

DIGITALES ARCHIV

ZBW – Leibniz-Informationszentrum Wirtschaft
ZBW – Leibniz Information Centre for Economics

Ramli, Yanto; Deden Kurniawan; Imaningsih, Erna Sofriana et al.

Article

Imposing green management to enhance the organizational awareness against the environmental sustainability

Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEPP)

Reference: Ramli, Yanto/Deden Kurniawan et. al. (2023). Imposing green management to enhance the organizational awareness against the environmental sustainability. In: International Journal of Energy Economics and Policy 13 (1), S. 518 - 528.

<https://econjournals.com/index.php/ijeep/article/download/14001/7161/32151>.

doi:10.32479/ijeep.14001.

This Version is available at:

<http://hdl.handle.net/11159/630175>

Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics

Düsternbrooker Weg 120

24105 Kiel (Germany)

E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)

<https://www.zbw.eu/econis-archiv/>

Standard-Nutzungsbedingungen:

Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte.

<https://zbw.eu/econis-archiv/termsfuse>

Terms of use:

This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence.



Imposing Green Management to Enhance the Organizational Awareness against the Environmental Sustainability

Yanto Ramli^{1*}, Deden Kurniawan¹, Erna Sofriana Imaningsih¹, Tine Yuliantini¹, Sri Anah¹, Anees Janee Ali²

¹Universitas Mercu Buana, Indonesia, ²Universiti Sains Malaysia, Malaysia. *Email: yanto.ramli@mercubuana.ac.id

Received: 29 October 2022

Accepted: 10 January 2023

DOI: <https://doi.org/10.32479/ijeeep.14001>

ABSTRACT

Palm oil mill effluents (POME) not only abuse environment and causing harm to river and streams but also putting near by communities in danger due to severe health issues such as toxic infections, digestion disorder and skin diseases. Thereby, the present study intends to explore the organizational awareness and how it could be helpful to address the POME and POMS issues by turning it in to green resources that may provide solution to combat the issue and safe communities which are being affected by COP production. The sample of the study is the province of Indonesia; North Sumatera and purposive sampling method was used to sample the population. PLS methodology is used to analyze the data. Findings reveal that green management positively impacts organizational awareness, environmental concern and green technology. Moreover, organizational awareness, environmental concern and green technology plays crucial role in environmental sustainability.

Keywords: Green Management, Organizational Awareness, Environmental Concern, Green Technology, Environmental Sustainability

JEL Classifications: Q01, Q56, R11, O32, O33, Q55

1. INTRODUCTION

Indonesia is counted as a largest producer of crude palm oil in the world. The reason is that the country has support in the form natural conditions which have potential of growing plantation. At present, crude palm oil considered to be a supported factor which enhances national economic growth. According to Indonesia Ministry of industry, CPO production contributes 48% to world CPO production. Moreover, it also regulates 52% of CPO export market (Ramli et al., 2022; Hoa et al., 2022)

The documented statistics from Indonesian central statistics agency stipulate that CPO production has been increasing constantly since 2016. The enhanced growth can be witnessed as the production rate jumped from 31,49 million tones to 44,76 million tones during 2016-2020. It is projected that oil palm plantation area of Indonesia in last 5 years may also increase. In 2017, the country has already witnessed an increment as the oil

palm plantation area increased from 11,20 million hectares to 12,38 million hectares. The figure reached up to 14.33 million hectares in 2017 which further increased again and reached up to 14.46 million in 2019 and 1.459 million hectares in 2020. These figures indicate that the country is expected to witness the increment again because of high demand of CPO and PKO (Abdul Hamid et al., 2020; Ainou et al., 2022).

The geography of Indonesia indicates that palm oil plantation area is wide spread across 26 provinces and covering few islands too. The major covered areas are Sumatra and Kalimantan, West Java, Banten, Central Sulawesi, South Sulawesi, Southeast Sulawesi, West Sulawesi, Gorontalo, Maluku, North Maluku, Papua and West Papua. 2020 was the year when Riau province become the largest palm oil production province by covering 19.62% area of total area of palm oil plantation. Since it covers the majority area, hence is responsible to produce 8.54 million tonnes of CPO. This information ensures the validity as it has extracted from provincial

based data from the year 2020 (Ali et al., 2022; Bai et al., 2022; Chien, 2022a).

It is said that the production process of crude oil begins from the harvesting of fresh fruit bunches which then further sent to be processed in to crude palm oil and palm kernel oil. The processing method of FEB in to CPO involves a series of steps such as strelising, threshing, digesting and pressing (Sriyakul et al., 2022). The next step is then involved in the calrification and purification through which palm oil gets purified and stored in the storage. Moreover, the palm kernel nut inside the palm fruit will be dried and crushed into palm kernel oil and then palm oil mill waste will be separated from sludge in the ponds and empty fuit bunches will become a waste that is to known as palm oil mill effluents (POME) (Chien et al., 2022b; Chien et al., 2022c).

The in-depth information of the whole process indicates that high volume of crude palm oil production comes with environmental consequences as the production is responsible of generating large amount of harmful waste known as POME. Based on the data, in 2018 crude oil production was 36,59 million tones which was responsible to generate around 1.4 million tonnes of POME. Such huge amount of waste is consisted of several suspended components such cell walls, short fibres, carbohydrates, harmful emissions, amino and organic acids and some mineral constituents (Chien, 2022d; Singh et al., 2021).

Further to discussion, POME is viewed as the strongest pollution amongst all having low PH due to organic and free fatty acids that birthed during palm fruit degradation. Normally, the charactersitics of POME vary as per raw material quality and production procedures. However, it is normally composed of suspended solids (4,500 mgL), oil and grease (400 mgL), biochemical oxygen demand (25,000 mgL) and chemical oxygen with the amount of 50,000 mgL. This is the true depiction which stimulates that POME contains highly toxic elements and because of this, it is viewed as a most pollute resource which causes great harm to stream, rivers and other areas. Moreover, this abrownish and smelly waste is a threat to humanity and aquatic organisms (Iwuagwu and Ugquanyi, 2014; Thitinan et al., 2022). When it is thrown away in oceans and rivers, it also harms the near by communities by spreading various skin diseases, infection and digestion issues. According to the report, thousands of cases have been documented at government and institutional level and regional assemblies because of the said destruction are demanding effective solution. Unfortunately, till now, the cases yet to remain unsolved infact more cases have been piled on, hence, alarming the seriousness of issue which if not address timely, could endanger the lives of people (Chien et al., 2021; Haroon et al., 2021).

