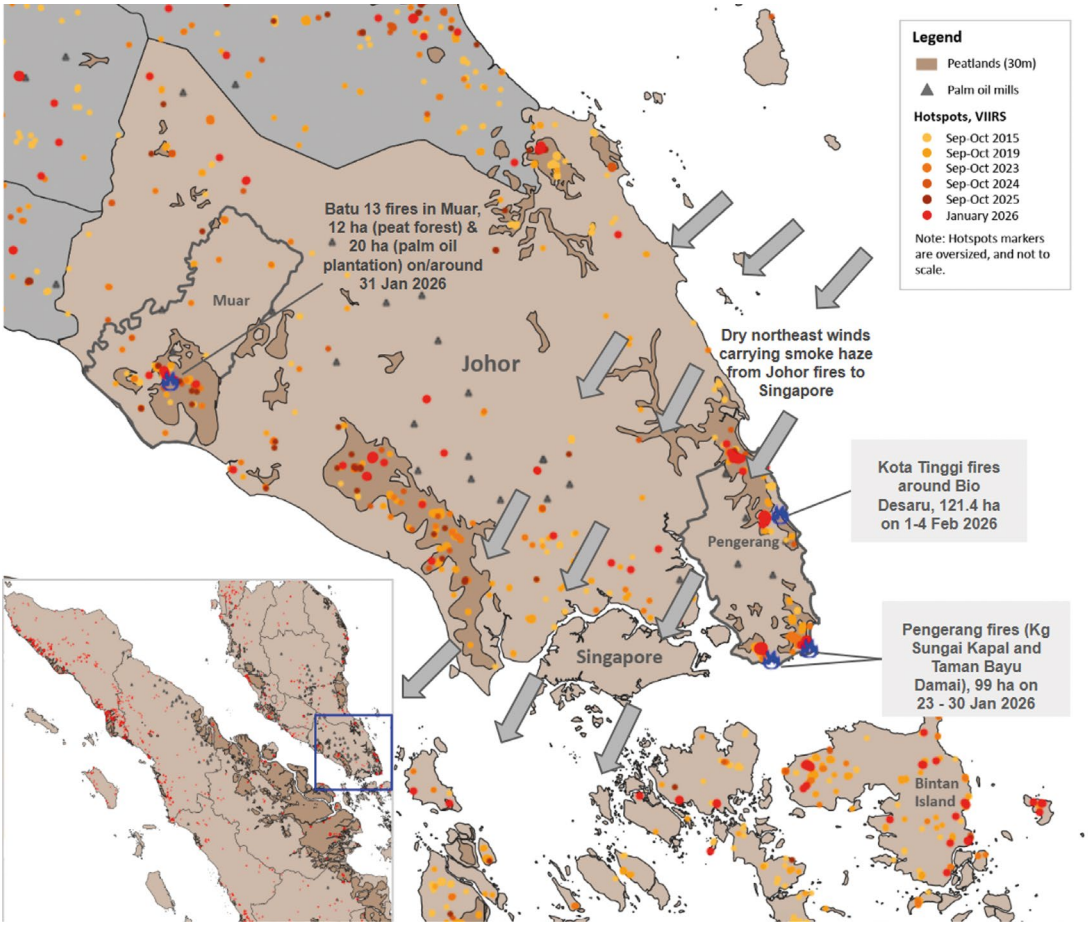
The severity of the upcoming dry season is the main factor in a Red warning in this Outlook. This is notwithstanding notable improvements in policy and action by national governments, ASEAN, larger companies, as well as NGOs and community groups.

The haze challenge today is more than simply a transboundary pollution issue resulting from dry weather and fires. There are increasing connections to questions about energy security and climate adaptation. Addressing the haze requires more than cooperation between environmental agencies. Government officials across ministries, as well as businesses, civil society organisations, and communities all have a stake in the outcome. Cross-cutting cooperation is needed to build economic frameworks that can support development and livelihoods while still improving sustainability.

