



ADDRESSING ENVIRONMENTAL,
SOCIAL, AND ETHICAL
CHALLENGES OF THE ANNUAL
HAZE IN SOUTHEAST ASIA FROM
A SINGAPOREAN PERSPECTIVE

Extended report

Commissioned by UNESCO

PMHAZE
October 2017

Outline	
Summary	3
Key findings.....	3
Recommendations	4
Background and research objectives.....	8
Beneficiaries and impact.....	9
Methods	9
Impact of transboundary haze in Singapore	11
Composition of haze.....	11
Health impacts.....	11
Environmental impacts.....	12
Socio-economic impacts	15
Bioethical considerations of haze impacts.....	16
Origin of and solutions to transboundary haze	17
Large-scale use of fire to clear land or claim tenure	19
The use of fire as a weapon in land conflict	20
Fire-prone landscapes due to deforestation and peat drainage.....	20
Failure to stop fire due to poor firefighting capacity and poor governance.....	23
Sustainability standards.....	24
What can Singapore’s commodity sector do?	27
Palm oil	29
Pulp and paper.....	40
What can Singapore’s financial sector do?.....	41
The major players financing the global palm oil and pulp and paper trade.....	43
Singapore’s role.....	46
Responsible finance	49
What can the Singapore government do?	56
What can Singapore’s civil society do?.....	66
Research	67
Campaigning.....	69
Capacity building	71
International collaboration	71
Bibliography	73
Appendix A: Health impact of Haze pollution	85
Appendix B: Analysis of sustainability standards.....	89
Appendix C: NDPE Policy Template	101
Appendix D: Results of eatery and supplier survey 2017	102

Summary

Key findings

Impact of transboundary haze

The transboundary haze often experienced on an annual basis in Southeast Asia is a toxic mix of harmful gases, such as carbon monoxide, ammonia, cyanide, and formaldehyde (Dayne, 2015), and microscopic particles coated with carcinogens such as polycyclic aromatic hydrocarbons (PAHs) (Pavagadhi, Betha, Venkatesan, Balasubramanian, & Hande, 2013a).

Health effects of the haze result from the irritating effect of these gases and microscopic particles on the nose, throat, airways, skin, and eyes. Individuals with medical conditions such as asthma, chronic lung disease, and skin conditions may experience severe symptoms.

The haze has a severe impact not only on human health, but also on society, the economy, and the environment. For example, the 2015 haze episode cost Singapore an estimated S\$700 million dollars (Barratt, 2016).

Origin of and solutions to transboundary haze

Much of Southeast Asia's transboundary haze originates from large-scale fires in Indonesia. Major factors contributing to these fires include the use of fire to clear land, claim tenure, or as a weapon in cases of social conflict; the emergence of fire-prone landscapes due to deforestation and peat drainage; and the inability or unwillingness to stop fires early due to poor firefighting capacity and lack of governance.

To mitigate fires and haze, as well as other sustainability issues, a wide range of agricultural sustainability standards have been developed by agricultural companies, especially those working in the palm oil and pulp and paper industries. The most common voluntary standard is known as No Deforestation, No Peat and No Exploitation (NDPE). The adoption of NDPE is spreading, but the standard lacks a harmonised set of criteria and remains reliant on NGOs for verification. Among the regulated standards specific to palm oil, Roundtable on Sustainable Palm Oil (RSPO) certification remains the most effective for stopping haze. None of the sustainability standards for pulp and paper adequately address the haze issue, as they do not address the problem of new peat development.

The role of Singapore's commodity sector

Indonesia and Malaysia account for approximately 87% of global palm oil production. Many major palm oil and pulpwood growers and traders have a presence in Singapore, either listed on SGX or headquartered in Singapore. This provides an avenue for Singapore's government and trade blocs to leverage standards such as RSPO to impose restrictions such as tariffs, quotas, and non-tariff barriers.

Singapore serves as the headquarters of numerous palm oil companies, including two of the five largest in the world by market capitalisation (Wilmar and Golden Agri-Resources). Palm oil is widely used as a cooking oil among eateries in Singapore, but awareness of this fact

remains low among both the public and the eateries, because it is often packaged and sold as “vegetable oil”.

The role of Singapore’s finance sector

All three Singaporean banks (DBS, OCBC, and UOB) are major financiers of regional high-risk forest commodity industries, such as palm oil, pulp and paper, rubber, and timber. Despite this, none of the three banks publish specific details of their loans to these industries. They have only recently adopted environmental, social, and governance (ESG) policies. Singapore’s sovereign wealth fund GIC and state-owned investment company Temasek have not publicly disclosed their ESG policies in detail.

The role of Singapore’s civil society

Civil society has a role in addressing the haze issue through promoting responsible consumption, research into peatland restoration and sustainability standards, monitoring the performance of plantation and consumer-facing companies, campaigning for greater consumer awareness, capacity building for businesses, and international collaboration.

Recommendations

Recommendations for Singapore’s commodity sector

1. Singapore-based palm oil companies should implement robust NDPE policies, make time-bound commitments to 100% RSPO certification for their own plantations and supply chains, and report annually on their progress.
2. Consumers, businesses, and other organisations in Singapore should avoid excessive consumption of fats and oil, especially by reducing their intake of fried food.
3. Consumers, businesses, and other organisations should reduce wastage of paper.
4. Eateries, manufacturers, and retailers that use palm oil should adopt a time-bound plan for 100% of the palm oil used as cooking oil across their operations to be RSPO-certified.
5. Singapore’s biofuel producers should shift from using palm oil for biofuel to using agricultural waste and algae.

Recommendations for Singapore’s finance sector

6. Singaporean financial institutions should use green finance and micro-credit to promote the adoption of sustainable palm oil and the development of forest- and peat-friendly agriculture.
7. Singaporean financial institutions, including local banks OCBC, DBS, and UOB and state-owned institutional investors GIC and Temasek, should all adopt ESG policies with publicly disclosed sector-specific policies covering agriculture and forestry that require customers who are palm oil growers, traders, and processors to:
 - a. Adhere to NDPE policies
 - b. Have RSPO membership and a time-bound plan for 100% RSPO certification for own plantations and supply chains

8. Singaporean financial institutions should publish a list of their clients in high-risk sectors, including agriculture and forestry, to promote transparency and accountability.
9. Singaporean financial institutions should become members of international sustainable finance governing bodies, covenants, and initiatives such as the Banking Environment Initiative (BEI), Equator Principles, and RSPO to understand industry issues and global best practices, build capacity, and participate in the decision-making process.
10. The Singapore Exchange should enact a timeframe for listed companies to improve their sustainability reporting standards, such as by obtaining third party assurance and engaging in stakeholder consultation.

Recommendations for Singapore's government

As ASEAN Chair in 2018, Singapore can initiate an ASEAN-wide approach towards tackling transboundary haze by:

11. Helping harmonise definitions and requirements for sustainable palm oil and paper and work together to enforce them throughout the supply chain and trading process within ASEAN.
12. Helping harmonise sustainable finance regulations across ASEAN.
13. Helping harmonise air quality standards and targets for ASEAN.

Singapore should also:

14. Tighten CITES protection to include items in transit and expanding the Endangered Species (Import & Export) Act to include illegally logged timber.
15. Increase its contribution to the ASEAN Haze Fund to be channelled to peat protection and restoration projects and the implementation of the ASEAN Haze-free Roadmap.
16. Empower non-state actors, such as academics and non-governmental organisations (NGOs), to collaborate in research to prevent haze, such as sustainable peat management and peat restoration.
17. Make a time-bound national commitment to import 100% sustainable palm oil
18. Enact a government procurement policy that includes RSPO-certified cooking oil.
19. Support the Singapore Alliance for Sustainable Palm Oil (SASPO) through financial or other means.
20. Promote sustainable business practices in Singapore by:
 - a. Promoting responsible finance and green micro-credit to support sustainable palm oil and forest- and peat-friendly agriculture (recommendation 6).
 - b. Encouraging all financial institutions and funds in Singapore to develop and disclose their Environmental, Social, and Governance (ESG) policies (recommendation 7).
 - c. Having the Singapore Exchange enact a timeframe for listed companies to improve their sustainability reporting standards, such as by obtaining third party assurance and engaging in stakeholder consultation (recommendation 10).

Recommendations for Singapore's civil society

21. NGOs should conduct and publish research on the sustainability standards currently available in the agribusiness sector; the financing policies of major financial institutions and funds in Singapore; the palm oil procurement policies of major eateries, manufacturers and retailers in Singapore; and the NDPE policies of palm oil companies that are listed and/or headquartered in Singapore, as well as their implementation.
22. NGOs should scale up awareness outreach among businesses and the general public about sustainable palm oil and forest- and peat-friendly products.
23. NGOs should help businesses and governments to build capacity in sustainable practices.
24. NGOs should encourage consumers to petition businesses to use sustainable palm oil.

25. NGOs should support on-the-ground projects in the region, including but not limited to forest- and peat-friendly agriculture development, community empowerment, mapping, and conservation.

Background and research objectives

Transboundary haze is a recurring large-scale air pollution problem in Southeast Asia, affecting multiple countries in the region. It involves large-scale, uncontrolled fires that destroy crops and property while creating thick smoke that can travel thousands of kilometres, impacting Indonesia, Malaysia, Singapore, Brunei, Thailand, and the Philippines (Harvey, 2015). Transboundary haze disrupts the lives of millions of civilians and has an impact on health, economies, and the environment, resulting in billions of dollars' worth of damage every time it occurs (World Bank, 2016).

Such haze incidents have occurred regularly in Singapore since the 1970s (Tan, 2016). The 2015 haze episode was particularly severe, lasting for two months.

Transboundary haze is a complex issue with multiple actors and shared responsibility across national borders. While it may be easy to single out countries where fires are located as the culprits, haze is also enabled by a complicated web of financial, trade, and geopolitical factors. Hence, it is pertinent for nations to act together in order to solve the issue.

The general principles of bioethics and sustainability form an international legal foundation for protecting biodiversity and the environment. These principles can also be applied to the transboundary haze issue in Southeast Asia. The UNESCO Universal Declaration on Bioethics and Human Rights also provides many basic tenets of environment protection that can be used to bring nations together and work on solutions to the haze.

This paper will show how, from the perspective of Singapore, universal ethical principles can be coupled with scientific knowledge to create concrete action on the ground to address the haze problem. Specifically, the objectives of this paper are to:

- Highlight the ethical imperative to take action on haze;
- Show the interlinkages between the causes and impacts of haze, and propose solutions to haze based on universal bioethical principles;
- Investigate the health, environmental, and socio-economic impact of the haze on Singapore;
- Analyse the overall geopolitical picture and inter-state relations with regards to the haze issue, including the role of unilateral, bilateral, and multilateral mechanisms such as the Association of Southeast Asian Nations (ASEAN) in addressing the problem;
- Explore the role of commodity trading and finance systems in contributing to and addressing the haze problem; and
- Identify best practices and develop recommendations for agricultural commodity producers and major Singapore-based actors (commodity buyers, financial institutions, government and civil society) with a focus on driving more sustainable practices in palm oil and paper production.

Beneficiaries and impact

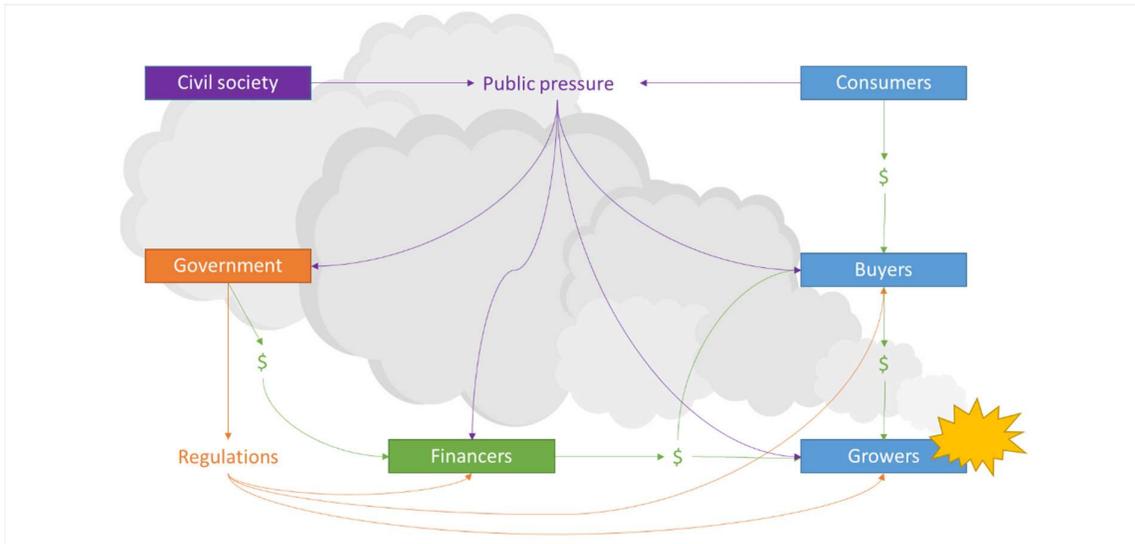


Figure 1 Stakeholders in the haze issue

Key stakeholders in Singapore in the haze issue include commodity buyers, financial institutions, the government, and civil society, which can use this paper as guidance on actions that can be taken to end haze.

If the severity of haze is reduced, the benefits would be greatest for the people and biodiversity in countries affected by the haze, as well as future generations and the global population.

Methods

This paper focuses on the transboundary haze issue and possible solutions from Singapore’s point of view.

Firstly, existing literature was reviewed to assess the causes, impacts, and geopolitical situation of and existing solutions to the haze, with a focus on Singapore. The literature reviewed mainly consisted of scientific journals, NGO reports, statutes, news articles, and documents of sustainability standards.

Where there were gaps in the existing literature, primary research was conducted. Primary research comprised a face-to-face survey conducted among 75 eateries in Singapore to assess the type of cooking oil they used, as well as email interviews of 3 farmers in Singapore to assess the impact of the haze on their businesses.

The principles of the Universal Declaration on Bioethics and Human Rights (United Nations Educational Scientific and Cultural Organization [UNESCO], 2005) as well as the Universal Declaration on Human Rights (The Universal Declaration of Human Rights, 2011) were then used to define why there is an imperative to act and to guide our recommendations on how existing solutions should be modified or scaled up.

Finally, consultations with stakeholders were conducted to obtain their feedback on the recommendations, which were then further refined. Stakeholders consulted were from the Singapore government, think tanks, finance experts, and international NGOs.

Impact of transboundary haze in Singapore

Composition of haze

Haze is largely (approximately two thirds) composed of carbonaceous material: organic carbon (OC) and elemental (“black”) carbon (EC). This material can be categorised into particulate matter (PM₁₀, or less than 10 micrometre in diameter) and fine particulate matter (PM_{2.5} or less than 2.5 micrometre in diameter). 40% to 95% of this material is in the PM_{2.5} range (Heil & Goldammer, 2001). Studies of fine particulates show that they contain metals (zinc, aluminium, and iron) and at least 5 polycyclic aromatic hydrocarbons (PAHs) known as potential or suspected carcinogens (Pavagadhi et al., 2013).

Gaseous compounds in haze include carbon dioxide (CO₂), carbon monoxide (CO), oxides of nitrogen (NO_x), sulphur dioxide (SO₂), hydrogen cyanide (HCN), ammonia (NH₃), hydrogen (H₂), and a variety of hydrocarbons, including methane (CH₄), formaldehyde (CH₂O), and methyl chloride (CH₃Cl). Ozone (O₃) can also be formed downwind from fires through photochemical reactions involving NO_x and other biomass burning products.

Health impacts

Exposure to air pollutants in haze can cause respiratory symptoms and aggravate existing heart or lung disease. It may also cause irritation of the eyes, nose, and throat in healthy individuals. Children, elderly, and people with chronic lung disease or heart disease are the most seriously affected (Ministry of Health Singapore [MOH], 2016). During the 1997 haze, a 30% increase in outpatient attendance for haze-related conditions was recorded (Emmanuel, 2000).

According to a study of over 8,500 cases by the Singapore General Hospital, the risk of cardiac arrest increases by 30% when the Pollutant Standards Index (PSI) level is above 100. The mean age of those who had a cardiac arrest was 66, and 65% of them were men (Ng, 2017).

Haze may also affect the brain. In one study, American researchers measured the brain volume of over a thousand women aged between 71 to 89 years old. The study found that a 3.49 microgram per cubic centimetre cumulative exposure to pollutants led to a 6.23 cubic centimetre decrease in white matter, the equivalent of around two years of brain aging (Bakalar, 2015).

There is evidence that haze may cause disruption to liver and kidney functions. Short-term exposure to ambient PM_{2.5} disrupts the healing process of the liver and leads to excess scar tissue accumulation, increasing the risk of liver fibrosis (Zheng et al., 2015). PM_{2.5} exposure also exacerbates insulin resistance and visceral inflammation/adiposity (Sun et al., 2009), increasing the risk of Type 2 diabetes, in particular when associated with obesity (Mazidi and Speakman, 2017).

Because of its volcanic origin, Indonesian peat has a sulphur content from 1 to 5 grams per kilogram. There is strong evidence that the Indonesian haze in 1997, which mostly originated from burning or smouldering peat, contained large amounts of sulphur, chlorine, and potassium (Langmann and Graf, 2003). The health impact of those contaminants is detailed in Appendix A.

Finally, one study found that haze caused an estimated 2,200 premature deaths in 2015 and 700 premature deaths in 2006 in Singapore alone (Koplitz et al., 2016).

Haze can also cause indirect health and psychological effects. Being confined indoors due to hazy conditions can cause feelings of anxiety, sadness, and helplessness (Gordon, 2015). A study of Malaysian students indicated that, during haze events, there was a general increase in emotional problems such as feeling depressed, lacking in energy, not feeling like doing anything, feeling anxious and afraid, having difficulty sleeping, feeling agitated and irritable, and having no appetite (Teoh & Tan, 2008). A Singaporean study suggested that a haze crisis is associated with acute physical symptoms and mild psychological stress (Ho et al., 2014).

Environmental impacts

Climate change

The large-scale fires that cause haze also generate a large amount of greenhouse gas emissions. During the 2015 haze, daily emissions from Indonesia's fires exceeded the daily emissions from the entire US economy, which is 20 times the size of Indonesia's, on 38 days (Harris, Minnemeyer, Stolle, & Payne, 2015; Neo, 2016).

Greenhouse gases are a major contributor to global warming and climate change. From 1972 to 2014, the annual mean temperature in Singapore increased from 26.6 degrees Celsius to 27.7 degrees Celsius. According to a joint study from the Centre for Climate Research Singapore (CCRS) and the UK Met Office, Hadley Centre, the long-term effects of climate change will lead to a temperature increase in Singapore of 1.4 degree Celsius to 4.6 degrees Celsius by the end of the century (Ministry of the Environment and Water Resources [MEWR], 2017). Higher annual temperatures may also lead to a greater use of air-conditioning, increasing Singapore's energy demands. This will in turn result in a cycle of higher domestic carbon emissions.

Frequent and severe instances of warm weather may lead to more occurrences of heat stress and discomfort among the elderly and sick. In addition, most cases of vector-borne diseases like dengue are observed during warmer periods of the year. Moreover, hot weather will shorten the life cycle of mosquitoes and cause them to attack humans more aggressively (Awani, 2016).

Greenhouse gases are also a contributor to more extreme weather events. For example, rainfall in Singapore has become more intense in recent years. According to Singapore's Second National Climate Change Study, there has been a general uptrend in annual average rainfall, which increased from 2192 millimetres in 1980 to 2727 millimetres in 2014. In 2001,

the first recorded cyclone near the equator, Typhoon Vamei, swept north of Singapore and caused major flooding in the region (MEWR, 2017).

An increase in weather variability presents significant challenges to the management of water resources. Periods of drought can affect the reliability of Singapore's water supply, while sudden episodes of intense rainfall could overwhelm the drainage system and lead to flash floods (MEWR, 2017).

The effects of climate change, such as intense storms, flooding and prolonged droughts, are one of the trends threatening global food security. Singapore is particularly vulnerable to fluctuations in global food supply and prices, as more than 90% of its food supply is imported (MEWR, 2017).

Finally, global warming may cause a rise in sea levels. This potential rise in sea level poses an existential threat to Singapore: much of the nation lies only 15 metres above sea level, and about 30% of the island lies less than 5 metres above the mean sea level (MEWR, 2017). The mean sea level in the Straits of Singapore has increased at the rate of 1.2 millimetres to 1.7 millimetres per year in the period from 1975 to 2009. At this rate, it is estimated that sea level rise will reach 1 metre by the end of the century.

Biodiversity

Besides affecting humans, haze also has an adverse effect on animal health. For example, one study found that the bird abundance at the Ecolink over the Bukit Timah Expressway was “substantially impacted” by the 2015 haze episode. Sixteen weeks after the haze episode, only a partial recovery to pre-haze levels had been made, and the decrease in the diversity of species observed showed “little sign of recovery” (Lee, Davies, & Struebig, 2017).

Haze episodes affect the ability of plants to photosynthesize. During the severe haze in 1997 and 1998, plant leaves and trees were observed to turn brown more quickly. Nurseries said that their plants dried up faster than usual (Kit, 2017). In addition, carbon-based particles in haze can dissolve and cause acid rain which can fatally affect plant functions and damage entire ecosystems (Hong, 2015).

The chemical content of haze also poses a threat to sensitive ecosystems, such as coral reefs and mangroves. These ecosystems are already at risk: over 85% of coral reefs in Singapore, Indonesia, and Malaysia are threatened, and at least 80% of all mangrove forests in Southeast Asia have been lost in the past 60 years (Hance, 2014). During haze episodes, nitrogen and phosphorus concentrations in coastal waters off Singapore were observed to increase by three to eight orders of magnitude (Jaafar & Loh, 2014). Accumulation of particulates and gases in seawater may cause coral bleaching and eutrophication (dead zones that cause a massive loss in species abundance and diversity).

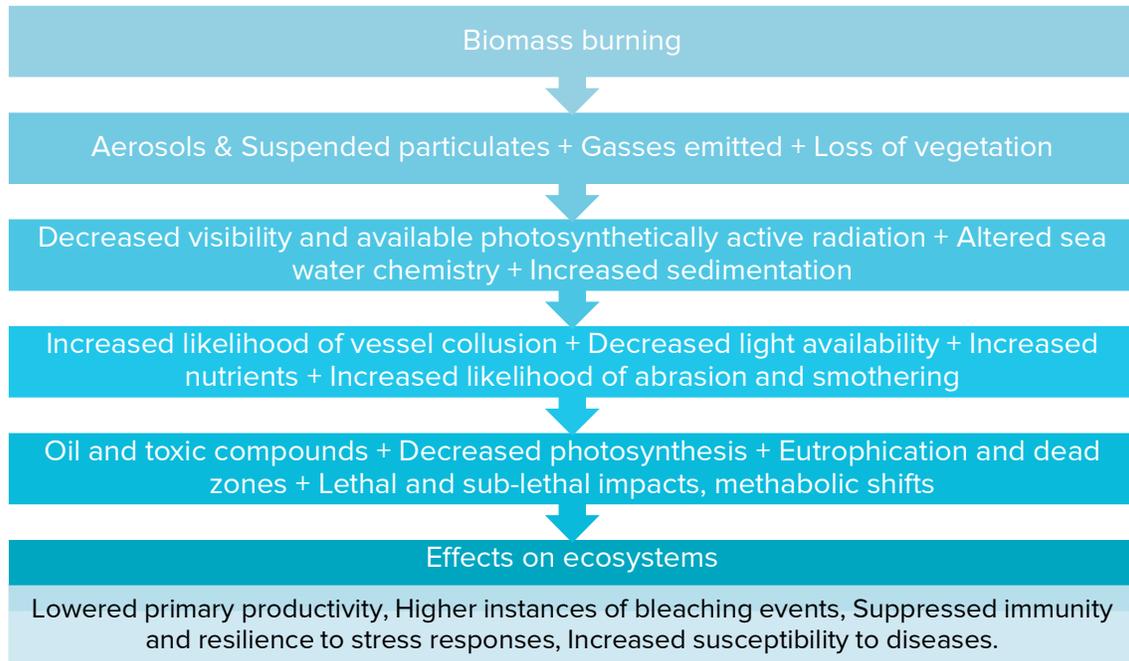


Figure 2 Haze impact on marine ecosystems (Jaafar & Loh, 2014)

Socio-economic impacts

The cost of 1997's haze episode to Singapore has been estimated at S\$100 million (EEPSEA & WWF, 1999) to S\$390 million (Islam, Pei, & Mangharam, 2016). Each of the 2006 (Zahara, 2006) and 2013 haze episodes were estimated to have cost Singapore S\$68 million (Bloomberg, 2015). The cost of the 2015 haze episode is the highest to date, estimated at S\$700 million (Barratt, 2016).