The aforementioned factual statements are enough to raise the question; is green management enough to ensure environmental sustainability and address POME issues successfully? Moreover, what role could organizational awareness, environmental concern and green technology play between the relationship of green management and environmental sustainability. In this regard, the present study aims to scrutinize ways under green management through which POME wastages could transform in to green

resources and make it usage effective and beneficial. The prior literature, in this regard, also proclaims that palm oil wastage has a potential to be used as a fertilizer, fuel or bio-oil, if processed innovatively (Kamarudin et al., 2021; Khatlak et al., 2021; Sulaiman et al., 2010). Similarly, Singh et al. (2010) also argued that there needs to be an effective way to deal with solid wastes as it is causing great harm to environment and well-being. Iwuagwu and Ugwuanyi (2014) also stressed that POME could be used as a carbon source with no supplementation that could be helpful in producing yeast. The study of Fauzianto (2014) also showed concern regarding the situation and introduced a framework where an effective utilization is told in detail with the help of torrefaction process, hence less impacting the environment. Other scholars also inculcated the idea in their studies that an integrated strategy must be developed to re-engineer the procedures which make solid wastes useful and save the environment from any losses (Lan et al., 2022; Paryanto et al., 2015; Sadiq et al., 2022a).

Hambali and Rivai (2017) also culminated that turning POME in to useful resources is an economical procedure hence can be used in various altervative forms such as fuel, fertilizers, bio materials and chemical compound. Leela et al. (2018) also argued that the characterstics the POME is similar to crude palm oil as POME is the fractional of oil wasted that comes from crude palm oil. This implies due to similar charactersitics, the waste can equally be useful if managed efficiently.

The repeated arguments gathered from various studies highlights this one issue that POME must be handled effectively if economies need to stop further harm and restrict destructive emissions and pollutions. In all of these studies, scholars repeatedly mentioned that POME is a potential candidate to be used as a renewable enrgy source due to similar characterstics. Also, these discussions even argued that POME could be used as an alternative source of fertilizer as well. Thereby, the present research primarily focuses on those practices through which POME could be utilized in the form of green resources. Moreover, the present study also attempts to enlighten the effectiveness of organizational awareness and green technology that bridges green management with environmental sustainability.

2. LITERATURE REVIEW

2.1. Green Management

One of the primary concerns of scholars is to decipher the comprehensive explanation of green management. The scrutinized existing studies indicate that few work has been done to address the concept of green management. The reason is that majority of studies focused on environmental management and related systems to improve environmental performance (Darnall et al., 2008; Florida and Davison, 2001; Liew et al., 2017). Zhou et al. (2019) argued that green management is a part of eco-management paradigm, hence inculcates novel management practices which not only enhances existing management ettiquites but also challenge existing practices and offer innovate yet different perspective. The author also argued that green management is a set of unique management practices that seek to address ecological and social realities which current management practices are unable to resolve.

It is stated that the term green management gained recognition in late 80s and early 90s. The concept first gained popularity in Europe where certain products were identified as a culprit of environmental catastrophe (Lin et al., 2022; Liu et al., 2022a).

According to Bakar and Azlan (2020) and Morelli (2011) green management refers to those practices which most organizations utilize to develop environmental strategies in order to offset industrial growth, safeguard natural resources for future generation. The concept is well-accepted by global firms as they normally use the phenomenon as a mechanism to perform operations without damaging environmental quality. Xing et al. (2020) also stated that green management offers environmental friendly practices which are helpful for firms in numerous ways such as providing pollutions control, promoting recyclable and biodegradable packaging etc.

Since green management is relatively new concept, thereby, scholars and practitioners perceive green management in numerous ways. Some scholars view it as a regulatory standard while some perceive it as a simple process which helps firms to reduce paper consumption. Some scholars also argue that green management brings new corporate strategies that overhaul the manufacturing processes through organizational restructuring (Liu et al., 2022b; Osman et al., 2020). The multiple perceptions indicate that green management is a broader and vast continuum and a range of business practices fall in the paradigm which could be as easy or simple or challenging or complex, depends on the viewer. Khan et al. (2021) argued that environmental based strategies could be reactive in nature or at time may behave proactively. These strategies either reactive or proactive, must comply with environmental standards. For firms, green management at times provides an opportunity to become more innovative and sustain market position. Having said argument, it can be deduced that green management practices vary from simple to complex ranges and are adopted according to the organizational needs. Thereby, scholars confine that one basic definition of green management is not enough to explain the broader concept, hence, it is a composition of various practices that comes in the umbrella of green management (Kurniawan et al., 2022).

2.2. Organizational Awareness

According to Harwani and Sakinah (2020), awareness is the first steps which helps in building a perception of something under various situations. This awareness further builds recognition on which decisions are being made to execute the plan effectively. Kotler and Keller (2016) defined awareness as the concept through which organizations or consumers are informed about the characteristics of products and encourage them to experience it so that the repurchasing behaviour can be build.

Kim et al. (2019) viewed organizational awareness as the toughest parameter that glued the firms and establishes a sense of unity. According to Barney and Wright (1998), organizational awareness is one of the key driven elements of businesses which ensures organizational success. Gibbs et al. (2017) explained organizational awareness as a critical yet important factors that promotes knowledge sharing behaviour.

2.3. Environmental Concern

Asih et al. (2020) viewed environmental concern as a predictive factor that rolls on environmentally friendly purchases. Moreover, the specific concern plays a major role in the decision-making process of consumers. Environmental concern indicates a sincere devotion, a high-level commitment and truthful emotions which are associated towards environmental issue and climate complexities (Begum et al., 2019; Moslehpour et al., 2022a).

Kotler and Keller (2016) argued that environmental problems now play a bigger role in product designing and manufacturing. Many of the organizations show concern towards environment and find ways to mitigate the negative aspects of environmental problems which arise in business operations. Organizations even change their procedures and manufacturing ways in order to show the devotion to environment. Kotler and Keller (2016) also stipulated that organizational specifically show concern in order to ensure organizational success which is only possible when they alter their existing methods and adopt eco-friendly procedures.

According to Cruz and Manata (2020), environmental attributes are homogenous to the classical concept, hence perceived and organized in similar manner. Environmental concern can be defined as “one’s attitudes toward specific environmental topics are distinct in some ways but are ultimately reflections of a single, broad environmental attitude which is sometimes referred to as the environmental concern.”

According to Hansla et al. (2008), environmental concerns enhance emotional responses of organizations as well as individuals regarding environmental problems. Thereby, it is defined as the positive or negative attitude towards environmental degradation and climate change. Lee (2009) also viewed environmental concern as a behavioural attitude of individuals which sum up the worries and compassion for environment. Thereby, environmental concern can be seen as a strong attitudinal predictor (Hamilton et al., 2014; Kollmuss and Agyeman, 2002). Similarly, the pile of literature proclaim that environmental concern is one of the critical constructs that shapes the environmental responsible behaviour (Felix et al., 2018). Sometimes it is also viewed as cognitive factor that assesses the environmental related attitude (Ibnou-Laaroussi et al., 2020; Moslehpour et al., 2022b).

2.4. Green Technology

Green technology is the central technology of industry 4.0. Green technology normally consists of artificial intelligence, robotics and autonomous. Literature argues that future technology must behave intelligently and revolves around environmentally friendly practices. Scholars argue that green technology which is also called clean technology is a unique bundle of technology favourable for human beings and environment (Billatos, 1997; Krass et al., 2013). Green technology is fueled by renewable energy; hence it is a great source of minimizing waste. As natural resources are depleting, thereby, the objective of green technology is to restrict fossil fuel consumption. Carbon fuel, carbon emissions and non recyclable garbage are on of the main contributors of pollution and environmental degradation. The over exploitation of limited non-renewable resources causes significant threat to climate and

the predictions claim that fossil fuel depletion is aberrant by 2050 (Du et al., 2019; Moslehpour et al., 2022c).

