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The development of an integrated and sustainable palm oil downstream industry: Evidence from Indonesia

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Abstract. The oil palm is a crop that accounts for approximately 40% of all vegetable oil stored globally. The trend has a significant positive impact on the GDP of developing countries producing palm oil, such as Indonesia. However, the plantations and the industry have often been criticized for their unsustainable production practices. This has motivated the Indonesian government to innovate by developing an integrated and sustainable palm oil downstream industry with reliable traceability. The aim is to counter the negative perceptions surrounding unsustainable palm oil production. The strategy is achieved through the establishment of the special economic zones (SEZs) Policy and Sei Mangkei SEZ serves as the pioneering initiative to position palm oil as a primary industrial commodity. Therefore, this study aimed to examine the impact of SEZs policy on the palm oil value chain in Sei Mangkei through the application of the triangulation method. The results confirmed that the palm oil value chain was positively impacted by the implementation of the SEZs policy. This effect was driven by both internal and external factors such as the Unilever Global (PT UOI) implementing USPOSP and sustainability or environmental certification regulations which integrated Sei Mangkei into the palm oil global value chains (GVCs). The sustainable palm oil downstream processing facilities produced were established on the principles of traceability, geographic integration, and export orientation.

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1. INTRODUCTION

The oil palm (Elaeis guineensis Jacq.) is a crop that contributes over 35% of total vegetable oil production in the world and accounts for approximately 40% of the edible oil trade (Murphy et al., 2021). It has become part of the most contested agricultural commodities in developing countries (Kayuzuki, 2018) due to the significant contribution of industry to economic growth. For example, the contribution of the crop to the gross domestic product (GDP) of Indonesia was 3.5% in 2021 (GAPKI, 2022).

Industry that is focused on palm oil has provided significant economic benefits to Indonesia but the rapid expansion has led to concerns about the environmental and social sustainability with a focus on the issues of deforestation, habitat destruction, and human rights protection (Cherie et al., 2020; Iddris et al., 2023; Yanita et al., 2021; Ayompe et al., 2021). The European Parliament recommended that the EU stop importing crude palm oil (CPO) in 2021 including products from Indonesia due to environmental, health, and animal protection concerns (Pratiwi, 2021). There is also a growing global concern about the sustainable supply chain for palm oil production (Carmagnac et al., 2022).

The pressure exerted by international groups specifically within the EU has led to a growing demand for the implementation of transparent practices within the palm oil industry in line with the required sustainability standards. The efforts have made industry part of the few sectors that actively motivate their members to join certification schemes such as the Indonesian Sustainable Palm Oil (ISPO) (Apriani et al., 2020) and the Roundtable on Sustainable Palm Oil (RSPO), the first global standard-setting initiative (Dauvergne, 2018). The certifications testify to the strong commitment of industry to produce palm oil responsibly and ensure traceability throughout the supply chain.

The Indonesian government established special economic zones (SEZs) as part of a strategy to provide an integrated and sustainable downstream palm oil industry with traceability. These zones which are designed to focus on export markets through industrialization and integration operate based on more liberal economic regulations than other regions. SEZs are commonly aimed at increasing investment, reducing operational obstacles, and attracting investors in several countries (Sa'dia & Fitrady, 2023). However, the policy has produced different experiences and impacts in different countries (Akinci & Crittle, 2008). SEZs are considered important to the configuration of value chain for products requiring quality control (Aggarwal, 2007; Ramingwong et al., 2016; Zeng, 2016) but there is little attention on this role.

SEZs can significantly impact the quality product value chain in several ways. The first is the ability to attract foreign direct investment (FDI) and local investment in high-value industries. This inflow of FDI can lead to the introduction of advanced technologies and production methods, increased competition, innovation, and quality improvement, as well as access to global markets and international quality standards. The second is the capability to assist countries in upgrading value chain by promoting product certification in order to enhance the quality of processing and raw materials with subsequent influence on higher-value exports. Therefore, this study aims to assess the impact of the SEZs policy on the palm oil value chain in Sei Mangkei. The area selected is the first palm oil industry-based SEZs throughout the world and is located in Simalungun Regency, North Sumatra, Indonesia.