Most of these losses can be attributed to the tourism sector. Tourism is one of Singapore's most important industries, constituting about 6% of Singapore's GDP. The tourism sector is also particularly susceptible to haze, which means that haze episodes have a direct negative impact on Singapore's economy (O'Callaghan, 2013).

Haze also impacts the economy by affecting the productivity of agriculture. As haze obstructs some solar radiation and decreases photosynthesis, some Singaporean farms have reported lower productivity during haze events (personal communication, n.d.) During the 2015 haze, millions of chickens died and production of vegetables decreased by a third in Malaysian states (F. F. Loh et al., 2015). Such fluctuations have a direct impact on Singapore's food supply, much of which is sourced from Malaysia and other neighbouring countries.

Studies show that the amount of nutrient loading into the Straits of Singapore on hazy days is double that of non-hazy days. This contributes to phytoplankton blooms (Sundarambal, Tklich, & Balasubramanian, 2010), which have occurred in Singapore since 2009 and are likely to recur every year. In 2015, more than 50 coastal farms across Singapore lost more than 500 tonnes of fish to the plankton bloom, causing some fish farms to lose more than S\$1 million in earnings (Ariffin, 2016).

Deteriorated visibility caused by severe haze pollution leads to damages and losses in the transportation industry. As a result of haze, hundreds of flights were cancelled in 2005 (Remember Singapore, 2013) and Seletar Airport was temporarily shut down in 2013 (Management, 2013). Other disruptions may occur in marine traffic and cargo shipping (Association of Southeast Asian Nations [ASEAN], 2016).

Delivery services may also be impacted. In 2013, McDonald's temporarily cancelled its delivery service due to haze (Fogarty, 2013).

Severe haze may force school closures and cause disruptions to workforce productivity (L. E. Chan & Leong, 2015).

The Singaporean military has been known to suspended outdoor training due to severe haze (Fogarty, 2013).

Bioethical considerations of haze impacts

The severe health impacts of haze clearly constitute a violation of the bioethics principle “social responsibility and health” (Article 14), which state that the “enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being”. Under this article, it is the social responsibility of governments and all sectors of society to promote health and social development. Therefore, governments and all sectors of society have the responsibility to prevent haze and mitigate its impacts.

In particular, the health impacts of the haze tend to be more severe for vulnerable groups such as children, the elderly, and the sick. Compared to the rich, the poor also tend to have less ability to afford mitigation measures such as air-purifiers and facemasks or overseas travel to escape the haze (Shaffer, 2015). The haze therefore is also a social justice issue, in violation of the bioethics principle “equality, justice and equity” (Article 10).

The bioethics principle “protection of the environment, the biosphere and biodiversity” (Article 17) is also compromised by the wide-ranging impacts of large-scale fires and haze on the air, land, and marine environments.

The carbon emissions and their global warming effects are accumulative, and thus have a greater impact on future generations. The bioethics principle “protecting future generations” (Article 16) should therefore compel us to consider not just the current, but also the future impacts of haze.

Origin of and solutions to transboundary haze

Introduction

Although historically, fires have only occurred in the rainforests of Indonesia during periods of extreme drought (Cochrane, 2003), in recent decades, fires and the associated haze have increased in frequency and severity (Field, van der Werf, & Shen, 2009).

The mainstream media has tended to focus on the use of fire to clear land, or “slash-and-burn” agriculture, as the cause of haze (Forsyth, 2014). Yet, swidden agriculture has been used traditionally by indigenous farmers on a small scale for hundreds of years with little negative impact. These farmers used fire to prepare rotating swidden fields of about 1.5 hectare each in a system also known as shifting cultivation (Goenner, 2000).

In this section, we will identify the key changes that occurred in recent decades that led to the recent occurrence of large-scale fires and haze, and possible solutions to prevent them.

Key findings

The causes of Indonesia’s large-scale fires and haze are a combination of the larger scale and more frequent use of fire to clear land, to claim tenure, or as a weapon in social conflict; the emergence of fire-prone landscapes due to deforestation and peat drainage; and the inability or unwillingness to stop fires early due to poor firefighting capacity and lack of governance.

The use of fire can be avoided by using machinery to clear land, but this is usually too expensive for local communities. Companies can assist communities living in and around their concessions to use mechanical clearing and other zero-burning methods.

Land rights of communities in Indonesia are unclear, and there are often competing claims over a plot of land. Migrant farmers, especially, may use slash-and-burn to claim land. To reduce the risk of fire being used as a weapon in land conflicts, companies opening new plantations should take steps to engage local communities and respect their traditional land rights.

Deforestation and drainage of peat swamps create fire-prone landscapes. Peat fires are much harder to detect and extinguish than normal fires. To avoid creating fire-prone landscapes, paludiculture and sustainable agricultural practices in the palm oil, pulpwood, and logging industries can be adopted.

Once fires start, stakeholders on the ground often have a limited ability to extinguish them. Limitations in firefighting capacity include insufficient manpower, training, equipment, and access to water. Companies represent one of the best channels of firefighting capacity in rural areas, and should prepare sufficient equipment and manpower for detecting and fighting fires within and around their concessions.

To mitigate fires and haze, as well as other sustainability issues, a wide range of agricultural sustainability standards have been developed by agricultural companies, especially those working in the palm oil and pulp and paper industries. The most common voluntary standard

is known as No Deforestation, No Peat and No Exploitation (NDPE). The adoption of NDPE is spreading, but the standard lacks a harmonised set of criteria and remains reliant on NGOs for verification. Among the regulated standards specific to palm oil, Roundtable on Sustainable Palm Oil (RSPO) certification remains the most effective for stopping haze. None of the sustainability standards for pulp and paper adequately address the haze issue, as they do not address the problem of new peat development.

Large-scale use of fire to clear land or claim tenure

From the 1980s, road construction by logging companies and transmigration projects opened up land in Indonesia, making it easy to access previously inaccessible land. As a result, migrant farmers used slash-and-burn techniques followed by tree planting to stake claims on uncultivated or forested land (Palm, Vosti, Sanchez, Tomich, & Kasyoki, 2005).

With the development of industrial-scale plantations, fires have sometimes been used in an uncontrolled manner to clear vegetation on a large scale. Small-scale farmers may also use fire to clear new land because it is much cheaper than mechanical methods; it can cost up to S\$300 for equipment and chemicals to clear one hectare of land, compared to less than S\$10 using fire (Varkkey, 2013). Starting a fire also removes plant debris, kills pests, fertilises the soil, and neutralises acidity in peatland at a much lower cost.

Most of the companies convicted in Indonesia for causing illegal fires are pulpwood and palm oil growers (The Jakarta Post, 2015), with multi-million dollar fines being imposed on PT Kallista Alam (palm oil) in 2015 (Rini, Nugraha, & Jacobson, 2015) and PT Bumi Mekar Hijau (pulpwood) in 2016 (F. Chan & Arshad, 2016). However, growers of other commodities have also been convicted, such as PT National Sago Prima (sago) in 2016 (Soeriaatmadja, 2016). Besides companies, poor small-scale farmers and rogue illegal operators involved in illegal clearance may also use fire to clear land (Balch, 2015). Once started, fires can easily go out of control, especially when used by medium sized companies, which usually lack fire management resources, or rogue operators, which may not stay to monitor the fires for fear of getting caught.

To prevent the start of fire, machines or tools can be used to clear land instead of fire. As early as 1999, ASEAN Environmental Ministers agreed to promote zero-burning agriculture in their respective countries. A guideline for zero-burning techniques in the context of oil palm was published in 2003 (The ASEAN Secretariat, 2003).

However, simply providing guidelines is not enough. Economic incentives and disincentives are also needed to shift growers and farmers towards haze-free practices and away from haze-causing practices. As fires can spread across a landscape, it is also to the benefit of all parties within the landscape to apply the bioethics principle “solidarity and cooperation” (Article 13) and cooperate in minimising the use of fire.

Some have called for a law banning the use of fire to clear land of any size (F. Chan, 2015). However, if small-scale farmers are not also supported to clear land via mechanical means, such a law would not only violate the bioethics principle “non-discrimination and non-stigmatization” (Article 11), but also likely be ineffective at preventing fires.

Governments usually lack the capital and capacity to provide this support on the ground. Hence, the best solution is for companies to ensure that their own plantations and those of their suppliers use zero-burning methods while assisting local communities living in and around their concessions to use zero-burning methods.

To clear land without the use of fire in their own plantations, companies should invest in the necessary machinery and identify and set aside High Conservation Value forests and

peatland within their concession areas (WWF, FMO, & CDC, 2012). At the same time, companies should engage local communities in fire-prevention efforts. For example, Asia Pulp and Paper, the largest pulp and paper company in Indonesia, has started a Desa Makmur Peduli Api (DMPA) programme in collaboration with the government that supports alternative local livelihoods in order to reduce community pressure on natural forest in and around the company's suppliers' concession areas (Double Helix et al., 2016). Some companies also participate in the Fire-Free Alliance, a coalition of plantation companies that implement fire training and prevention schemes at the village level. These companies provide monetary incentives to communities for preventing fire, and also meet on a regular basis to share best practices for community-focused fire prevention programmes (News Desk, 2017).

Where mechanical clearance is not feasible, local communities may be trained to use fire in a small-scale, controlled manner (The ASEAN Secretariat, 2004). To prevent fraud, it should be mandated that land cleared by fire cannot be converted to commercial use.

The use of fire as a weapon in land conflict

Land rights of communities in Indonesia are unclear and generally unrecognised by the government. These communities do not have the ability to enforce laws, which often results in competing claims over a plot of land. The arrival of new, external actors such as transmigrants and plantation operators onto land occupied by local communities increases the likelihood that fire will be used as a weapon, with buildings and plantations being burnt in retaliation for land grabbing (Colfer, 2002).

To reduce the risk of fire being used as a weapon in land conflicts, companies opening new plantations should actively engage with local communities to clarify their customary rights over the land and respect these rights. In accordance with the bioethics principle "consent" (Article 6). In the agricultural industry, this is most commonly done in accordance with a set of principles known as Free, Prior and Informed Consent (FPIC).

Respect of land rights of local communities and indigenous peoples also relates to Article 17 of the Universal Declaration of Human Rights which state that "everyone has the right to own property" and that "no one shall be arbitrarily deprived of his property".

Fire-prone landscapes due to deforestation and peat drainage

Peat is a type of soil that is composed mainly of partially decayed plant matter formed over thousands of years in waterlogged areas known as peat swamps. The peatland ecosystem is the most efficient carbon sink on the planet, but it has taken thousands of years for peatlands to develop these deposits. About 14% of Indonesia and 8% of Malaysia are covered by peat swamps (Joosten, 2009). Like sponges, peat domes store water during the wet season, reducing the risk of floods, and release water slowly during the dry season, reducing the risk of drought and fires.

When waterlogged, peat swamps are not prone to fire. But when dried, carbon-rich peat soil can catch fire easily. During the dry season, a single discarded cigarette can cause a fire in drained peatland (Goenner, 2000). Peat fires can smoulder underground for days, or even

months (Turetsky et al., 2015). Putting out peat fire requires huge volumes of water to soak through the soil to extinguish the fire below.

Peat swamps are often cleared and drained by companies and small-scale farmers to plant conventional crops or conduct logging operations, creating fire-prone landscapes that fuel the spread of fires. Miettinen, Shi, & Liew (2016) found that from 1990 to 2015, half of the peat swamp forests in Peninsular Malaysia, Sumatra, and Borneo were cleared. The same study showed that by 2015, industrial plantations covered 27% of peatland in the region, of which the great majority (73%) were oil palm plantations and most of the rest (26%) were pulp plantations.

In addition, continued deforestation results in fewer trees, causing a drier local climate. From 2001 to 2010, it was estimated that oil palm was responsible for half of the deforestation in Indonesia and a third of deforestation in Malaysia (Henders, Persson, & Kastner, 2015), while the pulpwood and timber industries were estimated to be responsible for a fifth of deforestation in Indonesia and a quarter in Malaysia. Such large-scale deforestation reduces the soil moisture level, making the area even more fire-prone (Uhl & Kauffman, 1990).

Solutions to avoid creating fire-prone landscapes can be broadly grouped into two categories. The first category replaces conventional agricultural methods with new agricultural practices that are complementary to existing forests and peatland, such as forest- and peat-friendly agriculture (paludiculture). The second involves retaining conventional agriculture, but taking steps to minimise contributions to the haze (i.e. haze-free practices).

Forest- and peat-friendly agriculture (paludiculture)

Forest- and peat-friendly agriculture refer to agricultural methods that strive to keep forests and peatlands, respectively, in their natural state.

Examples of forest-friendly agriculture includes agroforestry and harvesting of non-timber forest products (NTFP). NTFP refer to all products and services derived from forests, other than timber. Examples include wild honey, rattan and illipe butter. Harvesting of NTFP at a rate allowing for natural recovery allows for the sustainable monetisation of natural resources while preserving forest functions.

Paludiculture refers to the cultivation of native wetland crops without the use of drainage. One example is sago, which is grown for starch and processed products such as noodles and flour.

Case study of peat-friendly agriculture: Sago cultivation

Since the 1970s, sago palm has been cultivated on a large-scale in Sungai Tohor village on Tebing Tinggi island, Indonesia. Sago is peat-friendly because it thrives in wet conditions. The sago mills in Sungai Tohor produce wet sago flour. Some of the wet flour is exported for further processing in Malaysia, while the rest is processed in cottage industries within Sungai Tohor into food products such as noodles and snacks. The harvesting of sago has allowed the community to develop while protecting their environment.

Haze-free practices in conventional agriculture

It is also possible to cultivate conventional crops such as oil palm and acacia, which is grown for pulp and paper, in a haze-free manner.

To avoid creating fire-prone landscapes, growers should avoid clearing forests and draining peatland, and instead develop new plantations only on non-forested land on mineral soil. For existing plantations on peatland, water levels should be maintained as high as possible. Small dams, or canal blocks, can be built over canals in order to retain water in peat. To minimise the risk of fire, the groundwater level should be kept at no lower than 50 cm below the ground surface (Hayasaka, Takahashi, Limin, Yulianti, & Usup, 2016). Effective water management also requires a landscape approach across the entire peat hydrology unit, with water levels kept much higher in the deepest peat areas (the peat dome) as compared to the surrounding area.

Even with canal blocks, the water level in drained peatland will continue to drop during the dry season due to evaporation. To eliminate the risk of fire, the peatland should ideally be fully restored to natural, wet conditions. Some plantation companies are already taking steps towards doing so: for example, in 2015, Asia Pulp and Paper announced that it would retire 7,000 hectares of peatland plantations on peatland to restore the natural habitat (Butler, 2015).

Failure to stop fire due to poor firefighting capacity and poor governance

Despite possessing greater financial capacity, even multinational agribusinesses have had trouble protecting their crops from fire (Hutan Kita Institute - HaKI et al., 2016), let alone farmers and smallholders who often lack firefighting capacity. Limitations in firefighting capacity on the ground include insufficient manpower and training, insufficient or poor equipment, and lack of access to water. Early detection and suppression of fires may also be hampered by poor monitoring, lack of access to data such as satellite-detected hotspots, the inaccuracy of satellite hotspot data, and lack of equipment such as drones, cameras, and fire lookout towers.

Land tenure in Indonesia is frequently unclear and disputed. This can lead to situations in which culpability and responsibility for fires are difficult to establish, meaning that individuals are rarely held accountable for burning (Gaveau et al., 2017). Illegal land clearing, land grabbing, and land transactions with illegal companies are still rampant. For example, at the village level, elites may sell land to illegal companies in conservation areas gazetted by the central government, or a district government may extend concessions to companies without approval from the central government (Purnomo et al., 2017). Land concessions may also overlap, resulting in conflicts and disputes.

To detect and stop fires early, companies should ensure that they have sufficient equipment and manpower for detecting and fighting fires within and around their concessions. Technologies like thermal cameras and sensors, drones, and high-resolution micro-satellites are currently being developed for fast and accurate fire detection (Freischlad, 2015). Companies can also equip local communities in and around their concessions with the equipment and knowledge to detect and fight fires.

To resolve land conflicts, it is necessary to involve government agencies. This is most effective when local governments are committed to conducting mapping and land use reform within their jurisdictions. In various provinces and districts, NGOs are helping local governments to map out and resolve land conflicts, so that a clearer chain of culpability and responsibility for fire prevention can be established. A similar effort is also taking place at the national level in Indonesia, known as the One Map initiative, though the process is complicated and has been ongoing for several years.

Sustainability standards

A wide range of sustainability standards has been developed in recent years to provide growers with guidance in implementing sustainable practices. In return for compliance, these standards promise increased access to markets and finance, as well as the opportunity to sell agricultural products as certified products for a price premium. While there are no widely-adopted standards exclusively focused on haze, standards governing agricultural commodities, especially palm oil and timber, and the financing of such commodities are able to encourage the adoption of haze-preventing agricultural practices.

In this section, we will evaluate selected existing sustainability standards for palm oil and paper and their effectiveness as a proxy to haze-free standards. Details of the analysis can be found in Appendix B.

Voluntary certification standards have a global reach and include end-product labelling to allow consumers to verify that their product is produced in accordance with the prescribed standards. These include: Roundtable on Sustainable Palm Oil (RSPO), RSPO next, Rainforest Alliance (RA), Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC).

Mandatory national standards cover, or are intended to cover, all growers in the country. These include: Indonesian Sustainable Palm Oil Standard (ISPO), Malaysian Sustainable Palm Oil (MSPO) and Sistem Verifikasi Legalitas Kayu (SVLK).

Voluntary initiatives are for growers who want to apply more stringent criteria than mass market standards. This includes: Palm Oil Innovation Group (POIG).

Labelling schemes have multiple criteria covering life cycle considerations. Some labelling schemes require the submission of documents proving third-party verification (Global Ecolabelling Network (GEN), 2004), while others do not require formal certification. Labelling schemes may also cover multiple types of products and agricultural commodities. This includes: Singapore Green Label Scheme (SGLS).

Non-regulated standards consist of broad principles, although the exact criteria and indicators differ from company to company. This includes: No Deforestation, No Peat, and No Exploitation (NDPE).

Discussion of sustainability standards

Certification and NDPE are complementary

Adoption of NDPE has spread much faster than regulated standards, such as RSPO certification, because of its “commit first then implement” model, inclusion of suppliers, and support from large companies and NGOs. NDPE is thus able to widely propagate key principles that fits closely to the haze-free principles.

On the other hand, NDPE remains reliant on NGOs for monitoring and verification and lacks a landscape approach. While standards spell out the best practices that growers should follow, demand by the market and financiers is essential for incentivising growers to actually implement these standards. Finally, because NDPE criteria are not standardised, it is difficult for governments and consumers to base their procurement and buying decisions on them.

Hence, though NDPE complements the RSPO’s objectives, RSPO certification currently remains the easiest and most reliable route for smaller buyers such as eateries, manufacturers and retailers in Singapore to eliminate such destructive companies from their supply-chain.

Best standards for palm oil

Among the regulated standards, RSPO remains the most effective for stopping haze, especially with the promise of jurisdictional certification, which brings together all stakeholders within a district or state to ensure the entire region is certified.

MSPO and ISPO hold much potential because of their national-level coverage and support from their respective national governments. However, MSPO and ISPO need a lot more improvement to match the credibility and rigour of other standards.

SGLS can be useful as a green label on top of RSPO certification that is easily recognised by Singaporean consumers.

Best standards for pulp and paper

None of the sustainability standards for paper adequately address the haze issue as they do not address problem of new peat development. FSC and SGLS can be considered if they strengthen their protections for peat, and if SGLS also incorporates a whole-of-company approach to labelling and a grievance procedure. Because of its national-level coverage, SVLK provides a suitable minimum standard for legality.

The role of growers

The bioethics principle “benefit and harm” (Article 4) recommends that direct and indirect benefits to affected individuals should be maximised and any possible harm minimised. The bioethics principle “risk assessment and management” (Article 20) recommends appropriate assessment and adequate management of risk. In line with these principles and the global best practices in the palm oil industry, palm oil growers should ensure that their operations are sustainable.

At the minimum, palm oil growers should adopt a NDPE policy (see Appendix C for our template of a basic NDPE policy relevant to haze and its processes). To give more credibility to their commitments, growers should make a time-bound plan for 100% RSPO certification, at least for their own plantations.

Finally, in alignment with the bioethics principle “decision-making and addressing bioethical issues” (Article 18), growers should be transparent about the implementation of their policies. They should publicly report, at least annually, on their progress on NDPE and RSPO certification, as well as the achievement of other certifications and standards.

What can Singapore's commodity sector do?

Introduction

The high production yield, low global tariffs, and plethora of uses of palm oil have allowed it to become the most actively traded vegetable oil globally, with up to 90% of its global production traded on commodity markets (Thoumi, 2016). Singapore is a major Asia-Pacific hub for the trading of agri-commodities such as grains, palm oil, rubber, and sugar (IE Singapore, 2017). However, this also means that Singapore may be playing a significant role in facilitating environmentally-damaging practices. This section identifies the role of Singaporean traders and end-of-chain consumer-facing businesses in the palm oil industry.

Key findings

Many major palm oil and pulpwood growers and traders have a presence in Singapore, either as listed on SGX or as headquartered in Singapore.

Commodity trading firms have the most significant impact on the palm oil market. They are few in number and often vertically integrated, with a hand in both production and trading.

Palm oil is widely used as a cooking oil among eateries in Singapore, but awareness of this fact remains low, both among the public and the eateries.

When palm oil buyers such as traders, product manufacturers, retailers, and food-service companies commit to sustainable sourcing, it helps push palm oil growers and traders towards adopting sustainable policies, in order to mitigate the risk of losing their customers.

Many Singaporean eateries have a strong regional presence. This provides an opportunity for corporate practices initiated in Singapore to influence larger markets in the region.

Governments and trading blocs such as the European Union (EU) and the Association of Southeast Asian Nations (ASEAN) can leverage standards like RSPO to impose enforceable restrictions such as tariffs, quotas, and non-tariff barriers.

The haze issue is mainly due to the expansion of plantations, which in turn is mainly due to continuously growing demand for palm oil and pulpwood. To reduce pressure to expand palm oil planted areas, there can be either an increase in yield or a reduction in demand growth.

Reducing consumption only makes sense if this takes place across all types of oil, not only palm oil. Supporting the adoption of RSPO would have a bigger impact.

Recommendations:

1. Singapore-based palm oil companies should implement robust NDPE policies, make time-bound commitments to 100% RSPO certification for their own plantations and supply chains, and report annually on their progress.
2. Consumers, businesses, and other organisations in Singapore should avoid excessive consumption of fats and oil, especially by reducing their intake of fried food.
3. Consumers, businesses, and other organisations should reduce wastage of paper.

4. Eateries, manufacturers, and retailers that use palm oil should adopt a time-bound plan for 100% of the palm oil used as cooking oil across their operations to be RSPO-certified.
5. Singapore's biofuel producers should shift from using palm oil for biofuel to using agricultural waste and algae.

Palm oil

The international palm oil trading system

Figure 3 below shows the world’s major palm oil producing and consuming countries. Indonesia and Malaysia account for approximately 87% of global production, while the most significant importers are China, India, and the EU. Indonesia’s and Malaysia’s own domestic consumption is also growing: the two countries now consume approximately 22% of global production (Index Mundi, 2017a, 2017b).