Iravani et al. (2017) stressed out that green technology improves the existing technology and enhances the application of systems, equipment and products that are being utilized to conserve natural resources and environment. The reason is to minimize the adverse effect of human activities. It is also argued that green technology pacifies the criteria of environmental deterioration, minimizes GHG emissions. Along with it, green technology ensures safety procedures and increases quality life of well-being. Similarly, Mulvaney (2011) and Ramli and Soelton (2018) argued that green technology explore refers to the exploration of those technological innovations that are suitable for environmental sustainability. To conclude the debate, green technology cleans the corrupted form of technology in order to conserve energy and also set new criteria for existing practices in order to make effective utilization of renewable resources.

2.5. Environmental Sustainability

The environmental abuse has now fueled the concern of practitioners and scholars; hence, literature is looking for ways to greening the economy and finding ways for economies to make them disengage from those practices that favors economic growth but exerts huge amount of pressure on environment. It is argued that there needs a bundle of effective strategies to make economies green especially those which are associated with sustainable transitions and transform consumer patterns (Sadiq et al., 2022b; Sadiq et al., 2022c). According to Geels (2010), this could only be possible when challenges related to sustainable transitions are to be promoted and managed at multilevel. Yuliawati and Enjang (2018) also argued that maintaining environmentally sustainable should be a temporary action. Thereby, in order to experience long term effect, it should not be treated as seasonal trend. Environmental sustainability requires proper design and constructive strategy which influences sensitivity of people. This is necessary to do in order to gain support from public and various stakeholders along with enhanced participation. According to Kotler and Armstrong (2018), firms are engaging themselves in environmental practices and for that they are opting for those policies which embrace internal and external both activities. This eventually helps to attain environmental and operational both objectives.

According to Cillo et al. (2019) and Tidd and Bessant (2013), the sequential debate on sustainability by enlighten triple bottom effect has been thriving since decade. The reason is that it also impacts organizational practices. Organizations, thereby, centralize their focus towards environmental and social macroscopic problems (Pastré and Vigier, 2003). Because of its significance, organizations not only transformed their production and consumption patterns but also looking for ways to restrict the portion of harmful emissions that pollute environment and reduce quality of life (Dyck and Silvestre, 2018; Sadiq et al., 2022d). Furthermore, firms also indulge themselves in series of activities through which they can extract maximum environmental benefits (Rennings and Rammer, 2011; Shibli et al., 2021). Yuliawati and Enjang (2018) stressed

that environmental sustainability is not a sporadic trend. It requires a long-lasting strategical effect that could increase the participation of individuals. Kotler and Armstrong (2018) also reveal that now firm are opting those policies which ensure environmental sustainability through green activities

2.6. Research Hypothesis

2.6.1. Green management and organizational awareness

According to Hapsi et al. (2017), green management transforms the ideas in to environmental goods/services and processes in order to solve environmental issues and take benefits from available opportunities. According to Harwani and Sakinah (2020), awareness is one of the first initiatives that builds an understanding and belief which further shapes the recognition that plays significant role in decision making process. These two arguments, when integrated together, inculcates that green management affects organizational awareness positively. Similarly, Bakar and Azlan (2020) explain green management as the series of procedures that organizations utilize in order to build environmental management strategies. This helps them to offset industrial growth and protect natural environment for the sake of future generation. This implies that green management must be implemented in order to raise awareness of sustainable environment. Thus, we formulate following hypothesis:

H₁: Green management affects organizational awareness positively.

2.6.2. Green management and environmental concern

Green management is a strong predictor of environmental concern, because green management mainly shifts the focus of companies towards environmental management systems that helps in building green knowledge behaviour within organization (Bakar and Azlan 2020; Hartani et al., 2021; Tan et al., 2021). Argued by Asih et al. (2020), environmental concern alters the decision making process, however, it solely can not be responsible for triggering the green behaviour, this is possible when there is a proper management within firms to achieve green goals. Because under the strong management, individuals are able to behave in green manner and spread knowledge regarding environmental issues. Thereby, we propose that:

H₂: There is a positive relationship of green management with environmental awareness.

2.6.3. The affect of green management towards the green technology

Green management is helpful in promoting green technology, because under green management, it is possible to inculcate advanced technology which helps firms to achieve green goals. Moreover, green management can only be achieved when green technology is being utilized in firm in order to earn competitive edge over other industry players (Bakar and Azlan 2020; Zhao et al., 2022). It is also stated that procedural equipments and manufacturing process can only behave green when there is a proper management system to set green objectives. Moreover, it is the green management which minimizes the harmful impact of organizational activities through clean technology (Iravani et al., 2017; Zhao et al., 2021). Thereby, we propose that

H₃: There is a positive relationship of green management with the green technology.

2.6.4. Organizational awareness and environmental sustainability

Harwani and Sakinah (2020) stated that organizational awareness shapes the overall perception of individuals which further alters the whole decision making process. It is also argued that organizational awareness and environmental sustainability are integrated with each other because organizational awareness spread the word which eases the tangential effect of green practices, eventually helps firms to achieve environmental sustainability.

According to Yuliawati and Enjang (2018), environmental sustainability and organizational awareness are linked together because without awareness, one can not achieve the environmental goals easily, this is why, it is mandatory to first spread awareness and educate people because this way it is easier to build their behaviour accordingly. Based on the argument, we propose that: H₄: There is a positive relationship of organizational awareness and environmental sustainability.

2.6.5. Environmental concern and environmental sustainability

Asih et al. (2020) argued that environmental concern is an anticipating tool that not only appreciates eco friendly products but also shapes the decision making process. Linking it environmental sustainability highlights the focus towards long term initiatives. According to Khoshoo (2008), firms show concern by preferring those ways through which they can enhance environmental sustainability. Literature also states that organizations in order to show that environmental concern, utilize those eco-friendly practices that upgrades environmental quality and restrict harmful emissions (Yahya et al., 2020). This implies that firms show greater concern towards environment and think they have responsibility to play their part in order to minimize the waste and other harmful emissions. According to Felix et al. (2018), most of the literature confined that environmental concern is one such bold step to build sustainable behaviour. Similarly Ibnou-Laaroussi et al. (2020) argued that environmental concern shapes the attitude of firms which helps them to achieve environmental sustainability. Thereby, we postulate that:

H₅: There is a positive relationship of environmental concern with environmental sustainability.

