

GREEN INNOVATION IN THE MANUFACTURING INDUSTRY: A SYSTEMATIC LITERATURE REVIEW

Dzi Annur Roin¹, Annisya², Mohammad Ilham Ramdani³, Dhea Ramadhani Salim⁴, Ariska Azzahara⁵, Fazar Nuriansyah⁶, Lazuardi Imani Hakam⁷

¹⁻⁷ Economic Education, Universitas Pendidikan Indonesia, Indonesia

*Email corresponding author: arskqhr@upi.edu

Abstract

This study examines the sustainability of Indonesia's manufacturing sector using the Triple Bottom Line (TBL) approach, encompassing economic, social, and environmental aspects. Through a Systematic Literature Review (SLR), the research identifies key challenges such as environmental impacts, social conflicts, and dependence on global markets. Conversely, strategic opportunities are found in eco-friendly technologies and waste management innovations, like converting used cooking oil into biodiesel. The analysis reveals that cross-sector collaboration via the Pentahelix model plays a crucial role in driving sustainable industrial transformation. These findings underscore the urgency of integrating sustainability to support national development and achieve the Sustainable Development Goals (SDGs).

Keywords: Industry Sector, Manufacturing, Indonesia

INTRODUCTION

The industrial sector is one of the main pillars in economic growth in various countries, including Indonesia. As a developing country with abundant natural resources and a large labor force, Indonesia has great potential in the development of the manufacturing industry. Based on data from the Central Statistics Agency (BPS), the manufacturing industry sector contributed around 20% to the Gross Domestic Product (GDP) in 2023, making it a strategic sector in the national economy (BPS, 2024).

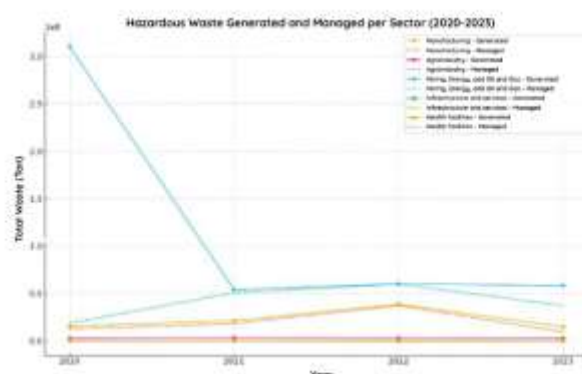


Figure 1. Performance of Processing Industry in Indonesia (BPS, 2024)

The establishment of industry certainly has an impact, both on the environment and the social environment. Some of these impacts include unemployment, reducing the level of improving the welfare of the community around the industrial area and so on. For social life, industry tends to have a positive impact. However, the rapid growth of industry often raises various challenges, especially related to aspects of sustainability which include environmental degradation, excessive exploitation of natural resources, and social inequality around industrial areas (Nurmaya & Saputra, 2025).

The main problem faced by industries in Indonesia is the lack of effective strategies in integrating economic growth with the principles of long-term sustainability. Many industries are still oriented towards resource exploitation without considering environmental and social impacts. In addition, regulations related to green industry still face obstacles in implementation, both in terms of policy and technology (Sunarjo et al., 2024). Therefore, a more systematic study is needed to formulate a sustainability strategy that not only focuses on economic growth but also provides concrete solutions to environmental and social problems.

Figure 2. Hazardous Waste Production and Management (KLHK, 2021)



Indonesia is the main focus of this study due to several factors. First, Indonesia is experiencing rapid industrial growth, but the implementation of sustainability strategies still faces significant challenges (Ministry of Industry RI). Second, Indonesia has one of the highest levels of industrial carbon emissions in Southeast Asia, which calls for stricter policies regarding the implementation of green industry (Climate Action Tracker, 2024). In addition, as a developing country, Indonesia faces gaps in access to green technologies and policy incentives that support the transition to sustainable industries (Budimansyah & Axel, 2023).

A number of previous studies have discussed various sustainability strategies in the industrial sector in Indonesia. Sunarjo et al. (2024) identified the main obstacles in implementing green industrial policies, which are still constrained by regulatory and technological aspects. They also examined the effect of trade and investment openness on the sustainability of the manufacturing industry, but have not examined the role of technological innovation in improving energy efficiency. Although previous research has explored various aspects of industrial sustainability, there is still a gap in summarizing the strategies that have been implemented and thoroughly evaluating their effectiveness. Therefore, this study was conducted using the Systematic Literature Review (SLR) method to identify, explore and summarize industrial sustainability strategies that have been reviewed in previous studies and fill the gaps in the existing literature.

