

Developing Environmental, Social and Governance Index for Palm Oil Industry Value Chain

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The common world effort to achieve United Nations 2030 Agenda on Sustainable Development has expedited the Environmental, Social and Governance reporting, both in the academic, financial, and business arenas. The composition and elements within ESG and its benefits have remained vague across a wide range of industries. Even though general guidelines and handbooks on ESG reporting have been introduced by respective securities markets, non-governmental organisations such as General Reporting Initiatives and World Business Council for Sustainable Development, a gap is observed in the ESG reporting for the entire value chain activities, particularly for the palm oil industry. In this work, Analytic Network Process is proposed to evaluate the priority weights of ESG indicators across the palm oil value chain to understand the importance of ESG reporting in improving the sustainability performance of the industry. The palm oil value chain is divided into three parts, which are downstream activities, main operations, and upstream activities. The result can serve as a reference for the policymakers in introducing the appropriate supports and measures to spur and monitor the sustainable development of the industry. It can also serve as a guideline to enhance credit and investment decisions for financial institutions and investors. The priority weights on the importance of ESG indicators can also help industry players to improve the resource allocation strategy as well as supplier and distribution selection.

1. Introduction

Environmental, Social, Governance (ESG) has become a popular term and gained traction, especially among business advocacy groups, since 2004 with the publication of the report “Who Cares Wins” by the United Nations Global Compact. The report is endorsed by 20 renowned financial institutions such as AXA Group, Morgan Stanley, and HSBC (United Nations, 2004) as a strategic framework designed for identifying, assessing, and addressing an organisation’s objectives and business practices, particularly from three main ethical finance pillars or categories, namely environmental, social, and governance. Each pillar encompasses various issues and presents a specific assessment target. It allows the stakeholders to understand how an organisation evaluates and manages the risks and opportunities associated with the categories (Li et al., 2021). ESG ratings or scores of an organisation are published by ESG rating agencies based on the evaluation of data ranging from the organisation’s carbon footprint and commitment to sustainability to the workplace culture and commitment to diversity and inclusion, to the overall social trend regarding corporate risks and practices. Some of the well-known ESG rating agencies include Sustainalytics, MSCI, and S&P Global. In 2005, Principles for Responsible Investment (UNPRI) was founded as a United Nations-supported international network of financial institutions working together to incorporate ESG principles into investment practices across asset classes. As of March 2022, UNPRI has garnered a total of 5319 asset owner signatories, with total assets under management of approximately 121.3 trillion US\$ (PRI, 2022). The success of UNPRI in gathering these signatories explains the importance of the role of ESG in modern business, especially for publicly traded companies in the securities market, as an obvious trend has been observed for mandatory ESG reporting.

The analysis by TruCost, a part of S&P Global Market Intelligence, shows that industrialised farming practices cost 3 trillion US\$/y (3×10^{12} US\$/y) in environmental impact worldwide (S&P Global, 2020). The agriculture sector is implicated in a variety of risks and opportunities related to ESG. In view of the importance of palm oil

to the world, this work focuses on developing an ESG index for the palm oil value chain which is segmented into three stages (i.e., upstream, main operation, and downstream). Palm oil is an extremely versatile oil that has many different compositions and properties and can be used in a range of products that, includes foods, cosmetics, industrial applications, and bioenergy. Oil palm is a very efficient crop that is able to produce a greater yield at a lower cost of production over a smaller land use almost all year round (Teng et al., 2020). As global production and demand for palm oil are increasing rapidly over the years, it is crucial to continuously improve the sustainability performance of the industry (Klemeš et al., 2021). ESG reporting came into light as it serves as an evaluation report to prove the sustainability efforts made by organisations in the industry. Even though the term ESG is getting more popular over time, the ESG reporting guidelines remain ambiguous for organisations within the palm oil industry value chain. It is partly due to the ESG indicators provided in the guidelines being mostly general and broad that each industry will need to work within its own industry to identify and pinpoint the concise ESG indicators that are applicable and appropriate for the industry's value chain. The lack of clear ESG indicators increases the difficulty for organisations to comply with the ESG reporting standards as the organisations are uncertain about what to and what not to do.

