Sustainability Risk Management and Sustainability Performance in Palm Oil Mills: Evidence from Malaysia

By

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Abstract

Palm oil industry in Malaysia, particularly palm oil mills, has been criticised due to the sustainability issues arising from the production of palm oil that severely impacted environmental and social sustainability. Companies that fail to manage sustainability issues may create significant sustainability risks to their sustainability performance in terms of boycotts, regulation, and reputation risks. Because of this concern, sustainability risk management (SRM) has gained attention as it influences companies' sustainability performance. Thus, this study aims to investigate the impact of sustainability risk management on sustainability performance in palm oil mills in Malaysia. In total, 457 questionnaires were distributed between July and December 2020, with a response rate of 25.8%. Data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings unveil that SRM has a positive and significant impact on the mill's sustainability performance. The findings contribute to current knowledge and provide useful insight to policymakers on the importance of SRM to sustainability performance.

Keywords: Sustainability Risk Management; Sustainability Performance; Palm Oil Mills; Partial Least Squares Structural Equation Modelling.

Introduction

The attention to sustainability risks has been grown due to the increasing sustainability issues because of company's activities (Abdul Aziz et al., 2015; Anderson & Anderson, 2009; Schulte & Knuts, 2022; Wijethilake & Lama, 2018; Wong, 2014). Although sustainability issues emerge from natural phenomenon, any solutions for sustainability issues must involve companies. Companies that fail to manage the sustainability issues may create significant sustainability risks to the company's long-term sustainability performance (Abdul Aziz et al., 2016b; Wijethilake & Lama, 2018; Wong, 2014). Sustainability risks, that include boycott risk, regulation risk, reputation risk, etc., are defined as the risks arising from sustainability issues caused by companies' activities on social and environment sustainability or by the companies' interaction with the external environment where they operate (Abdul Aziz et al., 2015; Anderson & Anderson, 2009; Giannakis & Papadopoulos, 2016). Sustainability risks primarily lead to bad press coverage and adverse stakeholder reaction (Hofmann et al., 2014; Zimmer et al., 2017). It consequently leads to damage in the form of reputational losses, and decreases both turnover and profit (Rostamzadeh et al., 2018).

In Malaysia, the performance of palm oil mill has seen a significant decline in total export revenue for two consecutive years from RM51.85 billion in 2017 to RM42.75 billion and RM42.44 billion in 2018 and 2019, respectively. The declining in performance is due to the claim of sustainability issues arising from palm oil production, which led several importing countries to impose anti-palm oil campaign and protectionist trade regulations (Naidu & Moorthy, 2021). For example, the EU passed two resolutions to ban the use of palm oil in its biofuel programmes and to introduce new sustainability regulation to be complied by exporting countries to enter EU market. The US has blocked the imports of Malaysian palm oil and palm oil products from entering the country. This has indirectly threatened the socio-economic conditions of 650,000 small growers whose depend on the total export revenue of palm oil (Saideed, 2017). Above all, the action of the EU and the US to boycott and to impose stricter regulation on Malaysian palm oil may tarnish Malaysian reputation as second largest producer and exporter of palm oil in the world. Thus, there is a need to address sustainability risks by managing the sustainability issues arising from the production of palm oil in palm oil mills in order to maintain sustainability performance.

Risk management is an important control system for every organisation in today's business environment due to the capacity it has in controlling organisational behaviour and operational activities (Bhimani, 2009; Themsen & Skærbæk, 2018). Moreover, risk management that consists of risk identification, risk assessment and analysis, risk response and risk monitoring is a critical to ensure the sustainability and survival of the organisations (Rasid et al., 2014). According to Bui and de Villiers (2017), risk management is crucial in managing the adverse impact of the risks at the same time provide opportunities to create competitive advantage in the form of organisational performance. However, the environmental issue of BP Deepwater horizon oil spill in Mexico and the social issues of poor working condition in Apple manufacturing as well as Rana Plaza have unveiled the poor risk management as a control system in ensuring business survival (Bromiley et al., 2015). More importantly, this has intensified the interest in risk management to manage sustainability issues (Giannakis & Papadopoulos, 2016; Soin & Collier, 2013).

Because of the concerns of poor risk management in managing sustainability issues, SRM has gained considerable attention. The main objective of SRM is at addressing the adverse impact of sustainability risks on organisation's performance in the market (Abdul Aziz et al., 2015). Nowadays, organisation's performance is not confined with economic or financial performance but includes environmental and social performance. SRM's focus is not only on addressing economic risk but also includes environmental and social risks, covering the three dimensions of sustainability. In fact, the concept of sustainability in SRM is broaden from merely highlighting the environmental risk to include the issues of social responsibility and other important risks such as national growth, socio-economic condition, stakeholder activism, and reputational risk. Hence, the SRM enables organisations to address sustainability risk as well as provide opportunities that can increase organisational value in term of enhancing organisation's sustainability performance (Bui & de Villiers, 2017).

In total, 89% of practitioners indicate that sustainability risks can have an adverse impact on their performance (WBCSC, 2017). This shows how important it is in managing sustainability risks. However, a survey found that environmental sensitive companies in Malaysia are not ready for SRM (Abdul Aziz et al., 2016c). The questions are despite the evidence of poor risk management in managing sustainability risks and despite the benefits of SRM, why Malaysian companies are not ready for SRM? Lack of information on the positive influence of SRM on sustainability performance is found as a reason to affect the readiness of companies for SRM (Schulte & Knuts, 2022; Wong, 2014). Previous literature in risk management tends to focus on financial performance (*see* Gordon et al., 2009; Hoyt & Liebenberg, 2011; Paape & Speklé, 2012). Extant empirical evidence on the SRM and sustainability performance however remains scant and unclear.

As such, the objective of this study is to investigate the impact of SRM on sustainability performance. Palm oil mills are demanded to improve their sustainability performance in the area of social, environment, and economic. The SRM can assist palm oil mills to control their behaviour and activities in managing sustainability issues which in turn, improves sustainability performance. Thus, the extent to which the SRM positively influences sustainability performance in Malaysian palm oil mills is worthwhile to be investigated. This study is significant to the Malaysian palm oil industry, especially the palm oil mills, by giving a better understanding on the importance of managing sustainability risk through sustainability risk management. Specifically, this study is significant to provide empirical evidence on the impact of SRM and sustainability performance within the specific industry context, contributing to the growing research in SRM.

The organisation of this paper is as follows. Section 2 presents the review of literature and development of hypothesis. Sections 3 and 4 outline the study's research methodology and results of data analysis, respectively. Section 5 section provide discussion of results, and conclusions and limitations of the study.