Global value chain (GVC) analysis was used to evaluate the impact of the policy. This was based on the ability of the analysis to show the importance of governance and relationships among value chain actors for the production and supply of differentiated products (Humphrey & Schmitz, 2001). The ability of the

SEZs policy to provide traceable downstream palm oil production systems was examined by identifying the influence of SEZs on sustainable value chain. Moreover, a rigorous and comprehensive analysis was conducted on the evolution of the palm oil value chain in Sei Mangkei over eight years with a focus on the period before and after the implementation of the SEZs policy. The hypothesis formulated posited that the policy could facilitate the traceability of sustainable palm oil products in Sei Mangkei.

2. LITERATURE REVIEW

2.1. SEZs Policy

SEZs are geographically designated areas with different business and trade laws compared to other regions, special regulatory bodies, and specific incentives for businesses (Akinci & Crittle, 2008). These are often in the form of different appellations such as free trade zones, free ports, foreign trade zones, export processing zones, free export zones, economic and trade cooperation zones, economic processing zones, and free zones (Farole & Akinci, 2011). The zones are typically established to enhance economic growth, promote exports, attract FDI, and provide jobs, particularly in underdeveloped areas or regions with lagging economic conditions (World Bank, 2008; Zeng, 2016).

Some of the fiscal and non-fiscal incentives associated with SEZs include exemptions from customs duties, simplified licensing, favorable taxation, and streamlined goods traffic as well as flexible immigration, labor, and land use regulations (National Council for Special Economic Zones, 2019, 2023; Wang, 2013). The incentives are provided by the governments to enhance competitiveness (Zheng et al., 2016).

The success of SEZs is attributed to their integration into the global economy mainly through export-oriented growth. The critical role of SEZs in the expansion of global value chains (GVCs) of several countries is achieved through different methods which include attracting FDI in GVC-related activities (Akinci & Crittle, 2008). Another is to facilitate the entry of host countries into GVCs to ensure trade and enable technology transfer (Zeng, 2016). This is often achieved through the provision of essential infrastructure such as transportation and electricity supply (Secretariat, 2016), production of better labor-job matching, and allowing workers to have broader employment opportunities (World Bank Group, 2017). Moreover, SEZs provide a platform for complex cross-border supply chain by reducing administrative burdens and customs procedures. These rules vary by country but the zones typically operate beyond borders for customs purposes despite the geographical location. The trend shows the possibilities of spreading product supply chain across global zones without the impact of tariffs, quotas, and detailed customs procedures. However, the level of backward linkages varies widely across countries.

The relationship between SEZs and GVCs has changed over time. This is observed from the fact that the rapid expansion of GVCs spurred a new wave of SEZs development in the late 1990s and early 2000s. SEZs are currently adapting to the Fourth Industrial Revolution by emphasizing access to skilled labor and fostering a network of relevant business and technology service providers (United Nations Conference on Trade and Development, 2019).

SEZs can be specialized to serve different aspects of GVCs such as logistics hubs focusing on commercial services, warehousing, and logistics. Another important observation is that specialized SEZs target specific sectors, industries, or GVC activities while innovation-driven SEZs focus on developing new ones (United Nations Conference on Trade and Development, 2019).

Practical experiences have shown the significant impacts of SEZs on the participation of host countries in GVCs. Some of the impacts include (1) assisting countries specifically in Asia connect to GVCs and drive industrialization. (2) Organizing production around processing and manufacturing activities in order to provide employment opportunities. (3) Enabling countries in some cases to move downstream in GVCs

within the proximity of end consumers toward ensuring increased addition of value to the zone (World Bank Group, 2016).

The increasing focus of countries on integrating their economies into the global market allows SEZs to provide an efficient platform to build export hubs (Jeong & Zeng, 2016). Moreover, the zones more importantly enable governments to influence the governance of the GVCs associated with a commodity such as palm oil. This is institutionally possible because SEZs are physically restricted areas where host countries relax rules and regulations, build efficient infrastructure, and offer fiscal and non-fiscal incentives in the hope of attracting GVCs activities which are highly responsive to the environment and business costs (Aggarwal, 2019).

