

THE EUROPEAN UNION DEFORESTATION-FREE REGULATION (EUDR): ASSESSING IMPACTS AND STRATEGIES FOR MALAYSIAN AND THE GLOBAL OIL PALM INDUSTRY

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Abstract: The European Union Deforestation Regulation (EUDR) is an EU initiative that limits deforestation and forest degradation caused by forestry and agricultural activities worldwide. The EUDR entered into force on 29 June 2023 and will generally apply on 30 December 2024 and 30 June 2025 for micro or small businesses. This study focused on exploring the probable impacts of the EUDR on the palm oil market and later specifically focused on the Malaysian palm oil industry. By integrating the findings from a PESTLE analysis, which evaluates the political, economic, social, technological, legal, and environmental factors that impact the global palm oil market, and a SWOT analysis, which categorises the strengths, weaknesses, opportunities, and threats of the Malaysian palm oil industry, this study delivers a holistic understanding of the challenges and opportunities brought forth by the EUDR. The findings showed that implementing the EUDR in the oil palm industry has wide-ranging consequences. The analysis sheds light on the multifaceted impacts of sustainability regulations on a crucial global commodity and offers valuable insights for policymakers, industry stakeholders, and researchers.

Keywords: European Union Deforestation-Free Regulation (EUDR), oil palm industry, SWOT, PESTLE, challenges, and strategies.

Introduction

Over the years, the Malaysian oil palm industry has faced exaggerated anti-palm oil campaigns, especially from the European Union (EU). This includes allegations by certain associations and, in particular, the non-governmental organisations (NGO) that are linking the palm oil supply chain with the destruction of rainforest and orangutan habitats, loss of biodiversity, illegal cultivation of oil palm, destruction of peat land, emission of greenhouse gasses, forced and child labour, adverse impacts on health link to saturated fats and most recently, the 3-Monochloropropane-1, 2-diol (3-MCPD), and glycidyl esters pollutants found in palm oil which are possibly carcinogenic to humans (Ahmad Parveez, 2023). Nevertheless, it is important to note that the scientific consensus on the health effects of these compounds is still an evolving area of research and a subject of

discussion (Matthäus & Pudel, 2022). Ongoing regulatory measures and research initiatives are being developed to address these uncertainties and establish more precise guidelines for the safe use and consumption of palm oil in response to health concerns. Malaysia continues to counter allegations surrounding palm oil by compelling scientific evidence through its research and development efforts. This has indisputably continued to address trade barriers related to health concerns.

The EU's strong obligation to environmental protection is evident in its establishment of numerous regulations to address deforestation and sustainability concerns. However, the intensified anti-palm oil campaigns in Europe possibly played a significant role in influencing the EU's specific focus on palm oil. The attention and pressure generated by these campaigns

and accusations may have prejudiced the EU's legislature aimed at deterring the import of goods allied with illegal logging and deforestation.

EU has always stood as 2nd world's largest importer of palm oil after India. In 2022, the EU became the third-largest Malaysian palm oil export market for the fourth consecutive year since 2019, accounting for approximately 9-11% share yearly (Malaysian Palm Oil Board, 2022; 2023). Based on MPOB statistics for 2022, palm oil exports to the EU stood at 1.47 million tonnes or 9.4% of Malaysian palm oil exports. Hence, Malaysia would lose much of the market given the strict environmental laws and regulations, which would lead to the possible limitation of palm oil in various food products and formulations and its usage in the non-food industry, such as biofuel and renewable energy.

This impact became apparent with the execution of the European Union Renewable Energy Directive (EU RED II), which led to a notable reduction in Malaysian palm oil exports to the European Union (Bob Flach, 2023). The European Commission adopted EU RED II on 13 March 2019 (European Commission, 2019b). The delegated regulation has singled out palm oil as a high indirect land use change (ILUC) risk feedstock. In contrast, the other major oil crops, rapeseed, soybean, and sunflower, are low ILUC risk feedstock. High ILUC feedstock will not be considered for contributing towards the renewable energy target of the EU and will not be eligible for financial support under EU RED II. In addition, high ILUC risk feedstock will gradually decrease from 1 January 2024 and be phased out by 2030. Before the regulation, the EU had been a significant market for Malaysian palm oil, accounting for approximately 9-11% of the country's total palm oil exports. However, after EU RED II came into effect, Malaysian palm oil exports to the EU declined. According to MPOB statistics, palm oil exports to the EU for 2022 stood at 1.47 million tonnes or 9.4% of total Malaysian palm oil exports, showing a 10% decrease from the previous year and a significant 40% drop from 2.43 million tonnes in 2015 (Malaysian Palm Oil Board, 2016; 2023).

Apart from higher soybean imports from the US for crushing activity in 2022, the reduction in export volume is likely due to the EU RED II Delegation Act, which limited palm oil usage and its eligibility for financial support under the EU's renewable energy targets. Losing a single high-value market in the EU is not economically beneficial for Malaysian exporters. Kushairi *et al.* (2019) emphasised the difficulties faced by Malaysia and Indonesia as palm oil producers and exporters due to the rigorous environmental laws executed, especially by the European Union (EU).

The European Union has applied further measures to alleviate deforestation through the European Green Deal (EGD). The principal objective of EGD is to position Europe as the groundbreaking continent in accomplishing carbon neutrality by 2050. The EU outlines a range of events encompassing the gradual abolition of fossil fuels, the progression of renewable energy sources, the transformation of the transportation sector, greater energy competence, and the investment in sustainable agriculture and forestry to safeguard biodiversity (European Council, 2023).