Literature Review and hypothesis development

In this section, the review of literature is separated into sustainability risk management and sustainability performance. The aims are to better understand, to provide insights into areas that have been well-researched, and to highlight several issues and areas of research that are under-researched. This section ends with the development of hypothesis to postulate the impact of SRM on sustainability performance.

2.1 Sustainability risk management (SRM)

Discussion on sustainability in relation to risk management has been articulated by Anderson (2006) in his study entitled "Corporate Survival: The Critical Importance of Sustainability Risk Management". The author indicated that although at that time the risk management to prevent the sustainability risks might not be apparent, managers should not ignore the management of sustainability risks as it will cause significant adverse impact to company's survival. A series of sustainability issues like Bhopal chemical disaster, Nike child labour, Apple poor working condition and Rana Plaza supply chain issue have seen the impact of these risks and piled up more pressure for companies to address their environmental and social responsibility, in addition to the traditional financial performance (Anderson & Anderson, 2009). These situations have also underscored the need of company to have a sustainability risk management that can facilitate and legitimise certain ways of organising, governing and managing individuals and business from creating sustainability issues out of irresponsible activities (Bui & de Villiers, 2017; Kumarasiri & Gunasekarage, 2017).Therefore, it is important to manage sustainable issues as sustainable issues is related to sustainable growth (Alwi, 2021).

Literature defines sustainability risks as the risks arising from sustainability issues, and the sustainability risks comprise economic risks, environmental risks, and social risks which may provoke harmful stakeholder reactions (Anderson & Anderson, 2009; Hofmann et al., 2014). Abdul Aziz et al. (2016a) and Giannakis and Papadopoulos (2016) further describe that those economic risks, environmental risks, and social risks are associated with economic issues, environmental issues, and social issues, respectively, due to companies' internal and external environments. This indicates that sustainability risks and their associated sustainability issues refer to the concept of sustainability comprising economic, environment and social dimensions. This study defines sustainability risks as risks that are categorised into economic risks, environmental risks and social risks emerging from sustainability issues encompassing economic issues, environmental issues, and social issues as a result of companies' internal activities and interaction with external environment.

SRM is a risk management that addresses risks deriving from the sustainability issues (Anderson & Anderson, 2009). Similarly, SRM is a control system that is useful to manage all risks related to economic, environmental, and social areas (Yilmaz & Flouris, 2010). In particular, Abdul Aziz et al. (2015) define SRM as a risk management which addresses a broad spectrum of sustainability risks by managing their associated sustainability issues to achieve long-term sustainability performance. Wong (2014), on the other hand, state that SRM is a control system that addresses quantified and non-quantified risks for maintaining companies' sustainability, whereby the quantified risks derive from economic risks and the non-quantified risks arise company's environment and social risks. SRM is a control system that control companies' behaviour and provides useful information to support decision making in addressing sustainability risk. Hence, SRM is a control system that focuses on controlling companies' behaviour and provides valuable information to manage sustainability risks comprising economic, environmental and social and their associated issues to achieve long-term sustainability performance. extend improvise

SRM provides advancement to the existing risk management framework. Risk management framework comprises risk identification, risk assessment and analysis, risk response and risk monitoring. This framework is regarded as an important control system for every organisation due to the capacity it has in controlling organisational behaviour and operational activities to ensure the sustainability of the organisations (Bhimani, 2009; Rasid et al., 2014). Risk management framework is not conceptually wrong when an organisation has poor risk management, but it is due to the failure in implementing the framework properly (Gendron et al., 2016). The components in risk management framework should be holistically implemented to manage the risk appetite defined by the organisation (Mishra et al., 2019). In this regard, SRM broadens the risk appetite of risk management framework by managing broad scope of sustainability risk including economic risks, environmental and social risks (non-quantifiable risks) (Abdul Aziz et al., 2015). Thus, the SRM enables organisations to holistically identify sustainability risks, assess and analyse their impact, employ suitable response strategy and conduct monitoring mechanism to ensure their survival and sustainability (Abdul Aziz et al., 2016b; Giannakis & Papadopoulos, 2016).

Previous studies have documented the management of sustainability risks. Giannakis and Papadopoulos (2016) identified and group the sustainability risks into three sustainability dimensions, namely economic, environment, and social. The sustainability risks are further divided into risks that arise from internal and external factors. Among the sustainability risks identified in their study are environmental accident, non-compliance with sustainability laws, work-life imbalance, discrimination, boycotts, reputation, and financial damages. Hofmann et al. (2014) identified social issues, ecological issues and ethical business conduct issues as sources of supply chain sustainability risks. The ecological and social issues include product waste, water pollution, child labour, low wages, and unbearable working conditions. Bui and de Villiers (2017) studied sustainability risks associated with climate change policies. It is found that climate change policies lead to economic risks in terms of new compliance costs, increased energy cost, carbon taxes, and potential penalties associated with noncompliance. In addition, climate change policies also carry social risks as a result of increased societal awareness, media and stakeholder attention, and reputation. Kumarasiri and Gunasekarage (2017) explored the sustainability risks in carbon intensive and low carbon intensive sectors with regard to climate change policies. Economic risks arise from increased operational costs and financial threat of new regulation. Social risks emerge due to the pressure from community and business reputation. Finally, environmental risks are associated with carbon emissions, carbon obligation, and carbon regulation.

In term of risk assessment and analysis, Giannakis and Papadopoulos (2016) found sustainability risks have major impact on organisations; the sustainability risks occur occasionally and moderately difficult to recognise. Similarly, Abdul Razak et al. (2020) also found that sustainability risks have major impact on organisation’s operations that could severely impact their performance. Hofmann et al.'s (2014) study particularly state that the impact of sustainability risks to organisations can be direct and indirect. The boycott against company’s products, litigation, and penalties due to environmental and social damage are the example of risks that have direct impact on organisation’s operation and performance. In contrast, the indirect impact is from the action of media and non-government organisations (NGOs) such as green consumers, environmental protection groups and international communities in influencing public perception on company’s environmental and social actions. Interestingly, the impact of economic and environmental risks have received considerable attention among companies despite higher mediea exposrure and public scrutiny are given on environmental and social issues (Abdul Razak et al., 2020; Giannakis & Papadopoulos, 2016).

