

Identifying nature- related financial risks and opportunities in palm oil supply chains

July 2022



Contents

Executive Summary	3
Introduction	3
Pathways to financial impact.....	3
Risks and opportunities.....	3
Conclusions.....	4
Introduction	5
The TNFD	5
The Soy pilot and TNFD-supported palm oil pilot	5
Report purpose and structure	6
Why palm oil	7
Overview.....	7
Finance providers	8
Financial risks and opportunities.....	9
Revenues and costs	9
Assets.....	9
Credit ratings and cost of capital	10
Part I: Nature-related risks	11
Physical Risks	12
Climate fluctuation	12
Pests, disease and monoculture	14
Water use, sea level rise and flooding	15
Transition Risks	16
Certification and No Deforestation, No Peat and No Exploitation (NDPE) policies	16
Changes in policies and regulations.....	19
Community disputes and other restrictions	20
Due diligence legislation	21
Stakeholder expectations.....	24
Biofuel market.....	26
Part II: Nature-related opportunities	27
Improved yields.....	27
Certification.....	28
Access to finance.....	29
Synthetic palm oil.....	30
Increased demand	30
Agroforestry	31
Sustainability-linked finance.....	31

Opportunities for financial institutions.....	32
Part III: Tools and data to analyse financial impacts	33
Nature-related tools and data	33
Market and financial tools and data	34
Scenario analysis	35
Part IV: Conclusions	37
Nature-related risks are already impacting the sector	37
Tools and data are insufficient	37
More research into physical risks is needed	37
Scenario analysis will be vital	37

Executive Summary

Introduction

The Taskforce on Nature-related Financial Disclosures (TNFD) launched in June 2021 with the aim of developing a risk management and disclosure framework for organisations to report and act on evolving nature-related risks and opportunities. The TNFD aims to develop a framework that is fit for purpose by releasing beta versions for wider testing and iterating these versions based on feedback received by various relevant stakeholders.

The first beta version of the framework was released in March 2022, and includes a set of definitions for understanding nature, draft disclosure recommendations and a first draft of a voluntary integrated nature-related risk and opportunity assessment process, called LEAP (Locate, Evaluate, Assess, Prepare). The 'Assess' component of the LEAP process asks companies to identify their nature-related risks and opportunities and highlight the material risks that should be disclosed in line with the TNFD draft recommended disclosures.

This report is designed to help companies and financial institutions better understand transition pathways for nature-related financial risks and opportunities by focusing on the palm oil sector as a case study. The report analyses natural capital risks and opportunities in order to:

- Identify the potential pathways by which they might have a financial impact on companies and
- Quantify those impacts in monetary terms, giving examples where available.

The report focuses on direct financial impacts on companies, rather than the hidden costs of natural capital destruction, which have received considerable attention over the past decade. The overlaps between the two, where the costs of nature-related damage is passed on to companies, have been covered where relevant.

Pathways to financial impact

The report finds that physical and transition risks can financially impact palm oil companies in multiple ways:

- Impacts on revenues, for example by changing yields in production;
- Impacts on costs, for example by changing requirements for production process;
- Impacts on asset valuations, for example by changing legislation removing concessions;
- Impacts on cost of capital, for example by changing investor requirements.

Risks and opportunities

The report looks at various nature-related physical, market, regulatory, technology and transition risks and opportunities and provides an assessment of associated financial impacts. These examples were taken from a review of literature, including academic research, media coverage, financial data providers and company reports. While the focus is on companies in the sector, the report also covers specific risks and opportunities for financial institutions where relevant.

In the context of palm oil, multiple nature-related impacts and dependencies can result in a variety of nature-related financial risks and opportunities. When considering risks:

- Fluctuations in climate on global, local and micro levels can result in physical risks which in turn can lead to significant reductions in oil palm yields. In combination, pests, diseases and the mismanagement of both can also result in significant yield reductions and potentially exacerbate nature-related impacts.
- Legislation and certification requirements can also present transition risks, with many examples of financial implications for palm oil companies who have not effectively complied with certification requirements or 'No Deforestation, No Peat and No Exploitation' (NDPE) policies.
- Community disputes and grievances, which can arise from the economic, environmental and social impacts associated with palm oil production, can also result in financial impacts to palm oil companies.

In contrast, many nature-related opportunities also exist within the palm oil sector, for example:

- Using leguminous cover crops to help protect against soil erosion, reduce soil water evapotranspiration, aid in nutrient cycling and ultimately improve palm oil crop yields.
- Agroforestry approaches which may increase biodiversity and be more sustainable than forestry or agricultural crops by themselves.
- Certification schemes which may improve the efficiency and productivity of palm plantations due to higher attention to crop management techniques.

Conclusions

The report finds that nature-related risks and opportunities are already impacting the profitability of the palm oil sector, in some cases materially. Some risks, such as pests, diseases and sea-level rise (e.g. large scale crop destruction), have the potential to cause very significant impacts to the entire sector, but these have not yet manifested at scale.

While there are many tools and data-sets available for companies to assess nature-related risks and opportunities, there are not yet sufficient tools and data to translate these into financial risks and opportunities. While some financial impacts, such as those from water stress and declining yields, are relatively straightforward for producers to calculate, others such as those from systemic risks are much harder to quantify, and downstream companies face difficulties in calculating their financial exposure to upstream risks.

The report finds that more research is needed on physical risks, especially in quantifying probabilities of events and translating these into financial impacts. Some work is underway, but better coordination with climate modelling would help to integrate risk management and provide clarity on some of the overlaps between climate and biodiversity scenarios.

Finally, the report highlights the importance of scenario analysis. While there are a number of high-quality scenarios for biodiversity loss, broader scenarios for impacts on nature as a whole, and in particular the combination of nature and climate-related events, would enable companies and their finance providers to have a clearer sense of probabilities and financial impacts and to mitigate where possible. It would also enable policymakers to address key issues at local and systemic levels.

Introduction

The TNFD

A Taskforce on Nature-related Financial Disclosures (TNFD) launched in June 2021 with the aim of developing a risk management and disclosure framework for organisations to report and act on evolving nature-related risks and opportunities, and ultimately shift financial flows away from nature-negative outcomes towards nature-positive outcomes. The TNFD aims to develop a framework that is fit for purpose by releasing beta versions for wider testing and iterating these versions based on feedback received by various relevant stakeholders. The first [beta version of the TNFD framework \(v0.1\)](#) was released in March 2022 and the final recommendations are expected to be published in September 2023 [Figure 1].

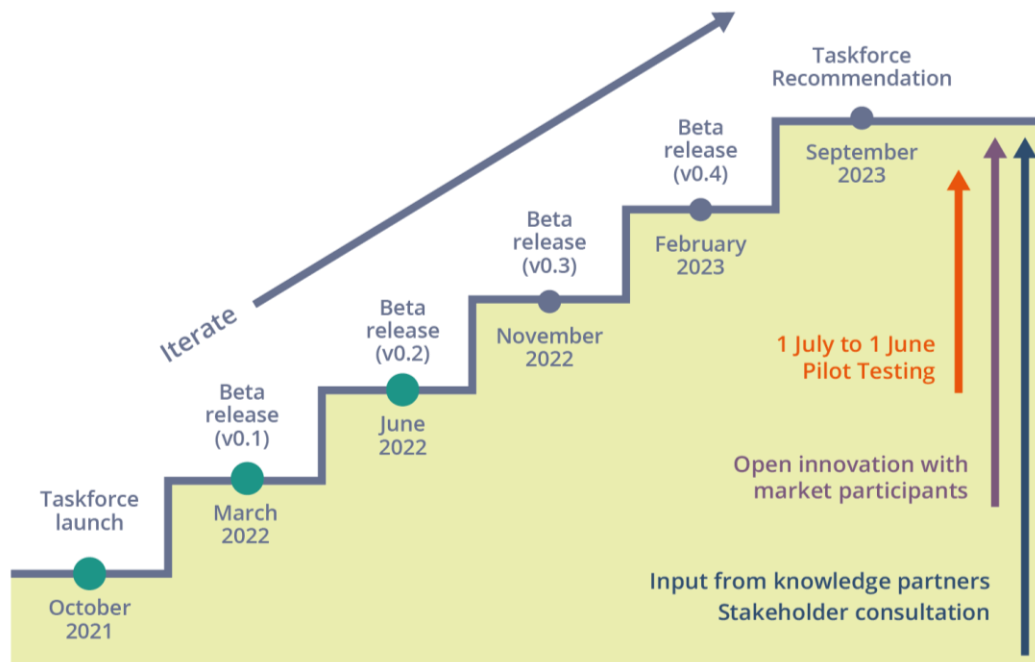


Figure 1: Open innovation timeline for developing the TNFD framework.

Source: The TNFD Nature-related Risk & Opportunity Management and Disclosure Framework – Beta v0.2 Release.

The Soy pilot and TNFD-supported palm oil pilot

As one of the many inputs which helped inform the development of the TNFD beta framework v0.1, Global Canopy and the United Nations Environment Programme Finance Initiative (UNEP FI) conducted an initial early stage pilot¹ with organisations operating within, or financing, soy supply chains. The aim was to test various concepts that were laid out in an earlier TNFD proposed technical scope², published in June 2021.

Global Canopy is now leading a TNFD-supported pilot focused on palm oil, which will test the TNFD beta framework v0.1 with organisations operating within, or financing, the palm oil sector. In addition to participant testing, the palm oil pilot has also commissioned three bespoke pieces of research to help address challenges identified in the soy pilot. One piece of feedback received from participants

1. <https://globalcanopy.org/wp-content/uploads/2022/02/Learnings-from-soy-supply-chains.pdf>
 2. <https://tnfd.global/wp-content/uploads/2021/07/TNFD-%E2%80%93-Technical-Scope-3.pdf>

involved in the soy pilot was that determining the financial impact of nature-related risks and opportunities was, from experience, often challenging. In addition, participants highlighted that more detailed guidance for their sector, including relevant examples, would help their organisations better interpret recommendations laid out in the final TNFD framework.

Report purpose and structure

The TNFD beta framework v0.1 presented a first version of a voluntary integrated nature-related risk and opportunity assessment process, called LEAP (Locate, Evaluate, Assess, Prepare) [Figure 2], alongside fundamental definitions for understanding nature and draft disclosure recommendations.

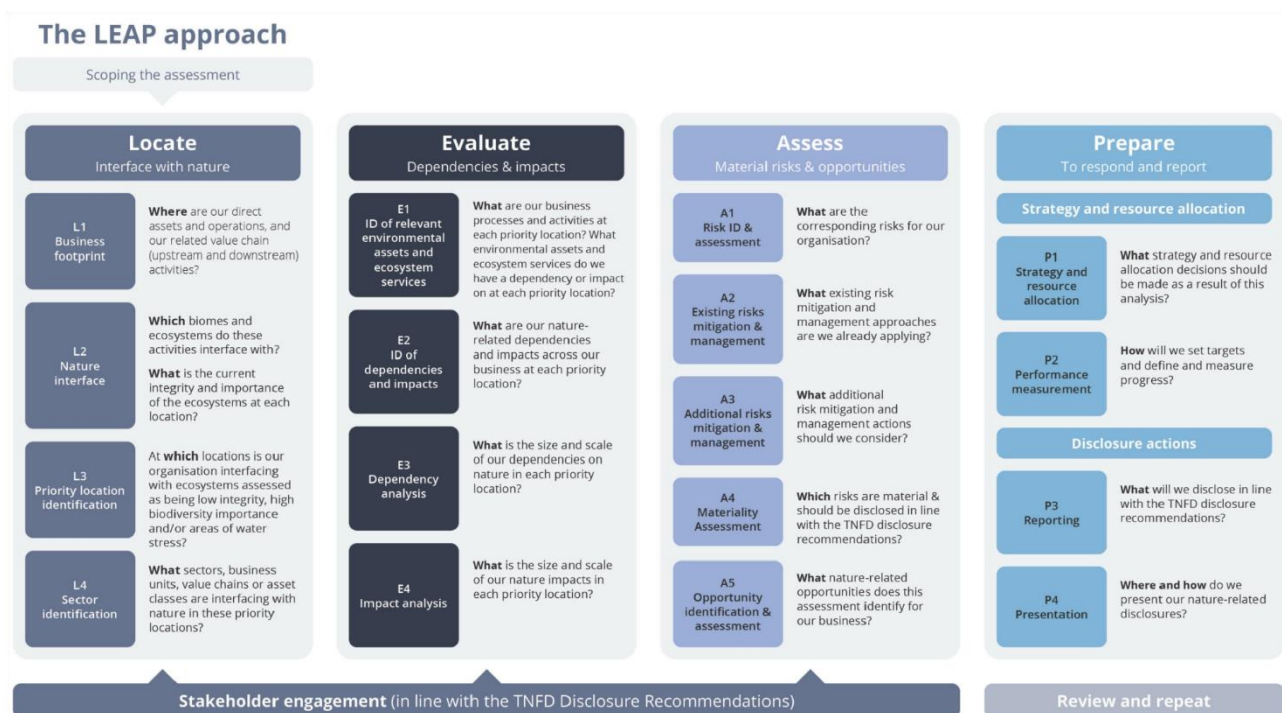


Figure 2: The LEAP approach.