The European Union Deforestation Regulation (EUDR) is the most recent addition to the EU's regulatory framework, specifically addressing deforestation issues. EUDR obtained official endorsement from the European Parliament on April 19, 2023, and was later disseminated in the EU Official Journal on June 9, 2023 (European Council, 2023). The regulation demands that all phases of the supply chain for any products inside the EU be free from deforestation activities. Thus, the EUDR prohibits importing any good, service, or commodity-linked to deforestation and forest degradation, regardless of its origin, including the European Union. The EU's proactive approach to deforestation aims to position the Union's policies to reduce greenhouse gas emissions, carbon footprint, and adherence to the responsibilities outlined in the United Nations COP15 agreement (European Commission, 2019).

The EUDR Overview

The European Union Deforestation Regulation (EUDR), adopted under Regulation (EU) 2023/1115, is a critical element of the European Green Deal intended to mitigate deforestation associated with the EU’s market activities. Effective 31 May 2023, this regulation targeted seven commodities including palm oil. It introduces a paradigm shift from Regulation (EU) No 995/2010, focusing on seven key commodities and a range of derivative products such as leather, chocolate, charcoal, furniture, and paper. Following the publication in the EU official journal, an eighteen-month grace period is provided for compliance to the major stakeholders and an extended period of twenty-four months for small and medium-sized enterprises (SMEs).

The EUDR outlines the three essential conditions listed commodities must fulfilled deforestation-free, produced per the relevant country’s legislation, and covered by a due diligence statement. This means the products entering the EU market after 31 December 2020 should not be associated with forest clearance, should adhere to local laws and regulations, and must have evidence of thorough checks to ensure compliance with EUDR requirements. The EUDR specifically impacts various oil palm commodities, as detailed in Table 1.

The EUDR identifies three key entities in the supply chain of relevant products: Operators, traders, and SMEs. Each has distinct responsibilities as described in Table 2.

The due diligence process encompasses comprehensive evaluation of risks, implementation of risk reduction strategies, and the regular publication of compliance reports annually (Table 3). The deployment of this measure promotes accountability and enhances transparency within the supply chain, hence facilitating improved oversight of regulatory compliance.

Establishing a central ‘country benchmarks’ system by the European Commission involves classifying nations into low, standard, or high-risk categories based on their production of commodities and their compliance with Article 3 of the European Union Drug Regime (EUDR). Currently, all countries are categorised as standard risk until further categorisation in 2025. Infringements will attract fines of up to 4% of the company’s total annual EU-wide turnover from the preceding financial year, product confiscation, and coverage of the Competent Authority’s costs.

The recent enactment of the EUDR marks a pivotal change in the European Union’s approach to deforestation and sustainable

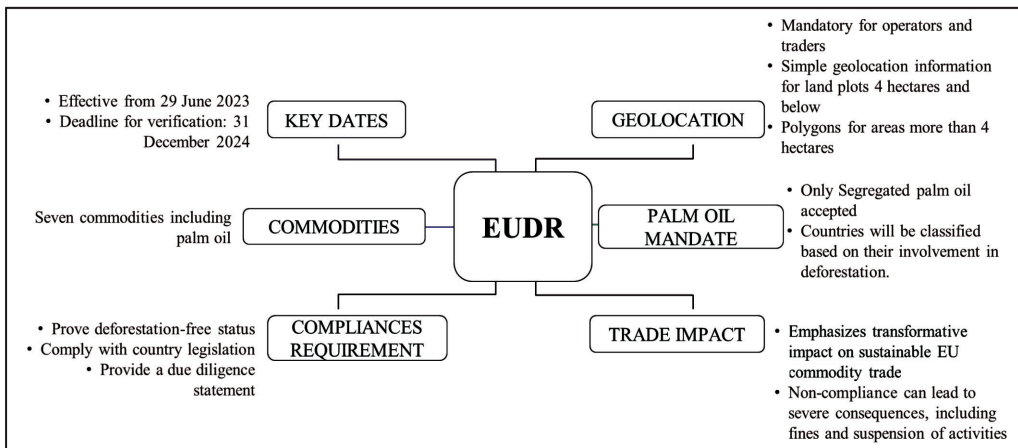


Figure 1: Key points of EUDR

Table 1: List of oil palm products listed under EUDR regulation

HS Code	Description
1207 10	Palm nuts and kernels
1511	Palm oil and its fractions, whether or not refined but not chemically modified
1513 21	Crude palm kernel and babassu oil and fractions thereof, whether or not refined but not chemically modified
1513 29	Palm kernel and babassu oil and their fractions, whether or not refined but not chemically modified (excluding crude oil)
2306 60	Oilcake and other solid residues of palm nuts or kernels, whether or not ground or in the form of pellets, resulting from the extraction of palm nut or kernel fats or oils
ex 2905 45	Glycerol, with a purity of 95% or more (calculated on the weight of the dry product)
2915 70	Palmitic acid, stearic acid, their salts, and esters
2915 90	Saturated acyclic monocarboxylic acids, their anhydrides, halides, peroxides, and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives (excluding formic acid, acetic acid, mono-, di- or trichloroacetic acids, propionic acid, butanoic acids, pentanoic acids, palmitic acid, stearic acid, their salts and esters, and acetic anhydride)
3823 11	Stearic acid, industrial
3823 12	Oleic acid, industrial
3823 19	Industrial monocarboxylic fatty acids; acid oils from refining (excluding stearic acid, oleic acid, and tall oil fatty acids)
3823 70	Industrial fatty alcohols

Source: (OJ L150, 2023)

Table 2: Entities and their roles in the EUDR supply chain

Entity	Description
Operators	Entities introduce or export relevant products to the EU market. They must perform due diligence to ensure compliance with EUDR regulations before marketing or exporting. Operators submit due diligence statements confirming compliance and negligible risk. They inform authorities and traders about any updates or non-compliance risks.
Traders	Entities are buying and selling relevant products within the EU market but not necessarily introducing them. Non-SME traders have the same obligations as non-SME operators. SME traders must only maintain and provide specific information about products and other entities they have dealt with.
SMEs	Small and Medium-sized Enterprises are classified based on factors like the number of employees and turnover. SME operators are exempt from due diligence if products have valid statements. They provide reference numbers when requested. SME traders maintain information about products and supply chain entities.