2.2. Sustainable Palm Oil GVCs

The literature on GVCs is multidisciplinary mainly due to the participation of different actors and the relationships. Value chain covers the production of goods or services through the transformation from raw materials into finished products and subsequent delivery to the final consumer. Gereffi and Korzeniewicz (1993) examined the differences between producer-driven and buyer-driven GVCs. It was reported that producer-driven value chain were often found in capital- and technology-intensive industries such as automobiles, aircraft, and computers, where transnational producers or large integrated firms played a key role in coordinating the entire production network (Gereffi & Korzeniewicz, 1993).

Studies conducted on governance issues often aimed to understand the coordination of geographically fragmented GVCs and the regulation of the relationships between actors (Gereffi, 2005). The GVC governance framework facilitates the analysis of the coordination and management of dispersed economic activities in addition to the identification of the opportunities and challenges for both developing and developed countries (Gereffi, 1994; Sturgeon & Lester, 2004). Previous relevant studies reported that the integration of dispersed economic activities into international trade was not a natural process but rather driven by certain actors (Gereffi, 2005; Gibbon et al., 2008; Ponte & Sturgeon, 2017). The internal actors are associated with the producing, processing, marketing, and retailing of the final product while the external actors do not participate directly in these activities but have an impact on value chain. External actors such as certification organizations and state regulatory bodies can have significant power in shaping value chain by deciding the stakeholders to include or exclude, methods and standards to use as well as the prices and consumers to target (Jespersen et al., 2014; Tran et al., 2013). The coordination along value chain is also observed to extend beyond a two-way process connecting production nodes with end consumers (Bush & Oosterveer, 2007).

Palm oil value chain has been generally studied by Hidayati and Hasibuan (2019) and Sipayung (2022). Moreover, a study related to GVCs and the palm oil value chain was conducted by Tong (2017). The focus was on sustainable vertical specialization using the Malaysian palm oil sector as a case study. Perdana (2019) also concluded that the majority of improvements in the palm oil industry value chain of Indonesia were predominantly due to market-driven and multi-party pathways while CSR-driven, cluster-driven and labor-centered, remained weak due to several factors.

Specific studies have been focused on the impact of the palm oil value chain on community development and gender (Hasudungan & Neilson, 2020; Uduji et al., 2024). Those related to the implications of the palm oil value chain for economic growth, social, and environmental sustainability were also conducted by Pacheco et al. (2017), Purnomo et al. (2020), and Ivanova et al. (2020).

Global attention has focused on ensuring palm oil production adheres to environmental and social sustainability principles in recent decades. Therefore, efforts are being made to establish a sustainable palm oil value chain to address the negative environmental and social impacts associated with conventional palm

oil production such as deforestation, biodiversity loss, and human rights violations (Vijay et al., 2016). An example of the methods identified is the implementation of RSPO certification in the palm oil industry.

RSPO is the largest voluntary certification scheme for sustainable oil palm designed to mitigate the adverse environmental and social effects of the cultivation process (Abdul Majid et al., 2021). The certification is very important in connecting sustainability across economic, social, and environmental dimensions to promote the production of certified sustainable palm oil. However, the implementation is based on the documentation which depends on input from specific manufacturers. This shows the possibility of difficulty in obtaining accurate information in some cases. The situation led to the general agreement in industry on the need for more robust and reliable arrangements to provide transparent tracking systems. The process also requires verifiable sources ideally through proven analytical methods to ensure the integrity of the palm oil supply chain (Goggin & Murphy, 2018).