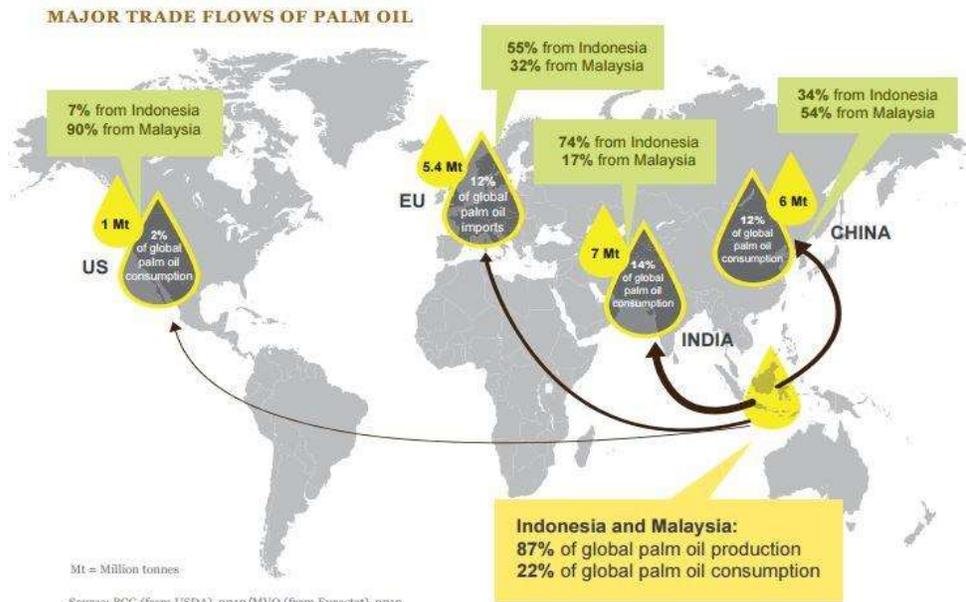


Figure 3: Major global trade flows of palm oil (WWF, 2011)

Within this geographical context is a constellation of corporations, trade institutions, industry associations, governments, and other parties involved in the palm oil trade, of which the major ones are listed in Table 1.

Category	Stakeholders, Policies, Initiatives
<i>Trade Institutions</i>	World Trade Organisation (WTO), World Bank, United Nations Conference on Trade and Development (UNCTAD), Organisation for Economic Co-operation and Development (OECD) Trade Ministries/Boards of Indonesia, Malaysia, and Singapore Indonesian Palm Oil Association Malaysian Palm Oil Board & Malaysian Palm Oil Council Council of Palm Oil Producing Countries (CPOPC)
<i>Trade Blocs</i>	EU, ASEAN, RCEP (proposed)
<i>Sustainable Trade-Focused NGOs</i>	IDH Sustainable Trade Initiative TFA 2020
<i>Standard-Setting Bodies</i>	RSPO ISPO MSPO
<i>Trade Finance</i>	Banking Environment Initiative

	Finance Alliance for Sustainable Trade
<i>Commodity Traders</i>	Integrated palm oil growers and traders: Golden Agri-Resources, Musim Mas, Wilmar Big four commodity traders: Archer Daniels Midland, Bunge, Cargill, and Louis Dreyfus

Table 1: Major players in the palm oil global trading system

Rising production and demand for palm oil

Almost half of all tropical deforestation arises from illegal exploitation of forest land for commercial agriculture, with half of that being the direct result of illegal exploitation for export markets (Forest Trends, 2014). The uncontrolled expansion of palm oil and paper plantations, especially in the last two decades, has been a significant cause of haze. This expansion has been fuelled by the exponential growth in global demand for palm oil, which rose from 17.7 million tonnes in 1997 to an astonishing 52.1 million tonnes in 2012 (see Figure 4). Under current forward projections by the United States Department of Agriculture (USDA), demand is expected to further increase to 68 million tonnes by 2020 and 77 million tonnes by 2050.

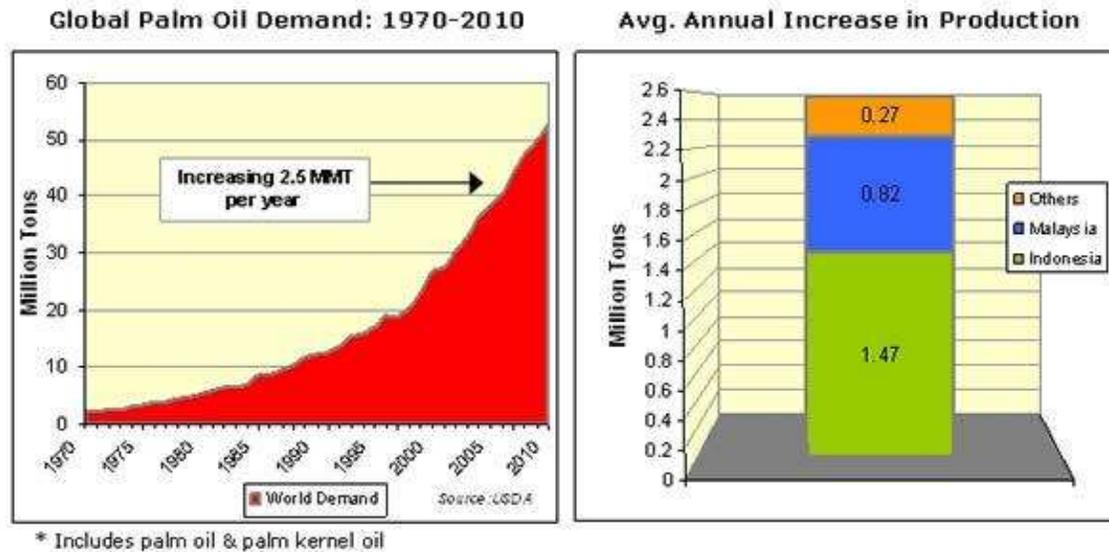


Figure 4: The exponential increase in demand for palm oil

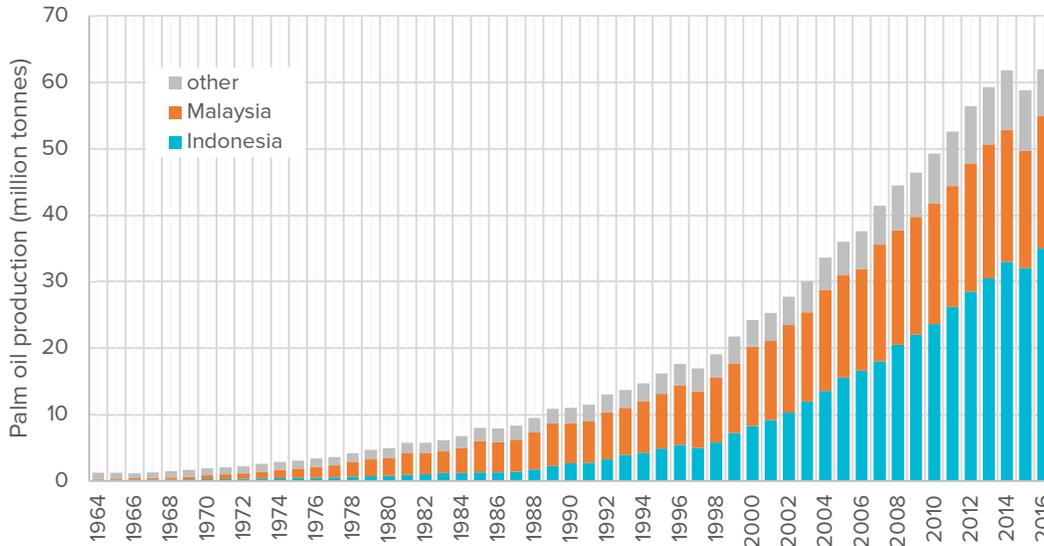


Figure 5: The rising production of palm oil (source: IndexMundi)

The global palm oil market was valued at USD 65.73 billion in 2015. The market is expected to continue growing at an annual growth rate of 7.2%, reaching USD 92.84 billion by 2021 (Zion Market Research, 2016).

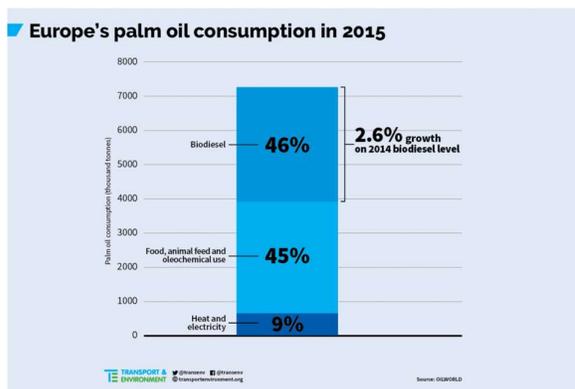


Figure 6: Europe's palm oil consumption in 2015 (Transport & Environment, 2016)

This acceleration is likely due to the fact that palm oil is both a cheaper substitute for other hydrogenated oils used in food production processes and a key component in biofuels, for which demand has risen in both European markets and the domestic markets of palm oil producers. For example, in 2015, 46% of all palm oil imported by the EU was used for biofuel production, a 45% increase from 2014 (see Figure 6). This demand is partially driven by the implementation of laws mandating the increased adoption of biodiesel in many countries, including Indonesia and Malaysia.

This increasing demand is driving the rapid spread of unsustainable practices in the palm oil industry. Such practices include the use of fire to clear land for planting; land-grabbing from locals, resulting in fire being used as a weapon by both companies and local communities; the destruction of forests, resulting in drier fire-prone areas; and the drainage of peat, exposing flammable peat soil. Inadequate firefighting capacity in many areas of Indonesia further complicates the situation.

The importance of promoting certification over boycotts

Despite the problems associated with the palm oil industry, palm oil nevertheless produces more oil per hectare than all other oil crops by a large margin. As such, palm oil could more efficiently meet the global population’s needs than any other food oil source.

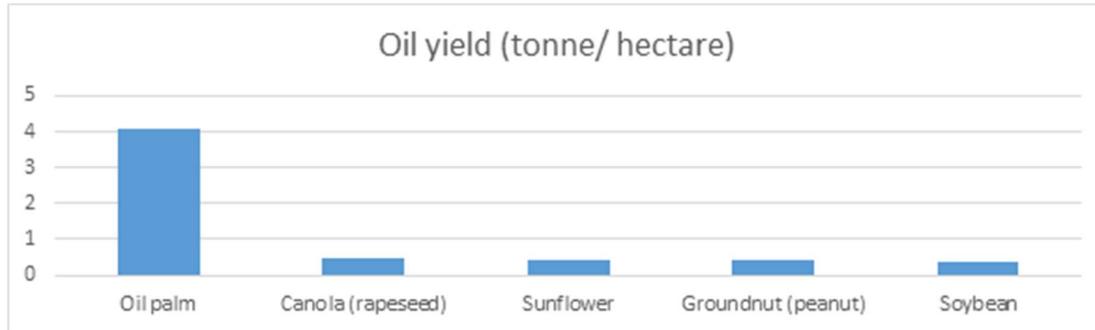


Figure 7. Oil yields of the major vegetable crops (Murphy, 2009).

In light of this information, it is clear that a boycott of palm oil would actually exacerbate environmental problems. It would drive palm oil producers to sell to less discerning markets, thereby eliminating incentives for existing growers to improve their practices, and it would encourage a shift in demand to other vegetable oils, which require more land for the same yield.

Rather, it would be preferable to adopt sustainably produced palm oil on a large scale. This can be encouraged by raising awareness of RSPO and other comparable standards so that consumers begin to demand responsibly produced palm oil.

However, both the production and uptake of RSPO-certified sustainable palm oil remain far below their potential. Currently, only 19% of global palm oil production on 2.83 million hectares of land in 14 producing countries is certified by the RSPO (RSPO, 2017). Malaysia and Indonesia are the two largest certified sustainable palm oil (CSPO)-producing countries, making up 2.3 million hectares or 81% of RSPO’s total certified area (Azman, 2017).

The demand for CSPO, however, is even lower than its supply. Only about half of RSPO-certified palm oil is sold as a certified product due to insufficient demand (RSPO, 2017). Part of the reason for this is insufficiently strong commitments to purchase certified palm oil by consumer goods companies: in 2016, only 14 out of 55 Consumer Goods Forum (CGF) members had made zero or net-zero deforestation commitments across all commodities, including palm oil (Bregman, Mccoy, Servent, & Macfarquhar, 2016). Another reason is that consumers in the two largest importing countries, China and India, are price-sensitive and view sustainability as a secondary concern, though there is evidence that CSPO may be gaining increased traction in China – for example, the number of RSPO-certified facilities in China increased by 70% in the 2015 to 2016 financial year.

On the whole, it is clear that much more needs to be done to shift consumption away from unsustainably produced palm oil and towards palm oil certified under sustainability schemes such as the RSPO.

Commodity sector solutions: Palm oil

1. Secure company-level commitments

Singapore is not a major producer or consumer of palm-oil or associated agri-products. Rather, its role within the trading process is in the middle. Singaporean companies (i.e. those listed on the SGX or private companies based in Singapore) are involved in various stages of the palm oil supply chain. Wilmar, founded in Singapore in 1991, is involved in every stage of the supply chain. It is the second largest vertically integrated company in the industry by market capital after the American ADM (Sustainable Palm Oil Transparency Toolkit (SPOTT), 2017a), which has a 25% ownership interest in Wilmar and a joint venture with Wilmar that markets palm oil products in Europe (Sustainable Palm Oil Transparency Toolkit (SPOTT), 2017a). Golden Agri-Resources Ltd, founded in Singapore in 1996, is the world’s third largest integrated palm oil company in terms of landbank, behind Malaysian Sime Darby and Felda (Sustainable Palm Oil Transparency Toolkit (SPOTT), 2017a).

Name	Presence in SG	Listed on SGX?
<i>Wilmar International Ltd</i>	HQ	Yes
<i>Olam International Ltd</i>	HQ	Yes
<i>Golden Agri Resources Ltd</i>	HQ	Yes
<i>First Resources Ltd</i>	HQ	Yes
<i>Bumitama Agri Ltd</i>	HQ	Yes
<i>Indofood Agri Resources Ltd</i>	HQ	Yes
<i>Kencana Agri Ltd</i>	HQ	Yes
<i>Mewah International Inc</i>	HQ	Yes
<i>Golden Palm Resources Holdings Ltd</i>	HQ	Yes
<i>Musim Mas Group PT</i>	HQ	No
<i>Cargill Inc</i>	Asia-Pacific hub	No

Table 2: Singapore-based companies involved in palm oil supply chain

Note: Wilmar has a 20% stake in Kencana Agri Ltd.

Commodity trading companies as change agents

Of all the players in the palm oil supply chain, commodity trading firms, such as the ones headquartered in Singapore, have the most significant impact on the palm oil market. They are few in number and often vertically integrated, with a hand in both production and trading, making them the link in the supply chain through which the largest volume passes through the fewest hands (see Figure 8). This is in sharp contrast to small-scale growers and end consumers, the beginning and end of the supply chain, where any attempt to tackle the problem is complicated by their fragmentation. Since the group of firms involved in the refining and trading stages, including both vertically integrated and non-integrated firms, remains relatively small, this is the most convenient choke point in the supply chain to implement effective legislation or pressure to help curb the haze indirectly.

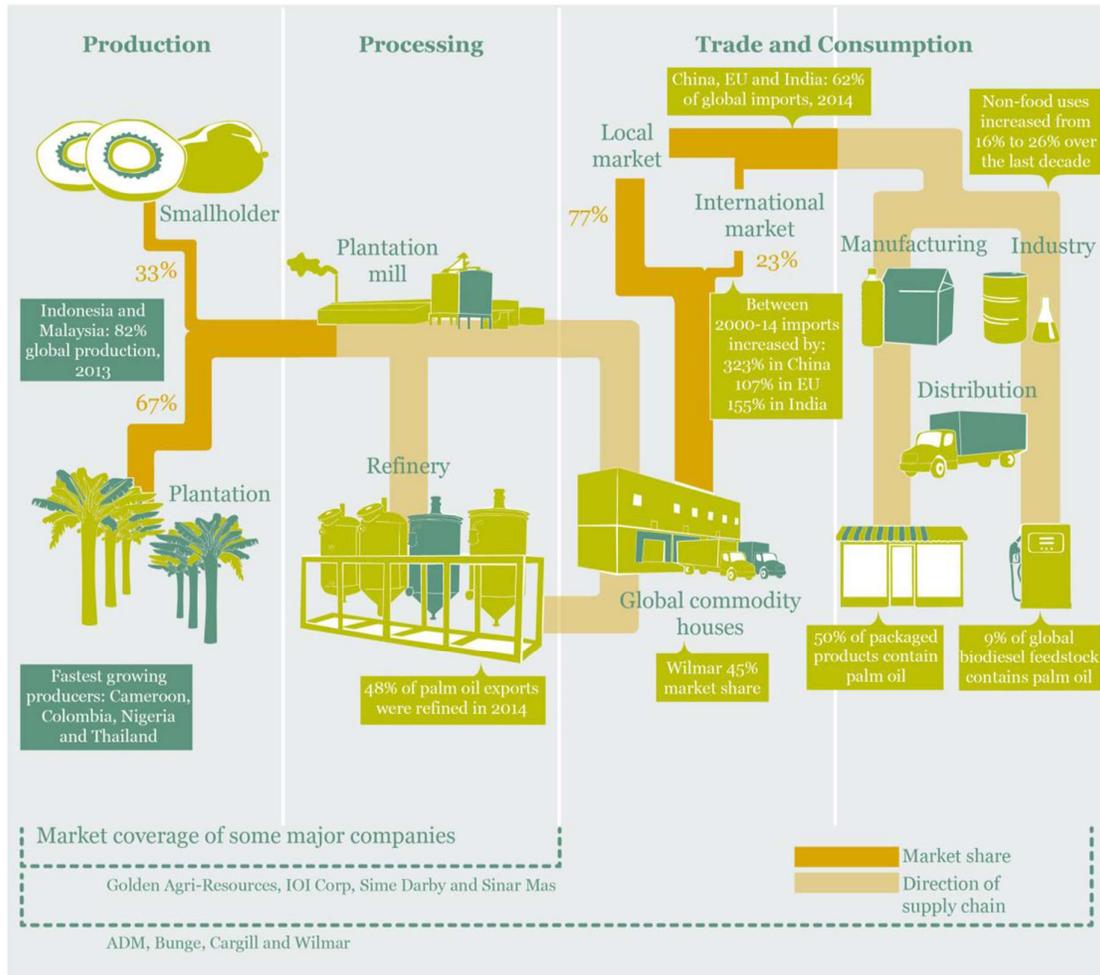


Figure 8: The palm oil supply chain mechanism (Brack, Glover, & Wellesley, 2016)

Recommendation: Singapore-based palm oil companies should implement robust NDPE policies, make time-bound commitments to 100% RSPO certification for their own plantations and supply chains, and report annually on their progress.

2. Shift demand

When compared to global production of palm oil, the amount of palm oil consumed in Singapore is small. In 2013, Singapore's net imports of palm oil and palm kernel oil were 0.4 million tonnes, out of a global production of 60.7 million tonnes (FAO, 2017).

Globally, the food industry is responsible for about 70% of palm oil usage, with personal care and cleaning products making up 20% and biofuel and feedstock the remaining 10% (Palm Oil Investigations, 2017). However, in Singapore, industrial use accounts for 85% of domestic consumption. This is largely the result of large biofuel refining activity. Much of the remaining 15% is used as cooking oil, either by itself or blended with other vegetable oils.

The following sections will discuss solutions that can be implemented by addressing Singapore's demand for palm oil as biofuel feedstock and as a cooking oil.

2.1 Singapore industrial consumption: Neste case study

The use of palm oil and other agricultural products for biofuel production has rapidly increased over the past decade. This is in large part driven by government mandates such as Malaysia's B10 programme, which requires broad-based adoption of blended biodiesel with a minimum biofuel content of 10%. The full implementation of this program is expected to consume 750,000 tonnes of palm oil a year (The Business Times, 2016). Indonesia has a similar program that aims for a 20% proportion of biodiesel in gasoil sold to the transportation, industrial, and commercial sectors, and 30% for gasoil sold to power plants (S&P Global Platts, 2016).

Singapore is home to one of the largest biodiesel refineries in the world, largely producing biodiesel for the European market. Operated by Neste Oil, an oil refining and marketing company based in Finland, this refinery can use as much as 360,000 tonnes of CPO a year.

Neste claims that all of the CPO it uses has been fully traceable to the plantation level since 2007 and 100% RSPO-certified since 2013.

However, in April 2017, the European Parliament adopted a resolution to ban biofuels made from vegetable oils including palm oil by 2020 (European Parliament, 2017) and in June, the Norwegian government voted to ban palm oil-based biofuels in public procurement of fuels and public transport (Chain Reaction Research, 2017). It is clear in Neste's bond prospectus that management wants to pursue supplying biofuels to the EU market, forecast to double in size by 2021 to 20 million tonnes. The Norwegian government's policy changes are important to Neste Corporation as Neste is the sole supplier to the Norwegian market of palm oil-based biofuels.

Biofuels produced from vegetable oil are called 1st generation biofuel. Because the production of this type of biofuels competes with food crops production, more sustainable technologies have been developed. 2nd generation biofuels are produced from agricultural waste and 3rd generation biofuels from algae.

2.2 Encouraging shifting consumption to sustainable palm oil

Singapore's consumption of palm oil-based cooking oil

Palm oil is widely used as a cooking oil among eateries in Singapore, but awareness of that fact remains low, both among the public and the eateries themselves. A PM.Haze investigation found that out of 75 eateries surveyed, 46 used palm oil in their cooking oil, of which only two (Veganburg and Grain) claimed to use certified sustainable palm oil (see

Appendix D). Of the 44 using uncertified palm oil, only one even knew they were using palm oil, while the rest referred to the oil they were using as “vegetable oil”.

In Singapore, there are at least 3 suppliers which can provide RSPO-certified cooking oil to eateries and 6 brands of retail-size RSPO-certified cooking oil (the list is available in Appendix D). As of October 2017, 4 Singapore-based food service companies claim to be using certified sustainable palm oil: IKEA Singapore’s restaurants, Wildlife Reserves Singapore’s eateries, Veganburg, and Grain.

Singaporean palm oil buyers as potential change agents

Though domestic consumption of palm oil is relatively low, many Singapore-based eateries also have a strong regional presence. For example, Old Chang Kee has outlets in Australia, Indonesia, and Malaysia, while the Breadtalk Group has operations in 17 countries, including China and Indonesia. If these Singapore-based eateries were to introduce company-wide sustainability sourcing policies, they would significantly influence larger markets in the region that until now have not shown strong consumer demand for sustainable palm oil.

The commitment of more Singapore-based eateries to sustainable palm oil would also send a strong signal palm oil growers that consumers are placing greater importance on sustainable sourcing. This would in turn push growers to adopt or enforce stronger sustainability practices. In 2010, Nestle, for example, adopted an NDPE policy, which in turn pushed one of their suppliers, Golden Agri-Resources, to also adopt an NDPE policy (Cheam, 2011).

Singapore has already established the Singapore Alliance for Sustainable Palm Oil (SASPO), a coalition of NGOs and palm oil buying companies and eateries that aim to increase the number of commitments by Singapore-based companies to sourcing sustainable palm oil. SASPO provides capacity-building, publicity, and other forms of support to companies interested in making this commitment.

Bioethics implications

The bioethics principle “risk assessment and management” (Article 20) recommends the appropriate assessment and adequate management of risk. In the context of increasing public concern over the impacts of plantations and fast-changing sustainability and environmental regulations, sourcing from unsustainable suppliers represents a considerable risk. Moreover, in line with the bioethics principle “benefit and harm” (Article 4), palm oil buyers should strive to minimise any possible direct or indirect harm caused by their operations, which includes indirectly contributing to the creation of haze pollution.

Recommendation: Eateries, manufacturers, and retailers that use palm oil should adopt a time-bound plan for 100% of the palm oil used as cooking oil across their operations to be RSPO-certified.

2.3 Reducing food-related demand for all types of vegetable oil

It stands to reason that reducing food-related demand for palm oil would help limit the expansion of unsustainably-produced palm oil. In fact, a recent study showed that if both developed and developing countries were to converge to a “healthy” level of vegetable oil consumption, the demand for land for oil production would be reduced by 70% (Koh & Lee, 2012).

Most experts agree that a reduction in overall oil consumption would have positive effects on global health. The preparation of fried food tends to use the most oil and is often associated with negative health effects.

Dietary guidelines in many countries discourage the consumption of food with high saturated fat. Singapore’s Health Promotion Board (HPB), for example, groups vegetable oils with lower saturated fat content under the “Healthier Choice” label (Singapore Health Promotion Board, 2016). Palm oil contains about 50% saturated fat, which is comparatively higher than other vegetable oils such as olive and rapeseed. Saturated fat intake has been linked with higher levels of LDL cholesterol (Sun et al., 2015), which is in turn linked to higher risk of heart disease and mortality.