This research aims to identify industrial sustainability strategies that have been implemented in Indonesia, analyze research gaps related to sustainability strategies, and develop recommendations based on findings from previous studies to support the development of sustainable industries in Indonesia. Thus, the results of this study are expected to make academic and practical contributions, especially in supporting the formulation of industrial policies that are more environmentally friendly and sustainable.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

The Triple Bottom Line (TBL) concept was first introduced by John Elkington in 1994 as an approach to assessing business success that not only focuses on financial returns, but also considers social and environmental impacts. This approach is known by three main pillars, namely profit (economic profit), people (social welfare), and planet (environmental sustainability). In practice, the profit dimension relates to achieving financial sustainability with long-term impacts.

Meanwhile, the people dimension emphasizes corporate social responsibility towards employees, communities, and other stakeholders. Finally, the planet dimension focuses on the efficient management of natural resources and the reduction of the industry's negative impact on the environment (Elkington, 2013).

Over time, the TBL concept has been increasingly adopted by various industrial sectors as part of a sustainable business strategy. Several studies have shown that companies that apply TBL principles tend to perform better in social and environmental aspects, which in turn improves their reputation in the eyes of the public. In addition, the application of these principles also helps to improve operational efficiency and create more stable economic value in the long run.

In various countries, including Indonesia, the implementation of the Triple Bottom Line is further strengthened by various policies and programs that encourage companies to be more socially and environmentally responsible. One concrete example in Indonesia is the Company Performance Rating Program in Environmental Management (PROPER) initiated by the Ministry of Environment and Forestry (KLHK., 2021). This program aims to assess company performance in environmental management and provide incentives for companies that implement sustainable business practices.

The successful implementation of TBL in the industrial world not only contributes to environmental sustainability, but also creates added value for the company itself. Companies that successfully obtain a Green PROPER rating or higher tend to gain greater trust from consumers, investors, and the wider community. Thus, the implementation of TBL is not just a moral obligation for industry, but also a profitable business strategy in the long run.

RESEARCH METHODS

This research uses the Systematic Literature Review (SLR) method as a qualitative approach to examine sustainable development in the processing industry in Indonesia with the Triple Bottom Line (TBL) concept. This method was chosen because it is able to systematically collect and analyze various research results, so as to provide a deeper understanding of the sustainability strategies that have been implemented, gaps in previous research, and evidence-based recommendations. As part of qualitative research, SLR enables synthesis of various perspectives in the literature, identifies patterns in existing findings, and interprets the implications of sustainability in the manufacturing sector more comprehensively.

The literature selection process in this study followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) stages which included identification, screening, eligibility assessment and inclusion of articles. Once the literature was collected, initial screening was done by reviewing the titles and abstracts to ensure relevance to the sustainability of the processing industry in Indonesia. Articles that addressed only one aspect of the Triple Bottom Line (TBL) or lacked economic, social and environmental integration were excluded. This step ensured that only empirical data-based studies or systematic reviews were analyzed (Moher et al., 2009).

The final results were used to identify challenges, trends and strategic recommendations for industry sector sustainability.