The accreditation and certification procedures of RSPO depend on administrative controls and assessments. The main challenge is that available analytical methods are currently unsuitable for routine applications to differentiate between sustainable and unsustainable palm oil sources. This requires the physical separation of sustainably produced palm oil that meets the RSPO standards from uncertified from the point of production to the period of reaching the consumers to ensure traceability throughout the supply chain (Ramli et al., 2020). Moreover, some studies argued that certification did not consistently improve environmental outcomes (Innocenti & Oosterveer, 2020). The process is also often criticized for being costly and time-consuming specifically for smallholders who are a crucial part of palm oil production (Meemken et al., 2021). This is possible because smallholders typically lack access to capital, technical knowledge, and the necessary support systems to comply with sustainability standards which leads to challenges in integrating into certified value chain (Morgans et al., 2018).

Another significant challenge is traceability within the palm oil supply chain. This is due to the complexity in ensuring full traceability from plantations to final products despite the implementation of certification systems, specifically in areas with informal or irregular production (Watts et al., 2021). The monitoring of compliance with sustainability standards across the fragmented supply chain consisting of several actors from plantations to processing is another key issue for global governance efforts (Chiriacò et al., 2022). However, the introduction of certification systems for safety assurance and product differentiation was popularly reported to have changed the entire value chain in other industries and GVCs (Gereffi & Lee, 2009).

Several studies have been conducted on RSPO certification. For example, Von Geibler (2013) examined the legitimacy and effectiveness of standard-setting in the case of palm oil with a focus on the RSPO as the first global standard-setting initiative. The results showed the strengths and weaknesses of the standard-setting process in response to the increasing market demand for palm oil. Hidayat et al. (2015) also reported that private certification had a positive impact on oil palm smallholder livelihoods in Indonesia. Moreover, Innocenti and Oosterveer (2020) investigated the influence of RSPO certification on upstream learning to improve agricultural practices in Thailand and Indonesia. The results showed that value chain structure was not consistently conducive to upstream learning beyond knowledge transfer.

Mechanisms and stakeholder engagement are important in achieving a sustainable palm oil value chain. The RSPO certification system requires different stakeholders including producers, traders, retailers, NGOs, and governments to ensure compliance with sustainability standards. The expansion of the palm oil value chain across multiple countries in addition to the participation of several actors shows the importance of coordination to enforce sustainability standards effectively. The government as part of the stakeholders can implement policies such as SEZs to regulate mechanisms and enhance the palm oil value chain. However, the impact of the policy on the upgrading of the palm oil value chain has not yet been fully explored.

3. STUDY METHODS

The concept of value chain describes the entire process of product creation (Porter, 2008), and the analysis is considered important in the era of globalization for three main reasons. The first is the continuous importance of systemic competitiveness due to the increasing division of labor and the global distribution of component production. The second is the importance of production efficiency for the successful penetration of global markets. The third is the need to understand the dynamic factors throughout value chain during the process of entering global markets to enable sustainable income growth (Kaplinsky & Morris, 2000).

Value chain analysis is narrowly used to explain the activities conducted within a single company in introducing a product to the market. In a broader sense, value chain includes a series of vertically and horizontally complex activities conducted by different actors such as primary producers, processors, traders, and service providers to move raw materials and final products through the chain to sales. The actor with the most activities is often called the "chain leader" and plays an important role in shaping the dynamics of the entire chain by exerting significant influence over the process. Moreover, Lazzarini et al. (2001) developed the net chain concept which was used as a critical theoretical framework in this study to show vertical and horizontal value chain linkages. The vertical integration reflected the flow of products and services from primary producers to final consumers through the concept of value or supply chain.

3.1. Data collection

This study combined three methods including field observation, semi-structured interviews, and document review through the concept of triangulation to answer the question formulated. Triangulation combines methods to study the same phenomenon in order to ensure the examination of similarities and differences as well as the assessment of socially desirable responses in sensitive and complex topics (Campbell & Fiske, 1959; Miles, 1994; Denzin, 2012; Bauwens, 2010). It also enables scholars to strive for completeness and confirmability of results because the weaknesses in a method can be offset by strengths in another (Carugi, 2016; Kopinak, 1999; Yeasmin & Rahman, 2012).