Source: The TNFD Nature-related Risk & Opportunity Management and Disclosure Framework – Beta v0.1 Release, p.11.

In the “Assess” component of the LEAP approach the TNFD poses the following guiding questions to reporting organisations:

- **A1:** What are the corresponding risks for our organisation?
- **A4:** Which risks are material and should be disclosed in line with the TNFD disclosure recommendations?
- **A5:** What nature-related opportunities does this assessment identify for our business?

An organisation following the LEAP approach or an equivalent approach would identify their own material nature-related risks and opportunities. However, in order to help financial institutions and companies answer these guiding questions and better understand transition pathways in the palm oil sector, this report presents some relevant examples of both physical and transition risks, as well as opportunities, elaborating where possible on their potential and real financial impacts.

The report provides an initial overview of the palm oil investment landscape and relevance in the context of the TNFD. It then briefly describes how financial risks and opportunities can materialise before detailing different relevant physical and transition risks, as well as opportunities, relevant to the palm oil sector. The report then finally touches on tools that could be used in the determination of nature-related financial risks and opportunities and highlights some research gaps and considerations for the TNFD.

To develop the report, a literature review was conducted, covering white and grey literature, business media coverage and company reports for financial relevance to forest risk commodity supply chains and specifically palm oil.

It is hoped that this additional information will help enable companies and their finance providers to make better decisions around risk mitigation and opportunities, in line with the TNFD recommendations.

Readers should note that the examples given reflect the financial impacts to companies, but do not take into account the costs to society or the true costs of environmental impacts. They are likely therefore to underrepresent the true costs of nature-related risks and opportunities.

Why palm oil

Overview

- Palm oil is one of the main industrial agricultural commodity contributors to deforestation alongside soy, cattle, paper, rubber and timber. Deforestation is the second largest driver of climate change after the burning of fossil fuels. Globally, roughly 12 percent of total greenhouse gas emissions are caused by deforestation, and some 80 percent of global deforestation is driven by industrial agriculture.³
- Forests and other natural ecosystems are critical for carbon storage, biodiversity protection, water supply, mitigation of natural hazards, adaptation to climate change, and sustaining the wellbeing of indigenous peoples and local communities.⁴
- Palm oil production has exploded in the past two decades to become the world's most widely traded vegetable oil. Current production of more than 70 million tons is projected to double again in the next decade.



3. <https://1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/Palm-Oil-Threat-to-Investors-V1.pdf>

4. <https://accountability-framework.org/the-framework/topics/deforestation-and-conversion/>

Finance providers

- Banks are important sources of capital for the palm oil sector, providing an estimated 24% of the total financing needed.⁵
- The total value of investments in forest-risk commodity companies (see definition below) has increased from USD 37.2 billion in 2020 (April), to USD 45.3 billion in 2021 (April). Overall, the palm oil sector attracted USD 22.5 billion, 50% of all investment and an increase of USD 2.5 billion from a year ago.⁶
 - The top 15 investors provided USD 25 billion to forest-risk commodity sector companies in the three largest tropical forest basins. Southeast Asia attracted 66% of all investment with USD 30 billion, while Latin America accounted for 33% and West and Central Africa just 1%.
 - Of the USD 30 billion investment in the forest-risk commodity sectors in Southeast Asia in 2021, 74% was in palm oil. The top 10 investors include 5 Malaysian financial institutions with Permodalan Nasional Berhad providing USD 5.6 billion, 19% of all investment in the region.
 - Of the USD 0.3 billion investment in the forest-risk commodity sectors in Central & West Africa in 2021 (April), 77% was in palm oil. Permodalan Nasional Berhad is also the largest investor in this region providing USD 106 million, 21% of all investment.⁷

Forest-risk commodities

The concept of forest risk commodities was developed by Global Canopy in 2013 and they are defined as 'globally traded goods and raw materials that originate from tropical forest ecosystems, either directly from within forest areas, or from areas previously under forest cover, whose extraction or production contributes significantly to global tropical deforestation and degradation'.

The main forest-risk commodities that contribute to tropical deforestation are soy, palm oil, rubber, cocoa, cattle (beef and leather), maize, and coffee.⁸



5. https://www.banktrack.org/campaign/banks_and_palm_oil

6. https://forestsandfinance.org/wp-content/uploads/2021/06/F_F_Briefing_2021_ENG.pdf

7. https://forestsandfinance.org/wp-content/uploads/2021/06/F_F_Briefing_2021_ENG.pdf

8. <https://ec.europa.eu/environment/forests/pdf/respondents-additional-inputs/Global%20Canopy.pdf>

Financial risks and opportunities

This report looks at the different types of risks and opportunities, such as physical, market and regulatory, and provides examples of pathways by which they become financially impactful [Figure 3].

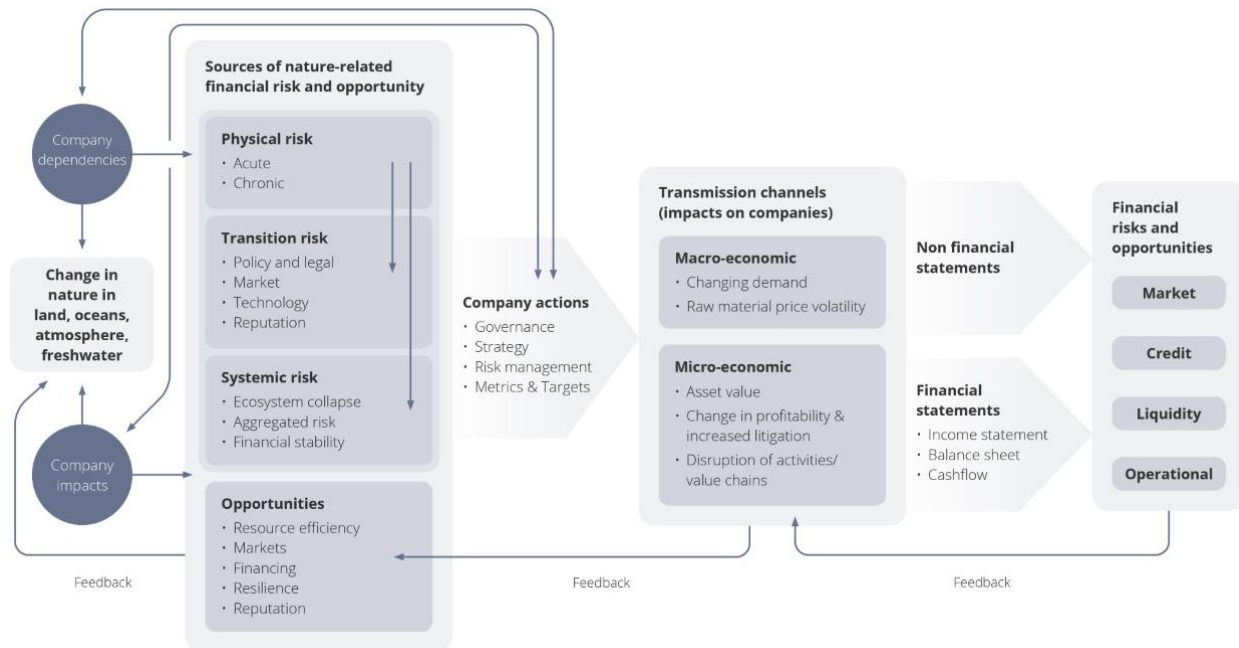


Figure 3: Financial risks and opportunities emerging from nature loss.

Source: The TNFD beta Framework v0.1

Revenues and costs

One of the most obvious ways in which nature-related risks and opportunities become financially relevant is through their effects on revenues and costs. For example:

- Physical risks such as reduced yield from water-related impacts can reduce revenues due to lower quantities of product for sale.
- Market risks and opportunities such as increased prices can lead to higher revenues.
- Fines from relevant authorities for failing to comply with regulations can lead to increased costs, both for the fines themselves and for potential remedial action to avoid further sanctions.
- Changing regulatory requirements can lead to increased costs as companies are required to invest in new initiatives or technology in order to remain compliant.

Assets

Agricultural assets can be significantly affected by changing customer or regulatory requirements. For example, an increase in the percentage of a concession which must be left undeveloped can lead to reduced valuation of assets, while in some cases concessions may be withdrawn, leading to 'stranded assets' which can no longer be developed.

Credit ratings and cost of capital

A reduction of asset valuation can in turn affect a company's credit rating as it has less collateral.

This in turn can affect the costs of capital.

Other impacts on costs of capital could include:

- Divestment from asset managers in response to multiple breaches of regulations
- Exclusion from responsible investment mandates due to lack of appropriate deforestation policies or non-compliance with zero-deforestation commitments
- Lower cost of capital for fully certified companies issuing green bonds

The following sections examine a wide range of nature-related risks and opportunities to show how they can lead to financial impacts for companies and their finance providers.



Part I: Nature-related risks

The TNFD categorises risks as transition, physical and systemic. Wider reports highlight other potential categorisations which could be considered separately or under TNFD’s categories. This report uses the TNFD categorisation for physical and transition risks, although it does not attempt to cover systemic risks due to the difficulty in translating such risks into company-level financial impacts.

There are numerous risks which are prevalent in the palm oil sector impacting both upstream and downstream companies [Table 1].