Based on the assessment and analysis, companies can employ the appropriate risk response strategies to address the sustainability risks. Risk prevention and risk mitigation are the common response strategies used by companies in textile industry to address the sustainability risks, followed by risk reduction and risk share. The least response strategy is risk retain (Giannakis & Papadopoulos, 2016). Risk retain is also the least response strategy found in Abdul Razak et al.’s (2020) study as compared to risk control and risk avoidance that dominate the strategies to deal with sustainability risks. It is understandable that companies employ risk retain to avoid conflict with their stakeholders as to maintain company’s reputation and competitive position in the market (Bui & de Villiers, 2017; Foerstl et al., 2010). In contrast, Sakhel (2017) state that environmental regulated and non-regulated European companies prefer to implement risk reduction instead of risk share and risk avoidance measures to address environmental risks. Similarly, risk reduction is the most response strategy used by telecommunication companies followed by risk retain and risk reduction (Valinejad & Rahmani, 2018). Some examples of risk reduction are imposing a minimum criteria to be met (Foerstl et al., 2010), compliance with sustainability regulations (Giannakis & Papadopoulos, 2016), emission or pollution reduction target (Bui & de Villiers, 2017; Kumarasiri & Gunasekarage, 2017), and integration of sustainability strategy into operations (Sakhel, 2017).

Despite a series of empirical evidence on the management of sustainability risk, the four components in SRM are discussed in isolated approach. The discussion on the SRM that includes the risk identification, risk assessment and analysis, risk response and risk monitoring holistically has so far received little attention. In fact, the management of sustainability risks has been solely focusing on environmental risk or social risk with limited discussion on the management of sustainability risks covering economic, environmental and social risks. Several studies (Abdul Razak et al., 2020; Giannakis & Papadopoulos, 2016; Valinejad & Rahmani, 2018) discuss the holistic SRM in managing the economic, environmental and social risks. However, lack of studies that discuss the extent to which SRM manages sustainability risks that lead to sustainability performance. Departing from the existing literature, this study focuses on the management of sustainability risks – across three dimensions – through SRM that includes risk identification, risk assessment and analysis, risk response and risk monitoring as a whole and its impact on sustainability performance.

2.2 Sustainability performance

Sustainability performance refers to the development that meets the needs of present generation, while at the same time protecting the human and natural resources for the future generations to meet their need (Lintukangas et al., 2019; Rajesh, 2020). Sustainability performance comprises three elements, namely economic, environmental, and social (EES) performance. For companies to become relevant in the 21st century, sustainability performance is all about incorporating environmental performance, economic efficiency, and social equity into companies' operations. Hence, the dominant aspect that focuses mainly on maximising financial performance is reduced and has changed, and the performance is widened to three segmentations - environment, economic and social performances (Naciti, 2019). Environmental performance refers to the combination of firms' capabilities to monitor their actions on water resources, air resources, energy resources, and wastage (Rajesh, 2020). Social performance is measured by the ability of the company to deal with customers, business partners, and labour relations such as labour equality, wage payment, health and safety, and ethical behaviours (Giannakis & Papadopoulos, 2016). Economic sustainability requires acting with social responsibility and minimal environmental impact, while maintaining organisation viability (Rostamzadeh et al., 2018). Contemporary businesses are paying more attention on the sustainability due to growing public awareness and corporate acknowledgement (Alsayegh et al., 2020). Thus, economic performance and firms viability must be maintained in order to achieve long run survival (Rajesh, 2020).

Wicher et al. (2019) outline several sustainability indicators, transform them into a single dimension, and develop an aggregated sustainability performance assessment of an industrial corporation, which is meant to measure the overall business sustainability. Nikolaou et al. (2019) develop a corporate sustainability performance framework by designing a composite sustainability index. The sustainability index, that simultaneously combines the economic, environmental, and social of sustainability, integrates the concept of thresholds values to address some basic principles of strong sustainability performance. In supply chain study, a sustainability performance measurement framework has been developed by Giannakis et al. (2020) for supplier evaluation and selection. The framework is motivated by the limited existing models that measure the three components of sustainability performance separately. Wijethilake (2017) incorporates environmental performance, social performance, and economic performance to measure the corporate sustainability performance of listed companies. Recently, Eikelenboom and de Jong (2019) identified variables and constructed a framework that used to assess sustainability performance in SMEs. The paper also highlighted the importance of firms' capabilities to balance environmental, economic, and social performance. Lintukangas et al. (2019) assert that establishing a measurement of sustainability performance measurement in one organisation is complicated due to multidimensionality and long-term focus. According to Pham et al. (2020), an important way to improve sustainability performance using a correct measurement is to focus on the fit between the organisation and the environment it operates.

Nevertheless, these studies mainly focus on the medium to large manufacturing, logistic and services companies outside Malaysia, particularly in developed countries. Research on sustainability performance that employs the three dimensions of sustainability as in line with its concept in Malaysia is limited. Moreover, studies that investigate the relationship between a control system and sustainability performance mostly focus on EMA (*see* Latan et al., 2018; Ong et al., 2018; Solovida & Latan, 2017), sustainability control system (*see* Maletič et al., 2018; Wijethilake, 2017), and green supply chain management (*see* Baah et al., 2020; Chu et al., 2018; Lintukangas et al., 2019). Previous studies on the relationship between risk management and sustainability performance remain unclear. In fact, studies in risk management field largely focus on the impact of risk management on financial performance, which mostly done in PLCs and financial institutions (*see* Baxter et al., 2013; Florio & Leoni, 2017; Gordon et al., 2009; Rasid et al., 2014; Soltanizadeh et al., 2016). This study departs from the existing literature to provide useful insight on the relationship between SRM as a control system and sustainability performance. In addition, the sustainability performance is measured by employing the three sustainability dimensions, namely economic performance, environmental performance and social performance. Finally, the study focuses on the relationship between SRM and sustainability performance in a specific context which is palm oil mills.

Hypothesis Development

SRM and Sustainability Performance

There are growing pressures around the world for companies to consider their sustainability performance seriously (Gunarathne & Lee, 2015). Nowadays, companies need to fully integrate sustainability into their operation and strategy as to not only to minimise potential sustainability issues, but also to exploit benefits of improving sustainability performance (Saunila et al., 2019; Wong, 2014; Yilmaz & Flouris, 2010). Literature documented that the benefits of sustainability performance could be in improved reputation, enhanced competitive advantaged, preventing sustainability issues, reduced emission, reduced pollution, improved employee’s welfare, decreased operational costs, etc. (Latan et al., 2018; Maletič et al., 2018; Ong et al., 2018; Phan et al., 2017; Zhu et al., 2013). When pressures towards sustainability increase, a control system is a crucial strategy to manage companies’ sustainability performance (Bui & de Villiers, 2017; Pondeville et al., 2013). Companies that implement a control system to embed sustainability issues into operation can describe what actions manager can take to improve sustainability performance (Engert & Baumgartner, 2016; Kumarasiri & Gunasekarage, 2017). Hence, it indicates that there is a positive relationship between MCS and sustainability performance.