However, a recent study across 18 countries has shown that higher saturated fat intake is associated with lower cardiovascular disease and mortality (Dehghan et al., 2017). The conflicting results may be due to the overall diet intake as many studies that linked higher saturated fat intake with poor health were done in Western countries (Dehghan et al., 2017). Overall, there is a lack of clear evidence showing clear benefits of unsaturated fat versus saturated fat.

Recommendation: Consumers, businesses, and other organisations in Singapore should avoid excessive consumption of fats and oil, especially by reducing their intake of fried food.

Pulp and paper

Out of 10.6 million hectares of pulpwood concessions in Indonesia, 1 million hectares is managed by APRIL Group, which is headquartered in Singapore, while another 2.6 million hectares is managed by Asia Pulp and Paper, which has an office in Singapore.

Singapore is a major consumer of paper and cardboard, using 1,183,100 tonnes of paper and cardboard in 2016 (National Environment Agency, 2017), or 211 kilograms per capita.

Category	Stakeholders, Policies, Initiatives
<i>Trade Institutions</i>	WTO, World Bank, UNCTAD, OECD Trade Ministries/Boards of Indonesia, Malaysia & Singapore
<i>Trade Blocs</i>	EU, ASEAN, RCEP (proposed)
<i>Sustainable Trade-Focused NGOs</i>	IDH Sustainable Trade Initiative TFA 2020
<i>Standard-Setting Bodies</i>	FSC, PEFC
<i>Trade Finance</i>	Banking Environment Initiative Finance Alliance for Sustainable Trade
<i>Producers</i>	APRIL, Asia Pulp and Paper

Recommendation: Consumers, businesses, and other organisations should reduce wastage of paper.

What can Singapore's financial sector do?

Introduction

Singapore's contribution to the haze problem extends to its financial system, which finances much of the region's agribusiness. When financial institutions provide financing to clients in the agribusiness sector without considering their clients' sustainability practices and possible negative impacts, they may contribute indirectly to causing fires and haze. To address this, financial institutions and retail investors can tie access to loans or investment capital to compliance with sustainability standards, thereby influencing agribusiness companies to align themselves with these standards.

This section will cover the major players in the financial system, particularly banks and institutional investors, and their role as creditors and investors for agribusinesses. It will then discuss existing sustainable finance solutions and how access to capital and finance can be used to influence palm oil and paper producers to adopt sustainable, haze-free practices.

Key findings:

All three Singaporean banks are major financiers of the regional palm oil industry and other industries producing high-risk forest commodities. Despite this, none of the three banks publish specific details of their loans to these industries.

All three Singaporean banks DBS, OCBC and UOB have only recently adopted responsible financing frameworks that embed environmental, social, and governance factors (ESG) into the process of deciding whom they lend money to and what conditions are included in the loan.

Singapore's sovereign wealth fund GIC and investment company Temasek have not publicly disclosed their ESG policies in detail, and as such, it is not known how much they have integrated sustainability criteria into their investment processes.

Recommendations:

6. Singaporean financial institutions should use green finance and micro-credit to promote the adoption of sustainable palm oil and the development of forest- and peat-friendly agriculture.
7. Singaporean financial institutions, including local banks OCBC, DBS, and UOB and state-owned institutional investors GIC and Temasek, should all adopt ESG policies with publicly disclosed sector-specific policies covering agriculture and forestry that require customers who are palm oil growers, traders, and processors to:
 - a. Adhere to NDPE policies
 - b. Have RSPO membership and a time-bound plan for 100% RSPO certification for own plantations and supply chains
8. Singaporean financial institutions should publish a list of their clients in high-risk sectors, including agriculture and forestry, to promote transparency and accountability.
9. Singaporean financial institutions should become members of international sustainable finance governing bodies, covenants, and initiatives such as the Banking Environment

Initiative (BEI), Equator Principles, and RSPO to understand industry issues and global best practices, build capacity, and participate in the decision-making process.

10. The Singapore Exchange should enact a timeframe for listed companies to improve their sustainability reporting standards, such as by obtaining third party assurance and engaging in stakeholder consultation.

The major players financing the global palm oil and pulp and paper trade

Palm oil and pulp and paper are highly capital-intensive industries that rely significantly on private financing. Between 2004 and 2014, more than USD 50 billion was invested in the Malaysian and Indonesian palm oil sectors, with half of this going to 27 of the largest palm oil companies (Friends of the Earth, 2014a).

Table 3 below highlights some of the major financial players and their roles.

Category	Stakeholders/Players/Policies
<i>Regulators</i>	Singapore: MAS Indonesia: OJK Malaysia: Bank Negara, Labuan FSA
<i>Stock Exchanges</i>	Singapore Exchange (SGX) Indonesia Stock Exchange (IDX) Bursa Malaysia
<i>Banks</i>	Global: HSBC, Citi, Rabobank, Standard Chartered, BNP Paribas Regional: CIMB, Bank Mandiri, Mitsubishi UFJ, Sumitomo, Australian banks Singapore: OCBC, DBS, UOB
<i>Institutional Investors</i>	Sovereign funds, pension funds, asset/fund managers, mutual funds, private equity firms, Insurance companies Singapore: Temasek, GIC
<i>Sustainable Finance Initiatives</i>	Global: UN PRI, Banking Environment Initiative, UN PRI Sustainable Palm Oil Investor Working Group, Equator Principles, UN Environment Finance Initiative, IFC Performance Standards, BACP, Soft Commodities Compact, OECD Guidelines, Sustainable Stock Exchanges Initiative Singapore: ABS Guidelines, SGX Sustainability Reporting Guidelines, Singapore Stewardship Principles
<i>NGOs, Think Tanks, Research and Advocacy Organisations</i>	WWF, Greenpeace, Rainforest Action Network, WALHI, Transformasi untuk Keadilan (TuK), Tropical Forest Alliance 2020, Chain Reaction Research, SIIA, Aidenvironment

Table 3: Major players in the financial system

The financial system is linked to the palm oil and pulp and paper industry in two ways: either as creditors or investors.

Creditors

Banks are important sources of capital for the palm oil sector through loans and underwriting. Banks directly provide an estimated 24% of the total financing needed by the palm oil sector (Vermeer, 2017). Between 2008 and 2014, major financial institutions have extended the palm industry more than S\$27 billion in loans, bonds, and equity financing (Friends of the Earth, 2014b).

The infographic below shows the various important roles banks play in the operations of different players in the supply chain, which include providing the funding for producers’ operations, growth and expansion, and the working capital for commodity traders and manufacturers.

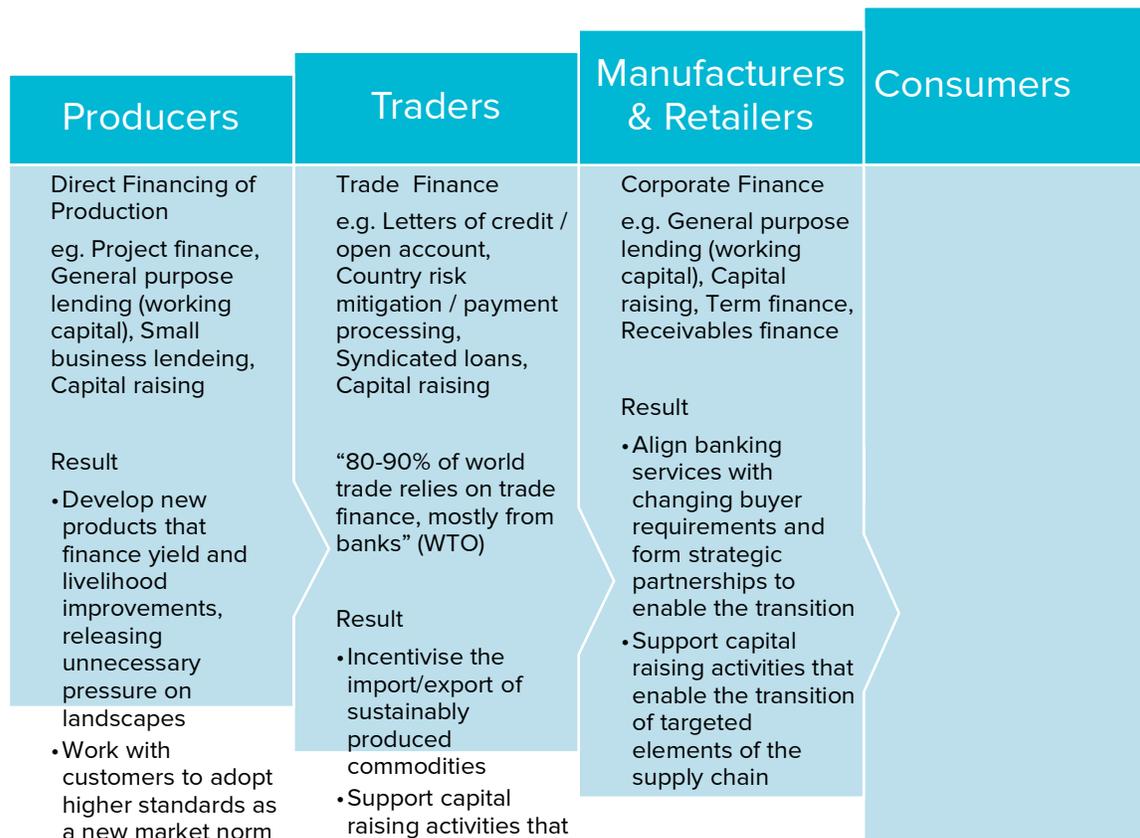


Figure 9: How banks finance commodity supply chains (Banking Environment Initiative (BEI), 2015)

The list of banks that have provided loans and underwritten shares for palm oil companies over the past 15 years is extensive and includes many of the most well-known banks in the region and in the world. The following infographic identifies the major international and regional banks that have given loans to the 25 biggest tycoon-controlled palm oil groups in Indonesia. All 3 Singaporean banks, DBS, OCBC, and UOB, are on the list.

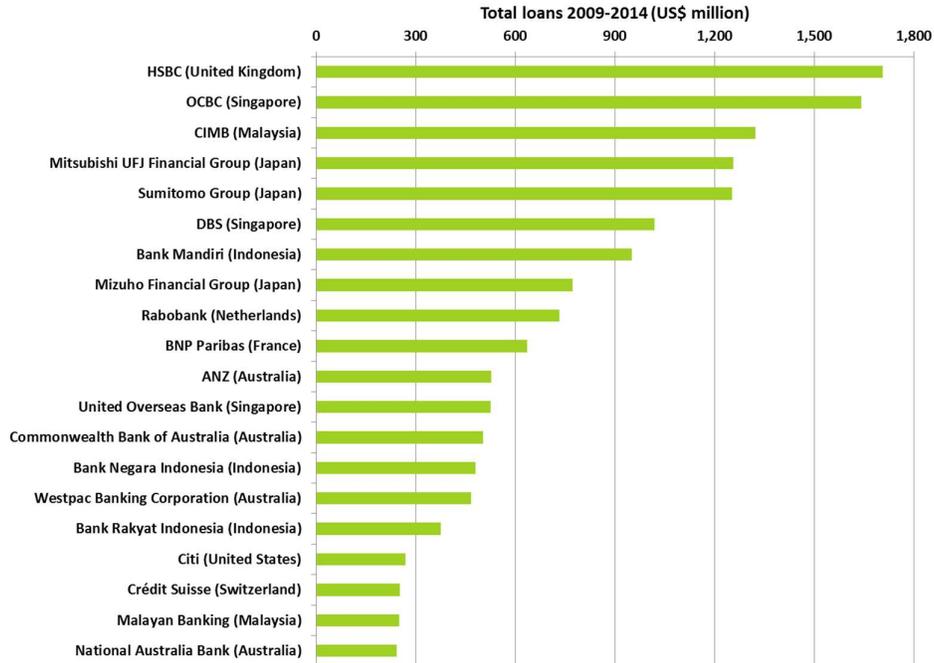


Figure 10: Direct financing to palm oil industry (2009-2014) (Winarni & van Gelder, 2015)

Many of these banks lack robust policies to avoid extending capital to companies that run a high risk of causing environmental damage (Pek, 2015). Given the sheer volume of financing provided by the banking sector to the palm oil sectors and the relatively low proportion of sustainably produced products to total production, it can be reasonably concluded that a significant percentage of financing goes towards firms engaging in unsustainable practices.

Investors

Equity holders include shareholders and institutional investors such as large pension funds, sovereign funds, investment management corporations, and mutual funds. Shareholders exert pressure on palm oil companies to generate higher returns and dividends, pushing companies to adopt less costly but unsustainable operating practices. However, shareholders of public companies can also play an important role in forcing positive reform through voting.

Singapore’s role

Singaporean banks

All three Singaporean banks are major financiers of the regional palm oil industry and other industries producing high-risk forest commodities. Despite this, none of the three banks publish specific details of their loans to these industries.

A Chain Reaction Research report from February 2017 (Climate Reaction Research, 2017) showed that 15 banks, including all 3 Singaporean banks, provided 72% of direct loans to 16 major palm oil companies from 2006 to 2015 (see Figure 8). Among Singaporean banks, OCBC topped the list with close to USD 2.5 billion provided. DBS was second with approximately USD 1.25 billion provided, and UOB came third, providing approximately USD 600 million. The report further concluded that direct financing via loans by banks was more significant to the industry than financing via equity and bonds.

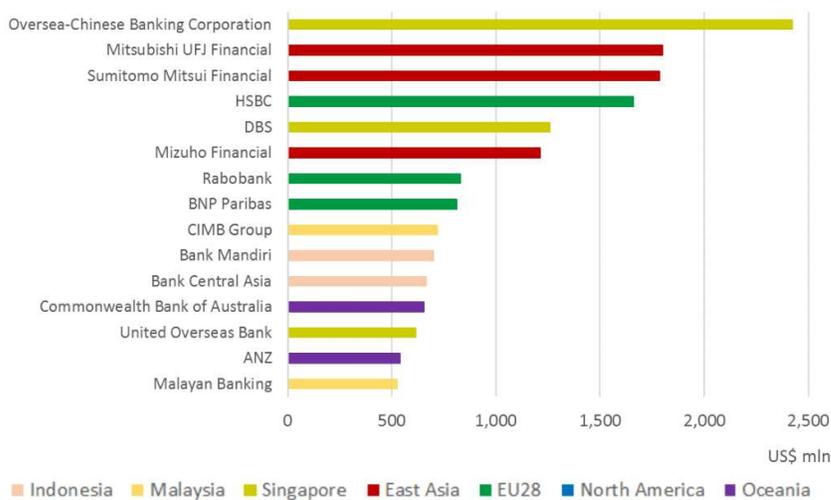


Figure 11: 15 Banks provided 72% of total loans to palm oil from 2006-2015 (Climate Reaction Research, 2017)

Rainforest Action Network’s Forests and Finance report also identified 180 banks who financed forest-risk commodities from 2010 to 2016 through both loans and equity underwriting. This list also placed DBS and OCBC in the top 15 (see Figure 9). The report further found that while OCBC’s financing had been mostly restricted to the palm oil sector, DBS had financed palm oil as well as rubber and timber companies. Another report, produced in 2017 by Aidenvironment (Aidenvironment, 2017), identified specific Indonesian palm oil firms financed by DBS and OCBC that were engaging in unsustainable practices.

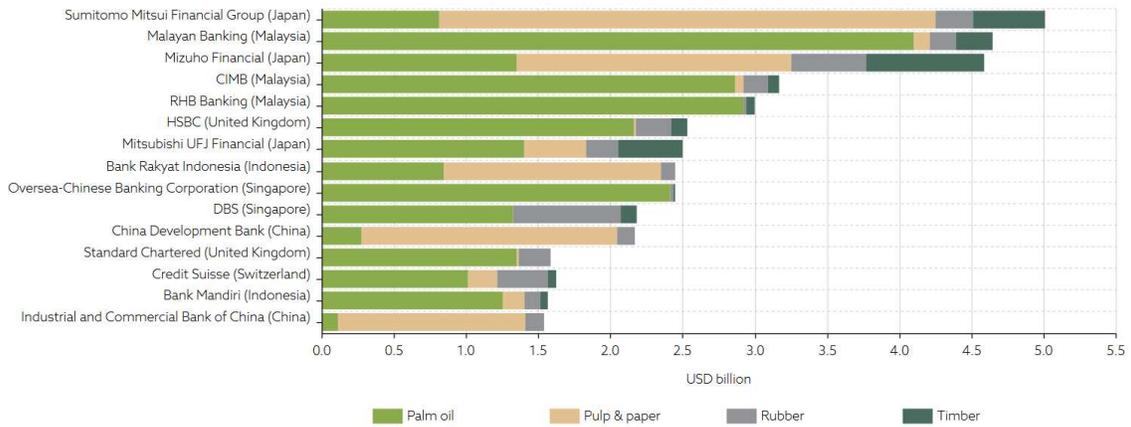


Figure 12: Top 15 loan and underwriting providers to forest-risk sector, 2010-2016 (Rainforest Action Network, Tuk INDONESIA, & Profundo, 2017)

A scorecard published by the Forests and Finance Project in September 2016 also assessed the environmental and social policies of 27 major banks (see Figure 10). Banks could score a maximum of 30 based on their “scope of commitments”, “environmental standards”, and “social standards”. DBS and OCBC scored 1 out of 30.

Singapore institutional investors

Institutional and retail investors hold significant investments in large publicly-traded palm oil companies such as Wilmar, Kuala Lumpur Kepong, and IOI Corporation. Unlike retail investors, institutional investors, such as large asset management firms and pension funds, often hold significant percentages of these companies, giving them the ability to influence these companies' operations. Institutional investors with major palm oil holdings include Schroders, BlackRock, Van Eck Associates, Fidelity, and sovereign wealth funds such as Singapore's Temasek Holdings (Pek, 2015).

A promising course of action is therefore to encourage institutional investors to enforce sustainability standards (e.g. RSPO, NDPE) across their holdings. It is comparatively easier to accomplish this for sovereign wealth funds than private funds, as sovereign wealth funds are answerable to their citizenry. Such a precedent was first set by Norway's Government Pension Fund Global (Statens pensjonsfond Utland, or SPU) when it divested from 30 palm oil companies between 2010 and 2012 in an effort to remove environmentally damaging industries from its portfolio.

For Singapore's sovereign wealth fund GIC and investment company Temasek Holdings, neither organisation has publicly disclosed their ESG policies in detail. As such, it is not known how much they have integrated sustainability criteria into their investment processes. It is however known that Temasek holds a 51% stake in Olam, one of the largest agri-business firms in the region. This provides a possible example through which the Singaporean government could directly influence a change in practices at Olam through Temasek's ownership.

The issue of GIC and Temasek's holdings in "haze-linked" companies was raised in Singapore's Parliament in January 2016. In his response, the Minister of Finance said that both GIC and Temasek support zero burning policies for land clearance. The Minister also pointed out that the individual investments of GIC and Temasek are the responsibility of their respective management teams, with the government choosing to monitor only their financial performance (Channel NewsAsia, 2016). However, should the Government rethink its position, it would not only be able to exert a major change in the oil palm and other agricultural commodities industries, but also pave the way for other investment managers to follow suit.

Responsible finance

The bioethics principle “benefit and harm” (Article 4) recommends that direct and indirect benefits to affected individuals should be maximised and any possible harm minimised. In addition, the bioethics principle “risk assessment and management” (Article 20) advises businesses to conduct appropriate assessment and adequate management of risk. In line with these principles and the global best practices in the palm oil and paper industry, local banks should adopt robust policies for socially responsible investment (SRI), otherwise known simply as “responsible financing”.

Responsible financing can be divided into negative and positive screening. In the context of haze, negative screening involves excluding companies that conduct burning, deforestation, peat drainage, and other haze-causing activities, while positive screening involves preferentially extending capital to companies that have verifiably exceeded industry sustainability standards.

As a minimum, responsible financing policies should include an NDPE policy. Unlike certification standards, NDPE does not have a regulatory body and there is no single standard set of criteria and indicators. However, there is increasing consensus on the best practices and specific criteria to meet those principles (see Appendix C for our template of a basic NDPE policy relevant to haze and its processes). Moreover, when conducting their evaluation of prospective clients, financial institutions should not look only at a specific project but consider the NDPE implementation across all operations of the company’s group.

Another important component of the ESG policy should be a requirement for customers in the agribusiness sector to be RSPO members and have a time-bound plan for 100% RSPO certification, at least for their own plantations in the case of growers.

Finally, in alignment with the bioethics principle “decision-making and addressing bioethical issues” (Article 18), banks should be transparent about the implementation of their ESG policy. They should publicly disclose sector-specific policies for the high-risk industries mentioned in the Association of Banks in Singapore (ABS)’s Guidelines on Responsible Financing, in particular agriculture and forestry. In addition, they should publish a list of their clients operating in these high-risk sectors. This will allow stakeholders to assess the effectiveness of the banks’ screening procedures.

Besides mitigating the banks’ risk and minimising their exposure to unsustainable practices, the implementation of responsible financing standards can also exert an influence on the operating practices of companies in the agribusiness sector. A 2017 Chain Reaction Research report, “Banks Finance More Palm Oil Than Investors”, highlighted that palm oil companies that improved their sustainability performance from 2010 to 2015 were able to attract more loans and issue more bonds (Climate Reaction Research, 2017). In comparison, companies that lagged in sustainability performance had to increasingly rely on loans from banks with similarly weak ESG policies. As more banks implement more stringent ESG policies and the cost of capital becomes further linked to environmental sustainability performance, industry laggards may be forced to adapt to avoid encountering significant financial difficulties.

Recommendation:

Singaporean financial institutions, including local banks OCBC, DBS, and UOB and state-owned institutional investors GIC and Temasek, should all adopt ESG policies with publicly disclosed sector-specific policies covering agriculture and forestry that require customers who are palm oil growers, traders, and processors to:

- a. **Adhere to NDPE policies**
- b. **Have RSPO membership and a time-bound plan for 100% RSPO certification for own plantations and supply chains.**

Financial institutions can also support companies and smallholders to adopt haze-free agricultural practices or develop forest- and peat-friendly agriculture, by providing low-interest loans or preferential credit terms to these clients.

Recommendation: Singaporean financial institutions should use green finance and micro-credit to promote the adoption of sustainable palm oil and the development of forest- and peat-friendly agriculture.

Transparency and accountability

The bioethics principle “decision-making and addressing bioethical issues” (Article 18) emphasises the importance of professionalism, honesty, integrity, and transparency in decision-making processes. It also encourages dialogue and informed pluralistic public debate, involving the expression of all relevant opinions.

The key to the successful implementation of responsible finance is transparency, from both palm oil companies and financial institutions. Increased transparency of financing policies and client lists provide stakeholders with oversight on how well responsible financing is being implemented, and sends a market signal to potential creditors that access to finance is increasingly tied to their sustainability performance.

Recommendation: Singaporean financial institutions should publish a list of their clients in high-risk sectors, including agriculture and forestry, to promote transparency and accountability.

It is also important for agribusiness companies to perform regular and rigorous sustainability reporting, so that their financiers and investors have access to latest information about their sustainability performance. The most important sustainability reporting regime in Singapore is overseen by the Singapore Exchange (SGX), which has mandated all its issuers to perform sustainability reporting on a “comply or explain” basis from the financial year ending on or after 31 December 2017 (L. Loh, Nguyen, Sim, Thomas, & Wang, 2016). “Comply or explain” means that issuers have to either issue a sustainability report outlining the material sustainability issues facing the company, or make a statement explaining why they did not issue such a report.

Though this is a good first step, “comply or explain” nevertheless provides a loophole for issuers to not report or under-report their sustainability-related risks. SGX has stated that its rationale for choosing “comply or explain” rather than a more stringent reporting requirement is so that issuers have time to analyse their sustainability risks, rather than produce sustainability reports as a “box-ticking exercise”.

Once Singaporean issuers have become more familiar with the sustainability reporting process and have investigated their sustainability risks, it would therefore be appropriate for SGX to mandate more stringent criteria for sustainability reporting that are not currently required, such as obtaining third-party assurance for sustainability reports and engaging in a public stakeholder consultation to ensure that all possible sustainability concerns are addressed.