The main objective of this work is to evaluate the priority weights of ESG indicators across the palm oil value chain and later develop the composite ESG index for the palm oil value chain with the Analytic Network Process (ANP) approach. This work contributes as a reference for organisations with mandatory ESG reporting in the palm oil value chain to pinpoint and recognise the ESG indicators which can benefit the organisation as a whole and plan for an easier and more systematic data collection process for reporting purposes. Besides, it allows the industry players to identify potential collaborators based on the rating of each organisation in the composite ESG index. It also serves as a reference for industry players to grasp a more thorough understanding and awareness of how ESG reporting and the ESG index can reflect the organisation's efforts and commitments to contributing to sustainability performance. The rest of the paper is structured as follows: Section 2 – Current ESG issues in the palm oil value chain; Section 3 – Methodology; Section 4 – Results; Section 5 – Conclusion - Prospect, recommendations, and future works.

2. Current ESG issues in the palm oil value chain

Based on Grand View Research (2023), the global palm oil market size was valued at US\$ 67.3 billion in 2022 and is expected to grow at a compound annual growth rate of 5.1 % from 2023 to 2030. The anticipated growth is mainly driven by exponentially growing demands from various industries that include food and beverages, biofuel, energy, and cosmetics. The potential growth, with its positive prospect for the industry, continues to attract the attention of stakeholders and investors in venturing into the industry. This phenomenon further highlights the importance of ESG reporting in the palm oil value chain to self-reflect on the commitments towards the sustainability effort while fulfilling the higher expectation of responsible investors and consumers.

One of the most contested issues in the palm oil value chain is the expansion of industrial farming practices of oil palm plantations leads to deforestation and subsequently causes the loss of biodiversity. A study by Gaveau et al. (2016) shows that 2.2 Mha of forests have been rapidly converted to industrial plantations from 2005 to 2015 across Borneo. The high conversion rate of other food crops to oil palm plantations, illegal logging and forest fires are the main causes of deforestation. These activities also increase atmospheric carbon dioxide emissions, which ultimately lead to global climate change (Longobardi et al., 2016). Resources efficiency and waste management also took the role as the other two important elements to evaluate the environmental aspects. The possibility of satisfying the role of clean renewable energy and the commitment to improve energy efficiency as biofuels while minimising environmental pollution proves to be a challenge for major players in the palm oil value chain (Dey et al., 2021). The management and utilisation of the significant amounts of biomass residues (i.e, empty fruit bunches (EFB), palm kernel shells (PKS), palm mesocarp fibres (PMF), and decanter cake, POME) generated with crude palm oil production also play a crucial role in reducing greenhouse gas emissions and wastewater which ultimately hinder the ESG performance of the industry.

The social category in the palm oil value chain involves common social issues that transcend across various industries, such as labour rights and standards, customer satisfaction, and community relations. The palm oil industry, as a labour-intensive industry, has been deemed with issues related to labour rights and standards, such as forced labour, unrealistically high production quotas, and health and safety risks over the years (Mittal and Blokhuis, 2018). Sundaraja et al. (2021) report that there has been an increasing trend of conscious consumers preferring sustainable palm oil (SPO) labelled products in the market. Community relations is no longer offering gifts and social initiatives for surrounding communities in exchange for a social license to operate, but to internalize the demands of communities by changing the production practices such as responsible application of chemicals in plantation areas that can benefit the local communities in the long term (Johnson, 2022).

The governance category issues are related to aspects such as board composition and structure, audit and internal control, risk management, as well as transparency and disclosure. These governance issues reflect the power relations and political settlements between shareholders, creditors, management, and labor. Effective board composition and structure not only applies to the major players in the palm oil industry, but towards all players in the value chain. A study by Dalton et al. (1998) highlights that effective board composition and structure of a firm have a positive relationship with financial performance, regardless of the firm size. Audit and internal control work as a mechanism to ensure the integrity of financial reporting as well as compliance with laws and regulations. It also indicates that the organisation is taking the active initiative to avoid taking responsibility for a function that will serve as a subject of future scandals caused by a single person in that organisation (Spira and Page, 2003). Risk management focuses on decreasing the possible risks in the palm oil value chain caused by various factors, such as the fluctuations in the price of crude palm oil, the new implementation of RSPO policies, and so on. Transparency and disclosure work hand in hand with all other governance practices as it allows the public to have access to the overall outlook and financial performance of the organisation in the industry. Most of the reputable organisations specialise in ESG, such as United Nations (UN), World Wildlife Fund (WWF), International Labor Organisation (ILO), Corporate Finance Institute (CFI) and so on have their own glossary of terms when it comes to these ESG indicators. However, it might not be as relevant and appropriate for the palm oil value chain. Table 1 below summarises the terminology of ESG indicators that were compiled and defined to correspond to the palm oil industry.