Source: (OJ L150, 2023)

Table 3: Due diligence process to ensure compliance with EUDR

Information Requirements	Risk Assessment	Risk Mitigation
<ul style="list-style-type: none"> Operators collect information, documents, and data to demonstrate product compliance Information includes: <ul style="list-style-type: none"> Product descriptions Quantity Country of production Geolocation <ul style="list-style-type: none"> Simple geolocation information for land plots 4 hectares and below Polygons for areas more than 4 hectares Supplier details Deforestation-free proof Legality evidence Operators verify and analyse information to assess non-compliance risks as predefined and listed in the country of production's law 	<ul style="list-style-type: none"> Some of the criteria include: <ul style="list-style-type: none"> Risk level of the country of production Forests, deforestation, and indigenous people presence Land use claims, deforestation Supply chain complexities Circumvention risk Complementary compliance from certified schemes Document and review of the risk at least once a year 	<ul style="list-style-type: none"> If significant non-compliance risk is identified, operators must implement risk mitigation measures to achieve no or negligible risk. Measures may include: <ul style="list-style-type: none"> Submit additional information requirements, Carry out independent audits, and compliance support. Adequate policies and controls required for effective risk management Document and review decisions on risk mitigation procedures and measures at least once a year

Source: (OJ L150, 2023)

Table 4: Deforestation involvement levels and their associated risk percentages

Risk Category	Percentage (%)	Descriptions
High risk	9	Significant involvement in deforestation, heavily contributing to the reduction of forest cover
Standard risk	3	Moderate involvement in deforestation, with some contribution to forest cover reduction
Low risk	1	Minimal involvement in deforestation, with the least contribution to the loss of forest cover

Source: (OJ L150, 2023)

sourcing. The European Union’s emphasis on assuring the traceability of palm oil back to its particular plantation of origin may present notable difficulties, particularly for nations that significantly rely on palm oil production, such as Malaysia. The EUDR’s strict standards and due diligence procedure could obstruct palm oil producers’ access to markets and ability to compete.

A thorough comprehension of the ramifications of the European Union’s Delegated Regulation on palm oil-producing nations, particularly its impact on the Malaysian palm oil business, remains elusive despite initial investigations. Officials from the EU assert that the rule only applies to land cleared after January 1, 2021, while palm-producing countries claim

that it should be followed regardless of the clearing date because data on both land and satellite use is provided.

The objective of this study is to conduct a comprehensive analysis of the extensive and specific effects of the EUDR using PESTLE (Political, Economic, Social, Technological, Legal, and Environmental) and SWOT (Strengths, Weaknesses, Opportunities, Threats) approaches. The PESTLE analysis will examine the global impacts from multiple viewpoints, whilst the SWOT analysis will concentrate on the position of the Malaysian palm oil sector. By integrating these methodologies, the study aims to comprehensively comprehend the implications of the EUDR, thereby facilitating informed strategic and policy determinations about its execution.

According to Nadras (2022), Malaysia's palm oil exports may fall by RM6.85 billion if all uses of palm oil for biofuel and renewable energy generation are outlawed, as is the case with the EU RED II Act in 2021. Significant challenges to numerous industries and Malaysia's economic stability could arise from this extreme reduction, which could cause an RM15.27 billion drop in the country's total output value. These results highlight Malaysia's vulnerabilities, particularly in light of the EUDR's upcoming enforcement.

The literature on this subject has explored previous studies and reports on the EU's deforestation policies, the global palm oil industry, and specific Malaysian palm oil industry studies. It also focused on the dynamics between EU regulations and palm oil-producing nations, assessing the effectiveness and implications of such policies. Many authors have always cited that one of the significant ways sustainable goals can be achieved is that green supply chain management can be implemented on macro and micro levels. On the macro level, government policies are always welcome that strictly bind the economic, social, and cultural activities that match the sustainable development goals and objectives laid down (Busch *et al.* 2022). According to Hinkes (2020), the EUDR is a step toward transforming

the supply chain into a green alternative where any product uses raw materials like palm oil, soy, coffee, cocoa, leather, furniture, and rubber. These raw materials are used in the largest amount in any product and have continuously led to the deforestation of natural vegetation such that plantations could be developed over those deforested land. Furthermore, the extraction of these raw materials has been done limitlessly, allowing most companies to exploit the vegetation of the regions where these plantations have been grown along with the exploitation of the communities growing these products.

The impact of the EUDR could be easily seen in business organisations and the economy as a whole. Studies suggest that there would be a negative impact on businesses outside of the EU in the short run and on the nations from which most of these raw materials are collected or imported by mega-corporations. Effectively, thus, when the MNCs and other business organisations overlook their entire supply chain for these raw materials, it would increase their production costs (Redondo Alamillos & de Mariz, 2022). However, contrary to the position of the governments and regulatory bodies, the EUDR is likely to influence other governments to follow these regulations and bring about a complete change in the production system of certain final goods using these raw materials which are leading toward high rates of deforestation (European Commission 2021). An article published recently by Ahimbisibwe *et al.* (2022) discussed the potential impacts of the proposed EU regulation on deforestation-free supply chains on smallholders, indigenous peoples, and local communities in producer countries outside the EU. The authors argue that while the regulation could help reduce deforestation and promote sustainable supply chains, it could also negatively impact these vulnerable groups. Consequently, the discussion surrounding the EUDR and other EU environmental regulations comprehends a widespread collection of themes, from environmental policy efficiency and green supply chain management to the socio-economic implications for producer communities.