SRM has become an important control system to manage sustainability performance (Abdul Aziz et al., 2016b; Wijethilake & Lama, 2018). SRM aims at improving sustainability performance by managing sustainability issues as a consequence of companies operations through coordinated and coherent approach (Wong, 2014). In particular, SRM concerns with the identification, assessment, analysis, mitigation, and monitoring of risks associated with sustainability issues that may adversely impact sustainability performance (Bui & de Villiers, 2017; Giannakis & Papadopoulos, 2016; Sakhel, 2017; Zimmer et al., 2017). This shows that SRM is a control system that manages a broad spectrum of emerging risks, including financial and non-financial risks, arising from sustainability issues to achieve sustainability performance for long-term competitive advantage and survival (Abdul Aziz et al., 2015, 2016c). Definitely, SRM provides guidance for managers to generate risk indicators, risk sources, risk analysis, and risk prevention that are needed to ensure effective management of sustainability risks and improved sustainability performance (Yilmaz & Flouris, 2010).

Palm oil mills in Malaysia have been at the centre of attention among numerous stakeholders due to the arising of sustainability issues from their operations (Lim et al., 2015). Hence, there is a demand for palm oil mills to improve their performance by adopting more sustainable palm oil manufacturing practices (Abdullah et al., 2017). SRM will enable companies to incorporate sustainability into their operations in pursuit of sustainability performance (Yilmaz & Flouris, 2010). In addition, SRM can help companies effectively, by responding to the growing expectation of various stakeholders though management of sustainability issues (Abdul Aziz et al., 2016b; Wijethilake & Lama, 2018; Wong, 2014). SRM also ensures that managers use available resources in effective and efficient manner to promote environmental and social performance (Giannakis & Papadopoulos, 2016; Hofmann et al., 2014). Thus, the SRM in palm oil mills is expected to reduce sustainability issues and improve sustainability performance, which in turn meet stakeholders' requirements. Drawing on the literature presented above, the following hypothesis is proposed:

H1: The SRM is positively associated with sustainability performance.

Methodology

The study employed a quantitative research approach. The quantitative survey approach was suitable in this study because it investigated the influence of a predictor on an outcome as suggested by Creswell (2009). Data were collected using a mail questionnaire survey. This approach enables this study to reach potential respondents across geographical areas and allows them to complete it at their convenience (Phellas et al., 2011). The survey was pretested with experienced university academics, research fellows and two industry experts, who have vast experience in palm oil mills. The questionnaire survey and the entire data collection process were assessed and approved by the Human Research Ethics Committee of the university at which the research was undertaken.

The questionnaire survey used for this study comprised three sections. Section A covered demographic information that includes manager's profile and mill's characteristics. Section B and Section C contained multi-item measures adapted from sustainability and risk management literature. This study used a 7-point Likert scale for measuring the questionnaire items. Based on the review of literature, this study adapted 42 items for the SRM. In total, 36 are divided into three dimensions of sustainability – economics (13 items), environment (13 items) and social (10 items) as adapted from Giannakis and Papadopoulos (2016), Hofmann et al. (2014), Anderson and Anderson (2009), Abdullah et al., (2015, 2017) and Jamaluddin et al., (2018). These items were used to measure the risk identification, risk assessment and analysis, and risk response. The remaining six items were used for risk monitoring measurement as adapted from Fan et al. (2017). Finally, Sustainability performance was measured by 15 measurement items adapted from Phan et al. (2017). Of the 15 items, 5 refer to environmental performance, 5 to economic performance, and 5 to social performance.

The sample was drawn from palm oil mills in Malaysia. Palm oil mills were selected because they are responsible in producing crude palm oil (CPO), the main unit in palm oil industry. CPO is not only important in meeting the demand for cooking and food processing but is also extensively used in oleo-chemicals, cosmetics and biofuel. CPO is imported and consumed in more than 150 countries, making it as the largest oil traded in the world. Malaysia is the world's second-largest producer and exporter of palm oil. In 2020, Malaysia was responsible for 25.8% of world palm oil production and 34.3% of world export of palm oil (MPOC, 2021). The total export of CPO alone is more than 70% out of total export of other palm oil products. Correspondingly, the export revenue of CPO contributes more than 55% to the total export revenue of palm oil and palm oil products which has been identified as the backbone of palm oil industry as well as Malaysian economic growth and socio-economic condition.

Despite the significant performance, palm oil mills have been criticised for the sustainability issues as a consequence of palm oil production. The sustainability issues such as gas emissions, large amount of solid waste, improper treatment of palm oil mill effluent, labour issues, etc. are claimed to severely impact the environment and social sustainability. These sustainability issues have exposed palm oil mill performance to the sustainability risk in terms of adverse stakeholder reactions (boycott and stricter regulations) and bad media coverage that may damage Malaysian palm oil reputation. To manage the sustainability issues, palm oil mills must now have a control system to keep track of their activities. Accordingly, the palm oil mills in Malaysia provides a unique platform to examine the impact of SRM on their sustainability performance.

A total of 457 questionnaires were distributed to palm oil mills across Malaysia between July and December 2020. Of these, 121 questionnaires were returned. However, 3 questionnaires were taken out due to incompleteness, resulting in 118 useable questionnaires and 25.8% response rate. The response rate was considered satisfactory and acceptable when compared to the rates reported in risk management, environmental management accounting, and sustainability studies (e.g. Chu et al., 2018; Pondeville et al., 2013; Subramaniam et al., 2015). Jalaludin et al. (2011) highlighted that any survey on emerging issues in Malaysia expects a pattern of low response rates. Abdullah et al. (2017), who conducted a survey method in Malaysian palm oil mills on sustainability manufacturing practices also recorded a response rate of 24%. Non-response bias test was carried out using t-test to compare the mean values of the variables in terms of early and late responses. In accordance with Oppenheim's (2001) recommendation, the first 30 respondents, which represent early response group, are compared with the last 30 respondents, representing late response group. There were no significant differences found between the variables, confirming that non-response may not be a problem.

Table 1 describes the demographic profiles of the 118 participating palm oil mills. The respondents were represented by 42.3% private-owned, 31.4% government-owned, and 26.3% independent-owned palm oil mills. These palm oil mills are spread across Malaysia. Most of the palm oil mills are from Sabah (24.6%). It is followed by 22.9% of palm oil mills that are located in Pahang and 13.6% that are located in Johor. Out of the total palm oil mills, 67% of the palm oil mills have been operating for more than 10 years, while the remaining 33% have operated less than 10 years. More importantly, the survey respondents represented mill managers, engineers, safety officer, sustainability compliance officers and executive admin. Less than 50% of the respondents have more than five years' experience in their current position. In terms of tenure in palm oil industry, 30.5% of the respondents have three to five years working experience. It is followed by 27.1% of the respondents with more than 10 years, 22% with six to 10 years, and 20.3% with one to three years working experience in palm oil industry. Overall, the respondents have sufficient knowledge and experience, particularly in mill operation activities and generally in the palm oil industry.