Table 1: Examples of nature-related risks and financial impacts affecting the palm oil sector: Nature-related risks

Nature-related physical risks	Nature-related transition risks	Financial impacts
<p>Acute: Monoculture and disease (upstream)</p> <p>Chronic: Loss of productivity from climate fluctuations and other factors (upstream)</p> <p>Chronic: Water related risk (upstream and downstream)</p> <p>Chronic: Impaired ecosystem functions (upstream)</p>	<p>Upstream</p> <p>Policy and legal: Concessions at risk / Stranded assets (upstream)</p> <p>Market: Loss of contracts if uncertified (upstream)</p>	<p>Non-performing loans</p> <p>Reduced value of collateral</p> <p>Increased costs</p> <p>Reduced revenues</p> <p>Increased cost of capital</p> <p>Fines and stranded assets</p>
	<p>Midstream</p> <p>Traceability: emergence of informal mills</p> <p>Traceability: refining and leakage market</p> <p>Traceability: hidden deforestation</p>	
	<p>Downstream</p> <p>Market: Consumer pressure (downstream)</p> <p>Market: Shifting biofuel market (downstream)</p> <p>Market exposure</p> <p>Policy and legal changes</p>	

Physical Risks

Climate fluctuation

Fluctuations in climate conditions at a global, local and micro level can impact oil palm productivity and resilience through factors such as temperature, rainfall and conditions for disease.⁹ Modelling suggests that future climate-induced mortality of oil palm crops is “very high” in some African countries, particularly Ghana and Nigeria, and “high” in Latin American countries, particularly Brazil, as well as some countries across Southeast Asia such as Thailand and Myanmar. These mortalities are expected to peak by the year 2100. In contrast, the predicted climatic impact for Malaysia and Indonesia is deemed more stable and therefore lower risk; however, there are regional variations with high mortality predicted across Peninsular Malaysia, Sumatra, and Java.¹⁰

Climate change is also likely to result in less predictable weather patterns, which could affect crop productivity. For example, the flower sex of oil palms is determined two years in advance of fruiting; if there is any water stress in this time the palm will produce more male flowers and therefore suffer reduced fruit production. Similarly, if there is unusually heavy rain in the five months between pollination and fruit maturation, fruit bunches are also likely to be smaller.¹¹ Modelling suggests that countries such as Malaysia and Indonesia will be exposed to extreme precipitation events by 2050¹², while El Nino events bringing prolonged dry seasons are also expected to become more frequent by 2040.¹³

Changes in total rainfall, seasonal variations in precipitation patterns, and increased temperatures will also impact yields within oil palm plantations and affect the distribution of areas that are suitable for oil palms. While climate change will enable oil palms to grow in new locations, total suitable area will decrease and some areas (Thailand, Colombia, Nigeria) are expected to see severe losses of suitable land.¹⁴ When climatic variables are overlaid on top of other criteria which might restrict future land availability for oil palm expansion (e.g. land already in use or not possible to convert), suitable area in the long term represents only 17% (234 million ha) of the total 1.37 billion hectares of potential viable land.¹⁵ This type of analysis so far has not featured in agronomic models and is therefore unseen by investors’ or lenders’ valuation of assets.¹⁶

Some climate risk could be mitigated by expanding production into new areas that are modelled to be less vulnerable to climate fluctuation, such as migrating production from Western to Eastern Africa¹⁷ or from Western to Eastern Brazil,¹⁸ or investing in countries with relatively low climate risk such as Paraguay.¹⁹ However this migration brings other concerns of encroachment into areas of high conservation or carbon value (including expansion into high forest cover countries), such as the

9. <https://link.springer.com/article/10.1186/s43170-021-00058-3>

10. Ibid.

11. https://www.smithschool.ox.ac.uk/research/sustainable-finance/publications/Stranded_Assets_in_Palm_Oil_Production.pdf

12. <https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-risk-and-response-in-asia>

13. <https://www.forbes.com/sites/carlieporterfield/2022/03/07/el-nio-events-will-become-more-frequent-by-2040-even-if-carbon-emissions-slashed-study-finds/?sh=42d68c6c7655>

14. Fleiss, S., Hill, J. K., Mcclean, C., Lucey, J. M., & Reynolds, G. (2020). Potential impacts of climate change on oil palm cultivation: a science for policy paper by the SEnSOR programme. Available from: <http://www.sensorproject.net/wp-content/uploads/2018/01/Climate-change-report-FINAL.pdf>

15. <https://www.sciencedirect.com/science/article/pii/S0959378016300814>

16. https://www.smithschool.ox.ac.uk/research/sustainable-finance/publications/Stranded_Assets_in_Palm_Oil_Production.pdf

17. <https://link.springer.com/article/10.1186/s43170-021-00058-3>

18. Paterson RRM. Longitudinal trends of future climate change and oil palm growth: empirical evidence for tropical Africa. *Environ Sci Pollut Res*. 2021a. <https://doi.org/10.1007/s11356-020-12072-5>.

19. Ibid.

Congo basin. In these geographies, policies like ‘No Deforestation, No Peat, No Exploitation’ (NDPE) will restrict indiscriminate expansion.²⁰

Any kind of expansion into new geographies is likely to be costly and commercial yields in these “new” geographies are considerably lower compared to yields in the main oil palm producing regions as a result of lower climate suitability.²¹ The mitigation of climate risks through shifting production to other regions is therefore likely to result in other production challenges.

Financial impact



For companies and their financiers, the changing climate represents a material financial risk to both existing investments and potential growth for the sector. Direct impacts include lower yields and therefore revenue, as plantations struggle to maintain productivity in a changing environment. For example, temperature rises of between 1-4°C in Malaysia could cause yield decreases of between 10-41%.²² Under the highest emission pathway scenario, average temperatures in Malaysia are expected to increase by 3.11°C by 2090.²³ At current production levels, this could reduce Malaysian GDP by MYR 3.7bn-15bn (USD 0.9-3.6bn).²⁴

Decreased yields could also place upward pressure on companies to expand plantation areas to meet growing global demand for palm oil, further exacerbating nature-related risks and impairing ecosystem functions, potentially leading to wider systemic risks.

Economic impacts of climate change on oil palm revenue vary considerably by country. An assessment of oil palm mortality due to unsuitable climatic conditions across major producers in Southeast Asia and South America found that on average 16% mortality was likely by 2100. Mortality in Indonesia and Malaysia was estimated at 10%, while Brazil and Colombia are forecast to lose their entire cultivated area by the year 2100.²⁵ At current levels of production and value this amounts to USD 15.8bn.²⁶

The cost of diversification and mitigation could also be unachievable for many smaller growers. If productive regions in Latin America or Western Africa are as vulnerable as suggested, mitigation measures will result in increased costs and reduced profitability. If these costs are untenable for some businesses, then it is feasible that a significant proportion of global production will remain in Malaysia and Indonesia, reducing opportunities for geographic diversification and placing businesses under concentrated vulnerability to the existing limits to expansion felt in these countries.²⁷ There could also be further risks to asset values, which may not reflect the potential loss of productivity.

20. https://www.cifor.org/publications/pdf_files/brief/6670-RSPObrief.pdf

21. https://www.cifor.org/publications/pdf_files/brief/6670-RSPObrief.pdf

22. Sarkar MSK, Begum RA, Pereira JJ. Impacts of climate change on oil palm production in Malaysia. *Environ Sci Pollut Res.* 27(9):9760–70

23. <https://reliefweb.int/report/malaysia/climate-risk-country-profile-malaysia>

24. <https://www.statista.com/topics/5814/palm-oil-industry-in-malaysia/#dossierKeyfigures>

25. <https://link.springer.com/article/10.1186/s43170-021-00058-3>

26. <https://www.statista.com/statistics/856231/palm-oil-top-global-producers/>

27. https://www.smithschool.ox.ac.uk/research/sustainable-finance/publications/Stranded_Assets_in_Palm_Oil_Production.pdf

Pests, disease and monoculture

Palm oil is vulnerable to a number of pests and diseases, the prevalence of which is affected by climate and management factors. Ganoderma or basal stem rot, is prevalent in Southeast Asia and exacerbated by repeated planting cycles on infested sites.²⁸ Fusarium rot is found more commonly in Western Africa and has capacity to cause both chronic and acute wilting of oil palm crops.²⁹ Other pests include rats, pigs and beetles who can all reduce oil palm yields.³⁰

There have been serious localised outbreaks of disease. Colombia and Ecuador have experienced repeated outbreaks of “bud rot” (*Phytophthora palmivora*) and lost tens of thousands of hectares of oil palms.³¹ Reports from 2008 suggest over 1000 jobs were lost and up to 46% lost revenue for the region, approximately USD 120 million.³² Similarly, a 2015 outbreak of bud rot in central-eastern Colombia is estimated to have caused more than 8,000 direct and indirect job losses, with USD 2.85 billion in financial losses.³³ The most effective means of managing the disease was to destroy entire affected plantations; for growers this brought catastrophic destruction of long-term investments, expensive replanting costs, plus lost revenue while they waited for new palms to bear fruit.³⁴ Western and central Africa similarly experienced a widespread outbreak of Fusarium rot in 2016.³⁵

Despite these localised outbreaks, there has to date not been a major sector-wide threat from pests or disease. However, as oil palms are grown in larger areas of monoculture, the risk of unmanageable outbreak becomes more acute and, with greater dependency on one crop, producers become increasingly vulnerable to subsequent losses.³⁶ A changing climate will also affect conditions for disease, a relationship which remains to this day insufficiently researched.

There are hybrid palm varieties which may offer greater resilience to pests, however these hybrids are sterile so are costly to pollinate manually, and require different harvesting machinery, therefore increasing the costs of production. For example, where these hybrids were planted in response to bud rot in Colombia, the costs of pollination can be as high as USD 500 per hectare per year.³⁷

There are also concerns that natural pollination services could be at risk from disease. In Southeast Asia, oil palm is primarily pollinated by one species of weevil whose behaviour is observed to vary depending on the climate. These pollinators were introduced from West Africa in small numbers, meaning that the Southeast Asian population is built upon a reduced and vulnerable gene pool and could therefore become as vulnerable to disease as the crop itself.³⁸ Any loss of natural pollinators could potentially be mitigated by using artificial pollination, though this would incur further costs. In combination with disease, natural pollinators can also be significantly affected by pesticides and

28. Paterson RRM. Ganoderma boninense disease deduced from simulation modelling with large data sets of future Malaysian oil palm climate. *Phytoparasitica*. 2019a;47(2):255–62.

29. <https://link.springer.com/content/pdf/10.1186/s43170-021-00058-3.pdf>

30. *ibid*

31. https://www.cambridge.org/core/journals/experimental-agriculture/article/abs/oil-palm-bud-rot-in-latin-america/1A713974C82E0162AE_A59F816EDE7AE2

32. Corredor R., A., G. Martínez L., and A. Silva C. 2008. Problemática de la pudrición del cogollo en Tumaco e instrumentos para su manejo y la renovación del cultivo. *Palmas* 29, 11-16. Translated content referenced in: <https://www.redalyc.org/pdf/1803/180333786011.pdf>

33. *ibid*

34. <https://news.mongabay.com/2018/08/i-cant-get-out-farmers-feel-the-pressure-as-ecuadors-palm-oil-sector-grows/>

35. <https://www.ajol.info/index.php/jab/article/view/186366>

36. <https://news.mongabay.com/2018/08/i-cant-get-out-farmers-feel-the-pressure-as-ecuadors-palm-oil-sector-grows/>

37. M. Mosquera et al., Costos de producción para el fruto de palma de aceite y el aceite de palma en 2015: estimación en un grupo de productores colombianos. *Palmas* 38, 11-27 (2017). Cited in <https://portals.iucn.org/library/sites/library/files/documents/2018-027-En.pdf>

38. Jackson, L., van Noordwijk, M., Bengtsson, J., Foster, W., Lipper, L., Pulleman, M., Said, M., Snaddon, J. & Vodouhe, R., 2010. Biodiversity and agricultural sustainability: from assessment to adaptive management. *Current Opinion in Environmental Sustainability*, 2(1), 80-87.

insecticides. A study on the impact of three chemical insecticides – used to control pests on palm oil plantations – on the Coleopteran weevil highlighted that all were found to cause heavy mortality.³⁹ The use of natural predators to tackle pests could therefore help reduce the reliance on pesticides and help mitigate further nature-related impacts.⁴⁰

Financial impact



Disease and pests have impacted yields, leading to reduced revenues and sometimes increased costs for mitigation. However, for palm oil companies and their investors, the risk of an uncontrolled outbreak represents a largely unknown and uncalculated risk that could threaten profitability and asset valuations. Case studies from other diseases provide possible scenarios for palm oil. For example, with Dutch elm disease the first observation was in 1910, with an initial epidemic which killed between 10% and 40% of European elms over the next 30 years. This was followed by a more virulent version in the 1960s which killed around two thirds of elms within a decade.⁴¹ It is possible, therefore, that any financial impacts might play out over decades, although the results could be catastrophic for the industry.

Companies could mitigate some of this risk through geographic diversification, though this may increase exposure to other risks, or through increased agroforestry and companion planting which could help to maintain biodiversity and natural predators (See section on [Agroforestry](#) in opportunities, below).

Water use, sea level rise and flooding

The effects of palm oil production on local water cycles has been widely researched, typically focusing on the impact of polluted effluent in waterways and on soil erosion. Water risks to palm production, however, are less well researched because, while palm is a water-intensive crop, it traditionally depends only upon rainfall⁴² and grows exclusively in equatorial regions where rainfall is reliable and plentiful and has not therefore faced significant water stress. However, new water risks may emerge as palm oil cultivation moves into more marginal areas as a result of an increase in no-deforestation commitments.