Annexes

Annex 1: Case Study – Fires and Haze in Johor (Jan-Feb 2026)

Figure 4: Hotspots, Peatland, and Palm Oil Mill Locations in Johor



Note: Information on fires sourced from news reports in New Straits Times (2026), Asia One (2026), Bernama (2026) and MalayMail (2026) and checked via Google Maps and Google Earth

Sources: Graphic by Khor Reports - Segi Enam Advisors (2026), base map from GADM Database of Global Administrative Areas (n.d.), hotspot data from FIRMS, peatland locations from Jiren Xu et al. (2018), palm oil mill locations from Global Forest Watch (2022)

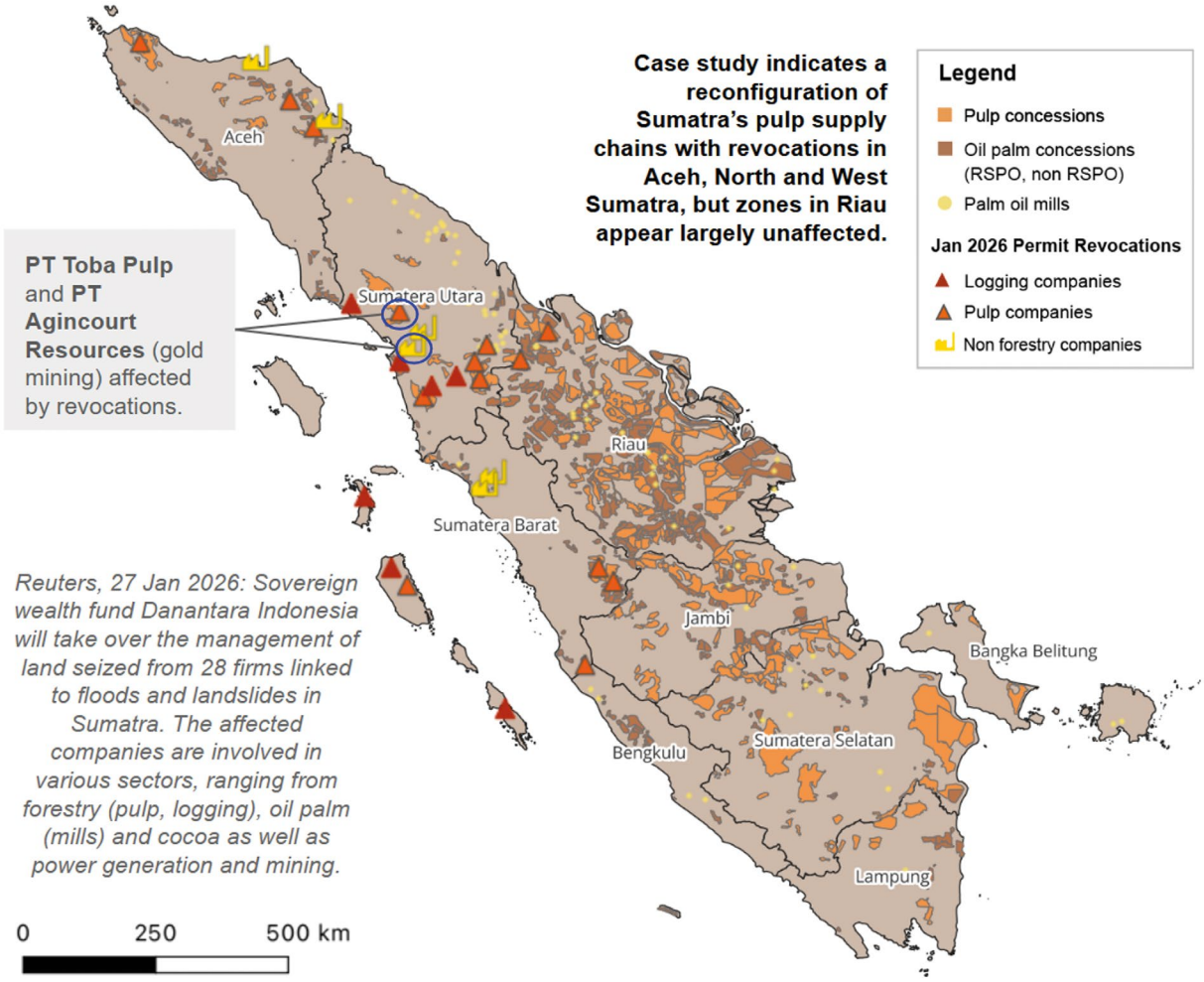
Malaysia and Singapore experienced haze in early 2026 from January to February, which are usually wetter months during the monsoon season rather than high fire risk periods. The haze was caused by wildfires in Johor state, including a peatland fire covering 200 hectares across Kota Tinggi and Pengerang. Fires near Batu 13 in Muar affected over 30 hectares. Smaller fires also occurred in Bakri (Muar) and Simpang Renggam (Klaung).