Methodology

The study employs a dual approach to investigate the impact of the EUDR on the palm oil industry; the PESTLE and SWOT analytical frameworks. For the PESTLE analysis, the political, economic, sociocultural, technological, legal, and environmental factors impacting global palm oil-producing countries were studied in the context of the EUDR. The PESTLE framework is extensively used in strategic management to comprehend the macro-environmental factors affecting an industry (Khan *et al.*, 2015). The PESTLE analysis is established through a thorough review of governmental policies, industrial reports, and academic articles. Relevant databases, such as JSTOR, ProQuest, and Web of Science, are explored for pertinent literature.

On the other hand, the SWOT analysis identified the strengths, weaknesses, opportunities, and threats posed by the EUDR to the Malaysian palm oil industry (Helms & Nixon, 2010). The SWOT analysis will involve media statements from pivotal industry stakeholders, reviews of corporate reports, and an examination of market trends. Both qualitative and quantitative data will be sourced from academic articles, industry reports, government publications, and stakeholder-published interviews. This will ensure a comprehensive understanding of the EUDR's potential impact.

The reliability of the data was validated via a comprehensive assessment. Cross-checking government policies, obtaining industry reports from reputable sources, and selecting scholarly articles according to peer-reviewed guidelines were done appropriately. Any restrictions associated with data sources were acknowledged, and efforts were made to alleviate these limitations. To ensure the quality

and fairness of the data obtained via media remarks, company reports, and interviews, this study places a high importance on ethical principles. The study design complies with ethical procedures, preserving correct credit and openly stating any possible conflicts of interest.

Results and Discussion

PESTLE Analysis Focus on Palm Oil Globally

PESTLE stands for Political, Economic, Social, Technological, Legal and Environmental, and it is an acronym used to analyse the macro environment of a business. In the case of the European deforestation-free regulation from 2023 onwards, the following PESTLE analysis was conducted and listed in Table 5.

SWOT Analysis Focus on the Malaysian Oil Palm Industry

A SWOT analysis is a common strategic planning instrument that allows comparison, selection and combination of different actions. The SWOT analysis of the EUDR on the palm oil market of Malaysia is laid out in Table 6.

The SWOT analysis (Table 6) gives the impression that the Weaknesses and Threats quadrants collectively have more issues and challenges than strengths and opportunities ranging from internal operational issues to external market access limitations, including geopolitical challenges. The strengths and opportunities quadrants may have fewer points but point out areas where the industry outshines and where credible growth exists. These include strengths in sustainability and market existence, opportunities for boosted reputation, better production management, technology investment and high yield.

Table 5: PESTLE Analysis of Palm Oil Globally

Category	Factors
<p>Political EUDR, which the European Union implemented, is characterised by its ambitious nature, surpassing the stipulations set forth by international agreements such as the Paris Agreement and UN Sustainable Development Goals. Nevertheless, this action may have substantial consequences in politics.</p>	<p>1. The political impact of the restrictions on palm oil products in the EU would be outright negative of the trade situation. This production is significant since palm oil is the most consumed and produced vegetable oil in some developing nations (Cisneros <i>et al.</i>, 2021). Given that the EU completely bans the entry of palm oil in any form in raw export, it would be hampered, and the governments of these nations would also have to comply with these deforestation regulations in due course of time (European Commission, 2019a).</p> <p>2. Malaysia and Indonesia have made immense efforts to ensure the sustainable development of the oil palm industry in their countries from the perspective of the environment, society, and governance (ESG). The oil palm-producing countries may feel that the regulations imposed infringe on their sovereignty and restrict the ability to trade. This could lead to retaliatory tariffs or other trade measures, which could, in turn, create political tension between the EU and palm oil-producing countries. Failure to abide by the rules could result in trade sanctions, lowering demand for palm oil worldwide. The possible effects of this action could include the escalation of diplomatic tensions and a negative reaction from countries that produce palm oil. Sicurelli, (2023) study reveals a conflict in EU-ASEAN trade negotiations, where the EU's stringent biofuel standards, especially for palm oil, clash with ASEAN producers' practices, affecting negotiations and challenging the EU's sustainability leadership.</p>
	<p>3. Imposing strict laws without soliciting input from all parties involved could result in more protectionist trade policies globally and shift the nature of international politics. Nations reliant on palm oil production may need to re-evaluate their external policy to manage these emerging conditions effectively. Cantyani <i>et al.</i> (2023) discuss the tit-for-tat strategy in EU-Indonesia trade disputes, particularly around palm oil and nickel ore exports, illustrating how such unilateral measures can provoke reciprocal trade barriers and reshape external policies of nations reliant on these exports.</p>
	<p>4. The Ambassador of Indonesia to Germany recently expressed a controversial viewpoint in the international media, suggesting that the European Union's General Data Protection Regulation (EUDR) could be perceived as a kind of espionage. This perspective raises apprehensions regarding the possible exploitation of data gathered through this regulatory framework. The implementation of the EUDR by the EU gives rise to political inquiries on the motives and intentions of the EU, notably concerning countries such as Indonesia and their regions of sensitivity, such as West Papua(Palmoilmonitor.org, 2023).</p>

Economic

The monetary consequences of the EUDR are noteworthy, particularly for enterprises that have strong acquaintances with the international palm oil trade.