For example, studies have found that large areas of marginal lands in Indonesia have lower quality, more acidic soils and that the introduction of irrigation techniques will thus become necessary to meet the water needs of palm crops,⁴³ although no estimates on the extent of investment needed have been found. These restraints appear to also be present in Africa, where average yields have so far been lower than anticipated, sometimes only half those in Southeast Asia. This appears to be in part due to water shortages and different soil composition, as well as limited sunlight from excessive cloud cover and use of lower quality seedlings.⁴⁴

With potential increased dependence on groundwater irrigation, an additional risk is presented by rising sea levels; low-lying regions may be vulnerable to flooding or saltwater intrusion on cropland.⁴⁵

39. P. Kalidas, P. Rajasekhar and S.V.L. Lalitha, Impact of pesticides on the pollinating weevils of oil palm, *Journal of Plantation Crops*, 2008, 36 (3): 460-462

40. <https://www.asianagri.com/en/media-publications/articles/natural-pest-control-eliminates-pesticide-use-on-asian-agri-estate/>

41. <https://www.forestresearch.gov.uk/tools-and-resources/fthr/pest-and-disease-resources/dutch-elm-disease/#:~:text=Dutch%20elm%20disease%20is%20a,tree%20by%20elm%20bark%20beetles.>

42. <https://www.sciencedirect.com/science/article/pii/S0378377421005692>

43. Ibid.

44. <https://portals.iucn.org/library/sites/library/files/documents/2018-027-En.pdf>

45. https://www.smithschool.ox.ac.uk/research/sustainable-finance/publications/Stranded_Assets_in_Palm_Oil_Production.pdf

In Malaysia for example, research suggests that the majority of oil palm is grown at low elevations (<200m) and that more than two thirds of these plantations were on slopes below 3% gradient.⁴⁶ As a result, up to 100,000ha of Malaysia’s coastal plantations could be flooded in the future.⁴⁷ Flooding could potentially be managed through expensive engineering or through greener solutions such as mangrove protection.

Financial impact

Water risks are already affecting asset valuations in Africa as yields fall short of expected, while decreasing revenues and potentially increasing costs if irrigation is needed.



If climate change begins to affect crop productivity, this could lead to increased price volatility. For example, in December 2021, Malaysia suffered severe flooding which affected its oil palm plantations and palm oil futures spiked by 5.5% as a result.⁴⁸

Transition Risks

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

As verification of compliance with company NDPE commitments becomes increasingly stringent, more buyers, traders and manufacturers are likely to use certification and other verification mechanisms to inform their procurement decisions, with non-compliant suppliers risking suspension or exclusion from supply chains of companies with NDPE policies.⁴⁹ This may pose significant market risks for those producers who are either uncertified or unable to demonstrate compliance with NDPE commitments.

Historically, the price premium for certified palm oil has not been significant, and in some cases does not cover the increased costs of compliance. As an increasing number of buyers implement NDPE policies, either through choice or in response to increasing legislation around due diligence in supply chains, it is possible that this price premium may begin to widen, leading to both risks and opportunities for companies. Certification is also being used as a risk mitigation strategy for downstream companies, given the difficulties of supply chain traceability, and this could increasingly impact on upstream companies who are not certified.

Producers who choose to remain non-compliant will shift their business to supply the leakage market (see definition below), typically to markets with lower regulation⁵⁰ (notably India, China⁵¹ or Japan⁵²) or for domestic biofuel, such as in Indonesia⁵³ and Brazil⁵⁴. Buyers in the leakage market however are likely to leverage lower prices and this could lead to lower revenue for these producers.

46. Harris N, Brown K, Netzer M, Gunarso P, Killeen T. Projections of Oil Palm Expansion in Indonesia, Malaysia, and Papua New Guinea from 2010–2050. In: Killeen T, Goon J, editors. Reports from the Science Panel of the Second RSPO GHG Working Group. Kuala Lumpur, Malaysia: Roundtable for Sustainable Palm Oil. November 2013. Cited in: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0210628>

47. Siwar, C., Ahmed, F. & Begum, R.A., 2013. Climate change, agriculture and food security issues: Malaysian perspective. *Journal: Food, Agriculture and Environment*, 11(2), 1118-1123.

48. <https://www.bloomberg.com/news/articles/2021-12-27/palm-oil-declines-after-four-days-of-gains-with-floods-in-focus>

49. <https://www.cifor.org/knowledge/publication/6670/>

50. <https://chinadialogue.net/en/nature/banning-high-deforestation-palm-oil-imports-would-barely-reduce-forest-loss/>

51. <https://chinadialogue.net/en/business/certification-fails-to-transform-the-palm-oil-industry-what-next/>

52. <https://chainreactionresearch.com/the-chain-shareholder-resolution-pressure-sumitomo-corporation-to-alter-climate-policies/>

53. <https://chainreactionresearch.com/wp-content/uploads/2020/04/NDPE-Policies-Cover-83-of-Palm-Oil-Refining-Market.pdf>

54. <https://chainreactionresearch.com/report/palm-oil-production-in-brazilian-amazon-threatens-ndpe-commitments/>

Leakage

Any activity in the palm oil industry, production, trade and/or consumption that is not compliant with NDPE policy requirements. Leakage creates an unfair playing field and slows and dilutes industry transformation, thereby incurring various financial and reputational risks.⁵⁵

The risk of leakage is especially exacerbated at the refining stage, whereby a small number of refiners source from thousands of mills and in turn sell on to many manufacturers.⁵⁶ As of April 2020, a review of NDPE policies suggest that only 83% of refining capacity in Indonesia and Malaysia is covered, while “effective” NDPE implementation is likely much lower.⁵⁷ Of the 52 “leakage refiners” operating in Indonesia and Malaysia in 2018, Chain Reaction Research analysed the investment providers of just 16. These 16 refiners were found to receive USD 5.5 billion in equity and debt financing and loans; 15 of the top 20 shareholders are international and five are based in Asia. These financial institutions hold USD 4 billion in shareholder value, representing a large amount of financing at risk of decreasing returns if the leakage market becomes less profitable.⁵⁸



55. <https://chainreactionresearch.files.wordpress.com/2017/06/ssms-supplying-the-palm-oil-leakage-market-170620.pdf>

56. <https://chainreactionresearch.com/wp-content/uploads/2020/04/NDPE-Policies-Cover-83-of-Palm-Oil-Refining-Market.pdf>

57. *ibid*

58. <https://chainreactionresearch.com/wp-content/uploads/2018/05/Leakage-Refiners-CRR-020518-Final.pdf>

Financial impact



There are many examples of financial impacts from companies who have not implemented some form of certification or NDPE policy, or who have failed to comply with certification requirements or their NDPE policy.

Between 2015-17, the Indonesian producer Sawit Sumbermas Sarana (SSMS) experienced repeated loss of business and a declining share price from its decision not to become NDPE compliant. In 2014 and 2015, buyers Wilmar, Golden Agri-Resources and Apical all suspended purchases from SSMS because of non-compliance with NDPE policies.⁵⁹ These buyers accounted for 79%, 81% and 53% of SSMS' business in 2013, 2014 and 2015 respectively.⁶⁰ SSMS gained a new contract with Unilever which was subsequently suspended in 2017 on account of breached policies on deforestation and peat.⁶¹ In search of new buyers, SSMS then transitioned into supplying the "leakage market" of uncertified, unsustainable palm oil resulting in losses for shareholders; analysis by Chain Reaction Research suggests that SSMS underperformed its peers by 17-20% between May 2015 – April 2017.⁶² Although the company managed to recover some of its losses, it also incurred higher debt due to portfolio changes and increasing capex from the shift onto the leakage market.⁶³

Chain Reaction Research has assessed similar losses by other producers who have chosen not to become NDPE compliant and found that they have also incurred lost revenue. Austindo Nusantara Jaya (ANJT) and Provident Agro (PALM) suffered actual revenue losses of 10% and 15% respectively as a result of not meeting buyers' NDPE expectations, while PALM also experienced a declining share price.⁶⁴

Between 2015 and 2019, Chain Reaction Research analysed the impact of 15 non-compliance related suspensions on four oil palm growers including some of those above; Sawit Sumbermas Sarana (SSMS), Austindo Nusantara Jaya (ANJ), Tunas Baru Lampung (TBLA), and Indofood Agri Resources. The research found that annual net profits of the suspended growers declined by USD 122 million (69 percent) since the first suspension events in 2015 and they experienced higher inventories, and net debt. Furthermore, the equity values of the four growers declined by a combined USD1.1 billion between 2015-2019, representing 42 percent of the total equity value.⁶⁵

The share value of IOI Corporation also dropped in response to a possible suspension from the RSPO in 2016.⁶⁶ When the suspension later came into effect, 24 RSPO certified buyers and traders including Unilever, Mars, Hershey's, Mondelez, General Mills, Bunge and Cargill all suspended their purchases from IOI.⁶⁷ In addition to the impact on cash flow, IOI then took the unprecedented measure of suing the RSPO for the suspension, accruing additional legal costs.⁶⁸

The World Bank and Bank Negara Malaysia noted that while crude palm oil prices rose 42 percent year to year in November 2021, the FBM KLCI Plantation Index slipped 3.8 percent during the corresponding period. This was partly attributed to the "steep ESG discount attached to plantation stock valuations" amid "deforestation, fire and haze, and labor concerns".⁶⁹

Climate Advisers undertook research for their Better Palm Oil Index, which showed that the equity returns of globally-traded companies that were members of RSPO exceeded a composite performance simulation of palm oil companies by 4.6 percentage points, while outperforming the companies that were not RSPO members by 24.7 percentage points.⁷⁰

Changes in policies and regulations

In several growing locations, there is a risk of stranded land due to changes in policy or regulation, representing huge areas of stranded assets for palm oil companies. In Malaysia, the government has also committed to maintain at least half of the country's area as forest cover and to cap oil palm estates at 6.5 million ha. In Indonesia, the government issued a (now expired) five-year moratorium on new oil palm concessions in 2016, including a review of existing licences where plantations have been developed illegally inside forest areas. In January 2022 the Indonesian government revoked over 2000 mining, forestry and plantation permits that were deemed unused, unproductive or against regulations.⁷¹ This most recent revocation comes on top of existing NDPE restrictions which have rendered 29% of Indonesia's leased out landbank, or 6.1 million ha of forest and peatland, ineligible for development.⁷² Research suggests these NDPE restrictions have resulted in 95 palm oil company groups, 35 of which are publicly traded, holding at least 1000 hectares of stranded land.⁷³ Additionally, according to the Indonesian state auditor BPK, as many as 81% of plantations have broken regulations⁷⁴, opening up these companies to litigation and/or exclusion from company supply chains.