Recommendation: The Singapore Exchange should enact a timeframe for listed companies to improve their sustainability reporting standards, such as by obtaining third party assurance and engaging in stakeholder consultation.

Existing initiatives

The following is a list of existing responsible financing initiatives at the Singapore, regional, and global level.

Singapore

Association of Banks in Singapore (ABS) Guidelines on Responsible Financing (October 2015)

The ABS Guidelines on Responsible Financing define the minimum standards for responsible financing practices for banks operating in Singapore. Member banks may adopt higher standards if they wish. Banks are expected to fully comply with the guidelines by 2017.

DBS, OCBC, and UOB have adopted responsible financing frameworks, which embed environmental, social and governance factors (ESG) into their credit processes. In particular, DBS has set an ambitious sector-specific standard for palm oil based on NDPE and RSPO. DBS has specified that new borrowers should “additionally demonstrate alignment with no deforestation, no peat and no exploitation policies... We will also consider new customers who have achieved RSPO certification or are able to demonstrate that they are working towards achieving RSPO certification within a satisfactory timeframe.”

Singapore Stewardship Principles (SSP)

The Singapore Stewardship Principles for Responsible Investors (SSP) are developed by the Stewardship Asia Centre think tank, which is part of the Temasek Management Services Group (Stewardship Asia, 2015). The SSP aims to enable investors to be active and responsible shareholders, and provides standards for the activities and functions of investors as related to the boards and management of investee companies.

The SSP outlines seven guiding principles:

- Take a stand on stewardship
- Know your investment
- Stay active and informed
- Uphold transparency in managing conflicts of interest
- Vote responsibly
- Set a good example
- Work together

A total of 38 asset manager and investment companies have pledged their support for the initiative. These include Aberdeen Asset Management, BlackRock, JPMorgan Asset Management, and Temasek Holdings (Wong, 2016).

Collaborative initiative for Green Finance in Singapore

In April 2017, the Singapore Institute of International Affairs (SIIA), an independent think tank based in Singapore that researches political economy and sustainability issues, launched the “Collaborative initiative for Green Finance in Singapore” (Othman, 2017b). The initiative aims to explore green financing possibilities for financial industry players in Singapore and create a framework for assessing their green finance practices. The Initiative is supported by the Monetary Authority of Singapore (MAS) and the Association of Banks in Singapore (ABS), and is conducted in partnership with the UN Environment Inquiry into the Design of a Sustainable Financial System, which has supported national dialogues on sustainable finance in various other countries.

So far, the initiative has convened various working group meetings among members of Singapore’s financial industry, as well as conducted one-on-one interviews with financial institutions and other stakeholders. Through these engagements, the Initiative hopes to establish a baseline for the implementation of green finance in Singapore and provide recommendations for scaling this up in the near future.

Based on these findings, the initiative will be compiling a list of recommendations into a paper that will be launched in mid-November 2017. Over the next few years, the initiative plans to expand their work to other ASEAN countries to streamline green finance initiatives across ASEAN.

Regional

Indonesia’s Sustainable Finance Roadmap

In December 2015, the Indonesian Financial Services Authority (OJK) and Indonesia’s Ministry of Environment and Forestry (KLHK) launched their "Roadmap for Sustainable Finance in Indonesia". The goal of the roadmap is to determine which measures need to be taken to improve the sustainability of finance in Indonesia, and to have these implemented by 2024 (Otoritas Jasa Keuangan, 2014).

Sustainability Reporting in ASEAN

It is difficult for investors to monitor the sustainability performance of agribusiness companies without adequate disclosure. One solution to this is sustainability reporting requirements, which are usually mandated by stock exchanges. Sustainability reports provide regular information about a company’s environmental, social, and governance performance.

Some of ASEAN’s national stock exchanges, including Indonesia’s IDX, Malaysia’s Bursa, and Thailand’s SET, have already mandated sustainability reporting for listed companies. In Singapore, sustainability reporting will be conducted on a “comply or explain” basis from the financial year ending on or after 31 December 2017 (L. Loh et al., 2016).

ASEAN Sustainability Landscape

	Indonesia (IDX)	Malaysia (BURSA)	Singapore (SGX)	Thailand (SET)
Sustainability Reporting Enforcement Level	Mandatory	Mandatory	‘Comply or explain’ basis from financial year ending on, or after 31 December 2017	Mandatory
Sustainability Reporting Written Guidance	Nil	Bursa’s ‘Sustainability Reporting Guide’	SGX’s ‘Guide to Sustainability Reporting for Listed Companies’	CSRI’s ‘Guidance for Sustainability Reporting’
Sustainability Index	KEHATI-SRI Index	FTSE4Good Bursa Malaysia Index	SGX Sustainability Indices	Nil

Figure 13 Sustainability reporting in ASEAN

Stock exchanges that need support on sustainability policies can join the Sustainable Stock Exchanges initiative (SSEI), which is a peer-to-peer learning platform for exploring how exchanges, in collaboration with investors, regulators, and companies, can enhance corporate transparency – and ultimately performance – on ESG (environmental, social and corporate governance) issues and encourage sustainable investment. SGX joined SSE in 2016.

Global

Norges Bank Investment Management (NBIM) manages Norway's USD 900 billion sovereign wealth fund, the Government Pension Fund Global (GPF). This is the world's largest sovereign fund. Between 2012 and 2015, NBIM divested from more than 30 palm oil companies due to their excessive risk of contributing to tropical deforestation.

Among international banks, **Standard Chartered and HSBC** have particularly strong palm oil policies based on NDPE and RSPO, with clearly defined standards and timeframes with expectations for both new and existing clients.

The **Sustainable Shipment Letter of Credit** is an initiative by the Banking Environment Initiative through which the International Finance Corporation, the World Bank's investment arm, will offer preferential terms of credit to its partner banks when they finance the import of RSPO-certified palm oil to emerging markets.

The **Equator Principles (EPs)**, launched in 2003, are a risk management framework adopted by financial institutions, primarily banks, for determining, assessing, and managing environmental and social risk in project financing. It is primarily intended to provide a minimum standard for due diligence to support responsible risk management and decision-making.

The **Sustainable Palm Oil Investor Working Group (IWG)** is a grouping of investment organizations, representing assets under management of over S\$3.4 trillion, which are members of the United Nations-supported Principles for Responsible Investment (PRI) and support the development of a sustainable palm oil industry.

Financial institutions that need capacity-building support can also turn to a number of industry and research groups dedicated to promoting sustainable finance. Membership in such groups can also help banks bridge the gap between policy and implementation. These groups include the United Nations Environment Programme Finance Initiative, the Bankers Environment Initiative (BEI), the UN Principles for Responsible Investment (PRI), and the Soft Commodities Compact. To date, none of the Singaporean banks have become members of these groups.

Recommendation: Singaporean financial institutions should become members of international sustainable finance governing bodies, covenants, and initiatives such as the Banking Environment Initiative (BEI), Equator Principles and RSPO to understand industry issues and global best practices, build their capacity, and participate in the decision-making process.

What can the Singapore government do?

Introduction

Under its Sustainable Singapore Blueprint 2015, the Singapore government has set long-term targets to bring domestic air quality in line with World Health Organisation (WHO) guidelines. Meanwhile, recurring regional haze has also been recognised by the Association of Southeast Asian Nations (ASEAN) as “one of the most pressing environmental problems facing ASEAN” (The ASEAN Secretariat, 2006). The haze’s extensive reach and its alarming ability to inflict considerable harm on health, the economy, and the environment have led it to be regarded as a grave non-traditional security (NTS) threat.

Over the years, the Singapore government has tried to tackle the haze issue at the unilateral, bilateral, and multilateral levels. While these attempts have led to notable progress, they have not been smooth-sailing. It is therefore instructive to examine past and current efforts by the Singapore government to address haze to design better avenues in the future that incorporate bioethics principles and current geopolitical concerns.

This section will review past and current attempts by the Singapore government to tackle the haze issue at the unilateral, bilateral, and multilateral levels. Next, it will discuss why the attempts worked or did not work, with reference to the inter-state geopolitical situation and bioethics principles. Finally, it will assess potential avenues for the Singapore government to more effectively tackle the haze issue in the future.

Key findings

- Efforts to address the haze issue through ASEAN have been more successful compared to unilateral and bilateral initiatives, due to ASEAN’s emphasis on solidarity, equity, and respecting autonomy and consent.
- Various policies to promote sustainable practices at the domestic level in Singapore have been successfully implemented without negative geopolitical impacts.

Recommendations

As ASEAN Chair in 2018, Singapore can initiate an ASEAN-wide approach towards tackling transboundary haze by:

11. Helping harmonise definitions and requirements for sustainable palm oil and paper and work together to enforce them throughout the supply chain and trading process within ASEAN.
12. Helping harmonise sustainable finance regulations across ASEAN.
13. Helping harmonise air quality standards and targets for ASEAN.

Singapore should also:

14. Tighten CITES protection to include items in transit and expanding the Endangered Species (Import & Export) Act to include illegally logged timber.
15. Increase its contribution to the ASEAN Haze Fund to be channelled to peat protection and restoration projects and the implementation of the ASEAN Haze-free Roadmap.
16. Empower non-state actors, such as academics and non-governmental organisations (NGOs), to collaborate in research to prevent haze, such as sustainable peat management and peat restoration.
17. Make a time-bound national commitment to import 100% sustainable palm oil
18. Enact a government procurement policy that includes RSPO-certified cooking oil.
19. Support the Singapore Alliance for Sustainable Palm Oil (SASPO) through financial or other means.
20. Promote sustainable business practices in Singapore by:
 - d. Promoting responsible finance and green micro-credit to support sustainable palm oil and forest- and peat-friendly agriculture (recommendation 6).
 - e. Encouraging all financial institutions and funds in Singapore to develop and disclose their Environmental, Social, and Governance (ESG) policies (recommendation 7).
 - f. Having the Singapore Exchange enact a timeframe for listed companies to improve their sustainability reporting standards, such as by obtaining third party assurance and engaging in stakeholder consultation (recommendation 10).

Past and current attempts by the Singapore government to address haze

Unilateral action

Singapore and Indonesia have traditionally enjoyed deep and friendly bilateral ties. However, serious haze episodes may severely strain this relationship.

A particular point of contention is the Transboundary Haze Pollution Act (THPA), a statute enacted by Singapore in 2014 criminalising activities that contribute to unhealthy levels of haze pollution in Singapore (Transboundary Haze Pollution Act, 2014). While some in Indonesia welcomed the THPA, others like Indonesia's Environment and Forestry Minister Siti Nurbaya Bakar felt that it was a contravention of Indonesia's national sovereignty (Saifulbahri, 2016). The backlash against the THPA was especially severe in 2016, when Singapore issued a court warrant against a director of an Indonesian firm that was suspected to have contributed to the haze in 2015 (A. Tan, 2016a). Shortly after the court warrant was issued, Minister Siti Nurbaya announced that Indonesia would be conducting a substantial review of all ongoing and upcoming environment and forestry-related bilateral collaboration projects with Singapore, and would subsequently inform Singapore of the projects and initiatives to be ceased (foresthints.news, 2016).

The Singapore government found it difficult to understand Indonesia's reaction, arguing that the THPA is designed to "complement the efforts of other countries to hold companies to account" and that it complied with international law as the crime had harmful effects on the state concerned (Jayakumar & Koh, 2016). However, we may be able to gain some insights by examining this episode through the lens of bioethics. The bioethics principles of "autonomy and individual responsibility" (Article 5) and "consent" (Article 6) state respectively that the "autonomy of persons to make decisions ... is to be respected" and any intervention should only be carried out with the "prior, free and informed consent of the person concerned". In this case, Indonesia might have felt that its autonomy to carry out its own laws for crimes committed on their soil had been interfered with (The Straits Times, 2016), based on a law that was enacted without their consent (Saifulbahri, 2016).

In contrast, there was no backlash when the Singapore government incorporated sustainably-certified paper into its public procurement policy, or when the Association of Banks in Singapore released guidelines for banks in Singapore to adopt ESG policies. This was likely because these initiatives focused on improving the sustainability performance of Singapore's domestic actors, rather than attributing blame to Indonesian parties.

An interesting comparison can be drawn the adoption of a resolution by the EU Parliament in April 2017 that called on the EU to "introduce a single certification scheme for palm oil entering the EU market and phase out the use of vegetable oils that drive deforestation" and to ban biofuels made from vegetable oils, including palm oil, by 2020 (European Parliament, 2017; Sustainable Brands, 2017). The response from the major palm oil producing countries, especially Indonesia and Malaysia, was highly negative. These countries claimed that the resolution was a form of protectionism and trade bias and have announced an intention to raise this issue with the World Trade Organisation (Reuters, 2017).

However, the EU Resolution appears to be in line with WTO regulations. World Trade Organisation rules state that members can adopt trade-related measures aimed at protecting the environment, subject to certain specified conditions (World Trade Organization, 2017). The General Agreement on Tariffs and Trade (GATT) also has an article on “General Exceptions” that allow for trade-related measures “necessary to protect human, animal or plant life or health” as long as such measures are not applied in a manner that discriminates between countries where the same conditions prevail, or serves as a disguised restriction on international trade (General Agreement on Tariffs and Trade, 2012). Similarly, the THPA was strongly rejected by Indonesia, despite having a basis in international law.

It was likely that the negative reception of the resolution by Indonesia and Malaysia was a result of the unilateral way in which the EU resolution was formulated. No palm oil producing countries were consulted during the process of drafting the resolution. Neither does the resolution provide for any measures to mitigate the impact such a regulation would exert on palm oil-producing companies and small-scale farmers, an issue of primary concern for countries such as Indonesia and Malaysia.

These two incidents highlight the importance of having nations on both ends of the supply chain involved in formulating any inter-governmental agreement on palm oil.

In summary, any unilateral actions taken by Singapore with regards to the haze issue should focus on improving the performance of domestic actors and curbing illegal activity within its borders, rather than seeking to influence the actions of non-Singaporean actors. The Singapore government should therefore support the following recommendations:

Expanding CITES protection

The illegal logging of timber is a contributing factor to haze, as protected areas and state-owned land is often cleared using fire after its timber has been illegally harvested. The illegal clearance of land for timber also makes it easier for other actors to encroach deeper into restricted areas and conduct further burning and clearing. By restricting the import and trading of illegal timber through Singapore’s ports, Singapore can make it more difficult for illegal loggers to sell their timber and reduce the attractiveness of engaging in haze-causing logging activities.

Recommendation: Singapore should tighten CITES protection to include items in transit and expand the Endangered Species (Import & Export) Act to include illegally logged timber.

Making a time-bound national commitment to sustainable palm oil

Seven European countries have signed the Amsterdam Declaration, which commit the countries to promoting the use of 100% sustainable palm oil by 2020. These countries are Denmark, France, Germany, Italy, the Netherlands, Norway, and the United Kingdom. A similar commitment from Singapore would greatly improve the uptake of certified sustainable palm oil and awareness of palm oil’s links to haze within Singapore.

Recommendation: The Singapore government should make a time-bound national commitment to import 100% sustainable palm oil.

Making a time-bound national commitment to sustainable palm oil

The Singapore government has already enacted a policy to procure only sustainable paper with the Singapore Green Label from September 2016. By extending this policy to certified sustainable palm oil, Singapore can significantly increase demand for sustainable palm oil.

Recommendation: The Singapore government should enact a procurement policy that includes RSPO-certified cooking oil.

Supporting the Singapore Alliance for Sustainable Palm Oil (SASPO)

The Singapore Alliance for Sustainable Palm Oil (SASPO) was launched in June 2016 by the World Wide Fund for Nature (WWF) Singapore and aims to provide a platform to connect retailers and manufacturers who have committed to sourcing and producing sustainable palm oil, as well as support other companies to make and implement such commitments. The five founding members of the alliance are consumer goods giant Unilever, established Singapore consumer goods manufacturer Ayam Brand, food and beverage specialist Danone, home furnishing retailer IKEA, and Wildlife Reserves Singapore.

Similar national associations for sustainable palm oil exist in other countries, such as Belgium, Denmark, Germany, the Netherlands, and Sweden. However, in most of these countries, these national associations are explicitly endorsed by the government and enjoy the financial and regulatory support of national trade associations. Though Singapore's Ministry of Environment and Water Resources has voiced support for SASPO, the Singapore government should take the additional step of making SASPO an officially government-backed initiative and provide it with financial and other means of support to scale up its activities.

Recommendation: The Singapore government should support the Singapore Alliance on Sustainable Palm Oil through financial or other means.

The Singapore government should also support the following recommendations, which have been outlined in further detail in other sections.

Recommendation: The Singapore government should promote green finance and micro-credit to support sustainable palm oil and forest- and peat-friendly agriculture.

Recommendation: The Singapore government should encourage all financial institutions and funds in Singapore to develop and disclose their ESG policies.

Recommendation: Through the Singapore Exchange, the Singapore government should enact a timeframe for listed companies to improve their sustainability reporting standards, such as by obtaining third party assurance and engaging in stakeholder consultation

Bilateral action

Since 2005, Singapore has offered annual haze assistance packages to aid Indonesia in battling forest fires during the dry season. These packages include military aircraft for cloud

seeding and firefighting operations, the sharing of satellite images and information, and the provision of expertise in firefighting planning and assessment. The assistance is only provided if the offer is accepted by Indonesia, which did so in 2005 and 2015.

From 2007 and 2011, Indonesia had agreements with Singapore and Malaysia to work with Jambi and Riau provinces, respectively, to enhance their fire-prevention and firefighting capacity (R. Tan, 2007). However, upon their conclusion, these agreements were not renewed; this may be because Indonesia prefers addressing haze through multilateral mechanisms established by ASEAN instead of bilateral ones, as it has separately indicated (TODAY online, 2016).

However, there is still potential for Singaporean and Indonesian parties to collaborate. Academic institutions from Japan, for example, are collaborating with Indonesia on peatland-related research, which has important implications for the prevention of fires and haze (Kyoto University, 2016). The Singapore government can support Singapore-based academics to conduct similar research in collaboration with Indonesian research institutions. It may also be possible for Singapore-based NGOs to work together with their Indonesian counterparts on similar research and awareness-building efforts. Such efforts would be in alignment with the bioethics principle on “bioethics education, training and information” (Article 23).

Recommendation: Singapore should empower non-state actors, such as academics and NGOs, to collaborate in research to prevent haze, such as sustainable peat management and peat restoration.

Multilateral action (ASEAN)

Whereas Singapore has not found much success in pushing for a solution to the haze issue through unilateral or bilateral routes, it has managed to advance the cause considerably through its active membership in ASEAN.

Multilateral political institutions such as ASEAN emphasise common rules and principles that all member states must abide by. These rules, principles, and norms are fundamental values that are agreed upon by all member states. In the case of ASEAN, they are enshrined in the Treaty of Amity and Cooperation in Southeast Asia (TAC) of 1976 (asean.org, 2016), which includes principles such as the equality of all Member States, mutual respect, and the need for effective cooperation and the peaceful settlement of disputes.

Responding to the haze is also aligned with ASEAN’s goal of promoting regional peace and stability (Weatherbee, 2015). The haze has the potential to disrupt the hard-won stability in the region by creating and exacerbating inter-state tensions.

ASEAN’s regional haze cooperation initiatives include the 1995 ASEAN Cooperation Plan on Transboundary Pollution (CP), the 1997 Regional Haze Action Plan (RHAP), and finally, the legally binding 2002 ASEAN Agreement on Transboundary Haze Pollution (AATHP).

The 1997 RHAP required all members to design and implement their own National Action Plan (NAP) that should include a host of ameliorative policy responses. Some of the prescribed directives for the NAP included enacting legislations to prohibit open burning and mobilising resources to prevent and arrest fires.

The RHAP also marked ASEAN's transition from merely responding to the haze after it had occurred to more proactive efforts to prevent future haze episodes (Tay, 2008). One of the tangible outcomes of RHAP was the development of a fire danger rating system for Southeast Asia to provide early warning of serious fire and haze events (Groot, Field, Brady, Roswintiarti, & Mohamad, 2006).

The AATHP set out how parties could cooperate on preventing, monitoring, preparing, and responding to land or forest fires. Indonesia has drawn criticism for not ratifying the AATHP until 2014, which some claim negatively affected the AATHP's effectiveness and impact. However, it is important to recognise that Indonesia had already been involved in many of AATHP's programmes prior to ratifying the AATHP. For example, Indonesia was involved in developing the ASEAN Peatland Management Strategy 2006 – 2020, and in 2014, it included key issues discussed at the ASEAN level in its National Regulation on Protection and Management on Peatland Ecosystems (PP 71/2014).

With the ratification of the AATHP by all ASEAN member states, there was new impetus behind its full implementation. In 2016, the Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation ("Haze-free Roadmap") was adopted. The Haze-free Roadmap set out a vision of a haze-free ASEAN by 2020, through implementation of 8 key strategies.

To a large extent, ASEAN's responses to the haze have adhered to the ASEAN Way (AW). The AW is the cornerstone of ASEAN's diplomatic framework and is considered integral to the stability and peace of the region. It essentially comprises behavioural and procedural norms that serve to guide member states' conduct in time of peace and conflict. The behavioural norms that are most relevant to our discussion include mutual respect for state sovereignty and independence, non-interference in the internal affairs of another state, and the settlement of disputes through peaceful means. Relevant procedural norms include reliance on informal and incremental arrangements, non-confrontational diplomacy, and a "consensual and consultative decision-making approach" (Loke, 2005). These norms parallel the bioethics principles "autonomy and individual responsibility" (Article 5), "consent" (Article 6) as well as "solidarity and cooperation" (Article 13) and "international cooperation" (Article 24).

However, the AW has also been subject to criticism. Critics of the AW say that it allows nations to cling too tightly to national sovereignty and that its blind adherence to the principle of non-interference in internal affairs of member states results in an inability to enforce policies, even when harm is caused to the citizens of the state concerned or other member states (Funston, 1999).

On the other hand, the constraints placed by the AW are beneficial in ways that may not be immediately apparent. Despite the controversial nature of haze, the AW compels member states to remain united in coming up with policy solutions to the haze problem. Another strength of ASEAN as the regional coordinating institution for haze solutions lies in its institutional credibility, legitimacy, and extensive networks with other international institutional actors, all of which can be capitalised upon to secure helpful resources (monetary or otherwise).

In sum, despite its shortcomings, ASEAN offers many fundamental institutional services and benefits in addressing haze that cannot be replaced by any other institution. It amalgamates conflicting national interests in the region in a peaceful way, amplifies the voice and concerns of smaller and weaker states, and facilitates the creation and implementation of constructive regional policy response. That said, ASEAN-led efforts should be paired with other efforts at the domestic level in the commodity sector, financial sector, and through civil society, as it is unlikely that ASEAN-led efforts alone can drive the changes that are needed to prevent haze.

Singapore can use the ASEAN framework to carry out the following initiatives:

Supporting the ASEAN Haze Fund

In 2016, the Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation (“Haze-free Roadmap”) was adopted. The Haze-free Roadmap set out a vision of a haze-free ASEAN by 2020.

The Singapore government, together with corporations and the public, can provide funding to implement this roadmap. For example, Singapore could increase its contributions to the ASEAN Haze Fund, which could then be channelled to haze prevention projects, such as projects to protect and restore peatland.

The need to provide financial support to these projects is urgent. In 2016, Indonesia set up the Peat Restoration Agency (Badan Restorasi Gambut or BRG) with the goal of restoring 2 million hectares of degraded peatland by 2020. The World Bank has estimated the initial cost of achieving this target at USD 2.1 billion, but the head of BRG, Nazir Foead, has said that the funding currently available from company donations and government grants is insufficient and hopes for more foreign funds to be made available (Mongabay Haze Beat, 2016). In response, Norway and the United States have pledged USD 50 million and USD 17 million to the BRG, respectively. Funding from Norway has helped to realise the peat mapping of 4 priority areas in Indonesia, providing data that is being used to protect and manage the peatland more sustainably (Royal Norwegian Embassy in Jakarta, 2017).

Recommendation: Singapore should increase its contributions to the ASEAN Haze Fund to be channelled to peat protection and restoration projects in Indonesia and the implementation of the ASEAN Haze-free Roadmap.

Standardising sustainable finance standards across ASEAN

Several ASEAN member states are trying to promote responsible finance at the national level. However, sustainable finance regulations within the region are not uniform. As ASEAN Chair

in 2018, Singapore could initiate efforts to promote and harmonise responsible finance standards across ASEAN.