1. The EU deforestation regulation on the global palm oil trade would also negatively affect businesses. As highlighted in a study by (El Benni *et al.*, 2022) on Swiss agriculture, complying with environmental regulations in one sector can have broader implications for administrative burdens in similar industries, including palm oil. The transformation of the entire supply chain of palm oil to comply with the EUDR requirement may increase the cost of production for these numerous business organisations and even SMEs. Producers must bear certification costs and adherence to sustainability mandates, leading to administrative burdens and cost escalation that could erode their profits. In the short run, this will reduce the income of the employees of the medium and SMEs.
2. There is also a claim that the total palm oil market reduction could impact other Nations outside the EU as the businesses would now try to dump the surplus products on low to middle-income nations (Varkkey *et al.*, 2018).
3. The EUDR has the potential to adversely impact the competitive position of palm oil producers due to the imposition of more rigorous environmental standards compared to other oils and fats producers. Gáspár-Szilágyi (2022) underscores the complexity of balancing trade and non-trade values in EU external relations, particularly in environmental legislation. Therefore, higher sustainability rules for EU palm oil imports may cause a trade imbalance between the EU and palm oil exporters.
4. The regulations surrounding palm oil are stirring up worries among operators and traders within the European Union (EU), primarily due to its production and trade's environmental and social implications. This unease has led them to prefer products devoid of palm oil. This preference is likely because dealing with palm oil requires "burdening due diligence." Consequently, the demand for palm oil within the EU will decline compared to other vegetable oils that are not subject to the same scrutiny and concerns.
5. Kunene and Chung, (2020) found that the sustainability policies placed extra pressure on palm oil firms, particularly larger ones. The stringent requirements of the EUDR can lead to a scenario where large companies, bolstered by their financial resources and compliance capacity, gain a significant advantage and monopolise the EU palm oil market. Consequently, due to the substantial compliance costs, certification prerequisites, and sustainability mandates, small producers hinder their ability to compete on an equal footing with larger counterparts, ultimately diminishing competition within the market. As a result, a few dominant players could emerge, potentially driving up consumer prices, limiting product diversity, and stifling innovation as the incentive for large companies to innovate diminishes in a monopolistic market environment.

Social

Approximately 17,000 small-scale producers grow oil palm on less than 10 ha of land each (Proforest, 2016). The EUDR's implementation could have far-reaching social implications, particularly affecting smaller stakeholders and labour forces within the palm oil trade.

1. As highlighted in the report by Brad *et al.* (2018), the benchmarking system of the regulations may create unjust comparisons between countries with different wealth and resources, potentially leading to a “race to the bottom” scenario regarding forest management and conservation.
2. Ahimbisibwe *et al.* (2022) summarised information related to smallholders' involvement in coffee, cocoa, and palm oil production in non-EU producer countries. The six top palm oil exporting countries supplied 97% of total EU imports of the commodity in 2020, where 73% is covered just by two countries, Indonesia and Malaysia. A considerable share of oil palm plantations (28% to 42% in Malaysia and Indonesia, respectively) in these two countries is still operated by smallholder farms. Smallholder producers may face challenges in meeting traceability requirements, potentially leading to their exclusion from global supply chains.
3. Communities heavily dependent on the palm oil industry, particularly in developing countries, may experience severe social welfare impacts. A decline in employment opportunities and wages and increased poverty levels could occur (Ngan *et al.*, 2022).
4. On the positive side, the EUDR may reduce the risk of exploitation for labourers and drive the creation of sustainable alternative livelihoods.

Technological

The EUDR may inspire technological improvements and foster modernisation in palm oil-producing countries.

1. To ensure the continuity of their operations, corporations must use satellite imagery technology in their practices to monitor deforestation in real-time, facilitating prompt identification of regions experiencing environmental degradation. Traceability systems will track palm oil production from plantation to consumer. These technologies pressure palm oil companies to adhere to sustainability standards and certify transparency in the supply chain (Sime Darby, 2021).
 2. Yusop *et al.* (2022) revealed that environmental regulations in the European Union positively impact the competitiveness of the palm oil industry. This aligns with the Porter Hypothesis, suggesting that stringent environmental regulations can foster innovation, reducing non-compliance costs. Additionally, the rules may lead to the developing more competent harvesting and processing technologies and exploring alternate energy and material options.
 3. However, technologically, there would be a transformation to create synthetic or alternative palm oil. Technology would have to bring about innovation in manufacturing and the use of alternative raw materials that are highly sustainable and do not lead to deforestation.
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Legal

Introducing the European Union's deforestation-free regulations (EUDR) signifies a new legal landscape for the global palm oil trade.

1. To comply with the regulations, companies must establish that their operations do not contribute to deforestation or land degradation after 31 Dec 2020. They must also transparently disclose the measures taken to achieve deforestation-free status and provide detailed information about the origins of their products. Therefore, traders face the prospect of lawful action and penalties if they fail to demonstrate the sustainability and traceability of their palm oil sources (Mohd Hanafiah *et al.*, 2022).
 2. Legal issues would also mean governments worldwide are transforming their manufacturing practices to meet export criteria; otherwise, a complete ban on palm oil could be economically harmful.
 3. Legal issues may also arise with the production, which the governments have to implement strictly, and lobbying firms have to be penalised with taxes or tariffs such that they change their production methods (Pacheco *et al.* 2017).
 4. An industry operational head stated that a single palm oil shipment would need over 300,000 data points to comply with the EUDR. European authorities and officials would obtain these data points after several transfers. Indonesia's Ambassador to Germany also questioned the EUDR's massive data collection and storage. The EUDR's data collection process raises worries regarding data privacy and personal information leaks. Addressing these concerns and protecting individual rights and freedoms requires compliance with the EU's General Data Protection Regulation (GDPR) (Palmoilmonitor.org, 2023).
 5. The obligations imposed by the European Union Data Regulation (EUDR) and their possible effects on small-scale farmers, mainly gathering personal information, give rise to legal inquiries over the legitimacy of processing and acquiring said data. Ensuring compliance with the General Data Protection Regulation (GDPR) and completing thorough Data Protection Impact Assessments are crucial steps in effectively addressing the legal considerations associated with protecting the rights of smallholders (Palmoilmonitor.org, 2023).
 6. Moreover, it is worth noting that the legislation could encounter legal challenges from palm oil-producing nations at the World Trade Organization (WTO) concerning the palm oil trade.
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Environmental

EUDR is anticipated to have substantial environmental consequences. The environmental implications of the EUDR are not universally beneficial and necessitate diligent monitoring to ensure the attainment of desired environmental goals while mitigating unforeseen repercussions.