On the other hand, Indonesia introduced an omnibus law on job creation which ushered in a wave of deregulation across a range of industries, including rolling back environmental protections and incentivizing extractive industries such as mining and plantations. This law gives plantation operators a grace period of three years to obtain the proper permits, including the degazetting of the forest designation, and to pay the requisite fines, allowing them to resume their operations in forested areas (which are currently classified as illegal).⁷⁵

The risk of stranded assets is also emerging as a major cost of business for new palm oil developments in Africa. Spatial modelling suggests that there is significant development potential across Africa that would not breach sustainability criteria such as NDPE; the extent of this potential development could be as high as 49% development of available land in Nigeria, 53% in Cote d'Ivoire or 69% in Uganda.⁷⁶ However, companies who have invested in this potential asset have encountered serious land tenure challenges from unpredictable public policy changes, governance risk, and land tenure disputes arising from unclear ownership law.⁷⁷

59. <https://chainreactionresearch.com/reports/sawit-sumbermas-sarana-full-analysis/>

60. <https://chainreactionresearch.files.wordpress.com/2017/06/ssms-supplying-the-palm-oil-leakage-market-170620.pdf>

61. <https://chainreactionresearch.com/the-chain-unilever-suspends-sourcing-from-sawit-sumbermas-sarana-because-of-deforestation/>

62. <https://chainreactionresearch.files.wordpress.com/2017/06/ssms-supplying-the-palm-oil-leakage-market-170620.pdf>

63. *ibid*

64. <https://chainreactionresearch.files.wordpress.com/2016/06/suspension-analysis-crr-june-9-2016-final.pdf>

65. <https://chainreactionresearch.com/report/palm-oil-growers-suspended-over-deforestation-lose-usd-usd-1-1b-in-equity-value/>

66. <http://www.theborneopost.com/2016/03/24/loi-shares-drop-on-possible-rspo-suspension/>

67. <https://forestsandfinance.org/case-studies/case-study-two/>

68. <https://chainreactionresearch.com/the-chain-ioi-sues-and-fqv-withdraws-both-actions-increase-buyer-risk/>

69. <https://www.bnm.gov.my/documents/20124/3770663/wb-bnm-2022-report.pdf>

70. Climate Advisers Better Palm Oil Index

71. <https://en.antaranews.com/news/208201/govt-revokes-thousands-of-mining-forestry-plantation-permits>

72. chainreactionresearch.files.wordpress.com/2017/02/palm-oil-stranded-land-size-equals-ten-million-football-fields-crr-170407.pdf

73. *ibid*

74. Jong, H.N. (2019). 81% of Indonesia's oil palm plantations flouting regulations, audit finds [online], Mongabay

<https://news.mongabay.com/2019/08/81-of-indonesias-oil-palm-plantations-flouting-regulations-audit-finds/>

75. <https://news.mongabay.com/2021/05/indonesian-omnibus-laws-whitewash-of-illegal-palm-oil-shocks-its-architects/>

76. <https://www.sciencedirect.com/science/article/pii/S0959378016300814>

77. <https://chainreactionresearch.com/wp-content/uploads/2016/10/palm-oil-frontiers.pdf>

Financial impact



These stranded landbanks present a valuation risk to investors who will have calculated future earnings and share price against expected productivity which can no longer be realised.⁷⁸ Affected companies are likely to experience a downgrade in their asset valuation which could lead to a weakened collateral position and lower equity valuations, which could increase the risk of default or credit downgrades.⁷⁹

For example, the Korindo Group had a notable area of licences revoked in 2021, estimated at around 65,000 ha including large areas of primary rainforest and 40% of the Group's total concession area.⁸⁰ The exposure of Korindo Group carries subsequent risk for its finance providers such as Bank Negara Indonesia (BNI), which reported outstanding loans of \$191 million in 2018.⁸¹

As Indonesia and Malaysia face increasing scrutiny over their commitment to ending deforestation, the possibility of further revocations remains. Furthermore, as palm oil production expands into new geographies, so does exposure to weaker governance and land tenure practices. For financial institutions, these risks present material loss of revenue and unrealised growth, as well as miscalculated collateral against lending and underperforming investments.

Policy enforcement may also increase enforcement of penalties and fines for malpractice. For example, in 2016 the Indonesian government fined Sampoerna Agro \$81 million for its role in forest fires two years prior, equivalent to around 6 months' revenue for the company.⁸² These unforeseen costs may become more common and more severe as national governments are under more pressure to manage deforestation.

Community disputes and other restrictions

Research has shown that oil palm plantations reduce the functioning of ecosystems compared to forests.⁸³ Some of these reduced functions may lead to irreversible global impacts, such as reduced GHG and climate regulation, while others may lead to local impacts such as increased pollution, lower water storage and microclimatic alterations including higher air temperature and lower air humidity. Economic, environmental and social impacts posed by palm oil production can lead to disputes with the communities affected. Therefore, it is not just changing regulations that can lead to impaired or stranded assets. Disputes with local communities or with governments can lead to higher costs or prevent plantations from being developed at all.

For example, in 2016, the developer Herakles Farms had its Cameroonian concession reduced from 73,000 ha to 19,843 ha after heavy campaigning by local communities, which subsequently led them to sell their stake.⁸⁴ Similarly, a 20,000 ha plantation owned by African Green Oil in Rufiji, Tanzania was halted entirely after a decade of villager protests.⁸⁵

78. chainreactionresearch.files.wordpress.com/2017/02/palm-oil-stranded-land-size-equals-ten-million-football-fields-crr-170407.pdf

79. <https://chainreactionresearch.com/the-chain-revocation-of-permits-increased-biofuel-volumes-point-to-significant-developments-in-indonesias-palm-oil-sector-in-2022/>

80. <https://forestsandfinance.org/news/financial-risks-of-indonesias-permit-revocation/>

81. <https://www.bni.co.id/Portals/1/BNI/Perusahaan/HubunganInvestor/Docs/2018/AM-1H-2018.pdf>

82. <https://chainreactionresearch.com/the-chain-sampoerna-agro-fined-81-million-for-fires-rspo-reaching-out-to-africa-and-latin-america/>

83. A review of the ecosystem functions in oil palm plantations, using forests as a reference system

84. <https://news.mongabay.com/2016/04/lessons-herakles-sorting-road-map-palm-oil-africa/>

85. <https://www.ozy.com/around-the-world/tanzanian-farmers-crack-the-code-for-fighting-land-grab/88561/>

In Liberia, every single Southeast Asian investment in palm oil has experienced delays, conflicts or complaints to the RSPO.⁸⁶ In Congo-Brazzaville, only 0.2% of the 520,000 ha of concessions awarded by the Government have actually been developed into plantations, thought to be because of links to corruption and illegal deforestation.⁸⁷

In Indonesia, a 15 year dispute between PT Mutiara Agam and local communities over land rights resulted in the company paying 202 billion rupiah (USD 14m) in compensation and acknowledging that the land does not belong to them. A 20 year dispute between PT Permata Hijau Pasaman and local communities resulted in an agreement in which the company had to provide land, acknowledge land claims, pay a one-time compensation of 1.2 billion rupiah, employ more locals and pay 25 million rupiah per month to community institutions.⁸⁸

Financial impact

Local impacts could lead to increased litigation from affected communities, with potential remediation costs affecting profitability. An ODI study, for example, concluded that land tenure issues can significantly increase the operating costs for oil palm plantations in sub-Saharan Africa to as much as \$15,000 per hectare, triple the cost of producing oil palm in Southeast Asia. As such, producers and investors could be exposed to losses between \$8.3 and \$22.1 million depending on the size and location of the development.⁸⁹

On top of these challenges are other costs such as financing the development of roads, mills or export facilities, importing necessary machinery, establishing nurseries and training skilled labour, which are likely to make African developments less profitable than hoped.^{90 91}



Due diligence legislation

Governments worldwide are strengthening their commitments to deforestation, in part due to growing recognition of the significance of forests in mitigating climate change⁹². For example, at the 2021 UN Climate Change Conference COP26, 141 countries signed the Glasgow Declaration on Forests and Land Use which includes a list of six commitments to conserve and restore forests, strengthen incentives and policies for more sustainable commodity production that does not drive forest loss, and increase available financing for sustainable agriculture and forest management.⁹³ Whilst voluntary and non-binding, the Glasgow Commitment is the first declaration to bring heads of state together on deforestation⁹⁴ including those from countries with tropical forests, and the largest palm oil producers, Malaysia and Indonesia.⁹⁵

A tougher approach to deforestation is shown by new due diligence requirements for agricultural commodity imports into the EU, UK and US. Two weeks after the Glasgow Declaration, the EU released its draft regulation on deforestation-free products, which aims to minimise consumption of

86. <https://news.mongabay.com/2019/09/industrial-palm-oil-investors-struggle-to-gain-foothold-in-africa/>

87. <https://www.earthshight.org.uk/media/download/783>

88. www.forestpeoples.org/sites/default/files/documents/ENG_Ekspansi%20Konflik%20Kelapa%20Sawit%20di%20Indonesia-EN-FA.pdf

89. <https://landportal.org/fr/library/resources/qtr-brief-palm-oil/palm-oil-companies-risk-losing-221-million-land-tenure-disputes>

90. <https://portals.iucn.org/library/sites/library/files/documents/2018-027-En.pdf>

91. <https://landportal.org/fr/library/resources/qtr-brief-palm-oil/palm-oil-companies-risk-losing-221-million-land-tenure-disputes>

92. <https://chainreactionresearch.com/the-chain-cop26-crucial-steps-in-combatting-deforestation/>

93. <https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/>

94. <https://www.globalwitness.org/en/blog/as-the-dust-settles-on-cop26-what-did-it-deliver-for-the-worlds-forests/>

95. <https://www.weforum.org/agenda/2022/02/borneo-islands-sabah-state-green-palm-oil-deforestation-sustainability/>

products coming from supply chains associated with deforestation or forest degradation.⁹⁶ The legislation proposes to ban all imports of commodities that are likely to have caused deforestation, whether legal or illegal in the country of origin. Commodities affected include beef, cocoa, coffee, oil palm, soy and timber as well as some derivatives.

Under the legislation, companies purchasing these products would need to show adequate and verifiable information that the production of these commodities entering their supply chain are deforestation-free and produced in accordance with the relevant legislation of the country of origin. This includes collecting the geographic coordinates of all plots of land where the commodities were produced. Countries of origin will be ranked as low, standard or high risk depending on their domestic legislation on deforestation, and obligations by companies importing from these countries will vary accordingly.⁹⁷

The proposed regulation is unprecedented in its indifference towards legal versus illegal deforestation, designed to discourage a “race to the bottom” where countries with tropical forest simply relax their deforestation protection laws to allow easier trade with the EU.⁹⁸ Similarly, primary legislation (Schedule 17 of the UK’s Environment Act) requiring companies to conduct mandatory due diligence to tackle illegal deforestation and conversion in their supply chains was also passed in the UK in November 2021.⁹⁹ Secondary legislation – which is currently under public consultation – will determine how this legislation is implemented.

If these regulations pass, oil palm producers and refiners will be under increased pressure from buyers and traders to evidence traceability and sustainability claims of their products. This could result in loss of business and revenue for those who cannot comply within the timeframe, or weighty costs to establish tighter traceability procedures. Alternatively, there is a risk that companies will deliver a segregated supply to the EU and UK, which accounts for less than 10% of global consumption, with deforestation-linked commodities continuing to be sold to other markets.

For downstream manufacturers, the challenge is exacerbated by the “bulking” or mixing of commodities before being traded, for which a whole supply chain approach to traceability will be needed.¹⁰⁰ Consequently, given the complexity of palm oil supply chains – particularly the often complex movement of fresh fruit bunches between farms, middlemen, agents and collection centres before being delivered to a palm oil mill – most companies have limited visibility of the plantations linked to their supply chains. In this context, resources such as the Accountability Framework,¹⁰¹ and industry wide collaboration through initiatives such as the Palm Oil Collaboration Group¹⁰² and Action for Sustainable Derivatives,¹⁰³ will be an increasingly essential component of managing complex supply chains.

Similarly in the US, the Forest Act of 2021 is designed to hold countries accountable for agricultural products that destroy forests. Under the Act, high risk countries will be put on an action plan that requires importers to improve how they document the source of their products, and imports of any products associated with illegal deforestation will become illegal. Commodities covered are palm oil, soy beans, cocoa, cattle, rubber, wood pulp and other associated derivatives.¹⁰⁴

96. https://ec.europa.eu/environment/publications/proposal-regulation-deforestation-free-products_en

97. *ibid*

98. https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_5919

99. <https://www.legislation.gov.uk/ukpga/2021/30/schedule/17/enacted>

100. <https://globalcanopy.org/wp-content/uploads/2020/12/AmsterdamDeclarationBriefing.pdf>

101. <https://accountability-framework.org/the-framework/topics/traceability/>

102. <https://palmoilcollaborationgroup.net/>

103. <https://sustainablederivatives.org/>

104. <https://www.govinfo.gov/content/pkg/BILLS-117s2950is/html/BILLS-117s2950is.htm>

Regulatory barriers can also be company specific. In 2020, US Customs and Border Protection issued a Withhold Release Order (WRO) on two palm oil producers from Malaysia – Sime Darby Plantations and Felda Global Ventures – due to allegations of forced labour within their supply chain. The sanction bans any palm oil produced by these companies from import to the US.¹⁰⁵ Both companies had already been under scrutiny for several years, with numerous buyers from the US and elsewhere either suspending or reducing contracts following a number of environmental and social accusations.¹⁰⁶

Financial impact



It is unclear how the increased supply chain traceability legislation will affect upstream companies at this point, but it is likely to increase due diligence costs for mid- and downstream companies selling into the EU, UK and US, who will need to develop traceability systems or move to buying segregated RSPO-certified palm oil at a premium to uncertified oil in order to comply.