2.6.6. Green technology and Environmental sustainability

The last few years shaped the organizational practices. Organizations are now taking keen interest to adopt ecological strategies in order to evolve themselves as a sustainable organization (Del Brío and Junquera, 2003). Green technology not only transforms the business practices but also helps economies to build green buildings which are equally helpful in environmental strategies. The prime reason is that buildings are also one of the corrupts that pollute the environment and degrade the quality of life. Thereby, environmentally friendly technologies are linked with environmental sustainability in multiple ways and teach firms to mold themselves with environmental objectives and gain environmental sustainability at multiple levels (Kato et al., 2009; Ojogiwa, 2021). Makower (2011) argued that green technology increases the organizational commitment towards sustainability. This is the reason that firms which are more focused towards environmental practices, are able to keep pace with environmental

regulatory and get a chance to ensure sustainability. Iravani et al. (2017) stated that green technology offsets adverse effects of human activities and conserves natural resources through clean procedures. According to Yuliawati and Irawan (2018), environmental sustainability through green technology also changes the business landscape and now organizations make sure to disrupt the practices which corrupt the environment in any way. Thus, the proposed hypothesis states that:

H₆: There is a positive relationship of green technology with environmental sustainability.

2.6.7. Green management and Environmental sustainability

According to Karakaya et al. (2014), green management is the outcome of diffused innovation which is viewed as the key driver strategy to enhance sustainable development and greening the economy. Green management process has been discussed repeatedly in the context of sustainability. The ever-growing importance of green management awakens the concern of scholars and practitioners to focus on sustainability issues and incorporate eco-friendly practices in organizational goals in order to ensure environmental sustainability (Bates et al., 2008; Jermisittiparsert, 2021). Organizations are also taking great interest in green activities in order to get maximum benefit from these practices (Rennings and Rammer, 2011). In green management literature it is specifically mentioned by scholars that green management complements the sustainability practices, hence, helps firms to build a sustainable competitive edge (Marcon et al., 2017; Wirsinna and Grega, 2021). Having said the argument, it is not wrong to say that green management is coined with environmental sustainability and transition the overall business processes (Gonzalez-Lafayse and Lapassouse-Madrid, 2016).

Bakar and Aslan (2020) explained that green management helps in building environmental management systems to safeguard natural resources and protect the environment. According to Yuliawati and Enjang (2018), green management prolongs the effect of sustainability and ensures long-term environmental goals. Green management also increases the citizenship behaviour, hence, increases the voluntary behaviour of employees through which maximum participation can be achieved in order to reach the sustainable goal. This whole argument is enough to propose that: H₇: There is a positive relationship of green management with environmental sustainability.

3. RESEARCH METHOD

The present study used deductive reasoning as it involves hypothesis development, data collection, sample size calculation and defining the study problem. The study also used sampling technique to perform the analysis in order to assess the formulated hypothesis. The study was conducted in North Sumatra province covering the period from November 2021 to April 2022. Moreover, the study only focused on POME factors that have the potential to turn into green resources. The particular analysis utilized causality analysis method in order to evaluate the effect of independent constructs on dependent constructs through multiple intervening constructs. As discussed, the research is descriptive in nature and involved verification methods as the prime

purpose of the study is to make sure that palm oil related mills have awareness regarding POME effect because only then, they are able to transform the waste into potential green resources.

The projected population of the present study is Palm oil mills located in North Sumatera Province and are chosen through purposive sampling technique. The reason to chose purposive sampling is that it was make sure that the defined sample possess specific characteristics that are in accordance with research agenda, hence, they are capable of providing answers of question which the study desire for (Ferdinand, 2014). Total no of respondents was 61 and operation or area managers represents the sample population

$$n = 61$$

$$n = 156$$

$$e = 10\% \text{ tolerance}$$

To analyze the study data, Smart PLS methodology was used in order to observed the relationship between variables. PLS methodology consists of two steps; measurement model which ensures the validity and reliability of proposed model and inner model which involves in hypothesis testing.

4. RESULTS

The descriptives of the study hold a significant importance as based on it, suggestions regarding POME could be given to transform the waste in to green resources. As discussed above, 61 respondents successfully provided answers to study question. These 61

respondents belonged to the individuals who are responsible for managing operation or assist manager in their operations. The measurement instrument was based on Likert scale ranging from strongly disagree to strongly agree.

It is necessary to assess goodness of fit of model through the value of Q. sq and Rsq. If Q. square is higher than 0, it means that model contains predictive relevance value. As it can be seen in Table 1, the Q square values are >0.35, hence, model is in a good shape. Moreover, R square value also shows that the model is selection benefits with the criteria. Since all the values of AVE are >0.5, it means that the validity of the model successfully fulfills the criteria. Moreover, reliability of the model is also satisfactory as all the values of composite reliability and Cronbach Alpha are >0.6 and 0.7 respectively.

Since the loading factor values are >0.7, it means that overall indicators which are used to measure the constructs are valid. Table 2 represent the detail of each latent variable with its dimensions

Table 3 represents the structural model. It can be seen that green management is positively correlated with organizational awareness as the beta coefficient is positive and $P < 5\%$. Similarly, green management also influences environmental concern and green technology in positive manner as the $P < 0.5$ and coefficients are positive. This implies that the results support H1-H3 hypotheses (Figure 1). Moreover, from the table, it can also be seen that green management directly impact the environmental sustainability,

Table 1: GoF

Variable	AVE	Composite reliability	Cronbach's alpha	R square	Q square
Green management	0.657	0.817	0.816	0.653	0.384
Organizational awareness	0.623	0.923	0.827	-	0.352
Environmental concern	0.751	0.872	0.931	-	0.387
Green technology	0.652	0.918	0.918	-	0.426
Environmental sustainability	0.723	0.925	0.862	0.624	0.416

GoF: Goodness of fit model

Table 2: Loading factor between latent variables and dimensions

Latent variables-dimensions	Loading factor (λ)	Standard Error	T Statistics ($ \lambda/SE $)
Green Management→Energy Resources	0.364	0.052	9.376
Green Management→Eco Friendly Technology	0.425	0.041	10.427
Green Management→Reuse of Waste	0.536	0.038	11.249
Green Management→Recycling Activities	0.472	0.045	10.634
Organizational Awareness→Knowledge	0.326	0.036	6.370
Organizational Awareness→Attitude	0.265	0.027	8.263
Organizational Awareness→Action	0.363	0.039	10.533
Environmental Concern→Ecological Concern	0.426	0.031	13.543
Environmental Concern→Ecological Paradigm	0.337	0.026	12.641
Environmental Concern→Ecological Attitude	0.436	0.028	13.275
Green Technology→Recycling System	0.638	0.058	12.539
Green Technology→Pollution Reduction	0.629	0.052	15.374
Green Technology→Waste Disposal Prevention	0.735	0.037	16.842
Green Technology→Environmental Sanitation	0.635	0.043	18.538
Environmental Sustainability→Pollution Prevention	0.729	0.047	17.623
Environmental Sustainability→New Clean Technology	0.635	0.052	10.863
Environmental Sustainability→Product Stewardship	0.636	0.065	9.629
Environmental Sustainability→Sustainability Vision	0.524	0.042	10.367