1. The primary objective of the EUDR is to strengthen the safeguarding of forests and biodiversity by increasing habitat connectivity, improving carbon storage capabilities, and fostering soil health. The EUDR stands to enhance air quality, mitigate climate change impacts, and safeguard endangered species and habitats. The European Commission, (2021a) aligns with these objectives by emphasising similar goals for forest conservation and sustainability within the EU.
2. The rule mandates that palm oil producers consider their goods' environmental impact along the production chain. Companies must demonstrate that their activities do not contribute to deforestation or land degradation. Additionally, the EUDR facilitates the implementation of improved traceability measures, enabling enterprises to effectively recognise and address the hazards associated with deforestation and land degradation within their supply chains (European Commission, 2021b).
3. However, there is a fear that the regulation's attention on specific commodities like palm oil may drive demand towards less efficient, more land-intensive substitutions, possibly worsening deforestation in other sectors (Katharina Brandt, 2022).

Weaknesses Quadrant:

- (1) Traceability to Plantation: EUDR requires that the raw materials used in all goods in the scope must be able to be tracked back to a plot of land. This means mass balance chains of custody that allow the mixing, at any point in the supply chain, of deforestation-free commodities with commodities of unknown origin or non-deforestation-free commodities are not allowed as they do not guarantee that the commodities put on the EU market or exported from it are deforestation-free. Thus, goods sold on or shipped from the Union market must be kept separate from goods of unknown origin or not deforestation-free at every supply chain step. Segregation requirements might lead to increased costs for the industry, particularly smallholders. Many companies usually store products by sharing supply chain infrastructures such as warehouses, trucks, tanks and pipelines to port. Additional or new storage facilities may incur high adaptation costs for them. An empirical study found that most already certified smallholders still have a non-compliance problem with the clauses relating to traceability (Kannan *et al.*, 2021) due to inaccurate farm records and a lack of understanding of the significance of record keeping.
- (2) Increased Operational Costs and Complexity: The EUDR introduces the necessity for increased resources and documentation, escalating operational costs and complicating industry practices. The segregated, certified sustainable palm oil requirement amplifies procurement difficulties, especially for small and medium-sized producers. This and certification costs might contribute to market concentration and destabilise the industry's competitive landscape. According to a study conducted by Proforest and WWF, the costs of segregating palm oil to ensure it is certified sustainable are estimated to be between USD 9 and USD 15 per tonne (SegiEnam, 2020).

Table 6: SWOT analysis of the Malaysian palm oil industry in summary

STRENGTHS		WEAKNESS	
1.	Resilience and commitment to sustainable development	1.	Traceability to plantation
2.	Widespread adoption of MSPO	2.	Increased operational costs and complexity
3.	High yield per hectare	3.	Differences in traceability requirement
4.	International presence	4.	Challenges in policy-making and lobbying
5.	Alternative market opportunities		
OPPORTUNITIES		THREATS	
1.	Enhanced reputation and branding (Buyer-Driven Product)	1.	Risk of restricted market access
2.	Improved production management and environmental protection	2.	Loss in revenue
3.	Technology investment	3.	Negative industry image
4.	Competitive edge in the European market	4.	Trade barriers and administrative burdens
		5.	Risk of land-use inefficiency
		6.	Monopolised market access
		7.	Declining demand for palm oil
		8.	Diplomatic tensions and delays in the Free Trade Agreement (FTA)

- (3) Differences in Traceability Requirements: The EU RED II and EUDR have different traceability requirements, necessitating investments in different systems and processes to comply with each regulation. The report (Drost *et al.*, 2022) underscores the difficulties and probable costs that industries may face due to contrary traceability requirements of the EU RED II and EUDR. This report supports the statement that ensuring compatibility with both regulations could be costly and time-consuming.
- (4) Challenges in Policy-making and Lobbying: Transforming the whole production process into green would require policy-making from the Malaysian government. Although investments could counterbalance the costs of adhering to regulations over time, the duration of policy implementation by the government can indeed be a challenge in transforming the palm oil production process into an environment friendly (Othman *et al.*, 2022).

Threats Quadrant

- (1) Risk of Restricted Market Access: The EU provides a large market for products

- like chocolate, coffee and other products that use palm oil in manufacturing. There would be a short-run fall in imports from the EU, making the market highly volatile (SegiEnam, 2020). Companies failing to meet EUDR’s sustainability criteria could face a considerable disadvantage, potentially resulting in restricted market access to the EU.
- (2) Loss in Revenue: The significant financial strain on non-compliant companies may cause potential revenue loss that affects the overall economic health of the industry. The report by Drost *et al.* (2022) supports this assertion.
- (3) Negative Industry Image: The EUDR’s focus on palm oil as a critical driver of deforestation risks strengthening negative perceptions of the industry, potentially lowering demand for its products. As highlighted by The Edge Market, such measures are expected to notably alter the industry’s reputation and influence consumer preferences (Vasu & Chung, 2023).
- (4) Trade Barriers and Administrative Burdens: Due diligence scrutiny under the EUDR may increase administrative burdens and

production costs, potentially diminishing the competitiveness of the Malaysian palm oil industry on the international market. This perspective is echoed in a report (Aman, 2022), which notes that the EU's latest ban is expected to add to administrative challenges and increase output costs for the Malaysian palm oil sector.