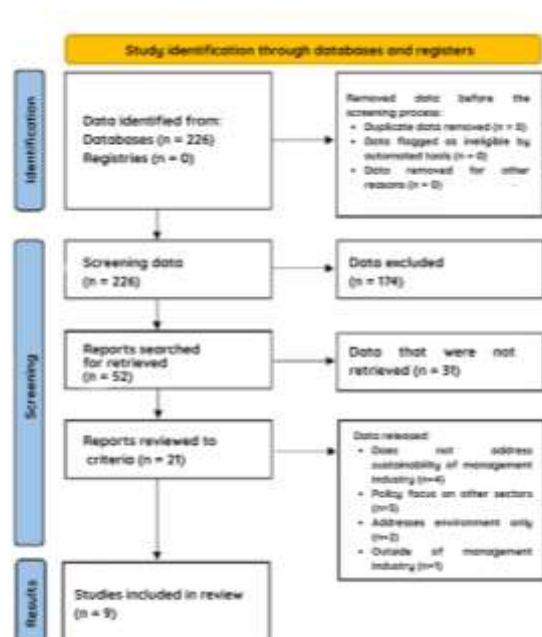


Figure 3. Article Review Flow Chart

RESULTS AND DISCUSSION

The analysis conducted in this study yields several important findings regarding the condition of the industrial and processing sector in Indonesia. The findings are obtained through a review of relevant literature and secondary data, and show that the sector is in the midst of considerable challenges, such as lack of equitable infrastructure, technological limitations, and dependence on imported raw materials. However, despite these challenges, there are also opportunities for growth, especially through innovation, digitalization, and government policy support. In this section, the findings will be further discussed by emphasizing the relationship between the challenges and opportunities, and how sustainable development strategies can be applied to strengthen the sector's role in the national economy.

Tabel 1. Systematic Article Analysis

Author	Country and Sample/Population	Method and Focus Research	Key Findings
(Wicaksono et al., 2023)	The research was conducted in Indonesia, Ngawi Regency. The population was 1,764 SMEs and 396 industrial business units.	This study uses multiple linear regression analysis methods to see the influence of independent variables and independent variables that determine the influence factors in industrial development. This research focuses on eco-industries, which are industries that grow while	The role of the Pentahelix model in the development of sustainable industries in Ngawi Regency in the aspects of academia, business, community, government, and media.

		protecting the environment. The approach used is the Pentahelix model, which involves government, institutions, communities, media, and businesses in sustainable development.	
(Primahardani et al., 2022)	The research was conducted in Indonesia, Riau Province. Data were collected through field surveys, observations, secondary data verification, and interviews.	This research uses a descriptive analysis approach with the Participatory Rural Appraisal (PRA) model, Multidimensional Scaling (MDS), and uses RapHTI software. Focusing on evaluating the sustainability of industrial forest plantation processing in Riau through ecological, economic, social, and institutional dimensions.	Plantation forest processing in Riau Province - The main factors affecting sustainability are the availability of raw materials, capital and support from the government and community. - The level of sustainability of forest management is uneven. - Strong collaboration between academics, businesses and communities is needed.
(Hariyanti et al., 2024)	The research was conducted in Indonesia, Bengkalis Regency. The research population included 14 palm oil companies and 400 households in the vicinity as a purposive sample. Village officials were also interviewed to gain a deeper picture of the industry's impact.	This study used a mixed method approach with a sequential explanation model. Quantitative data was collected through a survey and followed by qualitative analysis. The main focus was to assess the sustainable transformation of the palm oil-based economy in Bengkalis Regency and explore the potential, challenges and formulate strategies.	The main findings of this study describe the condition and potential of the palm oil industry in Bengkalis Regency: - The results of the analysis show a fairly good level of sustainability in terms of companies, households, and village development with indices of 59.76; 60.16; and 57.60 respectively. - The research found ten important factors in supporting sustainability, including community empowerment and waste treatment technology. - The suggested strategy involves collaboration

			between governments, companies and communities to strengthen these key factors
(Langford et al., 2023)	The Research conducted in Indonesia, East Nusa Tenggara. The research involved 30 seaweed farmers, 9 government officials, and 5 industry players through semi-structured interviews to find out their views, constraints faced, and production to marketing practices.	The research methods used in this study included a combination of primary and secondary data. Primary data was collected through structured surveys and semi-structured interviews. Secondary data was used to design interview questions and evaluate the feasibility of existing regulations. The focus of this study was to understand seaweed farmers' perceptions of the seaweed industry in Nusa Tenggara Timor (NTT), including the challenges they face, as well as their behaviors in production, post-harvest handling, and marketing.	The main findings of this research highlight the state of the seaweed industry in East Nusa Tenggara (NTT) from various perspectives: - Farmers see the seaweed industry as an economic opportunity, but are concerned about the lack of support and long-term sustainability. - Key challenges include price fluctuations, market access difficulties, and weak training support and resources. - Production and post-harvest handling practices are mixed. - Interviews with government and industry emphasized the need for better regulation and capacity building for farmers, especially in market access.
(Sarma et al., 2022)	The research was conducted in Indonesia, Bandung Regency and Pekalongan Regency. The study population consisted of MSME owners in three agro-industry clusters: fruit, fish and dairy. From the initial 102 respondents, 93 valid data were analyzed representing the main	This research uses primary data from structured interviews with closed questionnaires, analyzed descriptively and continued with SEM-PLS to build a model for improving agro-industrial clusters. The focus of this research is to develop a model to improve the competitiveness of agro-industrial MSMEs in facing	The main findings show that: - The entrepreneurial marketing approach is proven to have a significant impact in improving business development and competitiveness of MSMEs in the agro-industrial sector. - MSMEs with high competitiveness are better prepared to