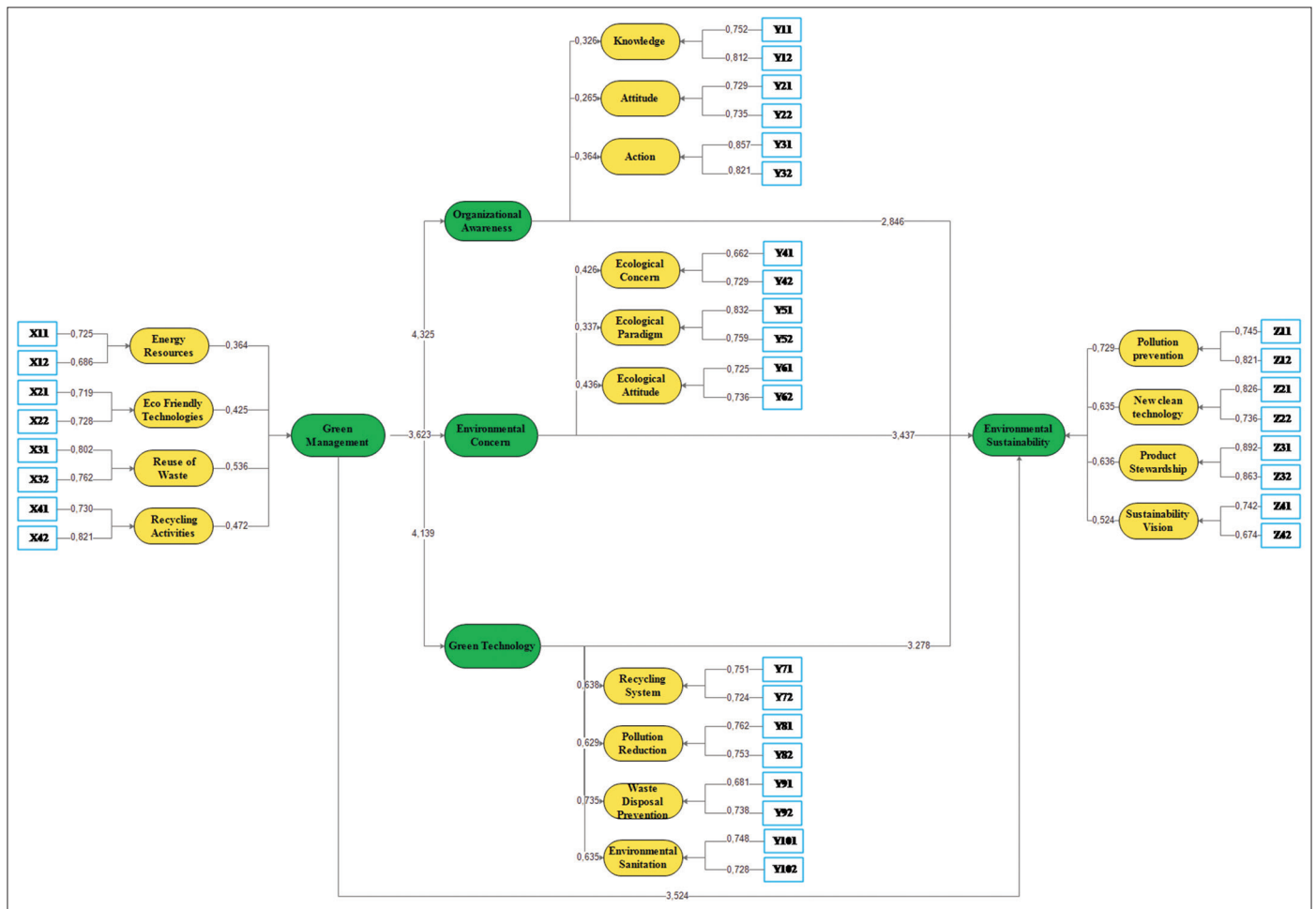
Source: From data processing (2022)

Table 3: Results of hypothesis testing

Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation	T Statistics ((O/STDEV))	P-values
Green Management→Organizational Awareness	0.328	0.385	0.179	4.325	0.059
Green Management→Environmental Concern	0.336	0.372	0.172	3.623	0.053
Green Management→Green Technology	0.318	0.348	0.183	4.139	0.031
Organizational Awareness→Environmental Sustainability	0.286	0.294	0.164	2.846	0.042
Environmental Concern→Environmental Sustainability	0.253	0.256	0.181	3.437	0.033
Green Technology→Environmental Sustainability	0.284	0.281	0.159	3.278	0.003
Green Management→Environmental Sustainability	0.326	0.346	0.189	3.524	0.036

Source: From data processing (2022)

Figure 1: Hypothesis testing.



Source: From (2022)

however, in the presence of environmental concern, the path is stronger. In the case of organizational awareness, it can be seen that there is a positive and significant relation with environmental sustainability with the beta value 0.286.

The testing results also indicate that green management highly influences organizational awareness amongst all as the t-value is 4.325 in contrast with environmental concern and green technology as their t-values are 3.623 and 4.139 as an intervening variable. Moreover, it can also be seen that as an intervening variable, environmental concern highly impacts environmental sustainability as t-value is 3.437 in contrast with other intervening variables; organizational awareness and green

technology. Lastly, the direct impact of green management on environmental sustainability shares greater hold with the value of 3.524. This indicates that firms must have better knowledge and understanding regarding green management as it helps in achieving environmental sustainability.

5. CONCLUSION

The current study proposed seven hypotheses which are formulated to evaluate the relationship between green management and environmental sustainability in the presence of three intervening variables; environmental concern, green technology and organizational awareness. The results clearly exhibit that green

management is one of the important tools of organization, hence, organization must take it into consideration to ensure sustainability. The results are also supported by prior studies which encapsulate that green management is a part of eco-management paradigm, hence inculcates novel management practices which not only enhances existing management etiquettes but also challenge existing practices and offer innovate yet different perspective. The author also argued that green management is a set of unique management practices that seek to address ecological and social realities which current management practices are unable to resolve (Darnall et al., 2008; Florida and Davison, 2001; Rehman, 2017). Results also show consistency with studies which postulate that green technology improves the existing technology and enhances the application of systems, equipment and products that are being utilized to conserve natural resources and environment. The reason is to minimize the adverse effect of human activities. It is also argued that green technology pacifies the criteria of environmental deterioration, minimizes GHG emissions (Du et al., 2019; Krass et al., 2013).

Results are also in line with the argument that there needs a bundle of effective strategies to make economies green especially those which are associated with sustainable transitions and transform consumer patterns which could only be possible when challenges related to sustainable transitions are to be promoted and managed at multilevel. Moreover, it also helps them to offset industrial growth and protect natural environment for the sake of future generation. This implies that green management must be implemented in order to raise awareness of sustainable environment (Bakar and Azlan 2020; Harwani and Sakinah 2020; Hapsi et al., 2017).

Lastly, results are also supported in a way that green technology increases the organizational commitment towards sustainability. This is the reason that firm which are more focused towards environmental practices, are able to keep pace with environmental regulatories and get a chance to ensure sustainability.

Based on the findings, several implications can be drawn. First, organization must implement green management practices and adopt green technology in order to manage the disrupted POME and transition them in to potential resources including fertilizers which could be of great use for environment. Moreover, organizations must create awareness regarding POME and other wastes and educated individuals regarding it consequences because this way, the firms are able to spread environmental knowledge. Moreover, firms must show environmental concern and prove it with their organizational activities, because only this way they can show that their preaching and actions both are interlinked and they really care about environment and communities. Moreover, organizations through green management can also build citizenship behavior which eventually helps them in gaining environmental performance. This also helps them to make their individuals creative and innovative which simultaneously helps them in achieving the ultimate goal altogether.