- (5) **Risk of Land-use Inefficiency:** Focusing on specific commodities in the EUDR may unintentionally drive demand towards less efficient ones that require more land, potentially causing further deforestation. This could lead to land-use inefficiency and environmental concerns (Khalid, 2020).
- (6) **Monopolised Market Access:** The stringent sustainability criteria of the EUDR could lead to the exclusion of non-compliant companies from the EU market, potentially creating an opportunity for specific competitors to monopolise market share. As regulatory scrutiny increases, it may drive up compliance costs and pose a risk of reputational damage for Malaysian palm oil producers, further consolidating the position of dominant players in the market. This dynamic is also highlighted in the analysis by Leenoi (2024), who discussed how the EUDR could affect global supply chains and market dominance.
- (7) **Declining Demand for Palm Oil:** Environmental concerns, climate change impacts, and global events like the pandemic significantly threaten the palm oil industry. A reduction in demand for palm oil due to these factors can lead to lower market prices, impacting the industry's profitability and the broader Malaysian economy that relies heavily on agricultural output. The findings from a study by Tan *et al.* (2023) revealed that palm oil prices are significantly influenced by climate change indicators, responding asymmetrically to temperature fluctuations and rainfall changes (Tan *et al.*, 2023).
- (8) **Diplomatic Tensions and Delays in FTA:** The implementation of the EUDR has

strained relations between Malaysia and the EU, notably delaying the progress toward FTA. The regulatory disparities and sustainability criteria imposed by the EUDR have become points of contention in trade negotiations, creating diplomatic challenges and hindering the establishment of mutually beneficial trade agreements. This regulatory mismatch echoes preceding conflicts from the EU Red II, highlighting how the EU regulatory approaches to sustainability can complicate trade relations with Asian countries, particularly delaying FTA discussions (Sicurelli, 2023).

Strengths Quadrants

- (1) **Resilience and Commitment to Sustainable Development:** Malaysia's palm oil industry demonstrates substantial resilience due to its pre-existing commitments to sustainable development and environmental preservation. Malaysia's relevant ministries and agencies have established the National Agri Commodity Policy 2021-2030 (DAKN, 2030) framework to ensure sustainable development, balancing the protection of the environment and socioeconomic development (Ministry of Plantation Industries and Commodities Malaysia, 2021). This is evident through the implementation of various programs and initiatives for the conservation and preservation of forests and biodiversity as below:
 - Limit the increase or expansion of oil palm areas to protect biodiversity and support efforts to maintain that forested regions cover 50% of the country's land area. Control the location of this plant.
 - The preparation of an official map to show the oil palm plantation area throughout the country for public access.
 - National forestry initiatives such as The Central Forest Spine and Heart of Borneo, reforestation through replanting of forest tree species.

- Establishment of wildlife corridors.
 - Reduction of greenhouse gas (GHG) emissions.
- (2) **Widespread Adoption of Malaysian Sustainable Palm Oil Standards (MSPO):** The government has adopted the Malaysian Sustainable Palm Oil (MSPO) Certification Scheme across the palm sector supply chain, emphasising environmental protection, social responsibility, and economic viability. The MSPO Certification Scheme was made mandatory on January 1, 2020, and will soon be implemented. MSPO 2.0 will be crucial for all palm oil industry players to advance sustainable palm oil production. Sustainable practices will ensure palm oil's worldwide competitiveness and acceptance. According to (Ahmad Parveez, 2023), as of December 2022, 187,215 independent smallholders with a planted area of 709,088.03 hectares were certified under the MSPO. More importantly, the development of the oil palm industry is governed by more than 60 regulations and laws, making it the most regulated industry in Malaysia. Future demand for Malaysian palm oil may rise due to efforts to broaden the acceptability of MSPO certification worldwide.
- (3) **High Yield Per Hectare:** It would require about five times more land to produce any other alternative vegetable oil as the yield per hectare is low for all other oils (Naidu & Moorthy, 2021). Palm oil's high yield per hectare compared to other oils makes it a preferred choice for various applications, maintaining its demand even in the face of potential challenges.
- (4) **International Presence in the Global Market:** Chalil (2008) analysed the Indonesian palm oil industry as oligopolistic. Similarly, Choo *et al.* (2018) affirm the oligopolistic characteristics within the Malaysian palm oil refining industry. These studies illustrated Malaysia and Indonesia as essential global palm oil industry players

with an oligopolistic market structure. It has a strong presence in producing and exporting palm oil, with strategic advantages such as economies of scale and negotiating power with buyers.

- (5) **Alternative Market Opportunities:** The strategic focus has always been to ensure that the Malaysian oil palm industry remains resilient, versatile, and able to adapt to shifting global market trends and policies. Therefore, Malaysia's palm oil industry is not solely reliant on the EU (Trading Economics, 2021). Countries outside the EU importing palm oil provide alternative market opportunities for Malaysian palm oil exporters. Malaysian palm oil has been exported to over 150 countries worldwide, indicating the industry's inherently diversified market base.

Opportunities Quadrant

- (1) **Enhanced Reputation, Branding and Increased Demand:** Compliance with the EUDR can improve the industry's reputation and potentially boost demand as buyer-driven products bring economic benefits. Malaysia can sustain its competitiveness in the palm oil trade with its national environmental policies or accreditations (Othman *et al.*, 2022). Meeting EUDR's sustainability criteria differentiates them as deforestation-free producers, positioning them for brandings like CSPO and RSPO and recognition through assessments like the WWF scorecard. This enhances reputation, builds consumer trust, and increases demand for sustainable palm oil. Embracing EUDR showcases commitment to sustainability, attracting conscientious consumers.
- (2) **Improved Production Management and Environmental Protection:** As mentioned in the study by Jafari *et al.* (2017), environmental regulations criteria may indirectly encourage improved traceability and transparency, leading to superior environmental and social outcomes

as it improves sustainable production management, curbing illegal deforestation risks.