Withhold Release Orders and similar actions can have a significant effect on company valuations, often disproportionate to the actual impact on lost revenues. For example, in 2018, FGV's stock price fell by more than two thirds following RSPO decertification of a mill and four plantations and had not recovered to its previous price before the 2020 WRO took effect.¹⁰⁷ Following the WRO, shares in FGV fell by nearly 10%¹⁰⁸ and Sime Darby Plantations' by 3.5%.¹⁰⁹

The US market was not dominant for either company: Sime Darby's annual exports to the US total about \$5million¹¹⁰ while the US represents less than 5% of FGV's annual sales.¹¹¹ However, there is a perceived significant risk that sanctions in the US could inspire similar responses in other important markets such as Europe or India, or that the gap in supply could be filled by competitors and difficult to regain.¹¹² The ban brings a knock-on effect for supply chain partners too, such as Procter & Gamble which has a joint venture with FGV.¹¹³

While these allegations relate to human rights violations, it is not implausible that similar punitive measures could be taken against companies for violations of key environmental requirements.

105. <https://www.cbp.gov/newsroom/national-media-release/cbp-issues-withhold-release-order-palm-oil-produced-forced-labor>

106. <https://chainreactionresearch.com/the-chain-sime-darby-fgv-see-reputational-hits-from-u-s-stop-orders/>

107. <https://chainreactionresearch.com/the-chain-sime-darby-fgv-see-reputational-hits-from-u-s-stop-orders/>

108. <https://asia.nikkei.com/Politics/International-relations/Shares-in-Malaysia-s-FGV-drop-on-US-ban-of-its-palm-oil-products>

109. www.reuters.com/business/energy/us-blocks-palm-oil-imports-malysias-sime-darby-over-forced-labour-allegations-2020-12-31/

110. *ibid*

111. <https://asia.nikkei.com/Politics/International-relations/Shares-in-Malaysia-s-FGV-drop-on-US-ban-of-its-palm-oil-products>

112. <https://www.theedgemarkets.com/article/us-sanctions-put-malaysian-palm-oil-giants-conundrum>

113. <https://www.reuters.com/article/malaysia-fgv-usa-idINKBN26L2VW>

Stakeholder expectations

In developed countries, awareness of palm oil's environmental and social impacts is driving some consumer preference for certified or palm-oil free products.¹¹⁴ A number of consumer-facing manufacturers and retailers have promoted palm-oil free pledges, such as the UK's Iceland¹¹⁵ and Selfridges,¹¹⁶ while others have publicly committed to use only certified palm oil, including well-known brands such as Ferrero, General Mills, Carrefour, Walmart, Mars, Nestle, Unilever and PepsiCo.¹¹⁷ However, the market significance of these commitments is minimal because of the relatively small quantities of palm oil affected.¹¹⁸

Over the longer term, rising consumer pressure could result in a gradual decline in demand for palm oil in some markets. However, any drop in demand is likely to be far outpaced by growing demand in other markets such as India and China, which in 2019 accounted for more than 30% of global import value for palm oil products.¹¹⁹

India has always been a major market for uncertified palm oil, with over 50% of imports not covered by any NDPE policies¹²⁰ and only one of five Indian companies assessed in WWF Palm Oil Buyers Scorecard receiving any score at all.¹²¹ However, this could change as India comes under increasing pressure to lower its carbon footprint¹²² and a younger, more sustainability-aware generation of consumers enters the economy.¹²³ A report from WWF on sustainable palm oil uptake in Asia showed that around 4-7% of China's domestic consumption of palm oil and 2-3% of India's consumption was RSPO certified, compared to 10% in Singapore and 9-10% in Malaysia.¹²⁴ The potential for increased certified palm oil is therefore significant.

There is increasing pressure from civil society and activist groups on investors and banks who are providing finance to forest-risk commodity companies. For example, in 2021 the Japanese bank Mitsubishi UFJ Financial Group (MUFG) was the subject of an investor resolution on climate change and deforestation calling for the bank to align its investments with the Paris climate agreement, including the financing of commodities associated with deforestation.¹²⁵ Between 2016-2019, MUFG is estimated to have provided USD 1.2 billion in loans and underwriting to the palm oil sector, making it the seventh largest creditor to Southeast Asian palm oil.¹²⁶

Between 2012-2019 the Norwegian USD 1 trillion sovereign wealth fund divested from 33 palm oil companies as a result of their deforestation risk¹²⁷, while other investors such as Robeco are using

114. <https://www.fao.org/publications/oecd-fao-agricultural-outlook/2021-2030/en/>

115. <https://about.iceland.co.uk/environment/>

116. <https://www.selfridges.com/GB/en/features/events/selfridges-selection-palm-oil-free/>

117. <https://www.weforum.org/agenda/2022/02/borneo-islands-sabah-state-green-palm-oil-deforestation-sustainability/>

118. <https://www.innovationforum.co.uk/articles/are-there-really-any-alternatives-to-palm-oil>

119. https://www.fint.awsassets.panda.org/downloads/sustainable_palm_oil_uptake_in_asia_sept_2021.pdf

120. <https://chainreactionresearch.com/wp-content/uploads/2018/11/Leakage-Risks-in-India.pdf>

121. https://palmoilscorecard.panda.org/uploads/WWF_2021_Palm_Oil_Buyers_Scorecard_Full_Report.pdf

122. <https://www.idhsustainabletrade.com/news/the-palm-oil-challenge-how-india-can-push-for-sustainable-edible-oils/>

123. <https://chinadialogue.net/en/food/what-do-young-people-in-india-think-of-palm-oil/>

124. https://www.fint.awsassets.panda.org/downloads/sustainable_palm_oil_uptake_in_asia_sept_2021.pdf

125. https://www.kikonet.org/wp/wp-content/uploads/2021/06/MUFG-2nd-Investor-Briefing-ENG_June2021_FINAL.pdf

126. <https://chainreactionresearch.com/the-chain-mufg-climate-shareholder-resolution-emphasizes-the-banks-financing-of-forest-risk-commodities/>

127. <https://www.reuters.com/article/us-norway-pension-palmoil-idUSKCN1QH1MR>

sophisticated technology, including satellite monitoring, to mitigate the risk of their investments in palm oil companies.¹²⁸

A number of asset owners and managers have collaborated through the Principles for Responsible Investment (PRI) to create a number of statements of shareholder expectations for companies in deforestation-related sectors, including palm oil. More than 50 investors, representing USD 8 trillion in assets, have endorsed the palm oil statement,¹²⁹ which calls on companies to have an NDPE policy as a minimum.

In 2019, environmental groups pressured the London Stock Exchange Group to remove Golden-Agri Resources from its FTSE4Good index, following allegations of corruption and unsustainable practice. FTSE Russell declined the removal, arguing that the scandals “*did not breach the required threshold in our Controversy Monitoring model to be suspended from the FTSE4Good Index Series. We continue to monitor GAR and the next evaluation will feed into the June semi-annual review process for the FTSE4Good index series.*”¹³⁰ Removal from the FTSE4Good index would threaten a loss of access to sustainable investment capital.

Financial impact



While there are limited short-term financial impacts for many of these stakeholder engagements, it is clear that there is a growing trend of greater societal expectations that companies and investors should behave in a more environmentally and socially responsible way.

With the Global Sustainable Investment Alliance reporting an increase in sustainable assets under management to USD 35 trillion in 2020, accounting for more than a third of all investment assets,¹³¹ there is a huge flow of capital to asset managers who are more likely to have:

- Net-zero climate targets
- Policies on investing in deforestation-related commodities, including palm oil
- Exclusion policies for non-compliant companies.

These investors may also begin to target the banks which are lending to palm oil companies, which could have significant repercussions for the cost of capital for the palm oil sector.

128. <https://www.robeco.com/uk/insights/2019/11/the-spy-in-the-sky-for-deforestation.html>

129. <https://www.unpri.org/sustainable-land-use/pri-investor-working-group-on-sustainable-palm-oil/5873.article#:~:text=Investor%20expectations%20statement,a%20sustainable%20palm%20oil%20industry.>

130. <https://www.theguardian.com/environment/2019/apr/07/london-stock-exchange-refuses-to-remove-palm-oil-firm-from-green-index>

131. <http://www.gsi-alliance.org/trends-report-2020/>

Biofuel market

Palm oil has been a substantial component of biodiesel mixes in Europe and the US. In 2020, palm oil accounted for almost 20% of the EU's biodiesel feedstock, the third highest after rapeseed (38%) and used cooking oil (23%).¹³² However, new legislation is likely to close this market opportunity for good. The EU's Renewable Energy Directive (RED II) came into effect in 2021 and categorised biodiesel made from palm oil and soybean oil as high deforestation risk crops and likely causing greater emissions than fossil fuel alternatives.¹³³ Under the directive, EU member states can no longer count palm oil-based biofuels within their renewable energy and climate targets.¹³⁴ As a direct result, palm oil imports into the EU are expected to decline by approximately a third over the next decade to 4.0 million tonnes in 2031, down from the 6.5 million tonnes imported in 2021.¹³⁵ This decrease represents approximately USD 3.7 billion of lost market value, based on current commodity prices.

There may still be a future for palm oil in biodiesel, but this is likely to be limited to domestic markets in countries such as Indonesia, Malaysia or Brazil, and potentially India and China in the longer term.¹³⁶ Under a high growth scenario, palm oil consumption due to biofuel policies would result in 67 million tonnes of palm oil consumption by 2030 (compared to 10.7 million tonnes in 2017), leading to an estimated 4.5 million hectares of deforestation, 2.9 million hectares of peatland loss, and 7 billion tonnes of CO₂ emissions.¹³⁷ Indonesia has increased the volume of palm oil allocated to supply domestic biofuel production in 2022 to 10 million kilolitres, up 6.4% from 2021 volumes. This increase is defended by the Indonesian government as part of its pathway to reduce fossil fuel dependency, despite concerns about the deforestation impact,¹³⁸ especially as biofuel can be an outlet for the illegal or unsustainable leakage market.¹³⁹ In Brazil also, a recent push for renewable biofuels is feared to drive deforestation given the development of new thermoelectric power plants which use palm oil as a major feedstock.¹⁴⁰

Financial impact

For palm oil producers, the closure of the European biodiesel market will likely result in some loss of revenue, but this is likely to be compensated by increased demand in domestic biofuel markets. However, a change in policies in any of these major markets could lead to material price changes for palm oil and could disproportionately affect producers of leaked palm oil, which is a significant supplier of biofuel markets.¹⁴¹



132. <https://www.spglobal.com/commodity-insights/en/market-insights/latest-news/agriculture/062421-eu-palm-oil-use-for-biodiesel-to-fall-in-2021-on-cost-concerns-usda>
133. <https://www.transportenvironment.org/discover/10-years-of-eus-failed-biofuels-policy-has-wiped-out-forests-the-size-of-the-netherlands-study/>
134. <https://www.spglobal.com/platts/en/market-insights/latest-news/agriculture/062421-eu-palm-oil-use-for-biodiesel-to-fall-in-2021-on-cost-concerns-usda>
135. <https://www.reuters.com/markets/commodities/eu-sees-biofuel-consumption-fall-by-2031-palm-oil-imports-slump-2021-12-09/>
136. https://www.cifor.org/publications/pdf_files/OccPapers/OP-51.pdf
137. https://d5i6is0eze552.cloudfront.net/documents/Publikasjoner/Andre-rapporter/Cerology_Driving-deforestation_Jan2018.pdf?mtime=20180122234132
138. <https://chainreactionresearch.com/the-chain-indonesias-new-targets-for-national-biodiesel-program-could-sharply-increase-pressure-on-the-countrys-remaining-forests/>
139. <https://chainreactionresearch.com/wp-content/uploads/2020/04/NDPE-Policies-Cover-83-of-Palm-Oil-Refining-Market.pdf>
140. <https://chainreactionresearch.com/report/palm-oil-production-in-brazilian-amazon-threatens-ndpe-commitments/>
141. <https://chainreactionresearch.com/wp-content/uploads/2020/04/NDPE-Policies-Cover-83-of-Palm-Oil-Refining-Market.pdf>

Part II: Nature-related opportunities

Improved yields

Research has suggested that most palm oil plantations are operating significantly below the maximum theoretical yield.¹⁴² While this annual maximum yield is around 18.5 tonnes per hectare, the global average achieved is around 3 tonnes per hectare, with some small plantations achieving 12 tonnes per hectare. As well as ageing plantations, pests and disease, and water stress, other factors limiting yields include:

- Presence of pollinators
- Crop management including pruning and efficient planting
- Fertiliser application
- Weeds
- Seed quality
- Soil quality.