The study other than contribution, has several limitations as well. Firstly, the main focus of the study was the POME wastage due to which the study ignored other palm oil waste which must be

included as well to generalize the findings of study. Moreover, the study only carried out at North Sumatera, findings can be different in case of different geographical location. Moreover, only Palm oil mills were considered in the study, other industries can also be included in order to draw generalized policy implications.

REFERENCES

- Abdul Hamid, B., Azmi, W., Ali, M. (2020), Bank risk and financial development: Evidence from dual banking countries. *Emerging Markets Finance and Trade*, 56(2), 286-304.
- Ainou, F.Z., Ali, M., Sadiq, M. (2022), Green energy security assessment in Morocco: Green finance as a step toward sustainable energy transition. *Environmental Science and Pollution Research*, 1-19. <https://doi.org/10.1007/s11356-022-19153-7>
- Ali, M., Ibrahim, M.H., Shah, M.E. (2022), Impact of non-intermediation activities of banks on economic growth and volatility: An evidence from OIC. *The Singapore Economic Review*, 67(01), 333-348.
- Asih, D., Setini, M., Soelton, M., Muna, N., Putra, Cahyadi, I.G., Darma, D.C., Judiarni, J.A. (2020), Predicting green product consumption using theory of planned behavior and reasoned action. *Management Science Letters*, 10(14), 3367-3374.
- Bai, X., Wang, K.T., Tran, T.K., Sadiq, M., Trung, L.M., Khudoykulov, K. (2022), Measuring China's green economic recovery and energy environment sustainability: Econometric analysis of sustainable development goals. *Economic Analysis and Policy*, 75, 768-779.
- Bakar, R.A., Azlan, M.A. (2020), Green management strategy-an initiative towards sustainable practices. *International Journal of Business and Management*, 4(6), 1-8.
- Barney, J.B., Wright, P.M. (1998), On becoming a strategic partner: The role of human resources in gaining competitive advantage. *Human Resource Management*, 37(1), 31-46.
- Bates, B., Kundzewicz, Z., Wu, S. (2008), *Climate Change and Water*. Geneva: Intergovernmental Panel on Climate Change Secretariat.
- Begum, H., Alam, A.S.F., Ghani, A.B.A. (2019), Environmental Sustainability Practices among Palm Oil Millers. *Clean Technologies and Environmental Policy*. In: 2nd International Conference on Business and Management At: Brac University, Dhaka Bangladesh.
- Billatos, S. (1997), *Green Technology and Design for the Environment*. United States: CRC Press.
- Chien, F. (2022a), How renewable energy and non-renewable energy affect environmental excellence in N-11 economies? *Renewable Energy*, 196, 526-534.
- Chien, F. (2022d), The mediating role of energy efficiency on the relationship between sharing economy benefits and sustainable development goals (Case Of China). *Journal of Innovation and Knowledge*, 7, 100270.
- Chien, F., Chau, K.Y., Sadiq, M., Hsu, C.C. (2022c), The impact of economic and non-economic determinants on the natural resources commodity prices volatility in China. *Resources Policy*, 78, 102863.
- Chien, F., Hsu, C.C., Sibghatullah, A., Hieu, V.M., Phan, T.T.H., Tien, N.H. (2021), The role of technological innovation and cleaner energy towards the environment in ASEAN countries: Proposing a policy for sustainable development goals. *Economic Research Ekonomika Istraživanja*, 35, 2016463.
- Chien, F., Zhang, Y., Sharif, A., Sadiq, M., Hieu, M.V. (2022b), Does air pollution affect the tourism industry in the USA? Evidence from the quantile autoregressive distributed lagged approach. *Tourism Economics*, <https://doi.org/10.1177/13548166221097021>.
- Cillo, V., Petruzzelli, A.M., Ardito, L., Del Giudice, M. (2019), Understanding sustainable innovation: A systematic literature review. *Corporate Social Responsibility and Environmental Management*,