- (3) **Technology Investment:** Natural forest regeneration is one-way palm oil cultivation can be sustainable, while palm oil processing can be made sustainable with technological change. Van Rossum (2013) evaluated the carbon mitigation potential of natural forest regeneration and palm oil production, concluding that palm oil production leads to better carbon sequestration results. Lim *et al.* (2021) discussed the potential of Industry 4.0 technologies to improve the sustainability of the palm oil industry, suggesting that technological change can make palm oil processing more sustainable. Thus, technology investment might improve efficiency and productivity in the long run beyond meeting EUDR requirements.
- (4) **Competitive Edge in the European Market:** EUDR compliance provides a gateway to the European market, granting Malaysian companies a competitive edge over non-compliant competitors. Furthermore, for increasing the production of palm oil, the developing countries, along with Malaysia, have also been accused of violation of human rights and labour laws, which can also be transformed very quickly if the palm oil is to be exported to the European union along with the application of green supply chain management for the businesses in Malaysia that export to the European Union (Kushairi *et al.* 2019).

The SWOT analysis aligns with the results presented in the recent research paper (Aljoghaiman, 2023). The identification of strengths, such as a resilient supply chain and sustainability pledge, is supported by the paper's recognition of advantageous conditions and competent supply chain practices. Similarly, the weaknesses highlighted in this analysis and environmental impact and sustainability challenges are addressed thoroughly in the paper, providing a wide-ranging understanding of these subjects.

Conclusions and Recommendations

The analysis of the European Union's Deforestation-Free Regulations (EUDR) on the palm oil industry reveals various political, economic, social, technological, legal, and environmental implications. Additionally, these findings highlight the internal strengths and weaknesses of the Malaysian palm oil industry and the external opportunities and threats arising from implementing the EUDR.

The SWOT analysis for Malaysia's palm oil industry shows that the Weaknesses and Threats quadrants collectively have more issues and challenges. The findings show that palm oil production in both the global and Malaysian markets might not be in good shape over the short term. As revealed by the macroeconomic and microeconomic situations, palm oil production is expected to reduce in the short term. Furthermore, imposing the EUDR would impact the EU and other parts of the world where the supply chain is situated.

While Malaysia boasts an impressive percentage of MSPO-certified oil palm plantations, a potential high-risk designation by EUDR could seriously hamper its market access to the EU, tarnishing its global reputation. Furthermore, it is crucial to understand that this high-risk labelling is not solely based on the oil palm industry's compliance with deforestation standards only. Other significant Malaysian export commodities, such as rubber, timber, and cocoa, also fall under the EUDR's purview. These commodities, too, must adhere to stringent sustainability and deforestation standards to ensure that the EU does not label Malaysia a high-risk country. This multi-commodity scope broadens the challenges and necessitates a holistic approach to sustainability and traceability across various sectors of the Malaysian export industry.

Governments of numerous other economies would soon enact limits on palm oil due to growing environmental concerns and the stringent application of the EUDR. Losing exports to Europe would have a detrimental

effect on the economy both directly and indirectly (by reducing the output of goods that include palm oil). As a result, there may be a global decline in the palm oil market, potential trade conflicts, and immediate social and political repercussions, such as income decrease and production adjustments to preserve ties with industrialised nations. Additionally, Herry Purnomo (2022) supported that, over time, environmentally friendly methods of production and consumption and the development of new technologies present chances for greater sustainability and better working conditions for labourers.

Some general commendations are applied to navigate the challenges and harness the opportunities the EUDR presents. Stakeholders, including governments, industry associations, NGOs, and the members of the oil palm industry, must engage in continuous dialogue and alliance. This covers ambassadorial consultations with the European Union, addressing concerns ranging from sovereignty to environmental standards. Mutual understanding and support can alleviate trade strains, with efforts such as sharing best practices and knowledge exchange contributing to favourable outcomes. Additionally, with smallholder palm oil producers potentially facing challenges in EUDR traceability requirements, collective initiatives can offer capacity-building programs, technical assistance, and funding.

Digital solutions should be urgently needed in the oil palm industry to improve transparency and traceability. Blockchain and other cutting-edge tools and platforms can offer real-time information and guarantee the provenance and validity of each batch of palm oil. Apart from traceability, the emphasis should be on practising norms that prevent deforestation, responsible land-use methods, and effective harvesting methods. Additionally, modern digital solutions may expedite data collection and analysis and offer advanced encoding and security measures to ensure strong data privacy and protection, thus uplifting the importance of embracing digitalisation. As more digital processes are incorporated,

protecting personal information and addressing potential risks related to data misuse become controllable obstacles. Additionally, funding should go toward R&D, which should focus on advancements in processing technology, renewable energy sources, and sustainable practices to environmental regulations.

According to conventional wisdom, nations that produce palm oil should investigate and grow potential in alternate markets to lessen reliance on the European market. Two examples are diversifying export locations and promoting eco-friendly palm oil goods in developing markets. Engaging with nations like India and China, where there is a rising market for sustainable goods, might help open up new markets and lessen vulnerability to trade restrictions imposed by the EUDR.

By implementing these suggestions, the palm oil industry can overcome EUDR's obstacles and seize sustainable expansion opportunities. Collaboration, innovation, and responsible practices are essential to ensure the industry's long-term profitability while fostering environmental stewardship and socio-economic well-being.

Future Studies

It would be useful to conduct a comprehensive gap analysis assessment between existing sustainability standards, such as the Malaysian Sustainable Palm Oil Standards (MSPO), Indonesian Sustainable Palm Oil (ISPO), Roundtable on Sustainable Palm Oil (RSPO), and the European Union's deforestation-free regulations (EUDR). This analysis would evaluate the alignment, differences, and efficiency of these standards in promoting sustainable practices within the palm oil industry.

Discovering buyer behaviour studies in the vegetable oils market may offer a platform to understand the impact of sustainability practices on purchasing decisions. Future studies can delve into consumer likings, the influence of certifications on product selections, and

the underlying factors driving the increasing demand for sustainable products.

Additionally, a thorough economic study that examines the resilience of the palm oil industry's supply chain, principally focusing on smallholders, will offer valuable perceptions into the encounters by meeting sustainability standards. By understanding these challenges, policymakers and industry stakeholders may develop targeted interventions and policies to bolster supply chain resilience and foster inclusivity.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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