As demand for palm oil continues to rise, investments in yield improvements and replanting will be critical to avoid further area expansion and deforestation.^{143 144} For plantations, this presents an opportunity to increase revenue from existing land assets and avoid many of the risks associated with land development.

This incentive to boost yields is felt especially keenly in Indonesia and Malaysia where pressure on land is high, revocations of permits are unpredictable (see risks section) and where so much of the national economy is dependent upon palm oil.¹⁴⁵ Growth in production has so far been slow, affected by rising labour costs and covid restrictions.¹⁴⁶

The use of leguminous cover crops help protect against soil erosion, reduce soil water evapotranspiration, aid in nutrient cycling and ultimately, improve crop yields;¹⁴⁷ some are already in use in Southeast Asia.¹⁴⁸ Another yield-enhancing management technique is the reapplication of organic matter such as empty fruit bunches or palm fronds to the soil, which improves soil fauna, moisture levels, nutrient cycling and carbon stabilisation among others.¹⁴⁹ Breeding and biotechnology may also hold potential for higher yielding, more climate resilient varieties in the future. Breeding of oil palms is a slow process owing to their long life-cycle and the small existing gene pool;¹⁵⁰ however, a number of efforts to improve yields are underway by larger palm oil companies.^{151 152}

142. Yield gaps in oil palm: A quantitative review of contributing factors

143. <https://www.fao.org/publications/oecd-fao-agricultural-outlook/2021-2030/en/>

144. https://wwf.panda.org/discover/our_focus/food_practice/sustainable_production/palm_oil/responsible_purchasing/

145. <https://epthinktank.eu/2018/02/19/palm-oil-economic-and-environmental-impacts>

146. <https://www.fao.org/publications/oecd-fao-agricultural-outlook/2021-2030/en/>

147. <https://cabiagbio.biomedcentral.com/track/pdf/10.1186/s43170-021-00058-3.pdf>

148. <https://chinadialogue.net/en/food/can-regenerative-agriculture-transform-palm-oil/>

149. <https://cabiagbio.biomedcentral.com/track/pdf/10.1186/s43170-021-00058-3.pdf>

150. *ibid*

151. <https://www.foodnavigator.com/Article/2017/05/30/New-oil-palms-promise-highest-crude-palm-oil-yields-in-industry-GAR#>

152. <https://biofuels-news.com/news/new-palm-oil-variety-produced-for-higher-yields/>

Boosting the productivity of smallholders is also an area of focus. Smallholders have the lowest yields of all but also hold a significant proportion of production; in Indonesia, smallholders account for more than 40% of the total planted area.¹⁵³ A smallholder support study in Indonesia, experimenting with different management techniques has managed to increase yields by 10-30%.¹⁵⁴

Financial impact

For palm oil producers, yield increases offer a way to increase profitability and avoid the legal, reputational and financial risks associated with area expansion.



Some management techniques, such as mulching soils, are very low cost whereas others, such as planting new seeds, may carry higher upfront capital requirements. Research would suggest that many improved management techniques can lead to increased revenues from improved yields, which more than offset the costs of implementation (see also certification section below).

Certification

RSPO certification allows companies greater access to all global markets as it is compliant with supply chain due diligence legislation and is suitable for customers with certification or NDPE requirements.

Certification can also improve the efficiency and productivity of farms because of higher attention to crop management techniques.

As a result, and in response to regulatory and consumer pressure, certification of oil palm production and processing is increasing. Approximately 20% of global production is now under RSPO, and the area under certification has been increasing 13% year on year.¹⁵⁵ Adaptations to the certification scheme are also helping broaden its reach. Jurisdictional approaches to how the certification criteria are applied is helping to ensure local relevance and greater engagement from stakeholders. It is also enabling the inclusion of smallholder producers.¹⁵⁶

Smallholder inclusion is important for sustainable palm oil supply chains as these growers represent 40% of the total area under production. Increasing their certification represents new sources of certified product entering the market and therefore more options for buyers with sustainable sourcing policies. In 2019, the number of RSPO-certified smallholders increased by 165%, with smallholder certified areas now accounting for 10% of total area under certification.¹⁵⁷

This has been aided by the RSPO Independent Smallholder Standard which was adopted in November 2019 and aims to increase the inclusivity of RSPO to independent smallholders by simplifying the certification process through a stepwise approach to certification and simpler criteria.

153. <https://chinadialogue.net/en/food/palm-oils-high-yield-masks-environmental-impact>

154. *ibid*

155. <https://rspo.org/impact>

156. <https://rspo.org/news-and-events/announcements/public-consultation-jurisdictional-approach-for-rspo-certification>

157. <https://rspo.org/impact>

Financial impact

An RSPO study suggested that certification can produce a 35% efficiency gain in the yield per hectare which, together with lower input costs such as pesticides, results in a net 45% increase in revenue per hectare. For each US dollar invested in the RSPO certification process, the gain was USD 150.¹⁵⁸



A 2016 study of smallholders suggested that costs of certification were variable:

- Upfront certification costs ranging from EUR 87 to EUR 215 per hectare
- Ongoing certification costs ranging from EUR 21 per year to EUR 65 per year
- Ongoing operational costs ranging from a decrease of EUR 34 per hectare per year to an increase of EUR 329 per hectare per year.

The study noted that good agricultural management practices led to increases of 12-30% in yields and were predicted to increase income for producers. However, the authors concluded that it was unclear whether certification resulted in a profit or loss for smallholders, due to low price premiums for certified palm oil.

For larger companies, a 2012 report noted that one company had saved USD 250,000 per year on reduced pesticide use, while another saved USD 74,000 in reduced herbicide use.¹⁵⁹ Being certified also allows companies access to capital from sustainable investors and banks with NDPE requirements, which could result in a lower cost of capital.

Increasing demand for sustainable palm oil led to one of the leading certified companies, New Britain Palm Oil, being taken over by Sime Darby in 2014 at an 85% premium to the stock price.¹⁶⁰

Access to finance

Those firms who can evidence their sustainability credentials could get access to capital at a lower rate through 'sustainability-linked loans'. The underlying margin of the loan is linked to pre-agreed sustainability performance targets; higher performance results in lower repayments. There are relatively few examples of palm oil producers accessing such facilities; however, Apical secured a \$750 million sustainability-linked loan from a syndicate of lenders in August 2021. Apical has committed to a range of incremental improvements on its sustainability performance, and that of its supply chain, which will be independently assessed annually.¹⁶¹

158. <https://www.rspo.org/news-and-events/announcements/the-correlation-between-economic-and-financial-viability-with-sustainability-for-palm-oil-plantations-study>

159. http://awsassets.panda.org/downloads/profitability_and_sustainability_in_palm_oil_production_update_.pdf

160. <https://www.reuters.com/article/us-sime-darby-bhd-new-britain-idUSKCN0HY05820141009>

161. <https://www.apicalgroup.com/wp-content/uploads/2021/10/EN-Press-Release-Apical-secures-sustainability-linked-loan-facility-of-US750-million.pdf>

Synthetic palm oil

Start-ups producing synthetic palm oil are attracting significant interest from investors, driven both by the risks facing the oil palm industry and a wish to find a less impactful substitute. In 2021 Bill Gates' Breakthrough Energy Ventures invested \$20 million in C16 Biosciences with Kiverdi and Xylome, two other firms in the race to bring a product to the market.¹⁶² The synthetic products all use yeast, fed with waste products such as corn husks, to produce an oil which is chemically almost identical to palm oil. However, they all face the same critical challenge: producing at a scale which is cost competitive with traditional production. Selective breeding and genetic modification of the yeast are both producing positive results, but there is still quite a distance to go before the synthetic market becomes a reliable investment for financial institutions.

Financial impact

While this technology is at an early stage, it has the potential to cause significant disruption to the palm oil market. There are parallels with the emergence of alternative meat products, including synthetic products, and it is worth noting that several leading beef producers are investing in companies and joint ventures which are developing alternatives, as a form of business risk mitigation.



Increased demand

For the foreseeable future, palm oil's distinguishing attributes of productivity, versatility and value are likely to underpin demand.¹⁶³ Despite the concerns over the crop's sustainability, its productivity per hectare far surpasses that of other vegetable oils. Estimates suggest that meeting global demand for vegetable oil with soy alternatives would require over five times as much as land as palm oil,¹⁶⁴ causing potentially greater loss of biodiversity and environmental damage.¹⁶⁵ Furthermore, oil palm is often economically viable in sites unsuitable for most other crops.¹⁶⁶ If production can be made more sustainable, palm oil has the credentials to help meet global sustainability targets through its reduced land use and high nutritional value.¹⁶⁷

Furthermore, demographic growth, improvements in standard of living and changing diets will drive growth and shift patterns of consumption.¹⁶⁸ Specifically, India and China together account for almost half of global imports,¹⁶⁹ but per capita consumption remains relatively low at just 16-21kg per capita, compared with 67kg per capita in the West,¹⁷⁰ indicating potential for significant growth in demand if the middle class continues to expand along with urbanisation and a preference for packaged food.¹⁷¹

162. <https://www.bloomberg.com/news/articles/2020-03-02/bill-gates-led-fund-invests-in-synthetic-palm-oil-startup>

163. <https://www.toptal.com/finance/market-research-analysts/palm-oil-investing>

164. <https://medium.com/global-canopy/not-if-but-how-the-palm-oil-of-the-future-c3c02c87fd32>

165. https://wwf.panda.org/discover/our_focus/food_practice/sustainable_production/palm_oil/responsible_purchasing/

166. https://www.nature.com/articles/s41477-020-00813-w.epdf?sharing_token=UTzqMEJCcggFakinK9U4OdRgN0jAjWel9jnR3ZoTv0PKb_sDdAgF5KxlyY5pV6d2AulOCR-MquZ19YYhCSRitTX2Z2iaKpCp4MKLbpgcxn6sS-iudfEPK9nqhQIGtfd0mQ1ghlywfhQ0rW95a09wesreZpQr3xs00KoKqGkgGvyc%3D

167. <https://medium.com/global-canopy/not-if-but-how-the-palm-oil-of-the-future-c3c02c87fd32>

168. <https://portals.iucn.org/library/sites/library/files/documents/2018-027-En.pdf>

169. <https://www.statista.com/statistics/1023677/palm-oil-importer-leading-global/>

170. <https://www.toptal.com/finance/market-research-analysts/palm-oil-investing>

171. <https://portals.iucn.org/library/sites/library/files/documents/2018-027-En.pdf>

Financial impact

For companies, palm oil remains a sector of undeniable opportunity. There is, however, uncertainty as to whether major markets such as India and China might begin to ask for the same level of traceability and/or sustainability requirements as is currently expected in the US and Europe. Given countries' commitments on climate and GHG emissions, reducing deforestation will need to be a component, as evidenced by the Glasgow Declaration on Forests and Land Use at COP 26, and this could result in increased costs for non-compliant companies and new opportunities for certified and NDPE-compliant organisations.



Agroforestry

Agroforestry – the growing of trees and agricultural crops on the same land – has the potential to increase biodiversity and be more sustainable than forestry or agricultural crops by themselves.¹⁷² For palm oil, there is a possibility that agroforestry could mitigate concerns about pest resistance, pollinator vulnerability and falling yields from soil quality.