Table 1: *Respondent's profile and Mill's characteristics*

Description	n=118 (%)
Mill's location	
Johor	16 (13.6)
Negri Sembilan	5 (4.2)
Selangor	7 (5.9)
Perak	13 (11.0)
Penang	2 (1.7)
Kedah	2 (1.7)
Kelantan	2 (1.7)
Terengganu	2 (1.7)
Pahang	27 (22.9)
Sabah	29 (24.6)
Sarawak	13 (11.0)
Mill's Ownership	
Independent-Owned	31 (26.3)
Government-Owned	37 (31.4)
Private-Owned	50 (42.3)
Mill's Establishment	
Less than 5 years	28 (23.7)
5 to 10 years	11 (9.3)
11 to 15 years	11 (9.3)
More than 15 years	68 (57.6)
Position	
Manager	40 (33.9)
Assistant Manager	26 (22.0)
Engineer	24 (20.3)
Safety, Sustainability & Compliance officer	13 (11.0)
Administrative officer	10 (8.5)
Others	5 (4.2)
Tenure in current position	
1 to 3 years	40 (33.9)
3 to 5 years	43 (36.4)
6 to 10 years	26 (22.0)
More than 10 years	9 (7.6)
Tenure in palm oil industry	
1 to 3 years	24 (20.3)
3 to 5 years	36 (30.5)
6 to 10 years	26 (22.0)
More than 10 years	32 (27.1)

Analysis and Findings

This study used PLS-SEM to to validate the data and to test the hypothesis. Specifically, Smart-PLS Version 3.2.38 was used to generate the PLS-SEM outcomes. PLS-SEM was employed because this particular analysis is suitable for a study with complex model that has sample size (Hair Jr et al., 2017; Richter et al., 2016; Rigdon, 2014). The PLS-SEM consists of measurement model and structural model. The measurement model (outer model) examines the relationship between latent variables and their associate manifest variables. The structural model (inner model) examines the relationship between latent variables.

4.1 Measurement model

In this study, measurement model involved assessment of reflective and formative measurement model. SRM and sustainability performance were evaluated as reflective-formative second-order hierarchical constructs. SRM comprises risk identification, risk assessment and analysis (severity, occurrence and detectability), risk response, and risk monitoring. Sustainability performance, on the other hand, consists of social performance, environmental performance and economics performance. These dimensions are the reflective first-order constructs (LOCs) that employ highly correlated indicators, and the removal of any indicator would not change the meaning of the dimensions. The four dimensions for SRM and three dimensions for sustainability performance will then act as the indicators to measure the SRM and sustainability performance, respectively. Since removing any one dimension would alter the conceptual domain of SRM and sustainability performance, data from the first order forms the indicators to measure the formative second-order constructs (HOCs) of SRM and sustainability performance. This study employed disjoint two-stage approach in specifying and estimating the reflective-formative second-order hierarchical constructs. In stage one, the disjoint two-stage approach only draws on the LOCs without the HOCs in the research model. The LOCs are directly linked to all other constructs that the HOCs are theoretically related to. In stage two, latent variable scores of LOCs are used to measure the HOCs while all other constructs use their respective items as in stage one. Thus, estimating and validating measurement model includes (1) measurement model of LOCs and (2) measurement model of HOCs as a whole.

4.1.1 Measurement of Lower-Order Constructs

In stage one, the measurement of reflective first-order construct includes testing of internal consistency reliability, convergent validity and discriminant validity. As shown in Table 2, risk identification, risk assessment and analysis (occurrence), risk response and risk monitoring meet the satisfactory values for factor loading, Cronbach's alpha, CR and AVE of 0.7, 0.7, and 0.5, respectively (Hair et al., 2017; Ramayah et al., 2018). Hence, these constructs fulfil the internal consistency and convergent validity requirements. Meanwhile, risk assessment and analysis (severity), risk assessment and analysis (detectability), economic performance, environmental performance and social performance have indicators with factor loading less than 0.7, but the Cronbach's alpha, CR, and AVE exceed the minimum values. Byrne (2016) state that indicators with factor loading equal to or greater than 0.5 are acceptable, if the AVE of the construct represented by the indicators is greater than 0.5. Hence, all indicators with factor loading value less than 0.7 are retained. Thus, the internal consistency and convergent validity for these constructs are not a problem. The risk identification, risk assessment and analysis - severity, risk assessment and analysis – occurrence and risk assessment and analysis – detectability were measured using item parcelling due to the small sample size that prevents the PLS algorithm to run the analysis. Hence, all indicators for these constructs were aggregated into economic, environmental and social issues. This study then uses those parcels as indicators for the four said constructs. Appendix 1 shows the original items that measures the risk identification and risk assessment and analysis.

Table 2: *Internal reliability and convergent validity of first-order construct*

Constructs and respective indicators	Loadings
Risk identification - *Alpha: 0.775; CR: 0.872; AVE: 0.696*	
Risk identification – economic issues	0.712
Risk identification – environmental issues	0.906
Risk identification – social issues	0.872
Risk assessment & analysis-severity - *Alpha: 0.763; CR: 0.858; AVE: 0.680*	
Risk assessment & analysis-severity – economic issues	0.530
Risk assessment & analysis-severity – environmental issues	0.956
Risk assessment & analysis-severity – social issues	0.921
Risk assessment & analysis-occurrence - *Alpha: 0.737; CR: 0.904; AVE: 0.760*	
Risk assessment & analysis-occurrence - economic issues	0.737
Risk assessment & analysis-occurrence - environmental issues	0.939
Risk assessment & analysis-occurrence - social issues	0.925
Risk assessment & analysis-detectability - *Alpha: 0.831; CR: 0.885; AVE: 0.727*	
Risk assessment & analysis-detectability	0.609
Risk assessment & analysis-detectability	0.948
Risk assessment & analysis-detectability	0.955
Risk response - *Alpha: 1.000; CR: 1.000; AVE: 1.000*	1.000
Risk monitoring - *Alpha: 0.946; CR: 0.958; AVE: 0.791*	
Monitor the occurrence of sustainability issues	0.912
Monitor the impact of sustainability	0.936
Monitor the mitigation strategies in dealing with sustainability issues.	0.931
There is a specialized monitoring group in my mill.	0.750
Internal audit assesses the effectiveness of risk monitoring of sustainability issues	0.898
External assessor evaluates the effectiveness of risk monitoring of sustainability issues	0.897
Economic performance - *Alpha: 0.875; CR: 0.894; AVE: 0.631*	
Reductions in the costs of regulatory compliance.	0.647
Reductions in the costs associated with cleaning up environmental damage.	0.884
Avoidance of penalties on environmental damage.	0.927
Reductions in production costs.	0.754
Increased production efficiency.	0.728
Environmental performance - *Alpha: 0.789; CR: 0.842; AVE: 0.520*	
Reductions in energy consumption.	0.840
Reductions in water usage.	0.597
Reductions in the levels of waste.	0.703
Reductions in levels of emissions.	0.727
Increased residue recycling.	0.717
Social performance - *Alpha: 0.809; CR: 0.866; AVE: 0.573*	
Complying with sustainability regulations	0.888
Preventing social issues (i.e., discrimination, local community right)	0.796
Improved reputation	0.651
Increased stakeholder relationship	0.866
Better employee well-being	0.519