Table 1: ESG indicators in the palm oil value chain

Category	ESG Indicators	Terminology
Environmental	Climate change	Climate change is driven by the emissions of greenhouse gases (GHGs) from fossil fuel combustion, land use change, and other sources. GHGs trap heat in the atmosphere, increasing global temperatures and causing a long-term shift in global climate patterns.
	Biodiversity	Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter. It includes the variety of living species on earth that includes animals, plants, fungi, and even microorganisms that make up our natural world.
	Resource efficiency	Resource efficiency indicates using the Earth's limited resources in a sustainable manner while minimising impacts on the environment. Resource efficiency can focus on natural resources including water, energy, land, and materials. It represents the relationship between natural raw materials or technical-economic materials and the benefits gained from their use.
	Waste management	Waste management refers to a streamlined process that organisations use to dispose of, reduce, reuse, and prevent waste. It includes the total supervision of waste production, handling, processing, storage, and transport from its point of generation to its final disposal.
Social	Labor rights and standards	Labor rights and standards are the rules and regulations that are applied to the way workers are treated in an organisation. It includes core principles and rights in the workplace such as a safe and healthy working environment, reasonable minimum wages and working hours.
	Customer satisfaction	Customer satisfaction is a measurement that determines how well an organisation's products or services, and overall customer experiences meet customer expectations. It can be formed on the basis of a single service encounter or on the basis of a number of service experiences.
	Community relations	Community relations refers to various methods that organisations use to establish and maintain a mutually beneficial relationship with the communities in which they operate. These organisations adapt corporate social responsibility to give back to the community while gaining community support and goodwill in return.
Governance	Board composition and structure	Board composition and structure refers to the elected panels in an organisation's board of directors, which is the primary internal corporate governance mechanism. The board composition and structure vary widely depending upon an organisation's goal and industry.
	Audit and internal control	Audit and internal control help in designing a system that governs the likelihood for fraud and irregularities in a timely and secure manner. It refers to systems of policies, procedures, and practices to prevent, detect and respond to issues, errors, and irregularities in an ethical and healthy approach.
	Risk management	Risk management is the process of identifying, analysing, assessing, mitigation and monitoring financial, legal, strategic and security risks to an organisation's capital and earnings. It is focused on enabling organisations to achieve objectives through performing activities while being aware of risks.
	Transparency and disclosure	Transparency and disclosure help improve public understanding of the organisation's objectives, ownership, stakeholders, structure, financial situations, activities, and corporate policies and performance with respect to environmental as well as corporate social responsibilities.

3. Methodology – Analytic Network Process (ANP)

The current ESG index mainly focuses on a single business entity or organisation to comply with the ESG requirement. In order to gauge the overall impacts of the palm oil industry on sustainability, an ESG index that is capable to measure the environmental, social and governance across different stages of the palm oil industry is deemed imperative. The development of the ESG index for the palm oil value chain consists of 4 main stages as follows: (i) Identification of key stages of palm oil industry supply chain and its relevant environmental, social and governance indicators; (ii) Calculation of individual sub-index (iii) Derivation of priority weightage via ANP; (iv) Integration of priority weightage of ESG indicators and multiple sub-indices to form the ESG index. The highlight of this work is to incorporate subjective judgements such as preference and applicability for both qualitative and quantitative ESG indicators at the different stages of the palm oil value chain. This work emphasises more on the demonstration of ANP in deriving priority weightage for ESG indicators.

Step 1: Identification of ESG indicators - Environmental, Social and Governance indicators are selected based on the different value chain stages of the palm oil industry.

Step 2: The ESG reporting for the organisations associated with the palm oil value chain are extracted to calculate the minimum and maximum point for the quantitative parameters (i.e., greenhouse gas emissions, habitat protection, energy consumption, staff turnover rate, litigation related expenses). For qualitative parameters (i.e., emission control / measures, waste disposal initiative, consumer protection, community development, reporting and transparency), the appropriate index is adopted to run the assessment. Normalization is then performed to convert the value into the same scale for comparison to form individual sub-indices.