- 26(5), 1012-1025.
- Cruz, S.M., Manata, B. (2020), Measurement of environmental concern: A review and analysis. *Frontiers in Psychology*, 11, 363.
- Darnall, N., Jolley, G.J., Handfield, R. (2008), Environmental management systems and green supply chain management: Complements for sustainability? *Business Strategy and the Environment*, 17(1), 30-45.
- Del Brío, J.Á., Junquera, B. (2003), A review of the literature on environmental innovation management in SMEs: Implications for public policies. *Technovation*, 23(12), 939-948.
- Du, K., Li, P., Yan, Z. (2019), Do green technology innovations contribute to carbon dioxide emission reduction? Empirical evidence from patent data. *Technological Forecasting and Social Change*, 146, 297-303.
- Dyck, B., Silvestre, B.S. (2018), Enhancing socio-ecological value creation through sustainable innovation 2.0: Moving away from maximizing financial value capture. *Journal of Cleaner Production*, 171, 1593-1604.
- Fauzianto, R. (2014), Implementation of bioenergy from palm oil waste in Indonesia. *Journal of Sustainable Development Studies*. 5(1), 100-115.
- Felix, R., Hinsch, C., Rauschnabel, P.A., Schlegelmilch, B.B. (2018), Religiousness and environmental concern: A multilevel and multi-country analysis of the role of life satisfaction and indulgence. *Journal of Business Research*, 91, 304-312.
- Ferdinand, A. (2014), *Management Research Method. Research Guideline for writing Management Paper, Thesis and Dissertation*. Seri Pustaka Kunci. Semarang.
- Florida, R., Davison, D. (2001), Gaining from green management: Environmental management systems inside and outside the factory. *California Management Review*, 43(3), 64-84.
- Geels, F.W. (2010), Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, 39(4), 495-510.
- Gibbs, J.L., Sivunen, A., Boyraz, M. (2017), Investigating the impacts of team type and design on virtual team processes. *Human Resource Management Review*, 27(4), 590-603.
- Gonzalez-Lafaysse, L., Lapassouse-Madrid, C. (2016), Facebook and sustainable development: A case study of a French supermarket chain. *International Journal of Retail and Distribution Management*, 44, 560-582.
- Hambali, E., Rivai, M. (2017), The Potential of Palm Oil Waste Biomass in Indonesia. In: 2020 and 2030. *International Conference on Biomass: Technology, Application, and Sustainable Development*. p.1-9.
- Hamilton, L.C., Hartter, J., Safford, T.G., Stevens, F.R. (2014), Rural environmental concern: Effects of position, partisanship, and place. *Rural Sociology*, 79(2), 257-281.
- Hansla, A., Gamble, A., Juliusson, A., Gärling, T. (2008), The relationships between awareness of consequences, environmental concern, and value orientations. *Journal of Environmental Psychology*, 28(1), 1-9.
- Hapsi, A., Mukhtar, R., Muspawi, M. (2017), Influence of transformational leadership and cultural organization toward chairman innovation of STAI: The college of islamic religion of private in Jambi province. *International Journal of Business and Commerce*, 6(2), 26-38.
- Haroon, O., Ali, M., Khan, A., Khattak, M.A., Rizvi, S.A.R. (2021), Financial market risks during the COVID-19 Pandemic. *Emerging Markets Finance and Trade*, 57(8), 2407-2414.
- Hartani, N.H., Haron, N., Tajuddin, N.I.I. (2021), The impact of strategic alignment on the sustainable competitive advantages: Mediating role of it implementation success and it managerial resource. *International Journal of eBusiness and eGovernment Studies*, 13(1), 78-96.
- Harwani, Y., Sakinah, A.A. (2020), The Influence of Brand Awareness, Packaging Design and Word of Mouth on Purchase Intention. In: 4th International Conference on Management, Economics and Business (ICMEB 2019). Netherlands: Atlantis Press. p.45-252.
- Ibnou-Laaroussi, S., Rjoub, H., Wong, W.K. (2020), Sustainability of green tourism among international tourists and its influence on the achievement of green environment: Evidence from North Cyprus. *Sustainability*, 12(14), 5698.
- Iravani, A., Akbari, M.H., Zohoori, M. (2017), Advantages and disadvantages of green technology; Goals, challenges and strengths. *International Journal of Science and Engineering Applications*, 6(9), 272-284.
- Iwuagwu, J.R., Ugwuanyi, J.O. (2014), Treatment and valorization of palm oil mill effluent through production of food grade yeast biomass. *Journal of Waste Management*, 2014, 439071.
- Jermisittiparsert, K. (2021), Linkage between energy consumption, natural environment pollution, and public health dynamics in ASEAN. *International Journal of Economics and Finance Studies*, 13(2), 1-21.
- Kamarudin, F., Anwar, N.A.M., Chien, F., Sadiq, M. (2021), Efficiency of microfinance institutions and economic freedom nexus: empirical evidence from four selected ASIAN countries. *Transformations in Business and Economics*, 20(2b), 845-868.
- Karakaya, E., Hidalgo, A., Nuur, C. (2014), Diffusion of eco-innovations: A review. *Renewable and Sustainable Energy Reviews*, 33, 392-399.
- Kato, H., Too, L., Rask, A. (2009), Occupier perceptions of green workplace environment: the Australian experience. *Journal of Corporate Real Estate*, 11(3), 183-195.
- Khan, N., Jhariya, M.K., Raj, A., Banerjee, A., Meena, R.S. (2021), Eco-designing for sustainability. In: *Ecological Intensification of Natural Resources for Sustainable Agriculture*. Singapore: Springer. p.565-595.
- Khattak, M.A., Ali, M., Rizvi, S.A.R. (2021), Predicting the European stock market during COVID-19: A machine learning approach. *MethodsX*, 8, 101198.
- Khoshoo, T.N. (2008), *Environmental Concerns and Strategies*. New Delhi: APH Publishing.
- Kim, H., Gibbs, J.L., Scott, C.R. (2019), Unpacking organizational awareness: Scale development and empirical examinations in the context of distributed knowledge sharing. *Journal of Applied Communication Research*, 47(1), 47-68.
- Kollmuss, A., Agyeman, J. (2002), Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260.
- Kotler, P., Armstrong, G. (2018), *Principles of Marketing*. 16th ed. England: Pearson Education Limited.
- Kotler, P., Keller, K.L. (2016), *Marketing Management*. 15th ed. England: Pearson Education Limited.
- Krass, D., Nedorezov, T., Ovchinnikov, A. (2013), Environmental taxes and the choice of green technology. *Production and Operations Management*, 22(5), 1035-1055.
- Kurniawan, K., Supriatna, J., Sapoheluwakan, J., Soesilo, T.E.B., Mariati, S., Gunarso, G. (2022), The analysis of forest and land fire and carbon and greenhouse gas emissions on the climate change in Indonesia. *AgBioForum*, 24(2), 1-11.
- Lan, J., Khan, S.U., Sadiq, M., Chien, F., Baloch, Z.A. (2022), Evaluating energy poverty and its effects using multi-dimensional based DEA-like mathematical composite indicator approach: Findings from Asia. *Energy Policy*, 165, 112933.
- Lee, K. (2009), Gender differences in Hong Kong adolescent consumers' green purchasing behavior. *Journal of Consumer Marketing*.
- Leela, D., Nur, S.M., Yandri, E., Ariati, R. (2018), Performance of Palm Oil Mill Effluent (POME) as Biodiesel Source Based on Different Ponds. Vol. 67. In: *E3S WEB of Conference*. p.02038.
- Liew, W.L., Muda, K., Azraai, M. (2017), Agro-industrial waste sustainable management-a potential source of economic benefits to palm oil mills in Malaysia. *Journal of Urban and Environmental*