Recommendation: As ASEAN Chair in 2018, Singapore should initiate efforts to help harmonise sustainable finance regulations across ASEAN.

Standardising air quality standards across ASEAN

An important initial step towards a long-term solution to haze is for all parties to agree on common health standards for haze management. This is in line with avoiding the risk of subjective healthcare, as described in the bioethics principle “social responsibility and health” (Article 14). Singapore can take steps to initiate this process at the ASEAN level.

To measure air quality, Indonesia uses its National Ambient Air Quality Standards (NAAQS), which cover SPM, PM₁₀, SO₂, NO₂, O₃, Pb, and CO. Cities are required to meet specific standards for each pollutant. Compared with WHO Guidelines, Indonesia’s NAAQS are less stringent. Singapore’s targets are more closely aligned with WHO Guidelines, although, in the case of PM_{2.5} and SO₂, WHO interim targets are used as a 2020 goal with the final WHO target used as a long-term goal.

Indonesia, Jakarta and Singapore’s Air Quality Standards Compared to WHO Guidelines

Pollutant	Average Time	Indonesia (Asian Development Bank, 2006)		Singapore (NEA, 2017)		WHO Guidelines (WHO, 2006)
		AAQS in Jakarta	NAAQS	Targets by 2020	Long Term Targets	
SPM	24 hours	230	230	---	---	---
	1 year	90	90	---	---	---
PM2.5	24 hours	---	---	37.5 ^c	25	25
	1 year	---	---	12 ^d	10	10
PM10	24 hours	150	150	50		50 ^a
	1 year	---	---	20		20 ^a
SO2	1 hour	900	900	50 ^c	20	20 ^a
	24 hours	260	365	15 ^d	---	---
	1 year	60	60	---		---
NO2	1 hour	400	400	200		200 ^a
	24 hours	92.5	150	---		---
	1 year	60	100	40		40 ^a
O3	1 hour	200	235	---		---
	8 hours	---	---	100		100 ^a
	1 year	30	50	---		---
Pb	1 year	---	1	---		0.5
CO	1 hour	26,000	30,000	30,000		30,000 ^b
	8 hours	---	---	10,000		10,000 ^b
	24 hours	9,000	10,000	---		---

Note: Values are in µg/m³ and are based on the atmospheric conditions at 25°C and pressure 1 atm.
 SPM= suspended particulate matter; PM₁₀= particulate matter with diameter less than or equal to 10 micrometers; SO₂= Sulfur dioxide; NO₂= Nitrogen dioxide; O₃= ozone; Pb= lead; CO= Carbon monoxide; WHO= World Health Organization
^a WHO Global Update 2005; ^b WHO 2000;
^c WHO Interim target;
 PM2.5: Based on published risk coefficients from multi-centre studies and meta-analyses (about 1.2% increase in short-term mortality over the Air quality guideline value).
 SO2: Intermediate goal based on controlling either motor vehicle emissions, industrial emissions and/or emissions from power production. This would be a reasonable and feasible goal for some developing countries (it could be achieved within a few years) which would lead to significant health improvements that, in turn, would justify further improvements (such as aiming for the AQG value)."
^d Sustainable Singapore Blueprint target.

Recommendation: As ASEAN Chair in 2018, Singapore should initiate efforts to help harmonise air quality standards and targets for ASEAN.

Standardising sustainable commodity standards across ASEAN

If ASEAN can agree on a uniform set of standards for sustainable palm oil or pulp and paper, it can impose restrictions such as tariffs, quotas, and non-tariff barriers to promote the trade of sustainably-produced commodities. Since most of the demand for palm oil comes from a relatively small number of countries and trading blocs, it is feasible to create an inter-governmental agreement governing the trade of palm oil, which will ensure greater coverage of the supply chain as compared to regulations imposed by a single country. Singapore's chairmanship of ASEAN in 2018 creates a window of opportunity to push for such an agreement at the ASEAN level.

The EU has had success in creating and enforcing regulations on the import of timber from Indonesia through the SVLK certification. The EU worked closely together with Indonesia to develop SVLK's regulations and continues to oversee their implementation. A similar process could be followed to harmonise standards for sustainable palm oil and pulp and paper.

Recommendation: As ASEAN Chair in 2018, Singapore should initiate efforts to help harmonise definitions and requirements for sustainable palm oil and paper and work together to enforce them throughout the supply chain and trading process within ASEAN.

What can Singapore's civil society do?

Introduction

In this section, we explore the role of non-governmental organisations and ordinary people in addressing the problem of haze.

Key findings

Civil society has a role in addressing the haze issue through promoting responsible consumption, research into peatland restoration and sustainability standards, monitoring the performance of plantation and consumer-facing companies, campaigning for greater consumer awareness, capacity building for businesses, and international collaboration.

Recommendations

21. NGOs should conduct and publish research on the sustainability standards currently available in the agribusiness sector; the financing policies of major financial institutions and funds in Singapore; the palm oil procurement policies of major eateries, manufacturers and retailers in Singapore; and the NDPE policies of palm oil companies that are listed and/or headquartered in Singapore, as well as their implementation.
22. NGOs should scale up awareness outreach among businesses and the general public about sustainable palm oil and forest- and peat-friendly products.
23. NGOs should help businesses and governments to build capacity in sustainable practices.
24. NGOs should encourage consumers to petition businesses to use sustainable palm oil.
25. NGOs should support on-the-ground projects in the region, including but not limited to forest- and peat-friendly agriculture development, community empowerment, mapping, and conservation.

Research

The bioethics principle “sharing of benefits” (Article 15) advises that benefits resulting from any scientific research and its applications should be shared with international society and with developing countries in particular.

In order to help other stakeholders to make decisions, NGOs can promote transparency and public awareness by analysing:

- The financing policies of major financial institutions and funds in Singapore
- The palm oil procurement policies of major eateries, manufacturers and retailers
- The NDPE policies of palm oil companies that are listed and/or headquartered in Singapore and their implementation

Academics and NGOs should also regularly review and provide recommendations on palm oil standards as they evolve.

Case study: The WWF Palm Oil Buyers’ Scorecard Malaysia and Singapore 2017 (Hashim, 2017)

The NGO World Wide Fund for Nature (WWF) first began releasing Palm Oil Buyers’ Scorecards (POBS) in 2009. These regular Scorecards measure how companies perform on various criteria with regards to sustainable palm oil sourcing, such as membership in the RSPO, committing to and buying sustainable palm oil, and transparency in their progress towards achieving their commitments. Another objective of the Scorecards is to encourage companies that have not yet made commitments to do so, with guidance from WWF.

In September 2017, the first Malaysia and Singapore POBS was jointly released by WWF-Malaysia and WWF Singapore, to evaluate which local companies were sourcing and using sustainable palm oil in their supply-chains. A total of 47 companies were ranked in the scorecard, with 27 from Singapore and 20 from Malaysia. The companies, which were selected from familiar house brands in the region, were asked to complete a simple online survey with regards to their sustainable palm oil use.

Compared to the international POBS, non-disclosure and non-responsiveness was higher among the Malaysian and Singaporean companies. Out of the 47 companies evaluated, 31 companies did not respond. Of those that did, the majority of companies cited a lack of internal capacity and expertise in sustainable practices, high costs, and lack of demand from consumers as reasons preventing them from switching to CSPO.

Research such as POBS and the attendant publicity and public pressure generated can be important in getting companies to make commitments to sustainability. For example, in the first 36 hours after the launch of the Malaysia and Singapore POBS, six non-respondent companies had made commitments to sourcing sustainable palm oil (WWF, 2017).

Recommendation: NGOs should conduct and publish research on the sustainability standards currently available in the agribusiness sector; the financing policies of major

financial institutions and funds in Singapore; the palm oil procurement policies of major eateries, manufacturers and retailers in Singapore; and the NDPE policies of palm oil companies that are listed and/or headquartered in Singapore, as well as their implementation.

Campaigning

The bioethics principle “bioethics education, training and information” (Article 23) recommends fostering bioethics education and training at all levels, with a particular focus on youth. This principle can be extended to public awareness campaigns about regional bioethical issues such as haze, the current measures available to address them, and how the general public can support these measures.

Current awareness about sustainable palm oil and responsible finance among Singaporean public and businesses is low. Hence, there is a need for NGOs to scale up awareness outreach. Such outreach will increase the reputational risk to businesses and financial institutions of failing to address the sustainable palm oil issue. This will in turn push businesses that use palm oil to switch to RSPO-certified palm oil and financial institutions to adopt more robust ESG policies.

For example, in 2015, public outcry over the haze and the release of NGO reports highlighting the inadequate sustainability performance of local financial institutions played a significant role in the announcement of the Guidelines on Responsible Financing by the Association of Banks in Singapore in October 2015.

Case study: PM Haze #GoHazeFree campaign

In August 2017, the People’s Movement to Stop Haze (PM.Haze) launched its #GoHazeFree campaign with the aim of:

- Raising awareness among eateries and the public about haze-free palm oil
- Encouraging members of the public to participate in asking eateries about haze-free cooking oil
- Securing commitments from eateries that use palm oil to switch to haze-free cooking oil

Prior to the launch of this campaign, PM.Haze researched the sources of RSPO-certified cooking oil available in Singapore and their prices, in order to support eateries to switch to sourcing certified sustainable cooking oil. PM.Haze also researched current levels of awareness among eateries. PM.Haze volunteers visited about 60 eateries to speak with management and staff about switching to haze-free cooking oil. Finally, the campaign was also supported by PM.Haze’s ongoing outreach activities, such as roadshows and talks, which helped grow its volunteer community and increase the scope of its public outreach.

As a result of PM.Haze’s campaign, two Singaporean eateries, VeganBurg and nomVnom, have switched to using 100% sustainable palm oil as cooking oil.

Case study: Singapore students’ petition

On 9 October 2017, two teenage environmental advocates from a group called Students of Singapore (SOS) Against Haze launched a petition to get local curry puff makers Old Chang Kee and Polar Puffs & Cakes to switch to using certified sustainable palm oil (SOS Against

Haze, 2017). Their petition singled out the two companies because curry puffs are both an iconic and popular local snack and one that requires a significant amount of oil to prepare.

In two weeks, the petition garnered close to 4,900 signatures. After the petition was featured in local media outlets, both companies made public statements on their cooking oil sourcing policies. On 11 October 2017, Polar Puffs declared that the vegetable oils they used were from RSPO-certified sustainable sources (Polar Puffs & Cakes, 2017), and Old Chang Kee announced that they were screening their oil suppliers to ensure that they are RSPO-certified (Old Chang Kee Singapore, 2017).

Recommendation: NGOs should scale up awareness outreach among businesses and the general public about sustainable palm oil and forest- and peat-friendly products.

Recommendation: NGOs should encourage consumers to petition businesses to use sustainable palm oil.

Capacity building

Capacity building involves supporting businesses and financiers to progress towards sustainability.

An example of such an initiative in Singapore's financial sector is the Collaborative initiative for Green Finance in Singapore, led by the Singapore Institute of International Affairs (SIIA). This initiative explores possibilities in green finance for Singapore-based financial institutions, and aims to create a framework to assess the sustainability practices of clients (Othman, 2017a). The Initiative also aims to connect financial institutions and leading practitioners of sustainable finance to show them what is currently being done in other countries and what else needs to change to scale up impact.

An example of capacity-building targeting palm oil industry players is the Singapore Alliance for Sustainable Palm Oil (SASPO). SASPO was launched in June 2016 by WWF Singapore and aims to provide a platform to connect retailers and manufacturers who have committed to sourcing and producing sustainable palm oil, as well as support other companies to make and implement such commitments. The five founding members of the alliance are consumer goods giant Unilever, established Singapore consumer goods manufacturer Ayam Brand, food and beverage specialist Danone, home furnishing retailer IKEA, and Wildlife Reserves Singapore.

Recommendation: NGOs should help businesses and governments build capacity in sustainable practices.

International collaboration

NGOs can also support the implementation of sustainability efforts in other countries.

The Singapore Institute of International Affairs (SIIA), a Singapore-based think tank, has been facilitating dialogue between governments, companies and NGOs on palm oil, responsible finance, peat restoration, and other sustainability issues related to the haze through conferences, workshops and closed-door discussions.

Since 2016, Singapore-based NGO PM.Haze has been working with Malaysian and Indonesian non-governmental organisations and government agencies on peat restoration efforts in both countries. While the impact in terms of land area covered remains small, the key objective has been to promote deeper and more positive people-to-people connections between Indonesia, Malaysia and Singapore with regards to haze. In 2017, PM Haze and SIIA collaborated to facilitate media coverage of community-led fire-prevention efforts in Sungai Tohor, Indonesia, and the efforts of ordinary Singaporeans to support these efforts (Arshad, 2017).

In 2015, the Singapore Business Federation and Indonesian Chamber of Commerce made a joint announcement exhorting their member companies to ensure that their activities do not contribute to forest fires and to embrace global standards for sustainable agriculture practices (SBF, 2015).

Key bioethics principles present in all these examples have been “solidarity and cooperation” (Article 13) and “international cooperation” (Article 24). Parties from different nations have come together on equal terms, using their knowledge and skill sets to contribute towards a common goal. Decision-making is driven by locals through the use of local knowledge. Adherence to these principles have led to fruitful partnerships across national boundaries.

Recommendation: NGOs should support on-the-ground projects in the region, including but not limited to forest- and peat-friendly agriculture development, community empowerment, mapping, and conservation.

Bibliography

- Aidenvironment. (2017). *Nordic investments in banks financing Indonesian palm oil*.
- Ariffin, A. (2016, January 18). Coastal fish farms in Singapore now better prepared for plankton blooms. *Channel News Asia*. Retrieved from <http://www.channelnewsasia.com/news/singapore/coastal-fish-farms-in-singapore-now-better-prepared-for-plankton-8210348>
- Arshad, A. (2017, May 23). Singapore team digs in to help Riau village combat haze. *The Straits Times*. Retrieved from <http://www.straitstimes.com/asia/se-asia/spore-team-digs-in-to-help-riau-village-combat-haze>
- asean.org. (2016). Treaty of Amity and Cooperation in Southeast Asia Indonesia, 24 February 1976. Retrieved from <http://asean.org/treaty-amity-cooperation-southeast-asia-indonesia-24-february-1976/>
- Asian Development Bank. (2006). *Country Synthesis Report on Urban Air Quality Management Indonesia*. Retrieved from http://cleanairasia.org/wp-content/uploads/portal/files/documents/indonesia_0.pdf
- Association of Southeast Asian Nations [ASEAN]. (2016). Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation. Retrieved from http://environment.asean.org/wp-content/uploads/2016/11/Roadmap-ASEAN-Haze-Free_adoptedbyCOP12.pdf
- Awani, A. (2016, January 18). Hot weather alters behaviour and life cycle of aedes mosquito. Retrieved from <http://english.astroawani.com/malaysia-news/hot-weather-alters-behaviour-and-life-cycle-aedes-mosquito-90095>
- Azman, S. (2017, April). RSPO sees opportunities in EU's stricter measures. *The Edge Financial Daily*.
- Bakalar, N. (2015, June 22). Pollution May Age the Brain. *The New York Times*. Retrieved from <https://well.blogs.nytimes.com/2015/06/22/pollution-may-age-the-brain/>
- Balch, O. (2015). Indonesia's forest fires: everything you need to know.
- Banking Environment Initiative (BEI). (2015). How do Banks Finance Commodity Supply Chains? Retrieved from https://www.cisl.cam.ac.uk/publications/publication-pdfs/Commodity_Supply_Chains.pdf
- Barratt, O. (2016, March 16). Haze episode cost Singapore estimated S\$700m last year: Masagos. *Channel News Asia*. Retrieved from <http://www.channelnewsasia.com/news/singapore/haze-episode-cost-singapore-estimated-s-700m-last-year-masagos-8147924>
- Bloomberg. (2015, October 7). Singapore GDP will take hit from haze as countries issue travel warnings. *The Business Times*. Retrieved from <http://www.businesstimes.com.sg/government-economy/singapore-gdp-will-take-hit-from-haze-as-countries-issue-travel-warnings>
- Brack, D., Glover, A., & Wellesley, L. (2016). *Agricultural Commodity Supply Chains: Trade,*

Consumption and Deforestation.

- Bregman, T. P., McCoy, K., Servent, R., & Macfarquhar, C. (2016). *Turning collective commitment into action: Assessing progress by Consumer Goods Forum members towards achieving deforestation-free supply chains*. UK.
- Butler, R. A. (2015, August 13). APP to clear plantations to restore peatlands. *Mongabay*. Retrieved from <https://news.mongabay.com/2015/08/app-to-clear-plantations-to-restore-peatlands>
- Chain Reaction Research. (2016). The Chain: Most global palm oil trade covered by zero-deforestation.
- Chain Reaction Research. (2017, June). The Chain: Neste revenue risk from Norwegian public procurement ban of palm oil-based biofuels.
- Chan, F. (2015, October). Slash-and-burn law may be reviewed. *The Straits Times*.
- Chan, F., & Arshad, A. (2016, August). Pulp firm Bumi Mekar Hijau found guilty of starting illegal fires in Indonesia. *The Straits Times*.
- Chan, L. E., & Leong, W. K. (2015, September 24). Schools to close on Friday due to worsening haze situation: MOE. *Channel News Asia*. Retrieved from <http://www.channelnewsasia.com/news/singapore/schools-to-close-on-friday-due-to-worsening-haze-situation-moe-8252374>
- Channel NewsAsia. (2016, January 28). GIC and Temasek support zero land-burning policies: Heng Swee Keat. *Channel NewsAsia*. Retrieved from <http://www.channelnewsasia.com/news/singapore/gic-and-temasek-support-zero-land-burning-policies-heng-swee-kea-8218574>
- Cheam, J. (2011, February 9). Golden Agri adopts no deforestation policy. *Eco-Business*. Retrieved from <http://www.eco-business.com/news/golden-agri-adopts-no-deforestation-policy/>
- Climate Reaction Research. (2017). *Banks Finance More Palm Oil Than Investors: Investors Face Indirect Exposure*. Washington.
- Cochrane, M. A. (2003). Fire science for rainforests. *Nature*, 421(6926), 913–9. <https://doi.org/10.1038/nature01437>
- Colfer, C. J. P. (2002). Ten Propositions to Explain Kalimantan's Fires. In C. J. P. Colfer & I. A. P. Resosudarmo (Eds.), *Which Way Forward? People, Forests, and Policymaking* (pp. 309–324). Resources for the Future.
- Dayne, S. (2015). Don't inhale: Scientists look at what the Indonesian haze is made of.
- Dehghan, M., Mente, A., Zhang, X., Swaminathan, S., Li, W., Mohan, V., ... Kumar, R. (2017). Associations of fats and carbohydrate intake with cardiovascular disease and mortality in 18 countries from five continents (PURE): a prospective cohort study. *The Lancet*, 6736(17), 1–13. [https://doi.org/10.1016/S0140-6736\(17\)32252-3](https://doi.org/10.1016/S0140-6736(17)32252-3)
- Double Helix, TFT, Wilmar, New Britain Palm Oil, PT Rimba Makmur Utama, APP, ... KPMG. (2016). *Asia Pacific Rainforest Partnership private sector roundtable: projects and policy briefs*.

- EEPSEA, & WWF. (1999). The Indonesian Fires and Haze of 1997: The Economic Toll. *Exchange Organizational Behavior Teaching Journal*, 3–11.
- Emmanuel, S. C. (2000). Impact to lung health of haze from forest fires: The Singapore experience. In *Respirology* (Vol. 5, pp. 175–182). <https://doi.org/10.1046/j.1440-1843.2000.00247.x>
- EPA. (2017). What are the harmful effects of SO₂? Retrieved July 20, 2009, from <https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#effects>
- EU FLEGT Facility. (2017). Indonesia-EU Voluntary Partnership Agreement.
- European Parliament. (2017). European Parliament resolution of 4 April 2017 on palm oil and deforestation of rainforests. Retrieved from <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2017-0098+0+DOC+XML+V0//EN>
- FAO. (2017). FAOSTAT database collections. Retrieved September 12, 2017, from <http://www.fao.org/faostat/en>
- Field, R. D., van der Werf, G. R., & Shen, S. S. P. (2009). Human amplification of drought-induced biomass burning in Indonesia since 1960. *Nature Geoscience*, 2(3), 185–188. <https://doi.org/10.1038/NGEO443>
- Fogarty, P. (2013, June 20). Singapore smog from Indonesia fire “could last weeks.” *BBC News*. Retrieved from <http://www.bbc.com/news/world-asia-22982018>
- Food and Agriculture Organization (FAO). (2014). *Global Forest resources assessment 2015, Country report, Indonesia*. Retrieved from <http://www.fao.org/3/a-az239e.pdf>
- Food and Agriculture Organization (FAO). (2016). *Global Forest Resources Assessment 2015*. Retrieved from <http://www.fao.org/3/a-i4793e.pdf>
- Forest Stewardship Council (FSC). (2015). *Global Volume of FSC Wood Produced Annually*. Retrieved from <https://www.google.com/url?q=https://ic.fsc.org/pre-preview.global-volume-of-fsc-wood-produced-annually.a-4920.pdf&sa=U&ved=0ahUKEwiLrYvKloHXAhWJtY8KHQWYAFIQFggEMAA&client=internal-uds-cse&cx=partner-pub-2887425616689413:3372496179&usg=AOvVawOV6Z8HD2vXfyF>
- Forest Trends. (2014). Consumer Goods and Deforestation: An Analysis of the Extent and Nature of Illegality in Forest Conversion for Agriculture and Timber Plantations.
- foresthints.news. (2016). All bilateral cooperation with Singapore being reviewed by Indonesian Environment Minister. Retrieved from <http://www.foresthints.news/all-bilateral-cooperation-with-singapore-being-reviewed-by-indonesian-environment-minister>
- foresthints.news. (2017, July 21). World’s largest palm oil trader’s supply chains linked to peat violations. Retrieved from <http://m.foresthints.news/world-largest-palm-oil-trader-supply-chains-linked-to-peat-violations>
- Forsyth, T. (2014). Public concerns about transboundary haze: A comparison of Indonesia, Singapore and Malaysia. *Global Environmental Change*, 25, 76–86. <https://doi.org/10.1016/j.gloenvcha.2014.01.013>

- Freischlad, N. (2015, November 10). Seeing through the haze: how technology could help protect Southeast Asia's forests. *Techinasia*. Retrieved from <https://www.techinasia.com/4-technologies-to-help-protect-southeast-asia-forests>
- Friends of the Earth. (2014a). Frequently asked questions: Palm oil, forests and finance. Retrieved from http://libcloud.s3.amazonaws.com/93/ea/2/3375/Palm_oil_FAQ_2014_final.pdf
- Friends of the Earth. (2014b). Years of Investing Dangerously - Dimensional Fund Advisors' Ties to Palm Oil. Retrieved from <http://www.profundo.nl/files/download/FOEUS1404.pdf>
- Funston, J. (1999). Challenges Facing ASEAN in a More Complex Age. *Contemporary Southeast Asia*, 21(2), CS21-2c. https://doi.org/10.1355/CS21_2C
- Gaveau, D. L. A., Pirard, R., Salim, M. A., Tonoto, P., Yaen, H., Parks, S. A., ... Mcelwee, P. (2017). Overlapping Land Claims Limit the Use of Satellites to Monitor No-Deforestation Commitments and No-Burning Compliance, 10(March), 257–264. <https://doi.org/10.1111/conl.12256>
- General Agreement on Tariffs and Trade. Article XX: General Exceptions (2012).
- Global Ecolabelling Network (GEN). (2004). *Introduction to Ecolabelling*. Retrieved from <https://globalecolabelling.net/assets/Uploads/intro-to-ecolabelling.pdf>
- Goenner, C. (2000). Causes and Impacts of Forest Fires: A Case Study from East Kalimantan, Indonesia.
- Gordon, J. (2015). How does the haze impact our brains. Retrieved from <http://gemmacalvert.com/haze-impact/>
- Greenpeace. (2016, November). HCS Convergence Process Concludes.
- Groot, W. J. De, Field, R. D., Brady, M. A., Roswintiarti, O., & Mohamad, M. (2006). Development of the Indonesian and Malaysian fire danger rating systems. *Mitigation and Adaptation Strategies for Global Change*, 12(1), 165–180. <https://doi.org/10.1007/s11027-006-9043-8>
- Hance, J. (2014, March 10). Does haze from burning forests affect marine life? *Mongabay*. Retrieved from <https://news.mongabay.com/2014/03/does-haze-from-burning-forests-affect-marine-life/>
- Hance, J. (2016, December). WWF and Greenpeace break with Indonesia's pulp and paper giant. *The Guardian*.
- Harris, N., Minnemeyer, S., Stolle, F., & Payne, O. (2015, October 16). Indonesia's Fire Outbreaks Producing More Daily Emissions than Entire US Economy. *World Resources Institute (WRI)*. Retrieved from <http://www.wri.org/blog/2015/10/indonesia-s-fire-outbreaks-producing-more-daily-emissions-entire-us-economy>
- Harvey, A. (2015, October 28). Indonesia haze: Philippines issues health warnings as deadly haze from forest fires reaches Manila. *ABC News*. Retrieved from <http://www.abc.net.au/news/2015-10-28/indonesia-forest-fires-prompt-philippines-to-issue-warnings/6892378>
- Hashim, S. (2017). WWF-Malaysia launches the results of the first Palm Oil Buyers' Scorecard.