In order to test the discriminant validity, this study employed Forner-Lacker criterion and cross-loadings. As depicted in Table 3 of Forner-Lacker criterion, the square root of AVE of each construct is more than its correlation with other constructs, indicating sufficient discriminant validity. Table 4 shows that all indicators are highly loaded on their respective constructs. Therefore, discriminant validity using cross loadings is met, confirming that the constructs are distinctly different from each other.

Table 3: *Discriminant validity using Forner-Lacker Criterion*

	RI	RAS	RAO	RAD	RR	RM	ECO	ENV	SOC
RI	0.834								
RAS	0.510	0.825							
RAO	0.513	0.601	0.872						
RAD	0.465	0.473	0.760	0.853					
RR	-0.050	-0.161	-0.228	-0.156	1.000				
RM	-0.126	-0.116	-0.030	0.022	-0.027	0.890			
ECO	-0.104	-0.070	-0.083	-0.152	0.064	0.053	0.795		
ENV	-0.100	-0.031	-0.145	-0.201	-0.074	0.084	0.518	0.721	
SOC	-0.112	-0.032	-0.046	-0.073	-0.081	0.125	0.582	0.414	0.757

Note: RI = Risk Identification; RAS = Risk Assessment & Analysis (severity); RAO = Risk Assessment & Analysis (Occurrence); RAD = Risk Assessment & Analysis (Detectability); RR = Risk Response; RM = Risk Monitoring; Econ = Economic Performance; Env = Environmental Performance; Soc = Social Performance

Table 4: *Discriminant validity using cross loadings*

	RI	RAS	RAO	RAD	RR	RM	ECO	ENV	SOC
Item 1	**0.72**	0.33	0.19	0.05	-0.01	-0.14	-0.07	0.02	-0.11
Item 2	**0.90**	0.52	0.55	0.55	-0.07	-0.08	-0.09	-0.13	-0.09
Item 3	**0.87**	0.42	0.53	0.55	-0.04	-0.10	-0.09	-0.11	-0.07
Item 1	0.37	**0.53**	0.34	0.22	-0.05	-0.05	-0.02	-0.05	-0.09
Item 2	0.47	**0.96**	0.62	0.49	-0.21	-0.13	-0.03	-0.01	0.02
Item 3	0.45	**0.92**	0.49	0.41	-0.10	-0.09	-0.14	-0.02	-0.06
Item 1	0.35	0.48	**0.73**	0.52	-0.18	0.01	-0.14	-0.11	-0.13
Item 2	0.46	0.55	**0.94**	0.72	-0.18	-0.05	-0.02	-0.18	0.00
Item 3	0.51	0.54	**0.93**	0.72	-0.24	-0.03	-0.08	-0.08	-0.03
Item 1	0.33	0.26	0.53	**0.61**	-0.08	0.11	-0.01	-0.02	-0.03
Item 2	0.46	0.49	0.75	**0.95**	-0.14	-0.01	-0.14	-0.24	-0.09
Item 3	0.41	0.42	0.68	**0.96**	-0.16	0.03	-0.16	-0.15	-0.06
Item 1	-0.05	-0.16	-0.23	-0.16	**1.00**	-0.03	0.06	-0.07	-0.08
Item 1	-0.16	-0.17	-0.07	-0.02	0.01	**0.91**	0.11	0.12	0.16
Item 2	-0.12	-0.16	-0.05	-0.01	0.03	**0.94**	0.04	0.08	0.12
Item 3	-0.10	-0.11	-0.02	0.04	-0.07	**0.93**	0.01	0.06	0.06
Item 4	-0.09	-0.04	0.03	0.02	0.05	**0.75**	0.01	0.01	0.07
Item 5	-0.12	-0.03	0.00	0.07	-0.09	**0.90**	0.04	0.04	0.11
Item 6	-0.09	-0.08	-0.03	0.03	-0.09	**0.90**	0.07	0.08	0.15
Item 1	0.06	-0.15	0.07	0.06	0.03	0.06	**0.67**	0.32	0.37
Item 2	-0.05	-0.08	-0.10	-0.15	0.08	0.00	**0.90**	0.44	0.49
Item 3	-0.13	-0.08	-0.06	-0.14	0.08	0.09	**0.93**	0.41	0.56
Item 4	-0.06	-0.06	0.00	-0.07	-0.03	0.06	**0.74**	0.58	0.47
Item 5	-0.03	0.06	-0.06	-0.03	-0.04	0.03	**0.71**	0.57	0.41
Item 1	-0.07	0.00	-0.17	-0.20	-0.06	0.02	0.39	**0.85**	0.26
Item 2	-0.18	-0.10	-0.04	-0.15	0.00	0.11	0.18	**0.55**	0.31
Item 3	0.07	0.08	-0.07	-0.06	-0.12	-0.02	0.51	**0.75**	0.29
Item 4	0.02	-0.01	-0.13	-0.12	-0.03	0.08	0.51	**0.74**	0.34
Item 5	-0.04	0.05	-0.04	-0.06	-0.12	0.06	0.45	**0.75**	0.37
Item 1	-0.16	-0.04	-0.01	-0.04	-0.04	0.09	0.52	0.28	**0.87**
Item 2	-0.02	-0.01	0.00	-0.04	-0.04	0.13	0.43	0.35	**0.80**
Item 3	-0.01	0.00	-0.04	-0.08	-0.11	0.15	0.35	0.37	**0.68**
Item 4	-0.13	-0.07	-0.08	-0.07	-0.07	0.08	0.44	0.23	**0.85**
Item 5	-0.06	0.07	-0.03	-0.06	-0.04	0.01	0.66	0.61	**0.52**

Note: RI = Risk Identification; RAS = Risk Assessment & Analysis (severity); RAO = Risk Assessment & Analysis (Occurrence); RAD = Risk Assessment & Analysis (Detectability); RR = Risk Response; RM = Risk Monitoring; Econ = Economic Performance; Env = Environmental Performance; Soc = Social Performance

4.1.2 Measurement of Higher-Order Constructs

In stage two, the measurement of formative second-order constructs was conducted to validate SRM and sustainability performance. The latent variable scores of the six SRM dimensions and the three sustainability performance dimensions are saved. These scores are then used as indicators to measure the HOCs of SRM and sustainability performance. In order to validate the formative second-order construct, collinearity issues, outer weights and outer loadings were checked. Based on the results shown in Table 5, all indicators for SRM and sustainability performance satisfy the VIF values, and they are below the threshold value of 5 (Hair et al., 2017). Therefore, the collinearity is not an issue for the estimation of the PLS path model.