Figure 4 overlays satellite hotspots from past El Niño years (2015, 2019, 2023), relatively wetter years in 2024 and 2025, and January 2026 with peatland and palm oil mill locations. There is no indication that fires were deliberately started by agricultural growers to clear land for new plantations. However, there are recurring burn zones across Johor in degraded peatland areas which may have previously been drained for past development, leaving them vulnerable to fire. Open burning for waste disposal in 2026 seems to have resulted in fires accidentally spreading into these semi-abandoned fire-prone areas.

Rather than agri expansion, the trend in Johor is to convert former plantation land to other uses, such as data centres or industrial parks. The 2026 haze in Johor suggests that fire monitoring and land management is needed year-round, even during monsoon and inter-monsoon periods. Any long period with low rainfall could result in fires. If wildfire risks become more entrenched, the current reactive multi-agency response will need to evolve into a proactive framework.

Annex 2: Case Study – Company Permit Revocations after Floods in Sumatra

Figure 5: Company Concession Areas in Sumatra, Affected and Non-affected Businesses



Note: Indicative locations of logging and non-forestry companies are based on WRI's Global Forest Watch and Google Map coordinates respectively, as downloadable data was not available

Sources: Graphic by Khor Reports - Segi Enam Advisors (2026), pulp concession locations from Ministry of Environment & Forestry, Republic of Indonesia (2019), oil palm concession locations from WRI Indonesia (2023), palm oil mill locations from Universal Mill List (UML) (2019), list of company permits revoked from Danantara Monitor (2026)

Southeast Asia was badly affected by storms and flooding in late 2025. Sumatra was hit by Cyclone Senyar and reports suggest that flooding and landslides were worse in areas that were previously burnt by fires, with the damage affecting the areas' ability to absorb water. In response, Indonesian authorities revoked permits for 28 plantation, forestry, mining, and hydropower areas covering about 1.01 million hectares, handing management of the land over to Indonesia's sovereign wealth fund Danantara rather than returning them to the state land bank. Officials have said most of the land will be slated for permanent conservation.

The map in Figure 5 shows land use concession areas in Sumatra across various sectors, with the revoked permit areas depicted as triangles. Logging concessions and revocations are included in this image though our case study did not cover the logging industry in detail, with analysis focusing on other sectors. Some uncertainty remains for two sites in Riau where there is inconsistent information between accounts (Bloomberg reports this as 82,000 hectares seized around Tesso Nilo National Park). Notably, two publicly listed firms, Toba Pulp and the Martabe Gold Mine operated by Astra International's Agincourt Resources, were affected in the revocations, along with the Batangtoru hydropower project backed by China's SDIC Power.

The revocations have come under scrutiny from NGOs and industry lawyers who have questioned their accuracy and legality. The status of the affected concessions remains uncertain as companies are not publicising the details. That said, the revocations demonstrate that the Prabowo administration is willing to take swift action following environmental incidents, in line with the government's push to bring land management under tighter state control.