- Engineering, 11(1), 108-118.
- Lin, C.Y., Chau, K.Y., Tran, T.K., Sadiq, M., Van, L., Phan, T.T.H. (2022), Development of renewable energy resources by green finance, volatility and risk: Empirical evidence from China. *Renewable Energy*, 201, 821-831.
- Liu, Z., Lan, J., Chien, F., Sadiq, M., Nawaz, M.A. (2022b), Role of tourism development in environmental degradation: A step towards emission reduction. *Journal of Environmental Management*, 303, 114078.
- Liu, Z., Yin, T., Putra, A.R.S., Sadiq, M. (2022a), Public spending as a new determinate of sustainable development goal and green economic recovery: Policy perspective analysis in the Post-Covid ERA. *Climate Change Economics*, 3, 2240007.
- Makower, J. (2011), *Beyond the Bottom Line: Putting Social Responsibility to Work for your Business and the World*. New York: Simon and Schuster.
- Marcon, A., de Medeiros, J.F., Ribeiro, J.L.D. (2017), Innovation and environmentally sustainable economy: Identifying the best practices developed by multinationals in Brazil. *Journal of Cleaner Production*, 160, 83-97.
- Morelli, J. (2011), Environmental sustainability: A definition for environmental professionals. *Journal of Environmental Sustainability*, 1(1), 1-8.
- Moslehpour, M., Chau, K.Y., Du, L., Qiu, R., Lin, C.Y., Batbayar, B. (2022), Predictors of green purchase intention toward eco-innovation and green products: Evidence from Taiwan. *Economic Research Ekonomika Istraživanja*, <https://doi.org/10.1080/1331677X.2022.2121934>.
- Moslehpour, M., Chau, K.Y., Tu, Y.T., Nguyen, K.L., Barry, M., Reddy, K.D. (2022), Impact of corporate sustainable practices, government initiative, technology usage, and organizational culture on automobile industry sustainable performance. *Environmental Science and Pollution Research*, 29(55), 83907-83920.
- Moslehpour, M., Shalehah, A., Wong, W.K., Ismail, T., Altantsetseg, P., Tsevegjav, M. (2022), Economic and tourism growth impact on the renewable energy production in Vietnam. *Environmental Science and Pollution Research*, 29(53), 81006-81020.
- Mulvaney, D, editor. (2011), *Green Technology: An A-to-Z guide*. Vol. 10. California: Sage.
- Nurato, Fitri, Muhamad, Manalu, Lamar Anton. (2019), The effect of percentage of oil palm fibre on fatigue age of axial load on resin matrix composites. *Rotasi*, 21(4), 215-223.
- Ojogiwa, O.T. (2021), The crux of strategic leadership for a transformed public sector management in Nigeria. *International Journal of Business and Management Studies*, 13(1), 83-96.
- Osman, N.A., Ujang, F.A., Roslan, A.M., Ibrahim, M.F., Hassan, M.A. (2020), The effect of palm oil mill effluent final discharge on the characteristics of *pennisetum purpureum*. *Scientific Reports*, 10(1), 6613.
- Paryanto, I., Ismanto, A., Hariana, M.D.S. (2015), *Development of Biodiesel Plant Design Integrated with Palm Oil Mill for Diesel Fuel Substitution in Oil Palm Industry*. Vol. 1. New Delhi: KnowledgeE Publishing Services. p.83-88.
- Pastré, O., Vigier, M. (2003), *Le Capitalisme Débousolé: Après Enron et Vivendi: Soixante Réformes pour un Nouveau Gouvernement D'entreprise*. France: Éd. La Découverte.
- Ramli, Y., Imaningsih, E.S., Shiratina, A., Rajak, A., Ali, A.J. (2022), Environmental sustainability: To enhance organizational awareness towards green environmental concern. *International Journal of Energy Economics and Policy*, 12(4), 307-316.
- Ramli, Y., Soelton, M. (2018), Implementing innovation management on market attractiveness and unique resources to enhance business performance on organic fertilizer industries in Indonesia. *Academy of Strategic Management Journal*, 17(2), 1-12.
- Rehman, S.U. (2017), *Green Management-A Handbook*. 1st ed. California: Create Space Independent Publishing Platform.
- Rennings, K., Rammer, C. (2011), The impact of regulation-driven environmental innovation on innovation success and firm performance. *Industry and Innovation*, 18(3), 255-283.
- Sadiq, M., Amayri, M.A., Paramaiah, C., Mai, N.H., Ngo, T.Q., Phan, T.T.H. (2022b), How green finance and financial development promote green economic growth: Deployment of clean energy sources in South Asia. *Environmental Science and Pollution Research*, 29(43), 65521-65534.
- Sadiq, M., Lin, C.Y., Wang, K.T., Trung, L.M., Duong, K.D., Ngo, T.Q. (2022d), Commodity dynamism in the COVID-19 crisis: Are gold, oil, and stock commodity prices, symmetrical? *Resources Policy*, 79, 103033.
- Sadiq, M., Ngo, T.Q., Pantamee, A.A., Khudoykulov, K., Ngan, T.T., Tan, L.L. (2022a), The role of environmental social and governance in achieving sustainable development goals: Evidence from ASEAN countries. *Economic Research Ekonomika Istraživanja*, 36, 2072357.
- Sadiq, M., Ou, J.P., Duong, K.D., Van, L., Ngo, T.Q., Bui, T.X. (2022c), The influence of economic factors on the sustainable energy consumption: Evidence from China. *Economic Research Ekonomika Istraživanja*, DOI: 10.1080/1331677X.2022.2093244.
- Shibli, R., Saifan, S., Yajid, M.S., Khatibi, A. (2021), Mediating role of entrepreneurial marketing between green marketing and green management in predicting sustainable performance in Malaysia's organic agriculture sector. *AgBioForum*, 23(2), 37-49.
- Singh, A. (2021), Soil salinization management for sustainable development: A review. *Journal of environmental management*, 277, 111383.
- Singh, R.P., Ibrahim, M.H., Esa, N., Iliyana, M.S. (2010), Composting of waste form palm oil mill: A sustainable waste management practice. *Reviews in Environmental Science and Biotechnology*, 9(4), 311-344.
- Sriyakul, T., Chienwattanasook, K., Chankoson, T. (2022), Does industrialization and renewable energy consumption determine economic growth? Empirical evidence from Asean countries. *International Journal of Economics and Finance Studies*, 14(3), 264-279.
- Sulaiman, F., Adbullah, N., Gerhauser, H., Shariff, A. (2010), A perspective of oil palm and its wastes. *Journal of Physical Science*, 21(1), 67-77.
- Tan, L.P., Sadiq, M., Aldeehani, T.M., Ehsanullah, S., Mutira, P., Vu, H.M. (2021), How COVID-19 induced panic on stock price and green finance markets: Global economic recovery nexus from volatility dynamics. *Environmental Science and Pollution Research*, 29, 26332-26335.
- Thitinan, T.S., Chankoson, K., Sukpasjaroen. (2022), Modelling the impact of e-government on corruption for the Covid-19 Crisis. *International Journal of eBusiness and eGovernment Studies*, 14(3), 26-45.
- Tidd, J., Bessant, J. (2013), *Managing Innovation: Integrating Technological, Market and Organizational Change*. 5th ed. United States: John Wiley & Sons.
- Van Hoa, N., Van Hien, P., Tiep, N.C., Huong, N.T.X., Mai, T.T.H., Phuong, P.T.L. (2022), The role of financial inclusion, green investment and green credit on sustainable economic development: Evidence from Vietnam. *Cuadernos de Economía*, 45(127), 1-10.
- Wirsinna, A., Grega, L. (2021), Assessment of economic benefits of smart city initiatives. *Cuadernos de Economía*, 44(126), 45-56.
- Xing, C., Zhang, Y., Wang, Y. (2020), Do banks value green management in China? The perspective of the green credit policy. *Finance Research Letters*, 35, 101601.
- Yahya, S.N.A., Abdullah, N., Ludin, N.A., Yuzir, A., Mohamad, S.E.,

- Koji, I. (2020), Environmental sustainability assessment approach for palm oil production in Malaysia. *Journal of Environmental Treatment Techniques*, 8(3), 1046-1053.
- Yuliawati, Y., Irawan, E.P. (2018), Identifikasi kampanye gerakan lingkungan hijau dalam mendukung ketahanan pangan nasional (Studi kasus tentang identifikasi kampanye program lingkungan hijau melalui tanaman hidroponik oleh kodim 0503 Jakarta Barat). *Jurnal Politikom Indonesiana*, 3(1), 197-197.
- Yuliawati., Enjang, I.P. (2018), The analysis of green environment movement campaign in supporting national food security of Indonesia. *Global Journal of Human Social Science*, 18(2), 29-33.
- Zhao, L., Chau, K.Y., Tran, T.K., Sadiq, M., Xuyen, N.T.M., Phan, T.T.H. (2022), Enhancing green economic recovery through green bonds financing and energy efficiency investments. *Economic Analysis and Policy*, 76, 488-501.
- Zhao, L., Zhang, Y., Sadiq, M., Hieu, V M., Ngo, T.Q. (2021), Testing green fiscal policies for green investment, innovation and green productivity amid the COVID-19 era. *Economic Change and Restructuring*, <https://doi.org/10.1007/s10644-021-09367-z>.
- Zhou, Y., Shu, C., Jiang, W., Gao, S. (2019), Green management, firm innovations, and environmental turbulence. *Business Strategy and the Environment*, 28(4), 567-581.