A trial project by Wild Asia and reNature in Borneo¹⁷³ is developing an initial 100 hectare plot of agroforestry farms, combining oil palms and food crops to provide a number of benefits including:

- Soil regeneration
- Increased carbon sequestration
- Diversification of smallholders' income
- Increased profitability due to lower input costs
- Risk mitigation against pests, diseases and extreme weather
- Improved diets and nutrition for farmers.

In Brazil, cosmetics company Natura formed a partnership with local organisations to research agroforestry for oil palm cultivation and found that it was more productive than oil palm monoculture.¹⁷⁴ It also generated other environmental benefits such as food and wood provision, and water and climate control. The project has fewer oil palm trees per hectare, but generates 180 kg of fruit per plant compared with 139kg for monoculture, while the fruit from agroforestry oil palm yields 57% more oil than fruit from monoculture palms.

Sustainability-linked finance

Companies in the palm oil sector who can show leadership on sustainability issues, or who are looking to become more sustainable, may be able to access sustainable finance, often at slightly preferential interest rates.

For example, the agricultural producer Bunge took out a sustainability-linked loan in 2019, with the interest rate linked to the company increasing traceability for its main commodities and adopting sustainable practices across its soy and palm oil supply chains.¹⁷⁵

172. <https://www.agroforestry.co.uk/about-agroforestry/>

173. <https://www.renature.co/projects/wild-asia-palm-oil-malaysia/>

174. api.mziq.com/mzfilemanager/v2/d/67c3b7d4-64ea-4c2f-b380-6596a2ac2fbf/410d6ca1-c740-0ad9-88d5-831d20d6e4bf?origin=1

175. <https://www.bnm.gov.my/documents/20124/3770663/wb-bnm-2022-report.pdf>

In Brazil, the Central Bank launched a Sustainable Rural Credit Bureau, which will collect information on farmers' sustainable agriculture practices and allow policymakers to assess the feasibility of granting incentives to finance sustainable rural projects.¹⁷⁶

Opportunities for financial institutions

Given the unwavering demand for palm oil in the global food industry and its superior land efficiency over other vegetable oils, achieving more sustainable production is critical for global food security and preserving natural forests and biodiversity.¹⁷⁷ WWF argues that divestment from underperforming companies is not a responsible strategy as alternative financing will always be available to the sector and often with fewer environmental or social conditions attached. Instead, they recommend that financial institutions should engage directly with palm oil businesses in their portfolios and invest in supporting more sustainable performance; for example, by investing in traceability mechanisms, demanding relevant disclosure, providing technical support and creating financial incentives.¹⁷⁸

Financial institutions who can improve the sustainability of palm oil actors in their portfolios stand to gain from the reliable demand for sustainable palm oil from major markets, profitability gains from greater yields and efficiency, and minimise exposure to the financial risks discussed in this report.

There are also opportunities for financial institutions to create new products in response to the risks from palm oil and other sectors. These might include:

- Deforestation-free indexes and funds
- Sustainability-linked loans
- Nature-based solutions¹⁷⁹ such as sustainable forestry management and ecosystem restoration

For example, French banking group BPCE raised EUR 750m in 2022 for a Sustainable Agriculture bond to support the transition towards a more sustainable agricultural system which respects natural resources and enables farmers to adapt to climate change.¹⁸⁰



176. <https://www.bnm.gov.my/documents/20124/3770663/wb-bnm-2022-report.pdf>

177. https://wwf.panda.org/wwf_news/?345432/WWF-to-financial-institutions-Dont-divest-away-our-forests

178. https://engagechain.org/sites/default/files/commodity/Ceres_EngageTheChain_PalmOil.pdf

179. <https://www.iucn.org/theme/nature-based-solutions>

180. <https://qsh.cib.natixis.com/our-center-of-expertise/articles/bpce-s-green-bond-to-refinance-sustainable-agriculture-assets>

Part III: Tools and data to analyse financial impacts

The CDSB Guide to Biodiversity Disclosure notes that ‘valuation metrics may be quantitative, qualitative, monetary or a combination. Valuation metrics should reflect the significant costs and benefits that are specific to the organisation. As well as demonstrating the significance of biodiversity impacts to the report user, valuation can also be useful in communicating exposure to risks or opportunities.’

For some companies and some risks, there is already sufficient information to assess potential financial impacts. For example, a palm oil producer with a number of plantations can assess which plantations might be susceptible to sea level rise and what financial impact there might be given a temporary loss of production. They can then use this information to look at potential mitigation options where available.

However, there are several gaps in the availability of tools and scenarios which could help companies and their finance providers to better assess potential financial impacts. These are highlighted in the gap analysis section.

Nature-related tools and data

There have been a number of studies of tools and data which can be used to assess nature-related risks and opportunities (eg. Deforestation tools assessment and gap analysis¹⁸¹). This section highlights those tools which might be useful in calculating financial impacts.

Table 2: Relevant nature-related tools and guidance useful for calculating financial impacts

Tools	Description
Natural Capital Protocol: Finance Supplement	The finance supplement to the natural capital protocol provides a framework for financial institutions – including banks, investors and insurers – to measure and value natural capital impacts and dependencies across the entities and portfolios that they finance, invest in or underwrite. The valuation section is especially relevant to companies.
Investor guide to Deforestation and Climate Change	The Investor Guide helps investors to understand the drivers of deforestation risk and prioritise company engagements based on industries, geographies and sourcing patterns. It also outlines key expectations that investors should be looking for in a company’s climate and deforestation commitments and example questions for company engagements. Companies should be aware of these expectations as their access to capital will be restricted if they are not compliant.

181. <https://www.storebrand.no/en/asset-management/sustainable-investments/active-ownership/an-introduction-to-how-investors-can-manage-deforestation-risk>

Tools	Description
CDSB Biodiversity Disclosure	The disclosure framework assists companies in the disclosure of the material information about the risks and opportunities that biodiversity presents to an organisation’s strategy, financial performance and condition within the mainstream report (biodiversity-related financial disclosure). The framework references a number of valuation tools which may be relevant to companies.
Environmental Valuation Reference Inventory	The Environmental Valuation Reference Inventory is a searchable storehouse of empirical studies on the economic value of environmental assets and human health effects.

Market and financial tools and data

The Natural Capital Protocol describes market and financial valuation as ‘several related approaches, including:

- Costs/prices paid for goods and services traded in markets (e.g. timber, carbon, value of water bill or pollution permit)
- Other internal/financial information (e.g., estimated financial value of liabilities, assets, receivables)
- Other interpretations of market data (e.g., derived demand functions, opportunity costs, mitigation costs/aversive behaviour, cost of illness)¹⁸²

There are a number of potential data sources for this information, some examples of which are listed in **Table 3** below:

Table 3: Data sources useful for calculating financial impacts

Data source	Description	Applicable to FIs, Companies, or both?
Company accounts	Company accounts can be used to assess valuations of assets such as undeveloped plantations, as well as calculating geographic exposure in terms of revenues and profits.	FIs
Investor research	Research from investment houses can indicate the valuation which they are putting on assets as well as their growth forecasts, which can be used to assess financial risks.	FIs
Statista	Source of statistics on global palm oil production and trade, which can be used to calculate potential financial impacts	Both

182. https://capitalscoalition.org/wp-content/uploads/2021/01/NCC_Protocol.pdf

Data source	Description	Applicable to FIs, Companies, or both?
Bursa Malaysia palm oil futures CME palm oil futures	Enables companies and investors to see palm oil futures prices and to hedge production and consumption requirements	Both
Trading Economics	Includes forecast palm oil prices for quarter-end and year-end timescales	Both

Scenario analysis

As with climate change, scenario analysis can play an important role in exploring possible outcomes and analysing their financial consequences and mitigation options. For palm oil, key areas to explore might include:

- **Global biodiversity trends and implications for local ecosystems**
 - What key trends are likely to impact palm oil plantations across the globe and what is the likelihood and potential significance of such impacts?
- **Tipping points and irreversible changes to the environment**
 - Which tipping points might be materially significant to palm oil cultivation, e.g. changes in weather systems, and what might their impacts be? Is there a mitigation strategy?
- **Likelihood and possible impacts of pollinator disruption**
 - Given that palm oil is dependent on a single pollinator, what alternative artificial forms of pollination are available? What other strategies are there to mitigate risks?
- **Likelihood and possible impacts of catastrophic oil palm loss from disease**
 - What are the chances of diseases wiping out entire crops across regions, as has happened with Dutch Elm disease, for example? What can be done to mitigate such risks?
- **Impacts of sea level rises and possible disruption to plantation locations**
 - What proportion of palm oil plantations are situated in areas which are predicted to be vulnerable to sea-level rise and what are the probabilities and expected timings of sea-level rise? What is the forecast for frequency and intensity of tsunamis in Asia?
- **Impacts of water stress scenarios on oil palm productivity**
 - What proportion of palm oil plantations are in water-stressed areas and what might that proportion look like in 30 years? What are the impacts on yields likely to be? What mitigation strategies are feasible?

In 2020, BiodivERsA and the Belmont Forum produced a handbook on the use of biodiversity scenarios, which is a valuable source of information for companies and investors.¹⁸³ Other useful resources include UNEP-WCMC's Biodiversity Scenarios for the Convention on Biological Diversity.¹⁸⁴



183. <https://www.biodiversa.org/1823/download#:~:text=According%20to%20the%20Intergovernmental%20Sci.services%2C%20including%20alternative%20policy%20or>

184. <https://www.unep-wcmc.org/resources-and-data/biodiversity-scenarios--projections-of-21st-century-change-in-biodiversity-and-associated-ecosystem-services>

Part IV: Conclusions

Nature-related risks are already impacting the sector

The research has identified many relevant examples of nature-related risks and opportunities translating into tangible financial impacts for companies, confirming that these risks and opportunities are already impacting profitability for the palm oil sector. Recorded impacts range from millions of dollars for individual companies, through to billions of dollars for regions and sectors. The report also highlights some risks which could potentially have a very significant impact on the sector, but which have not yet (fully) manifested, such as pests, diseases and sea-level rise (e.g. large scale crop destruction).

Tools and data are insufficient

While there has been considerable work – and a number of tools developed – to assist with the valuation of natural capital, the report found that tools and data for the quantification and financial valuation of company risk exposure is currently quite limited. For upstream companies, where there are clearly defined assets and where revenues and costs are entirely palm oil-related, such quantification is more straightforward, but for downstream and more diversified companies, assessing financial exposure is complicated.

The case studies have mostly focused on physical and transition risks rather than systemic risks, which tend to play out over longer time-scales and whose direct financial impact on companies can be hard to quantify. In terms of tools and data, there is very little to help companies translate systemic risks from nature loss into financial impacts, especially in terms of probability. The IPCC report contains useful probability analysis and something similar for nature-related impacts would be helpful to assess risks.

More research into physical risks is needed

More research and spatial modelling is urgently needed on physical risks such as water stress, disease and temperature impacts to yields and, particularly the potential losses to viable productive land area resulting from climate change and the costs of mitigation where applicable. Existing models are limited but already suggest serious implications across the globe, including for the new development geographies of Africa and Latin America. Further research will better enable businesses and financial institutions to prepare for the costs of mitigation, make informed choices about geographical diversification, and calculate more accurate valuations of landbanks.

Coordination between climate modelling and nature-related modelling would also help to integrate risk management and provide clarity on some of the overlaps between climate and biodiversity scenarios.

Scenario analysis will be vital

While there has been some good work on scenario analysis at a global scale for nature, this has yet to be translated into specific impacts on forest risk commodities, and the possible financial implications of these impacts. This work is now being done for climate scenarios and there will likely be overlaps with nature-related scenarios to fully understand the changes ahead.

Collaboration between climate and nature scenario analysis would be an invaluable development for the full understanding of risks and possible mitigation actions. In particular, a scientific assessment of probabilities of key events (and combinations of events) would be helpful for the assessment of risk exposure.

Finally, more work on scenario analysis for systemic risks would help companies and finance providers to understand their exposure and to diversify where possible. It would also help policymakers to prioritise key actions to minimise these systemic risks going forward.