The significance of the outer weights of formative constructs is subsequently assessed. Results in Table 5 shows that all formative indicators except risk monitoring and environmental performance are not significant. At this stage, risk monitoring and environmental performance are retained. Further test to support any decision on retaining the insignificant indicators is checked through outer loadings. Ramayah et al. (2018) state that formative indicators can be retained if the outer loadings are above 0.5 and significant. Based on the result of outer loadings, the remaining formative indicators except risk identification and risk response have outer loadings above 0.5 and significant. Thus, these indicators are retained. The significance of the outer loadings is checked for risk identification and risk response. Risk identification has significant outer loading, allowing this study to retain this indicator. However, outer loading for risk response is not significant. Prior studies provide evidence for the relevance of risk response for capturing the definition of SRM (*see* Yilmaz et al., 2010; Soomro and Lai, 2017). Hence, risk response is also retained in the formative construct even though their outer weights and outer loadings are not significant and less than 0.5. Hair et al. (2017) state that the method of retaining the insignificant formative indicators is known as absolute contribution because dropping a formative indicator may result in poor content validity.

Table 5: *Collinearity issues, outer weights and outer loadings*

HOC	LOCs	VIF	Outer weights	T-values	P-values	Outer loadings	P-values
SRM	RI	2.444	-0.278	1.444	0.149	0.489	0.002
	RAS	3.788	0.285	1.160	0.246	0.837	0.000
	RAO	4.737	0.277	1.216	0.224	0.892	0.000
	RAD	4.264	0.247	1.023	0.307	0.797	0.000
	RR	1.061	-0.029	0.243	0.808	0.041	0.805
	RM	3.290	0.484	2.005	0.045	0.939	0.000
SP	ECON	1.760	0.355	1.720	0.086	0.763	0.000
	ENV	1.404	0.750	5.551	0.000	0.948	0.000
	SOC	1.553	0.033	0.153	0.878	0.550	0.001

Note: SRM = SRM; RI = Risk Identification; RAS = Risk Assessment & Analysis (severity); RAO = Risk Assessment & Analysis (Occurrence); RAD = Risk Assessment & Analysis (Detectability); RR = Risk Response; RM = Risk Monitoring; Sustainability Performance; Econ = Economic Performance; Env = Environmental Performance; Soc = Social Performance

4.2 Structural Model

This study used PLS algorithm and 1000 bootstrapping resample for the structural model. Collinearity of structural model is assessed before the generation of hypothesis result. Table 6 shows that the VIF value is less than the recommended threshold values of 3 and 5, indicating lateral multicollinearity as not a concern in the study (Hair et al., 2017). The quality of structural model continues with the evaluation of coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2). The R^2 measures the predictive power of the model that is represented by the amount of variance in the endogenous variable is explained by the exogenous variables linked up to it. Table 6 shows that the R^2 value for sustainability performance is 0.359, suggesting that SRM explains 35.9% of variance in sustainability performance. The R^2 value of 35.9% is above the 0.26 value as suggested by Cohen (1988) which indicates substantial research model. Next, the predictive relevance (Q^2) of the model is examined using the blindfolding procedure. Based on Table 6, the predictive relevance value for sustainability performance is 0.339. The value is more than 0, indicating sufficient predictive relevance of research model. Finally, the effect sizes (f^2) indicate how strong the predictor constructs contribute to explaining the dependent variable (Ramayah et al., 2018). According to Cohen (1988), f^2 values of 0.35, 0.15, and 0.02 are considered large, medium, and small effect sizes, respectively. It can be seen that SRM has a large effect size on sustainability performance.

As shown in Table 6, the path coefficients provide significant value at the p-value less than 0.001 level. The significant results indicate that H1 is supported. Specifically, the SRM has a significant positive effect on the sustainability performance of palm oil mills in Malaysia.

Table 6: *Results of structural model*

Structural path	Coefficient	T-values	P-values	VIF	R^2	Q^2	f^2
SRM □ SP	0.600	10.782	0.000	1.000	0.359	0.339	0.561
SRM □ EP	0.455	5.995	0.000				
SRM □ EvP	0.570	9.547	0.000				
SRM □ ScP	0.331	3.461	0.001				

Note: SRM = Sustainability Risk Management; SP = Sustainability Performance; EP = Economic Performance; EvP = Environmental Performance; ScP = Social Performance

t-value > 1.96; *p-value < 0.01 (two-tailed)

Discussion and conclusions

This study aims to investigate the impact of SRM on sustainability performance. Drawing from sustainability, risk management and management control system (MCS) literature, this study hypothesises that there is a positive and significant relationship between the SRM and sustainability performance. As predicted, the result shows that the SRM has a positive and significant impact on sustainability performance. More specifically, the SRM significantly impacts the sustainability performance of palm oil mills in Malaysia. This is evident when the SRM has large effect size in explaining the mill's sustainability performance. Companies with operations that potentially lead to sustainability issues, such as the palm oil mills, require a holistic MCS that is capable to coordinate their internal operations with external requirements effectively (Abdul Aziz et al., 2015; Wijethilake & Lama, 2018). The finding of this study indicates the capacity of SRM to assist palm oil mills in identifying, assessing, analysing, mitigating, and monitoring their operations to minimise the sustainability issues, which directly lead to effective coordination with external requirement for sustainable palm oil production. Contrastingly, palm oil mills that do not identify the sustainability issues and assess and analyse their impact, it is difficult for them to implement appropriate mitigation strategies and monitoring mechanisms to manage the sustainability issues at the earlier stage. Consequently, it will be difficult for them to deal with sustainability risks such as boycott, regulation, and reputation, which eventually restrict them to experience the competitive advantage in term of improved sustainable performance. According to Giannakis and Papadopoulos (2016), the main feature of sustainability risks is obvious as they adversely impact the sustainability performance without disrupting their business operations. Hence, by identifying the sustainability issues, assessing and analysing their impact, match with appropriate risk response strategies and monitoring the whole process holistically as what SRM offers, palm oil mills can keep track on their palm oil production, and manage any potential sustainability issues, accordingly, hence improving sustainability performance.