- Retrieved from <https://wwf.panda.org/?312710/WWF-Malaysia-launches-the-results-of-the-first-Palm-Oil-Buyers-Scorecard>
- Hayasaka, H., Takahashi, H., Limin, S., Yulianti, N., & Usup, A. (2016). Peat fire occurrence. In M. Osaki & N. Tsuji (Eds.), *Tropical Peatland Ecosystems* (pp. 377–396). Springer.
- Heil, A., & Goldammer, J. G. (2001). Smoke-haze pollution: a review of the 1997 episode in Southeast Asia. *Regional Environmental Change*, 2(1), 24–37. <https://doi.org/10.1007/s101130100021>
- Henders, S., Persson, U. M., & Kastner, T. (2015). Trading forests: land-use change and carbon emissions embodied in production and exports of forest-risk commodities. *Environmental Research Letters*, 10. <https://doi.org/10.1088/1748-9326/10/12/125012>
- Ho, R. C., Zhang, M. W., Ho, C. S., Pan, F., Lu, Y., & Sharma, V. K. (2014). Impact of 2013 south Asian haze crisis: study of physical and psychological symptoms and perceived dangerousness of pollution level. *BMC Psychiatry*, 14(1), 81. <https://doi.org/10.1186/1471-244X-14-81>
- Hong, J. (2015, November 19). The impacts of haze on Southeast Asia's wildlife. *Mongabay*. Retrieved from <https://news.mongabay.com/2015/11/haze-killing-the-mood-for-southeast-asias-wildlife/>
- Hutan Kita Institute - HaKI, WALHI South Sumatra, Pilar Nusantara – PINUS, LBH Palembang, Jaringan Masyarakat Gambut – South Sumatra, FKMPH, ... Rimba Institute. (2016). 2015 Fires Burned 26% of APP's Plantations in South Sumatra, Raising Questions about Fiber Supply for New OKI Mill, (February 4), 1–5.
- IE Singapore. (2017). Reasons to trade from Singapore.
- Index Mundi. (2017a). Indonesia Palm Oil Domestic Consumption by Year. Retrieved September 15, 2017, from <http://www.indexmundi.com/agriculture/?country=id&commodity=palm-oil&graph=domestic-consumption>
- Index Mundi. (2017). Indonesia Palm Oil Domestic Consumption by Year.
- Index Mundi. (2017b). Malaysia Palm Oil Domestic Consumption by Year. Retrieved September 15, 2017, from <http://www.indexmundi.com/agriculture/?country=id&commodity=palm-oil&graph=domestic-consumption>
- Index Mundi. (2017). Malaysia Palm Oil Domestic Consumption by Year.
- Islam, M. S., Pei, Y. H., & Mangharam, S. (2016). Trans-Boundary haze pollution in Southeast Asia: Sustainability through plural environmental governance. *Sustainability (Switzerland)*, 8(5), 1–13. <https://doi.org/10.3390/su8050499>
- Jaafar, Z., & Loh, T. L. (2014). Linking land, air and sea: Potential impacts of biomass burning and the resultant haze on marine ecosystems of Southeast Asia. *Global Change Biology*, 20(9), 2701–2707. <https://doi.org/10.1111/gcb.12539>
- Jaringan Pemantau Independen Kehutanan (JPIK). (n.d.). Retrieved from <http://jpik.or.id/>
- Jayakumar, S., & Koh, T. (2016, June 25). Sovereignty, Jurisdiction and International Law. *The*

- Straits Times*. Retrieved from <http://www.straitstimes.com/opinion/sovereignty-jurisdiction-and-international-law>
- Joosten, H. (2009). The Global Peatland CO₂ picture Peatland status and drainage related emissions in all countries of the world. *Wetlands International*, 36.
- Koh, L. P., & Lee, T. M. (2012). Sensible consumerism for environmental sustainability. *Biological Conservation*, 151(1), 3–6. <https://doi.org/10.1016/j.biocon.2011.10.029>
- Koplitz, S. N., Mickley, L. J., Marlier, M. E., Buonocore, J. J., Kim, P. S., Liu, T., ... Myers, S. S. (2016). Public health impacts of the severe haze in Equatorial Asia in September–October 2015: demonstration of a new framework for informing fire management strategies to reduce downwind smoke exposure. *Environmental Research Letters*, 11(9), 94023. <https://doi.org/10.1088/1748-9326/11/9/094023>
- Kyoto University. (2016). KU, NIHU to partner with Indonesia's Peatland Restoration Agency (25 April 2016). Retrieved from http://www.kyoto-u.ac.jp/en/research/events_news/department/se_asia/news/2016/160425_1.html
- Langmann, B., & Graf, H. F. (2003). Indonesian smoke aerosols from peat fires and the contribution from volcanic sulfur emissions. *Geophysical Research Letters*, 30(11). <https://doi.org/10.1029/2002GL016646>
- Lee, B. P. Y.-H., Davies, Z. G., & Struebig, M. J. (2017). Smoke pollution disrupted biodiversity during the 2015 El Niño fires in Southeast Asia. *Environmental Research Letters*, 12(9), 94022. <https://doi.org/10.1088/1748-9326/aa87ed>
- Lenntech. (2017). Sulphur. Retrieved July 20, 2009, from <http://www.lenntech.com/periodic/elements/s.htm>
- Loh, F. F., Musa, Z., De Silva, J., Chong, K. Y., Shah, M. F., & Lian, V. (2015, October 2). Haze choking farms too. *The Star*. Retrieved from <http://www.thestar.com.my/news/nation/2015/10/02/haze-choking-farms-too-prices-set-to-soar-as-produce-dwindles-and-animals-die-warns-association/>
- Loh, L., Nguyen, T. P. T., Sim, I., Thomas, T., & Wang, Y. (2016). *Sustainability reporting in ASEAN: State of progress in Indonesia, Malaysia, Singapore and Thailand 2015*.
- Loke, B. (2005). The “ASEAN Way”: Towards regional order and security cooperation? *Melbourne Journal of Politics*, 30, 8.
- Management, A. T. (2013). Haze shuts down Singapore's Seletar. Retrieved from <http://www.airtrafficmanagement.net/2013/06/haze-shuts-down-singapores-seletar/>
- Mazidi, M., & Speakman, J. R. (2017). Ambient particulate air pollution (PM_{2.5}) is associated with the ratio of type 2 diabetes to obesity. *Scientific Reports*, 7(1). <https://doi.org/10.1038/s41598-017-08287-1>
- Miettinen, J., Shi, C., & Liew, S. C. (2016). Land cover distribution in the peatlands of Peninsular Malaysia, Sumatra and Borneo in 2015 with changes since 1990. *Global Ecology and Conservation*, 6, 67–78. <https://doi.org/10.1016/j.gecco.2016.02.004>
- Ministry of Health Singapore [MOH]. (2016). FAQ: Impact of Haze on Health. Retrieved from https://www.moh.gov.sg/content/moh_web/home/pressRoom/Current_Issues/2014/haze/faq-impact-of-haze-on-health0.html

- Ministry of the Environment and Water Resources (MEWR). (2017). Impact of Climate Change on Singapore. Retrieved February 28, 2017, from <https://www.nccs.gov.sg/climate-change-and-singapore/national-circumstances/impact-climate-change-singapore>
- Miteva, D. A., Loucks, C. J., Pattanayak, S. K. S., Gibbs, H., Brown, S., Niles, J., ... Rivera, J. (2015). Social and Environmental Impacts of Forest Management Certification in Indonesia. *Plos One*, *10*(7), e0129675. <https://doi.org/10.1371/journal.pone.0129675>
- Mongabay Haze Beat. (2016, September 26). Indonesia seeks foreign funds to aid peat restoration drive. *Mongabay*. Retrieved from <https://news.mongabay.com/2016/09/indonesia-seeks-foreign-funds-to-aid-peat-restoration-drive/>
- Murphy, D. (2009). Global oil yields: Have we got it seriously wrong?
- National Environment Agency. (2017). Waste and recycling statistics for 2016. Retrieved October 28, 2017, from <http://www.nea.gov.sg/energy-waste/waste-management/waste-statistics-and-overall-recycling>
- NEA. (2017). Air Quality and Targets. Retrieved from <http://www.nea.gov.sg/anti-pollution-radiation-protection>
- Neo, C. C. (2016, May 5). ASEAN haze meeting ends on “disappointing, bewildering” note. *TODAY Online*. Retrieved from <http://www.todayonline.com/world/asia/asean-conduct-study-impact-2015-haze-episode>
- News Desk. (2017, March 16). Fire Free Alliance claims to have dramatically reduced forest fires in Sumatra since 2015. *The Jakarta Post*. Retrieved from <http://www.thejakartapost.com/news/2017/03/16/fire-free-alliance-claims-to-have-dramatically-reduced-forest-fires-in-sumatra-since-2015.html>
- Ng WY, A. (2017, April 6). Haze brings risk of cardiac arrests: Study. *The Straits Times*. Retrieved from <http://www.straitstimes.com/singapore/health/haze-brings-risk-of-cardiac-arrests-study>
- NPS. (2017a). Particulate Matter Effects on Health. Retrieved from https://www.nature.nps.gov/air/aqbasics/understand_pm.cfm
- NPS. (2017b). Sulfur Dioxide Effects on Health. Retrieved from https://www.nature.nps.gov/air/aqbasics/understand_so2.cfm
- O’Callaghan, J. (2013, June 24). Singapore, Malaysia face economic hit from prolonged smog. *Reuters*. Retrieved from <http://www.reuters.com/article/us-southeastasia-haze-impact-idUSBRE95N0BS20130624>
- Old Chang Kee Singapore. (2017). Facebook post. Retrieved from <https://www.facebook.com/oldchangkee1956/posts/1684418254941829>
- Othman, L. (2017a, April). Framework being developed for banks to assess green practices of borrowers. *Channel NewsAsia*.
- Othman, L. (2017b, April 6). Framework being developed for banks to assess green practices of borrowers. *Channel NewsAsia*. Retrieved from <http://www.channelnewsasia.com/news/singapore/framework-being-developed-for-banks-to-assess-green-practices-of-8704344>

- Otoritas Jasa Keuangan. (2014). *Roadmap for Sustainable Finance in Indonesia*.
- Palm, C. A., Vosti, S. A., Sanchez, P. A., Tomich, T. P., & Kasyoki, J. (2005). Alternatives to slash and burn. In C. A. Palm, S. A. Vosti, P. A. Sanchez, & P. J. Ericksen (Eds.), *Slash-and-burn agriculture* (pp. 3–37). New York: Columbia University Press.
- Palm Oil Investigations. (2017). About palm oil.
- Pavagadhi, S., Betha, R., Venkatesan, S., Balasubramanian, R., & Hande, M. P. (2013). Physicochemical and toxicological characteristics of urban aerosols during a recent Indonesian biomass burning episode. *Environmental Science and Pollution Research*, *20*(4), 2569–2578. <https://doi.org/10.1007/s11356-012-1157-9>
- Pek, S. (2015, July 27). Big Palm Oil's financiers. *Mongabay*. Retrieved from <https://news.mongabay.com/2015/07/big-palm-oils-financiers/>
- Personal communication*. (n.d.).
- Polar Puffs & Cakes. (2017). Facebook post. Retrieved from <https://www.facebook.com/Polar.Puffs.Cakes/posts/1559098247461606>
- Purnomo, H., Shantiko, B., Sitorus, S., Gunawan, H., Achdiawan, R., Kartodihardjo, H., & Dewayani, A. A. (2017). Fire economy and actor network of forest and land fires in Indonesia. *Forest Policy and Economics*, *78*, 21–31. <https://doi.org/10.1016/j.forpol.2017.01.001>
- Rainforest Action Network, Tuk INDONESIA, & Profundo. (2017). Forests & Finance. Retrieved September 14, 2017, from <http://forestsandfinance.org/>
- Remember Singapore. (2013). Haze – A Burning Issue For Four Decades. Retrieved September 1, 2017, from <https://remembersingapore.org/2013/06/19/a-hazy-problem-for-40-years/>
- Reuters. (2017, May 11). Indonesia plans to file WTO complaint over EU biodiesel duties. *Reuters*. Retrieved from <http://www.reuters.com/article/us-indonesia-biofuels-eu/indonesia-plans-to-file-wto-complaint-over-eu-biodiesel-duties-idUSKBN16Q09Z>
- Ribka, S. (2017, April). Only 12% of Indonesia's oil palm plantations ISPO certified. *The Jakarta Post*.
- Rijk, G., Steinweg, T., & Thoumi, G. (2017). Indonesia's Palm Oil Landbank Expansion Limited by Proposed Moratorium and NDPE Policies. *Chain Reaction Research*. Retrieved from <https://chainreactionresearch.com/2017/02/13/report-indonesias-palm-oil-landbank-expansion-limited-by-proposed-moratorium-and-ndpe-policies/>
- Rini, C., Nugraha, I., & Jacobson, P. (2015, September). Rogue oil palm company must pay \$26m, rules Indonesia's Supreme Court. *Mongabay*.
- Roundtable on Sustainable Palm Oil (RSPO). (n.d.). About us. Retrieved from <http://www.rspo.org/about>
- Roundtable on Sustainable Palm Oil (RSPO). (2017). The journey to defining the RSPO Smallholder Strategy.
- Royal Norwegian Embassy in Jakarta. (2017). One step closer to large-scale peat restoration.

- RSPO. (2017). Impacts. Retrieved October 23, 2017, from <http://www.rspo.org/about/impacts>
- S&P Global Platts. (2016, November). Indonesia's biodiesel mandate—the long road ahead: Fuel for Thought. *S&P Global Platts*.
- Saifulbahri, I. (2016). Singapore cannot enter Indonesia's legal domain on forest fire issues: Forestry Minister. *Channel News Asia*.
- SBF. (2015). KADIN and SBF support the efforts by both Governments to alleviate the haze problem and galvanise stakeholders for Good Agricultural Practices.
- Singapore Health Promotion Board. (2016). Healthier Choice Symbol nutrient guidelines. Singapore.
- Soeriaatmadja, W. (2016, August). Indonesian sago plantation company gets record \$107 million fine for fires that caused haze in 2015. *The Straits Times*.
- SOS Against Haze. (2017). Petition: Tell Old Chang Kee & Polar Puffs to stop frying our rainforests. Retrieved from <https://www.change.org/p/old-chang-kee-tell-old-chang-kee-polar-puffs-to-stop-frying-our-rainforests>
- Stewardship Asia. (2015). Singapore Stewardship Principles (SSP).
- Sun, Q., Yue, P., Deiluiis, J. A., Lumeng, C. N., Kampfrath, T., Mikolaj, M. B., ... Rajagopalan, S. (2009). Ambient Air Pollution Exaggerates Adipose Inflammation and Insulin Resistance in a Mouse Model of Diet-Induced Obesity. *Circulation*, *119*(4), 538–546. <https://doi.org/10.1161/CIRCULATIONAHA.108.799015>
- Sun, Y., Neelakantan, N., Wu, Y., Lote-oke, R., Pan, A., & Dam, R. M. Van. (2015). Palm Oil Consumption Increases LDL Cholesterol Compared with Vegetable Oils Low in Saturated Fat in a Meta-Analysis of Clinical Trials. *The Journal of Nutrition*. <https://doi.org/10.3945/jn.115.210575>.Palm
- Sundarambal, P., Tklich, P., & Balasubramanian, R. (2010). Impact of biomass burning on ocean water quality in Southeast Asia through atmospheric deposition: Eutrophication modeling. *Atmospheric Chemistry and Physics*, *10*(23), 11337–11357. <https://doi.org/10.5194/acp-10-11337-2010>
- Sustainable Brands. (2017, April 11). European Parliament Votes to Phase Out Palm Oil-Based Biofuels by 2020. Retrieved from http://www.sustainablebrands.com/news_and_views/leadership/sustainable_brands/european_parliament_votes_phase_out_palm_oil-based_bio
- Sustainable Palm Oil Transparency Toolkit (SPOTT). (2017a). Palm oil company ESG transparency scores and assessments. Retrieved July 20, 2010, from <https://www.spott.org/palm-oil/>
- Sustainable Palm Oil Transparency Toolkit (SPOTT). (2017b). What does a high score mean? Retrieved July 20, 2010, from <https://www.spott.org/faq/#highscore>
- Tan, A. (2016a). NEA gets court warrant against haze-linked firm's director. *The Straits Times*. Retrieved from <http://www.straitstimes.com/singapore/environment/nea-obtains-court-warrant-against-director-of-indonesian-company-with>
- Tan, A. (2016b, October 26). 55 years of haze: How plane bound for KL overflowed to Singapore

- when it was all hazy on Oct 19, 1961. *The Straits Times*. Retrieved from <http://www.straitstimes.com/singapore/environment/55-years-of-haze-how-plane-bound-for-kl-overflew-to-singapore-when-it-was-all>
- Tan, R. (2007). Singapore offers help to regency in Jambi to fight haze problem in Indonesia. Retrieved from <http://www.wildsingapore.com/news/20070304/070306-3.htm>
- Tay, S. (2008). Blowing Smoke: Regional Cooperation, Indonesian Democracy, and the Haze. In *Hard Choices: Security, Democracy, and Regionalism in Southeast Asia* (pp. 219–240). ISEAS–Yusof Ishak Institute.
- Teoh, H.-J., & Tan, K. L. (2008). Psychological and Physical Impact of the Haze Amongst a Malaysian Community. *Jurnal Sains Kesihatan Malaysia (Malaysian Journal of Health Sciences) [Online]*. Retrieved from <http://ejournal.ukm.my/jskm/article/view/2312>
- The ASEAN Secretariat. (2003). *Guidelines for the implementation of the ASEAN policy on zero-burning*. Retrieved from http://haze.asean.org/?wpfb_dl=163
- The ASEAN Secretariat. (2004). *Guidelines for the implementation of controlled burning practices*. Retrieved from http://haze.asean.org/?wpfb_dl=16
- The ASEAN Secretariat. (2006). *Third ASEAN state of the environment report 2006*. Jakarta.
- The Business Times. (2016, November). Malaysia to implement higher biodiesel mandates from Dec. *The Business Times*.
- The Jakarta Post. (2015, December 23). Indonesia punishes 23 companies for causing forest fires. *The Jakarta Post*. Retrieved from <http://www.thejakartapost.com/news/2015/12/23/indonesia-punishes-23-companies-causing-forest-fires.html>
- The Rainforest Alliance. (2015). *An Evaluation of Asia Pulp & Paper's Progress to Meet its Forest Conservation Policy (2013) and Additional Public Statements*.
- The Rainforest Alliance. (2016, October 14). Expanding Our Reach in Southeast Asia With a New Regional Director. Retrieved from <http://www.rainforest-alliance.org/press-releases/southeast-asia-director>
- The Straits Times. (2016, June 13). Indonesia won't allow citizen accused of causing forest fires to be arraigned under Singapore laws: V-P Jusuf Kalla. *The Straits Times*. Retrieved from <http://www.straitstimes.com/asia/se-asia/indonesia-wont-allow-citizen-accused-of-causing-forest-fires-to-be-arraigned-under>
- The Universal Declaration of Human Rights. (2011). The Universal Declaration of Human Rights.
- Thoumi, G. (2016, August). Palm Oil 101 For Investors And Lessons Learned: Government Of Norway, Revenue At Risk, IOI And Felda. *Seeking Alpha*.
- TODAY online. (2016). Indonesia rebuffs Singapore offer of haze assistance. *TODAY Online*. Retrieved from <http://www.todayonline.com/world/asia/jakarta-seeks-regional-agreement-spore-offers-fire-fighting-help>
- Transboundary Haze Pollution Act, Pub. L. No. 24 (2014). Singapore, Singapore.
- Transport & Environment. (2016). Europe keeps burning more palm oil in its diesel cars and

trucks.

- Turetsky, M. R., Benscoter, B., Page, S., Rein, G., van der Werf, G. R., & Watts, A. (2015). Global vulnerability of peatlands to fire and carbon loss. *Nature Geosci*, *8*(1), 11–14. <https://doi.org/10.1038/ngeo2325>
<http://www.nature.com/ngeo/journal/v8/n1/abs/ngeo2325.html#supplementary-information>
- Uhl, C., & Kauffman, J. B. (1990). Deforestation, Fire Susceptibility, and Potential Tree Responses to Fire in the Eastern Amazon. *Ecology*, *71*(2), 437–449. <https://doi.org/10.2307/1940299>
- UNESCO. (2005). Universal Declaration on Bioethics and Human Rights.
- Varkkey, H. (2013). Patronage politics, plantation fires and transboundary haze. *Environmental Hazards*, *12*(3–4), 200–217. <https://doi.org/10.1080/17477891.2012.759524>
- Vermeer, K. (2017). Banks and palm oil. Retrieved from https://www.banktrack.org/show/pages/banks_and_palm_oil
- Weatherbee, D. E. (2015). The what and why of Southeast Asia. *International Relations in Southeast Asia*.
- WHO. (2006). Air Quality Guidelines: Global Update 2005. *World Health Organization*, (October). [https://doi.org/10.1016/0004-6981\(88\)90109-6](https://doi.org/10.1016/0004-6981(88)90109-6)
- Winarni, R. R., & van Gelder, J. W. (2015). Tycoon - controlled oil palm groups in Indonesia. Retrieved from www.tuk.or.id/wp-content/uploads/2015/02/Tycoons-in-the-Indonesian-palm-oil-sector-140828-Tuk-Summary.pdf
- Wong, W. H. (2016, November). Initiative aims to foster good investment practices. *The Straits Times*.
- World Bank. (2016). *The cost of fire. An economic analysis of Indonesia's 2015 fire crisis. Indonesia Sustainable Landscapes Knowledge Note* (Vol. 1). Jakarta, Indonesia.
- World Trade Organization. (2017). WTO rules and environmental policies: introduction.
- WWF. (2011). *Palm oil buyers' scorecard 2011*.
- WWF. (2017). WWF Palm Oil Buyers' Scorecard Malaysia and Singapore 2017. Retrieved from <https://palmoil.sg/>
- WWF, FMO, & CDC. (2012). *Profitability and Sustainability in Palm Oil Production*.
- Zahara, R. (2006, October 12). Economic loss estimated at US\$50 m since the start of the haze. *Channel News Asia - Archived from the Original on 22 October 2006*. Retrieved from <https://archive.is/20061022152817/http://www.channelnewsasia.com/stories/singaporelocalnews/view/235112/1.html>
- Zheng, Z., Zhang, X., Wang, J., Dandekar, A., Kim, H., Qiu, Y., ... Zhang, K. (2015). Exposure to fine airborne particulate matters induces hepatic fibrosis in murine models. *Journal of Hepatology*, *63*(6), 1397–1404. <https://doi.org/10.1016/j.jhep.2015.07.020>
- Zion Market Research. (2016). Global Palm Oil Market is Expected to Reach Around USD

92.84 Billion in 2021.

Appendix A: Health impact of Haze pollution

Particulate matter (NPS, 2017a)

What is particulate matter?

Particle matter is made up of a mixture of microscopic solids and liquid droplets suspended in air. This pollution includes acids (such as nitrates and sulphates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mould spores).