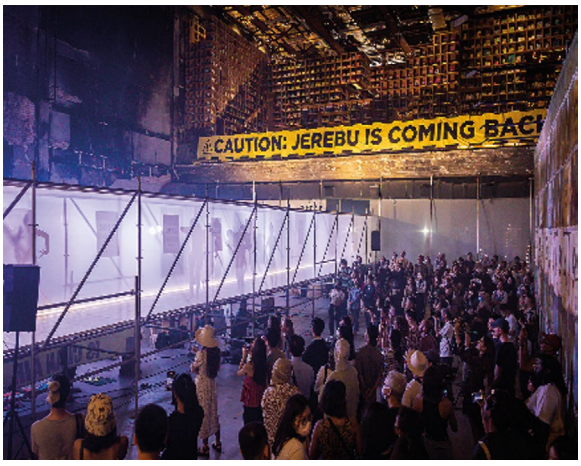
Annex 3: Literature Review

Expanding on our previous Haze Outlook reports, we reviewed 116 relevant recent papers related to transboundary haze and Indonesian peatland fires from 2025 to 2026. Of these, 24 percent were on **social, political and economic** elements, 18 percent on **peatland management**, and 14 percent on **fire warning** systems. The remaining papers considered issues such as **climatic events**. Compared to 2024, the last two years have seen fewer publications focusing on the health impacts and carbon emissions from the haze.

Social, political and economic considerations of land and fire management remain a major research area for academics (Roengtam & Agustiyara, 2025; Andarini & Hasan, 2025; Alisyahbana et al, 2025; Octifanny et al, 2025). Wulandari et al (2025) examined the 3Rs (rewetting, revegetation, revitalisation) policy conducted in Jebus Village, Jambi, Sumatra, raising questions about the effectiveness of these efforts. However, Hidayat et al (2025) found that the 3R policy highly benefitted peatlands in Riau and Central Kalimantan, indicating some success of government-led restoration in partnership with villages.

Nguitragool & Varkkey (2025) extend this analysis, emphasising the importance of civil society in managing transboundary haze across ASEAN. Liu et al (2026) examine a different form of community involvement, exploring 'artivism' in cities to create spaces for discussion of the haze.

Figure 6: Images from the 'Haze: Coming Soon' Artivist Exhibit in Kuala Lumpur, Malaysia (2021)



Source: Greenpeace Malaysia (2021)

Papers on **peatland management** considered the importance of evaluating restoration efforts utilising remote sensing and machine learning (Zahro et al, 2025; Umarhadi & Siegert, 2026). There was an uptick in papers on the importance of hydrological factors for fire management and ecosystem restoration (Bruno et al, 2025; Qalbi et al, 2025; Kurniawan, 2025).

We identified 16 papers on **fire warning** since 2025, including fire risk modelling and mapping for Sumatra and Kalimantan (Agustiyara et al, 2025; Hapsoro et al, 2026; Situngkir et al, 2025). Huda et al (2026) formulated a model to predict forest fires in Ketapang Regency, achieving 85 per cent accuracy.

On the influence of **climatic events**, Suwarman (2025) established that analysis at meteorological stations improves early warning systems. They found a correlation between El Niño-driven consecutive dry days and increases in hotspot frequency on peatland. Yin et al (2026) found that in El Niño years, synchronous fire weather increased to an average of over 60 days.

Gaveau et al (2026) published data from monthly monitoring of burnt areas in Indonesia. They found that at least 5.6 million hectares were affected across Indonesia between 2019 and 2024, peaking in September to October, with fires strongly linked to El Niño and "positive" IOD. The authors said fire prevention efforts are yielding progress, with lower fire activity in 2019 and 2023 compared to earlier major El Niño and IOD events.

We also reviewed reports from NGOs and media investigations. Mongabay reported on revocations of forestry, plantation, and mining company permits by the Prabowo administration following Cyclone Senyar in Sumatra (Jong, 2026). Ecobusiness (2025) and Fern (2025) also highlighted the EU's further delay in the rollout of its anti-deforestation law governing certain commodity imports and exports from 2025 to 2026.

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