	business actors in each cluster.	the challenges of the AEC, emphasizing the entrepreneurial marketing approach in the fruit, fish and dairy processing clusters.	compete in the ASEAN market. - Government policies that support and encourage innovation also play an important role in improving the readiness of MSMEs to face AEC challenges.
(Hariyanti et al., 2022)	The research was conducted in Indonesia, Bengkalis Regency. The research population consisted of managers of the palm oil (CPO) processing industry in Bengkalis Regency. Of the 10 existing industries, 6 industries were willing to be interviewed and sampled in this study.	This research uses the Rapid Appraisal Technique (RAP) approach with Multi-Dimensional Scaling (MDS) analysis. This research focuses on determining the sustainability status of the palm oil (CPO) processing industry in Bengkalis Regency and identifying sensitive variables that affect it. Using the MDS approach through RAP, the analysis includes five dimensions. The results are expected to be a reference for the development of the CPO industry sustainability system towards achieving SDGs.	The main findings of this study reveal the sustainability condition of the palm oil (CPO) processing industry in Bengkalis Regency and the key variables that influence it, as follows: - The sustainability status of the CPO industry in Bengkalis Regency is quite good with an index of 59.76. - The social dimension shows the best performance with an index of 78.95, indicating high social sustainability. - The environmental and technological dimensions are in the less sustainable category.
(Burmana et al., 2024)	The research was conducted in Indonesia. The sample used is on the utilization of cooking oil (waste cooking oil) WCO as a raw material for biodiesel.	This research used experimental method to test the efficiency of Amberlite 62i heterogeneous catalyst in transesterification process of used cooking oil into biodiesel. The process was carried out in the lab using a 250 mL beaker with variations in catalyst concentration of 5%, 10%, 15%, and 20% of the oil weight. SEM and FT-IR analysis were used to evaluate the reusability of the catalyst. The focus	This research resulted in the following findings: - The highest biodiesel conversion of 82% was achieved at 60°C with the use of 20% Amberlite 62i catalyst. - The highest flash point was recorded at 162°C under the same conditions. - Amberlite 62i proved to have potential as an effective alternative catalyst in biodiesel production from waste cooking oil.

		of this research is to find a sustainable solution for the utilization of waste cooking oil in biodiesel production.	- This finding contributes to the development of sustainable energy by reducing industrial waste and utilizing wasted resources efficiently in Indonesia.
(Goenadi et al., 2021)	The research was conducted in Indonesia. A sample was taken to assess the sustainability of palm oil by reviewing 56 literature references from Google Scholar.	This research uses the literature review method. The focus of the research was to evaluate land suitability and soil management technology as two key factors in achieving sustainability of the palm oil industry in accordance with the Sustainable Development Goals (SDGs).	The research found that palm oil contributes to six SDG goals, such as poverty alleviation, food security and economic growth. However, the industry faces challenges in land management and environmental impacts. Certifications such as RSPO and ISPO are necessary for sustainability. In addition, land management technologies and soil carbon maintenance also play an important role in reducing its negative impacts.
(Teapon et al., 2023)	The research was conducted in Indonesia. 200 respondents from local communities in Gane Dalam, Jibubu and Yamli Villages, South Halmahera District, North Maluku Province	This research uses Structural Equation Modelling-Partial Least Squares (SEM-PLS) method to analyze Sustainable Development Goals (SDGs) indicators in relation to Indonesian Sustainable Palm Oil (ISPO) principles and criteria. The research focuses on the sustainability of oil palm development from the perspective of local communities.	This study found that the SDGs indicators significantly influence the sustainability of palm oil within the ISPO framework. The main factors include poverty alleviation, food security, gender equality, and social aspects which are more dominant before moving on to the environmental pillar. The model developed emphasizes the importance of company consistency, resource efficiency, and land conservation in

supporting the ISPO
standard.