Step 3: ANP is employed to derive the priority weightage of the selected indicators based on the respective stages of palm oil value chain. The procedure of ANP is illustrated in the following:

(a) Model development: The problem is structured into a hierarchical network model, where the goal is located on the top level, follow by the stages of the industry at level 2, and ESG indicators at level 3 as illustrated in Figure 1. Arrow is used to represent the relationship between levels, clusters, and elements. For example, the downward arrow from level 1 to level 2 represents the priority weightages of n elements in level 2 with respect to goal. Similarly, the downward arrow from level 2 and level 3 represents the priority weightages of n clusters, with n elements in each cluster with respect to the elements in level 2.

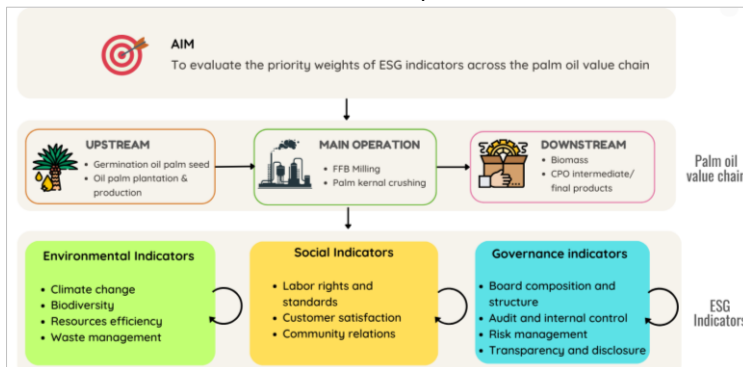


Figure 1: Hierarchical Network Model for developing the ESG index for palm oil value chain

b) Elicit judgements with pairwise comparisons' survey: Experts of the subject matter are gathered to compare the dominant relationship (i.e., importance, preferences, likelihood and influence) of the elements in pair. Saaty's 9-point fundamental scale of Analytic Hierarchy Process is employed in this survey to indicate the intensity of the dominant relationship for the pairwise comparisons (Saaty and Takizawa, 1986).

(c) Derive priority vector for local pairwise comparison matrices – The responses for the pairwise comparison questionnaire serves as the inputs to form local priority matrices, \hat{A} . Local priority matrix is reciprocal matrix, whereas $\hat{a}_{ij} \times \hat{a}_{ji} = 1$. Geometric mean method is used to combine the input from multiple responses. The local priority matrix is then multiple by itself until the normalized priorities weightage becomes stable to form the eigenvector for that respective relationship. The consistency ratio is also calculated to ensure the responses are acceptable to continue the analysis (Saaty and Takizawa, 1986).

$$\hat{A} = \begin{bmatrix} 1 & \hat{a}_{12} & \cdots & \hat{a}_{1n} \\ \hat{a}_{21} & 1 & \cdots & \hat{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \hat{a}_{n1} & \hat{a}_{n1} & \cdots & 1 \end{bmatrix} \text{ where } \hat{a}_{ij} \times \hat{a}_{ji} = 1 \quad (1)$$

resource allocation strategy when it comes to ESG reporting. A greater rating in the ESG report guarantees the organisation's future outlook towards sustainability while attracting more potential investors. The ESG index also serves as a benchmark for supplier and distribution partner selection as the rating of a particular organisation in the index directly reflects their effort towards sustainability. One of the limitations of this study is the inability to fix an industry-specific standard for ESG reporting worldwide as the ESG regulations differ from country to country. Besides, it is also very challenging for the organisation to quantify all the ESG risks considering the scope of sustainability is very broad. The future works will focus on the extension of the work to produce a complete ESG index with concise guideline that applies to all organisations in the palm oil value chain. Further analysis can be done to include more respondents in the survey (i.e., experts from finance, academia, other profession background) to observe the differences in terms of priority in compliance with ESG reporting.

Acknowledgments

The authors would like to thank Huachang Growmax (M) Sdn Bhd, Universiti Kebangsaan Malaysia - Graduate School of Business (GSB-2023-020) and UKM (GP-2021-K023353) for partnership and funding of this research.

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