By conducting a further test, this result reveals that SRM also has a positive and significant impact on economic performance, environmental performance, and social performance. Interestingly, SRM has a substantial influence on environmental performance (Beta Coefficient = 0.570) of palm oil mills. One plausible reason due to the unique characteristic of palm oil mills that involve considerable engagement with the nature from the transportation of FFB until the production of palm oil which requires the need to control their operation in improving environmental performance. For example, water pollution due to palm oil waste has been identified as the leading environmental issues (Abdul Razak et al., 2020) due to the fact that the production of palm oil consumes large amount of freshwater (Abdullah et al., 2015; Jamaluddin et al., 2018), Based on the identified issues, SRM can assist palm oil mills to assess and analyse its impact which subsequently match with the appropriate response strategies. Eventually, the SRM enables palm oil mills to improve their environmental performance in the form of reduction of water usage. The similar positive effect of SRM is found the lead to the improvement of the social performance in palm oil mills. When the SRM is able to assist palm oil mills in managing the environmental and social issues the SRM is at the same time help the palm oil mills to avoid penalty on environmental damage, reduction in the cost of regulatory compliance and reduction in production costs, hence improving the economic performance. Thus, the finding highlights the merit of SRM to assist the palm oil mills remain economically competitive without disregarding environmental and social areas.

The significant and positive relationship between the SRM and sustainability performance is consistent with previous literature (Baxter et al., 2013; Bertinetti et al., 2013; Farrell & Gallagher, 2015; Florio & Leoni, 2017; Gordon et al., 2009) who found that risk management has positive impact on companies' performance. In addition, the findings also support the results of previous studies in control systems literature that showed positive impact on companies' performance (Chu et al., 2018; Latan et al., 2018; Ong et al., 2018; Zeng et al., 2017). Nonetheless, this line of studies only focused on economic performance, market performance and environmental performance. The finding of this study shows that the SRM significantly enhances companies' sustainability performance that comprises economic performance, environment performance, and social performance. Foerstl et al. (2010) found that SRM is a source of competitive advantage in terms of lowering exposure to sustainability risks and enhanced performance. It means that, organisations that are able to perceive and evaluate the risks mounting from sustainability issues can assist them to achieve sustainability performance. Therefore, the result shows that identifying sustainability issues, assessing their impact, and employing appropriate response strategies through the SRM are important for palm oil mills in Malaysia in achieving sustainability performance.

In summary, this study's results contribute to the sustainability and risk management literature in the following distinct ways. Literature in sustainability has acknowledged the importance of managing sustainability risk and the adverse impact it may bring upon company's performance. However, most of the studies only provide theoretical and conceptual discussions on managing the sustainability risk. Findings in this study provide empirical evidence that the SRM can assist company to manage sustainability issues and avoid the sustainability risk that enable the company to realize the competitive benefits of the SRM in the form of sustainability performance. Above all, the findings contribute to the sustainability literature that all three sustainability dimensions should be managed as a whole rather than an isolated. In risk management literature, this study extends the applicability of risk management framework to not only managing economic or financial risks, but also managing risk arising from environment and social areas. By combining the risk management framework and sustainability, this study answers the call in the risk management literature to examine the applicable of SRM in managing sustainability risk to improve sustainability performance.

In the practical implications, the findings provide a deep understanding that palm oil mills can overcome the sustainability issues through SRM to realise the competitive benefit of the SRM in the form of improved sustainability performance. In addition, the result of effect size provides useful insight to the practitioner that the SRM, comprising the risk identification, risk assessment and analysis, risk response and risk monitoring, should be implemented holistically and ongoing basis to improve mill's sustainability performance. The effective SRM does not only improve economic performance but also environmental performance and social performance, covering all three sustainability performances. As such, the findings provide useful insight to the policy makers to impose formal regulation for palm oil mills to implement the SRM in managing the sustainability and to improves the sustainability performance.

There are several limitations in this study. First, the results of this study should be interpreted with caution as it is unclear if the findings could be generalised to other industry players (e.g. plantation, refinery, fractionation, etc.). In addition, the generalisability of the findings may also be affected by the sample drawn from palm oil industry only. The extent to which the results can be applied to other components of environmentally sensitive companies, such as oil and gas, manufacturing, or to other industries should be made with considerable caution. Future study can also include multiple industries to find the differences and/or similarity of the management of sustainability issues using SRM. Second, the data are subject to limitation of survey method where the in-depth understanding of the subjects and objects are not possible to be acquired from the respondents. Since the SRM is new is Malaysia, future research is recommended to use a variety of research, such as the mixed method, by combining questionnaire survey and a series of in-depth interview, or case study analysis. This recommendation is useful to obtain detailed data and provide more understanding of the issues being examined. Future study can also include multiple respondents to explore the risk attitudes and behaviour among different managers. This is because risk averse and risk seeking managers have an influence on decision making, which can change the choice of risk response, and ultimately the way they manage the sustainability risk.

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Appendix 1. Potential sustainability issues in Malaysian palm oil mills

	Sustainability Issues
	Economics Issues
1.	Increased production costs
2.	Price volatility of crude palm oil (CPO)
3.	Low crude palm oil profit
4.	Low amount of oil extraction rate
5.	Low CPO yield
6.	Low amount of CPO sold
7.	Oil Losses per Fresh Fruit Bunch (FFB)
8.	Surplus of palm oil inventories
9.	Penalties for sustainability related issues
10.	False claim on Malaysian palm oil production and process
11.	Boycott of Malaysian palm oil products
12.	Increased duty imports for Malaysian crude palm oil
13.	Introduction of new sustainable palm oil regulation (e.g., MSPO)
	Environmental issues
1.	Excessive freshwater consumption
2.	Water pollution due to palm oil waste
3.	Water scarcity in producing palm oil
4.	High percentage of dust concentration (boiler emission)
5.	Excessive emission of sulphur dioxide SO_2
6.	Excessive emission of nitrogen dioxide
7.	Mixed raw effluent
8.	Large amount of solid waste (sludge)
9.	Poor Palm oil mill effluent (POME) treatment
10.	Reduced soil quality due to POME
11.	Non-compliance with environmental laws
12.	Inefficient diesel consumption for palm oil processes
13.	Disruption in palm oil process caused by natural disaster (floods, drought, heatwaves)
	Social issues
1.	Unfair wages
2.	Excessive working time
3.	Discrimination on employees' background (race, sex, religion, disability, age, politics)
4.	Poor working condition
5.	Healthy and safe working environment
6.	Occupational poisoning case
7.	Occupational disease case
8.	Land ownership conflict
9.	Threat to wildlife caused by palm oil process
10.	Disease(s) from palm oil process

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