Source: Author, 2025

Nine studies show that efforts towards sustainable industry in Indonesia are carried out through diverse approaches, according to the characteristics of each region and sector. In Ngawi, multi-stakeholder collaboration with the Pentahelix model is used to develop green industries. Riau and Bengkalis focus on the forestry and palm oil sectors, with attention to raw material availability, technology and community empowerment. In East Nusa Tenggara, the seaweed industry's main challenges include regulation and market access. Meanwhile, the national study addressed the potential for biodiesel from used cooking oil and palm land management issues. Research in South Halmahera linked mustard farming to sustainable development goals (SDGs), and in Bandung and Pekalongan, strengthening agro-industrial MSMEs became a key focus in the face of regional competition.

Sustainability Dynamics of the Processing Industry in Indonesia

The processing industry in Indonesia, especially the palm oil sub-sector and agro-industry based on agricultural products, plays an important role in the national economy (Goenadi et al., 2021). This industry plays a major role in the Indonesian economy, both as a source of state revenue and a provider of employment for the community. In a study conducted by Teapon and friends (2023), palm oil is a major export commodity that contributes to the country's foreign exchange. For example, in South Halmahera, oil palm plantations are one of the main sectors that support local economic growth.

The sustainability of the processing industry in Indonesia not only contributes greatly to the national economy, but also poses various challenges that need to be faced. Sustainability challenges that cover environmental, social and economic aspects require structural changes and policy innovations (Goenadi et al., 2021). The challenge for environmental aspects is that oil palm plantations are often associated with deforestation, land degradation, and environmental pollution. Furthermore, the challenge for the social aspect is the emergence of agrarian conflicts with local communities and plantation laborers. Finally, the challenge for the economic aspect is that fluctuating palm oil prices and dependence on global markets are pressures for smallholders and large companies.

In response to the complexity of the challenges faced by the processing industry, a collaborative approach is becoming increasingly relevant, particularly through the application of the Pentahelix model (Wicaksono et al., 2023). This model emphasizes the synergy between five main actors: government, academia, industry players, community, and media. These five elements have complementary roles in encouraging the creation of sustainable industrial development. In the study on the development of an environmentally friendly industrial estate in Pati Regency, the Pentahelix approach demonstrated its effectiveness in bringing together various interests and resources.

The government plays a role as a policy maker and provider of infrastructure that supports the transformation of the industry towards a greener direction. Academics contribute through research and the provision of scientific data needed to formulate evidence-based development strategies. Industry players are the ones who implement sustainability principles in the production process, including waste management and energy efficiency. On the other hand, local communities act as social partners who monitor and are actively involved in the development process so that it remains in favor of the community. Meanwhile, the media serves as a communication bridge that conveys information widely and raises public awareness of the importance of socially and ecologically responsible industrial development. This cross-sector collaboration shows that challenges in the social, environmental and economic aspects cannot be overcome partially, but require structured and sustainable multi-stakeholder involvement.

In addition to multi-stakeholder collaboration, sustainability strategies in the processing industry must also include economic, social and environmental dimensions in a balanced manner. From an environmental perspective, waste management is a priority so that the impact of pollution can be minimized. One innovative solution is the conversion of used cooking oil waste into biodiesel through transesterification and esterification processes with Amberlite 62i catalyst. The biodiesel produced is renewable energy and more environmentally friendly than fossil fuels. Burmana and friends (2024) emphasized that utilizing waste for biodiesel production not only reduces greenhouse gas emissions, but also supports Indonesia's carbon emission reduction target of 43.2% by 2030. This strategy reflects the integration of environmental efficiency, new economic opportunities, and positive social impacts through the involvement of local communities. Therefore, a sustainable approach that integrates these three aspects is key to meeting the challenges of the processing industry going forward.

Supporting and Hindering Factors for Sustainability

The sustainability of processing industries in developing countries is influenced by a number of interrelated supporting factors. One of the most influential is the support of policies and regulations that encourage industrial transformation, such as downstream policies and the Indonesia Sustainable Palm Oil (ISPO) standard, which aims to strengthen competitiveness while ensuring environmentally friendly practices. In addition, environmentally friendly technological innovations have begun to be adopted by industry players in an effort to reduce ecological impacts. Energy efficiency technology, waste management, and renewable energy have become part of the company's operational strategy in the face of global market pressures and international commitments to reduce emissions.