Particle size is directly linked to the potential for causing health problems. Particles smaller than 10 micrometres in diameter pose the greatest problems because they can get deep into the lungs and bloodstream. Larger particles can irritate the eyes, nose, and throat, but are of less concern for health impacts.

Particles of concern are classified as “fine particles” (found in smoke and haze), which are 2.5 micrometres in diameter or less (PM_{2.5}), and “coarse particles” (found in wind-blown dust), which have diameters between 2.5 and 10 micrometres (PM₁₀).

How can particulate matter affect health?

Particle exposure can lead to a variety of health effects. Both long- and short-term particle exposures have been linked to health problems. Long-term exposures, such as those experienced by people living for many years in areas with high particle levels, have been associated with problems such as reduced lung function and the development of chronic bronchitis and even premature death. Short-term exposures to particles (hours or days) can aggravate lung disease, causing asthma attacks and acute bronchitis, and may also increase susceptibility to respiratory infections. In people with heart disease, short-term exposures have been linked to heart attacks.

Healthy children and adults have not been reported to suffer serious effects from short-term exposures, although they may experience temporary minor irritation when particle levels are elevated.

What are the symptoms of particle exposure?

Even healthy individuals may experience temporary symptoms, such as irritation of the eyes, nose, and throat, coughing, phlegm, chest tightness, and shortness of breath when particulate conditions are poor. Individuals with lung disease may not be able to breathe as deeply or as vigorously as normal and may also experience coughing, chest discomfort, wheezing, shortness of breath, and unusual fatigue during periods of elevated particulate matter pollution.

Who is at risk?

People with heart or lung disease, diabetics, older adults, and children are considered at greater risk from particulate matter pollution than other people, especially when they are

physically active. Exercise and physical activity cause people to breathe faster and more deeply, drawing more particles into their lungs.

The following people may be particularly sensitive to particulate matter:

- **People with heart or lung diseases** such as coronary artery disease, congestive heart failure, and asthma or chronic obstructive pulmonary disease (COPD) are at increased risk, because particles can aggravate these diseases.
- **People with diabetes** may also be at increased risk, possibly because they are more likely to have underlying cardiovascular disease.
- **Older adults** are at increased risk, possibly because they may have undiagnosed heart or lung disease or diabetes.
- **Children** are likely at increased risk for several reasons. Their lungs are still developing; they spend more time at high activity levels; and they are more likely to have asthma or acute respiratory diseases, which can be aggravated when particle levels are high.

Sulphur, sulphur dioxide, and other sulphur oxides (NPS, 2017b)

What is sulphur dioxide?

Sulphur dioxide (SO₂) is a colourless, reactive, gaseous air pollutant with a pungent odour. This gas can pose a threat to human health, animal health, and plant life. The primary sources of sulphur dioxide emissions are from fossil fuel combustion and natural volcanic activity.

How can sulphur dioxide affect health?

Sulphur dioxide irritates the skin and mucous membranes of the eyes, nose, throat, and lungs. High concentrations of SO₂ can cause inflammation and irritation of the respiratory system, particularly during heavy physical activity. The resulting symptoms may include pain when taking a deep breath, coughing, throat irritation, and breathing difficulties. High concentrations of SO₂ can affect lung function, worsen asthma attacks, and aggravate existing heart disease in sensitive groups. SO₂ emissions that lead to high concentrations of SO₂ in the air generally also lead to the formation of other sulphur oxides (SO_x). SO_x can react with other compounds in the atmosphere to form small particles. These particles contribute to particulate matter (PM) pollution.

Who is at risk?

The following people may be particularly sensitive to sulphur dioxide:

- **People with lung diseases**, such as asthma, chronic bronchitis, and emphysema will generally experience more serious health effects at lower SO₂ levels.
- **Children** are at higher risk from SO₂ exposure because they are more likely to have asthma, which may be aggravated by SO₂ exposure. Their lungs are still developing.
- **Older adults** may be more affected by SO₂ exposure, possibly because they are more likely to have pre-existing lung or cardiovascular disease.
- **Active people** of all ages who exercise or work vigorously outdoors have higher exposure to sulphur dioxide than people who are less active.

What are the environmental effects of SO₂ and other sulphur oxides? (EPA, 2017)

At high concentrations, gaseous SO_x can harm trees and plants by damaging foliage and decreasing growth. SO₂ and other sulphur oxides can contribute to acid rain which can harm sensitive ecosystems.

Health effects of sulphur (Lenntech, 2017)

All living things need sulphur. It is especially important for humans because it is part of the amino acid methionine, which is an absolute dietary requirement. The amino acid cysteine also contains sulphur. The average person takes in around 900 milligrams of sulphur per day, mainly in the form of protein.

Elemental sulphur is not toxic, but many simple sulphur derivatives are, such as sulphur dioxide (SO₂) and hydrogen sulphide.

Sulphur can be found commonly in nature as sulphides. During several processes sulphur bonds are added to the environment that are damaging to animals, as well as humans. These damaging sulphur bonds are also shaped in nature during various reactions, mostly when substances that are not naturally present have already been added. They are unwanted because of their unpleasant smells and are often highly toxic.

Sulphuric substances can have the following effects on human health:

- Neurological effects and behavioural changes
- Disturbance of blood circulation
- Heart damage
- Effects on eyes and eyesight
- Reproductive failure
- Damage to immune systems
- Stomach and gastrointestinal disorder
- Damage to liver and kidney functions
- Hearing defects
- Disturbance of the hormonal metabolism
- Dermatological effects
- Suffocation and lung embolism

Effects of sulphur on the environment

Sulphur can be found in the air in many different forms. It can cause irritation of the eyes and throat of animals through inhalation of sulphur in the gaseous phase. Sulphur is applied in industries widely and emitted to air, due to the limited possibilities of destruction of the sulphur bonds that are applied.

The damaging effects of sulphur on animals are mostly brain damage, through malfunctioning of the hypothalamus, and damage to the nervous system.

Laboratory tests with test animals have indicated that sulphur can cause serious vascular damage in veins of the brains, the heart, and the kidneys. These tests have also indicated that certain forms of sulphur can cause foetal damage and congenital effects. Mothers can even carry sulphur poisoning over to their children through mother's milk.

Finally, sulphur can damage the internal enzyme systems of animals.

Appendix B: Analysis of sustainability standards

In this appendix, we will evaluate selected existing sustainability standards for palm oil and paper and their effectiveness as a proxy to haze-free standards.

We categorise the standards into two types: regulated and non-regulated.

Regulated standards have a regulatory body that ensures companies that subscribe to the standard comply with a common set of criteria and processes.

Regulated standards can be further divided into various types:

- **Voluntary certification standards** have a global reach and include end-product labelling to allow consumers to verify that their product is produced in accordance with the prescribed standards.
- **Mandatory national standards** cover, or are intended to cover, all growers in the country.
- **Voluntary initiatives** are for growers who want to apply more stringent criteria than mass market standards.
- **Labelling schemes** have multiple criteria covering life cycle considerations. Some labelling schemes require the submission of documents proving third-party verification (Global Ecolabelling Network (GEN), 2004), while others do not require formal certification. Labelling schemes may also cover multiple types of products and agricultural commodities.

Non-regulated standards consist of broad principles, although the exact criteria and indicators differ from company to company.

Below we will analyse in detail the main standards currently available.

Voluntary certification standards

Roundtable on Sustainable Palm Oil (RSPO)

Established in 2004, the RSPO is a non-profit organisation that encompasses stakeholders from seven sectors of the palm oil industry: oil palm producers, processors or traders, consumer goods manufacturers, retailers, banks/investors, and environmental and social non-governmental organisations (NGOs). The RSPO works together with these stakeholders to develop and implement global standards for sustainable palm oil (Roundtable on Sustainable Palm Oil (RSPO), n.d.).

Criteria

- Criteria include banning the use of fire for land preparation, managing water levels in existing plantations on peat, limiting new developments on peat, banning the clearance of primary forest or areas with High Conservation Value (HCV), and recognising local communities' land rights based on principles of Free Prior and Informed Consent (FPIC).

Impact

- The RSPO is the most widely adopted and recognised certification standard for palm oil globally. As of August 2017, 19% of global crude palm oil is certified by RSPO.
- RSPO criteria regarding new development applies to all plantations operated by RSPO members, regardless of whether there is an intention for these plantations to be certified.
- Smallholder inclusion is a challenge. Just 12% of RSPO-certified area globally is owned or managed by smallholders, although smallholders produce 40% of the world's palm oil. There is a steep barrier to entry for smallholders to adopt certification, although there are various schemes actively looking to address this, for example through jurisdictional certification programmes which bring together all stakeholders within a district or state to ensure the entire region is certified.
- The RSPO has recognised the importance of smallholders and the need for improving smallholder inclusion in the RSPO system. During the 12th General Assembly in November 2015, the RSPO passed Resolution 6f, which called for the development of a comprehensive strategy and action plan to realise the full potential of smallholders. In March 2017, the RSPO Board of Governors approved the strategic framework that underpins the full RSPO Smallholder Strategy (Roundtable on Sustainable Palm Oil (RSPO), 2017).

Trustworthiness

- As a multi-stakeholder grouping, the RSPO includes many environmental and social NGOs that provide checks and balances on RSPO's criteria and processes.
- The level of transparency is high, with the following information publicly available on RSPO's website: standards, list of companies certified, audit forms, grievances, concession maps (with the exception of Malaysia, but including Sabah), and list of RSPO board members.
- The RSPO possesses a transparent grievance system that can be used to suspend errant companies and auditors.

- Challenges remain regarding the audit system, which may not be able to detect all cases of non-compliance. The audit system is also subject to conflicts of interest, because audit companies are hired by growers. RSPO has tried to address this issue by appointing an accreditation body to check on the auditors.
- Some NGOs criticise the RSPO criteria for not protecting secondary forests, which are not considered HCV areas, and for allowing limited new development on peat. Hence, the RSPO standards fall short of the “no deforestation” and “no peat” standards that have become widespread throughout the oil palm industry.

Improvement

- Commitment to improvement is shown by RSPO’s renewal of its Principles and Criteria every 5 years, as well as a large number of RSPO-led working groups that constantly develop improved procedures and processes.

RSPO Next

RSPO Next is a voluntary add-on to the standard RSPO criteria. RSPO Next has stronger protection for forests and eliminates new development on peat on any depth. However, as of September 2017, only one company, Colombia-based Daabon, has received RSPO Next certification.

Rainforest Alliance (RA)

Rainforest Alliance is a non-profit organisation that certifies more than 100 different varieties of crops, including oil palm, based on the Sustainable Agriculture Network (SAN) standard.

Criteria

- SAN criteria limit the use of fire to pest control and regulate it under strict conditions. They also ban the clearance of forests and HCV areas. Local communities’ land rights are respected under FPIC.
- Peat is not protected explicitly. Peat swamp forests are protected under the category of natural ecosystems, but there are no provisions covering non-forested peatland and existing plantations on peat.

Impact

- RA currently certifies growers in Central America and Papua New Guinea. There are currently no certified areas in Malaysia or Indonesia, although expansion plans exist (Rainforest Alliance, 2016).

Trustworthiness

- SAN is a coalition of non-profit conservation groups, and RA is also a non-profit organisation which reduces the risk of conflict of interest.

- A grievance system exists, but it lacks transparency.

Improvement

- Commitment to improvement is shown by RA's renewal of its criteria every 5 years.
- There is strong support for certified growers to improve via a learning and support programme. The standard contains a continuous improvement system that requires farms to gradually increase their compliance over a six-year period.

Forest Stewardship Council (FSC)

FSC is an international non-profit, multi-stakeholder organisation established in 1993 to promote responsible management of the world's forests. It certifies mainly timber products, including paper, but also non-timber products such as bamboo and recycled paper.

Criteria

- FSC bans uncontrolled fires, protects High Conservation Value (HCV) areas, and allows only very limited clearance of natural forests.
- Local community land rights are recognised, based on FPIC principles.
- Peat is not protected explicitly. Peat swamp forests are protected under the category of natural forests, but there are no provisions covering non-forested peatland and existing plantations on peat.

Impact

- FSC certification covers 5% of global forested area (Food and Agriculture Organization (FAO), 2016) and 8% of global wood production (Forest Stewardship Council (FSC), 2015).
- In 2015, FSC forests represented 5.6% of planted forests and 0.3% of all forests in Indonesia (including primary, secondary and planted forests) (Food and Agriculture Organization (FAO), 2014).
- FSC's Policy of Association mechanism can be and has been used to remove members that clear more than 10,000 ha or 10% of the forest areas under the member's responsibility in the past 5 years, whichever is higher, regardless of whether that area is or is intended to be certified.
- A study comparing FSC-certified and non-certified logging concessions in Kalimantan, Indonesia found that FSC certification reduced deforestation by 5%, though it had no statistically significant impact on fire incidence (Miteva et al., 2015).

Trustworthiness

- Members are divided into environmental, social, and economic chambers, which have an equal proportion of votes in the governing board and assembly, thus providing checks and balances on companies.
- A grievance system exists, but only Policy of Association disputes are publicly available on the website. Grievances against certificate holders have to be submitted to certification bodies,¹ with limited transparency in the process.

Improvement

- Criteria is revised every 5 years. Other processes and procedures are also constantly revised.

¹ FCS only designs the standard. Companies are audited by external Certification Bodies who evaluate their compliance to the standard.

Programme for the Endorsement of Forest Certification (PEFC)

PEFC is an international non-profit organisation established in 1999 to promote the sustainable management of forests. It does so through endorsement of national forest certification systems that meet PEFC's criteria, such as the Malaysian Timber Certification Council and the Indonesian Forestry Certification Cooperation.

Criteria

- The use of fire is not allowed except if it is “necessary for the achievement of the management goals of the forest management unit”.
- Conversion of forests to other land use types is restricted.
- Respect for local community land rights is mandated, based on FPIC principles.
- Peat is not protected explicitly. Peat swamp forests are protected under the category of natural forests, but there are no provisions covering non-forested peatland and existing plantations on peat.

Impact

- PEFC certification covers about 8% of global forest area.
- PEFC allows certified companies to operate non-certified plantations, thus allowing for a two-tiered system where the same company may produce certified products for more discerning markets, while causing environmental and social damage in uncertified areas.

Trustworthiness

- Members consist of companies and industry bodies. There is a lack of NGO oversight.
- Grievance mechanisms are devolved to national certification systems, which generally have limited transparency.

Improvement

- Criteria have to be reviewed every 5 years.

Mandatory national standards

Indonesian Sustainable Palm Oil Standard (ISPO)

ISPO was launched in 2011 by the Indonesian government to ensure the adherence of all palm oil plantations to government laws and regulations.

Criteria

- ISPO bans the use of fire to clear land, and requires the implementation of measures for fire prevention and suppression.
- Protection of forests is based on environmental impact assessments and the avoidance of forests zoned by authorities for conservation.
- New peatland development is allowed as long as maximum peat depth does not exceed 3 metres. Existing plantations on peat require the implementation of water management processes.
- Local communities' land rights have to be respected, although there is no specific requirement for FPIC.

Impact

- ISPO is mandatory for all plantation companies and voluntary for smallholders. This means that ISPO could have a large potential impact, although only 12% of planted area had been certified as of April 2017 (Ribka, 2017).

Trustworthiness

- There are no NGOs involved in the governance and oversight of the standard.
- There is a grievance system but transparency is low, with no publicly available information regarding grievances.

Malaysian Sustainable Palm Oil (MSPO) Certification Scheme

MSPO was launched in 2015 and is Malaysia's national scheme for certifying oil palm plantations.

Criteria

- MSPO bans land burning for waste disposal and land preparation.
- The protection of forests is limited to lands with high biodiversity value and environmentally sensitive areas.
- There is no protection of peat. Existing plantations on peat require water management.
- Local community land rights are respected based on FPIC principles.

Impact

- MSPO is mandatory for all Malaysian oil palm plantations, including smallholders, so its potential impact is very large.
- However, only 4% of planted area in Malaysia had been certified as of January 2017.

Trustworthiness

- There is a grievance system, but complaints against certificate holders have to be sent to a certification body which may not be independent.
- There is low transparency. Detailed certification criteria are not publicly available.

Sistem Verifikasi Legalitas Kayu (SVLK)

SVLK, also known as the Indonesian Timber Legality Assurance system, was adopted in 2009 with the goal of ensuring that timber products in Indonesia originate from legal sources. It covers wood and wood products, including paper.

Criteria

- As the SVLK is focused on timber legality, it does not include regulations on fire and peat. Protection of forests and local community rights is based on environmental impact assessments. Forest exploitation is limited to areas zoned as production forest.

Impact

- SVLK is mandatory in Indonesia and as of April 2017, all timber concessions and pulpwood plantations have been certified (EU FLEGT Facility, 2017).
- The EU has endorsed SVLK as a standard that meets the requirements of the EU Timber Regulation, which prohibits EU importers and domestic producers from placing illegally harvested timber and timber products on the EU market.

Trustworthiness

- SVLK regulation specifies the responsibilities of independent monitors and their access to information. To perform this task, Indonesian civil society organizations formed an independent forestry monitoring network, JPIK – Jaringan Pemantau Independen Kehutanan (“Jaringan Pemantau Independen Kehutanan (JPIK),” n.d.) whose members include more than 300 individuals and 60 organisations.

Improvement

- The SVLK regulation has been revised three times since 2009.
- There are no specific deadlines for reviewing the SVLK, but under the agreement with the EU, a Joint Implementation Committee was formed which oversees the agreement and will take remedial actions if systematic failures are identified.

Voluntary initiatives

Palm Oil Innovation Group (POIG)

The POIG is a multi-stakeholder platform that aims to go beyond the standard RSPO criteria. It has developed a set of verification indicators, the first version of which has been trialled by two companies. However, it lacks features commonly associated with certification systems, such as a grievance mechanism and accreditation.

Labelling schemes

Singapore Green Label Scheme (SGLS)

The SGLS was launched in 1992 as a way to endorse environmentally friendly products. It certifies a wide range of products including palm oil and paper products. The SGLS is administered by the Singapore Environment Council.

Criteria

- The palm oil criteria includes a requirement for RSPO certification.
- The paper criteria includes a requirement for FSC certification or “equivalent”. Companies need to go through audits and fulfil all FSC criteria except those pertaining to the Policy of Association.

Impact

- SGLS labels over 3000 products under a single label, making it easier for Singaporean consumers to recognise eco-friendly products.

Trustworthiness

- Transparency is low and criteria is not publicly available. There is also no grievance mechanism.
- A single company may have both labelled and unlabelled products. This allows for a two-tiered system where the same company may produce labelled products as well as non-labelled products that cause environmental and social damage.

Non-regulated standards

No Deforestation, No Peat, and No Exploitation (NDPE)

Criteria

- NDPE is a broad set of principles created as a result of NGOs' demands for an end to these three types of damaging practices.
- While there is no one standard set of criteria and indicators, there is a general consensus on the criteria required (see Appendix C for our template of a basic NDPE policy relevant to haze and its processes).
- No Deforestation usually includes no clearance of High Conservation Value (HCV) and High Carbon Stock (HCS) forests. The main challenges are the definition of "forest" and the practical aspects of avoiding deforestation in landscapes with high forest cover or highly fragmented forests. A multi-stakeholder group has come together to develop a High Carbon Stock Approach (HCS Approach), which aims to consolidate an agreement on the actual implementation of No Deforestation principles. Some companies also include "no burning" principles under No Deforestation.
- No Peat generally refers to a ban on new development on peat of any depth. Some companies include best management practices for existing plantations on peat, as well as a commitment to explore options to restore peat.
- No Exploitation generally covers both a company's labour force and local communities. For local communities, Free, Prior and Informed Consent (FPIC) should be sought and respected. Some companies go into further detail on what constitute acceptable and unacceptable labour conditions.

Impact

- Chain Reaction Research reported in February 2017 that 365 companies globally have either No Deforestation or NDPE policies (Rijk, Steinweg, & Thoumi, 2017).
- These NDPE policies apply company-wide. For refiners and traders, NDPE policies are generally expected to cover not only the company's own plantations, but also third-party suppliers, giving them more reach than traditional certification standards. A 2016 study estimated that 60% of global palm oil production is covered by NDPE policies (Chain Reaction Research, 2016).
- Actual implementation will take time especially when third-party suppliers, middlemen and smallholders are involved. Challenges include traceability and illegal logging by third parties (Rainforest Alliance, 2015).

Trustworthiness

- Companies are expected to have their own grievance system and conduct transparent reporting. This presents a challenge for smaller companies that lack such capacity.
- Third-party oversight and audits are sometimes provided by NGOs or consultants that the company appoints, but at least one company has been accused of misleading these third-party organisations (Hance, 2016).

- NDPE policies are non-standardised in terms of their underlying mechanisms and requirements across the industry, and currently lack policing by any overarching regulatory authority.
- Hence, while such commitments are commendable and certainly a step in the right direction for the palm oil industry, they do not guarantee robust or concerted industry-wide efforts towards sustainability. This is evidenced by the latest 2017 assessment by the Sustainable Palm Oil Transparency Toolkit (SPOTT)¹ of the 50 largest palm oil producers and traders.
- Of those major companies, 8 are headquartered in Singapore. SPOTTs scores indicate that while 5 of the 8 companies are operating with ‘acceptable,’ scores², three, including Bumitama Agri Ltd, First Resources Ltd and Kencana Agri Ltd are below this bar.
- Furthermore, despite a relatively high SPOTT rating of 77.5% based on the strength of its commitments, Wilmar’s supply chains continue to be linked to deforestation and new peatland development. (foresthints.news, 2017) This is perhaps the clearest indicator that self-policing has not resulted in the improvements, and has instead resulted in different firms operating at different levels of sustainability and different definitions for sustainable palm oil.

Improvement

- Consensus building on the definition and methodology of “No Deforestation” has been an area of active work. The two initially divergent approaches: HCS+ and the HCS Approach, were merged on 8 November 2016. The HCS Approach steering group is currently working towards converging HCV, HCS, and FPIC (Greenpeace, 2016).

¹ SPOTT assesses palm oil producers and traders on the public disclosure of their operations and their commitments to environmental, social, and governance (ESG) best practice, to facilitate corporate engagement and increase industry transparency (Sustainable Palm Oil Transparency Toolkit (SPOTT), 2017a).

² A high score (i.e. >66%) indicates that the company is being transparent around their operations and their policies and commitments to environmental and social best practice, but this does not necessarily mean that the company is sustainable in terms of its impact on the ground (Sustainable Palm Oil Transparency Toolkit (SPOTT), 2017b).

Appendix C: NDPE Policy Template

Criteria

1. No Burning
 - a. No land clearance using fire
2. No Deforestation
 - a. No development of High Carbon Stock (HCS) forest as determined using the HCS Approach
 - b. No development of High Conservation Value (HCV) area
3. No Peat
 - a. No new development on peat of any extent, where peat is defined minimally as “soil containing 65% or more organic matter and depth of 50 cm or greater”
 - b. Best management practices for existing plantations on peat
 - c. Existing plantings on peat assessed by experts to be unsuitable for replanting will be rehabilitated to original ecological conditions and conserved
4. No Exploitation
 - a. Respect rights of indigenous and local communities to give or withhold their free, prior and informed consent (FPIC) to any new developments
 - b. Comply with the fundamental conventions of the International Labour Organisation (ILO) and uphold the wider United Nations Guiding Principles on Business and Human Rights

Scope

- Applies at parent company level, including all subsidiaries, for all upstream and downstream palm oil operations that the parent company owns, manages, or invests in, regardless of stake.
- Applies to all third-party suppliers that the company purchases from or has a trading relationship with.

Processes

- Have grievance mechanism
- Make list of suppliers and mills publicly available
- Actively engage suppliers to verify compliance and take corrective action in case of violation

Appendix D: Results of eatery and supplier survey 2017

Type of cooking oil	Number of eateries	Remarks
Palm oil or blend containing palm oil but not certified sustainable	44	
RSPO-certified palm oil	2	One eatery switched to RSPO -certified sustainable palm oil after engagement by PM.Haze
Does not use palm oil	29	Including eateries that do not use any cooking oil
Total	75	

Suppliers which can provide RSPO-certified cooking oil to eateries in Singapore (15 – 20kg tins):

- Ngo Chew Hong/ Mewah
- Sime Darby
- Hap Seng

RSPO-certified cooking oil brands available in Singapore supermarkets:

- Cabbage
- Chief
- Hand
- Golden
- King Rooster
- New Moon