Collaboration between stakeholders is also an important element in strengthening sustainability. A pentahelix approach involving government, academia, industry, community and media strengthens cross-sector synergies and accelerates the implementation of sustainability programs (Wicaksono et al., 2023). Furthermore, increasing social awareness, both from domestic consumers and export markets, is also putting moral and economic pressure on industries to implement responsible production practices. Demands for transparency, sustainability certification, as well as pressure from global financial institutions, strengthen the impetus for industrial sector transformation.

There are also regulations such as the Minister of Agriculture Regulation No. 19/2015, which requires palm oil production to be done responsibly for surrounding communities, individuals, and workers (Teapon et al., 2023). The impact of these policies on the processing industry is significant, where regulations such as ISPO can encourage more sustainable industry practices, but there are also challenges in implementation. These challenges usually arise in the social and economic aspects of local communities. The development of a sustainable palm oil industry relies heavily on the balance of various aspects, including social, economic, legal, governance, and environmental. Thus, policies and regulations play a crucial role in determining the direction of the industry's development, both in supporting and hindering its sustainability.

CONCLUSION

This research successfully identifies various industrial sustainability strategies that have been implemented in Indonesia, ranging from energy efficiency, the use of renewable resources, waste management, to the application of circular economy principles. The findings show that although some industrial sectors are starting to adopt sustainable practices, there are still gaps in the scale of implementation, as well as weak integration with social and institutional aspects. A review of the 9 articles analyzed shows that most studies still focus on technical aspects, while the role of local actors, policy dynamics, and community involvement are rarely discussed in depth. For example, Burmana and colleagues' study (2024) emphasized the important role of contextualized policy

interventions in promoting industrial sustainability in developing countries that are relevant to Indonesia. This research also identified gaps in the literature that can inform future policy and research directions.

The findings of this study are in line with the results of previous studies that emphasize the importance of an integrated approach in industrial sustainability strategies, especially in developing countries. For example, Sunarjo and colleagues (2024) showed that the effectiveness of sustainability strategies depends heavily on a combination of policy incentives, technological support, and local stakeholder engagement. In this context, the study results reinforce this argument by highlighting the need to strengthen regulations and fiscal incentives to encourage industrial transformation, increase the capacity of businesses through the adoption of green technology, and integrate sustainability principles in regional development planning. In addition, transparency through sustainability reporting is also a key element that needs to be encouraged more systematically. The practical implications of these findings cover a variety of parties, namely policy makers can use them as a basis for designing more inclusive and sustainable industrialization strategies, industry players can get guidance to navigate changes towards greener practices, and academics can use these findings as a foothold to expand studies that are more contextual and cross-sectoral.

For future research, it is suggested that empirical approaches such as field studies or mixed-methods be used to evaluate the actual implementation of the identified strategies. In addition, more in-depth exploration of specific industry sectors and the involvement of local actors in the decision-making process will be important in designing sustainability strategies that are more adaptive and responsive to Indonesian conditions.

BIBLIOGRAPHY

- BPS. (2024). *Proporsi nilai tambah sektor industri manufaktur terhadap PDB* (pp. 1–3). <https://www.bps.go.id/id/statistics-table/2/MTIxNCMy/proporsi-nilai-tambah-sektor-industri-manufaktur-terhadap-pdb.html>
- Budimansyah, B., & Axel, L. (2023). Penerapan Strategi Pengelolaan Sumber Daya Manusia Dalam Menghadapi Tantangan Globalisasi Industri. *Jurnal Ilmiah Manajemen Ekonomi Dan Akuntansi (JIMEA)*, 1(2), 48–55. <https://doi.org/10.62017/jimea.v1i2.270>
- Burmana, A. D., Iriany, Nazri, E., Hasibuan, D. R., Tambun, R., & Benguerba, Y. (2024). Biodiesel production using waste cooking oil and Amberlite 62i as heterogeneous catalyst: Sustainability energy solution. *Case Studies in Chemical and Environmental Engineering*, 10(October), 101011. <https://doi.org/10.1016/j.cscee.2024.101011>
- Elkington, J. (2013). Enter the triple bottom line. *The Triple Bottom Line: Does It All Add Up*, 1(1986), 1–16. <https://doi.org/10.4324/9781849773348>
- Goenadi, D. H., Setyobudi, R. H., Yandri, E., Siregar, K., Winaya, A., Damat, D., Widodo, W., Wahyudi, A., Adinurani, P. G., Mel, M., Zekker, I., Mazwan, M. Z., Siskawardani, D. D., Purbajanti, E. D., & Ekawati, I. (2021). Land Suitability Assessment and Soil Organic Carbon Stocks as Two Keys for Achieving Sustainability of Oil Palm (*Elaeis guineensis* Jacq.). *Sarhad Journal of Agriculture*, 37(Special Issue 1), 184–196. <https://doi.org/10.17582/journal.sja/2022.37.s1.184.196>
- Hariyanti, F., Syahza, A., Zulkarnain, & Nofrizal. (2022). Sustainability of the Palm Oil Industry: An Empirical Study of the Development of Sustainable Oil Palm in Bengkalis Regency, Indonesia. *International Journal of Sustainable Development and Planning*, 17(1), 109–118. <https://doi.org/10.18280/ijstdp.170110>
- Hariyanti, F., Syahza, A., Zulkarnain, & Nofrizal. (2024). Economic transformation based on leading commodities through sustainable development of the oil palm industry. *Heliyon*, 10(4), e25674. <https://doi.org/10.1016/j.heliyon.2024.e25674>
- Kehutanan., K. L. H. dan. (2021). Best Practices dan Inovasi PROPER 2021. *Proper*, 0–370.
- Langford, A., Turupadang, W., & Waldron, S. (2023). Interventionist industry policy to support local

- value-adding: Evidence from the Eastern Indonesian seaweed industry. *Marine Policy*, 151(February), 105561. <https://doi.org/10.1016/j.marpol.2023.105561>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., Antes, G., Atkins, D., Barbour, V., Barrowman, N., Berlin, J. A., Clark, J., Clarke, M., Cook, D., D'Amico, R., Deeks, J. J., Devereaux, P. J., Dickersin, K., Egger, M., Ernst, E., Gøtzsche, P. C., ... Tugwell, P. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7). <https://doi.org/10.1371/journal.pmed.1000097>
- Nurmaya, D. F., & Saputra, B. M. (2025). *THE IMPACT OF INDUSTRIALIZATION IN IMPROVING THE QUALITY OF BASIC HUMAN RESOURCES DIGITALIZATION ON THE INDONESIAN ECONOMY*. 5(2), 3047–3056.
- Primahardani, I., Mulyadi, A., Syahza, A., & Restuhadi, F. (2022). Sustainability Strategy for Industrial Plantation Forest Management in Riau Province, Indonesia. *International Journal of Sustainable Development and Planning*, 17(2), 399–411. <https://doi.org/10.18280/ijssdp.170205>
- Sarma, M., Septiani, S., & Nanere, M. (2022). The Role of Entrepreneurial Marketing in the Indonesian Agro-Based Industry Cluster to Face the ASEAN Economic Community. *Sustainability (Switzerland)*, 14(10). <https://doi.org/10.3390/su14106163>
- Sunarjo, W. A., Magfiroh, Susanti, N., Milzam, M., Ermawati, N., Chirsti, Y., & Rahmawati, A. (2024). Analisis Tingkat Penerimaan Tentang Penerapan Industri Hijau Pada Peraturan Pemerintah Sebagai Bentuk Eko-Efisiensi Dalam Meningkatkan Kinerja Hijau. *ENTREPRENEUR Jurnal Bisnis Manajemen Dan Kewirausahaan*, 5, 2723–1941.
- Teapon, R. R. H., Evalia, N. A., Purba, K. F., Rumkel, N., & Hayati, P. K. D. (2023). a Modeling for Sustainable Oil Palm Development in South Halmahera, Indonesia: an Evidence From Local Community. *Journal of Sustainability Science and Management*, 18(5), 16–32. <https://doi.org/10.46754/jssm.2023.05.002>
- Wicaksono, A. D., Agustina, D., & Hidayat, A. R. R. T. (2023). Pentahelix Model for Eco-Industrial Development: A Collaborative Policy Approach. *International Journal of Sustainable Development and Planning*, 18(9), 2673–2683. <https://doi.org/10.18280/ijssdp.180906>