Direct observations were made at the Sei Mangkei SEZ in September 2023 with a focus on the palm oil industry supply chain followed by value chain analysis. Moreover, semi-structured interviews were conducted with eight key actors, including the Head of the Bureau for SEZs Indonesia Supervision (expert in SEZs policy in Indonesia), SEVP Business Support, PT KINRA (representative of Sei Mangkei SEZ management), Manager of POM (Palm Oil Mill), PT Perkebunan Nusantara III (PTPNIII) Sei Mangkei (stakeholder in CPO and palm kernel (PK) production in Sei Mangkei SEZ), Manager of PKOM, PTPNIII Sei Mangkei (produces palm kernel oil meal (PKOM)), Management of PT INL (industry actor in Sei Mangkei SEZ), Management of PT Unilever Oleochemical Indonesia (UOI) (downstream industry actor in Sei Mangkei SEZ), Management of Sei Mangkei Dry Port (logistics actor in Sei Mangkei SEZ), and the Regent of Simalungun District (head of local government of Sei Mangkei SEZ).

The key actors were selected intentionally due to their expertise and authority in relation to the objectives of this study. Moreover, the semi-structured interviews conducted through the field survey consisted of three main parts. The first was on the company profile with a focus on the establishment time, facilities, and activities conducted by actors and workers. The second was on products and markets with a focus on the procurement of raw materials, main products, and primary markets. Meanwhile, the third was on quality standards and value chain with the intention of exploring information related to quality standards, supply chain, and value of raw materials to the products. Additional questions were used to address risks related to the availability of raw materials and product prices.

The socio-economic information and the history of Sei Mangkei SEZ were further explored through in-depth interviews conducted with 14 stakeholders around the Sei Mangkei SEZ. These included six oil palm smallholders in Nagori Sei Mangkei, Bosar Malingas Subdistrict, four workers from PTPN III plantations, the Manager of the oil palm smallholders' cooperative Bersatu Makmur Jaya, Nagori Boluk, Bosar Malingas Subdistrict, the Head of Nagori Boluk, Bosar Malingas Subdistrict, the Head of a private POM, Bosar Malingas Subdistrict, Head of SMK Satrya Budi 1 Perdagangan School.

Relevant documents collected and analyzed include the annual reports of the SEZ Council (2011–2023), PTPNIII annual reports (2013–2023) to determine PTPNIII Fresh Fruit Bunches (FFB) production amounts, PTPNIII sustainability reports (2016–2023), and Indonesian Law Number 39 of 2009 on SEZs. The others were Indonesian Government Regulation Number 29 of 2012, FAO documents on palm oil-producing countries to identify the top 10 in the world (average 1994–2021), total production of palm oil globally, in Indonesia, and Malaysia (1994–2022), as well as the total export value and destination countries for Indonesian palm oil exports (2012–2022). Furthermore, statistical data documents issued by the Central Statistics Agency of Indonesia (BPS) were also assessed to determine the area of Nagori in Simalungun Regency (2012–2022), the population of each Nagori (2015–2022), and land ownership for palm oil in Simalungun Regency including those owned by PTPNIII. The review was used to understand the palm oil supply chain and value in Sei Mangkei before the SEZ was established. The three methods were combined to estimate value chain pattern of the palm oil industry before and after the implementation of the SEZ in Sei Mangkei.

3.2. Study site

Sei Mangkei is a village (nagori) located in Bosar Maligas District, Simalungun Regency, North Sumatra Province, Indonesia as presented in Figure 1. According to the data from the BPS, Bosar Maligas District covered an area of 285.43 hectares and the population in 2019 was 41,171. Oil palm industry in Sei Mangkei and Bosar Maligas has a long history. The trend dates back to 1980 when smallholders first started planting oil palm. The areas were home to oil palm plantations owned by PT Perkebunan Nusantara III (PTPN III) and PT Perkebunan Nusantara (PTPN IV) before the designation as SEZ by the Indonesian government.

The palm oil industry in Indonesia consists of both on-farm production to generate FFB as well as the processing aspect which is further divided into two main sectors. The first includes the factories transforming FFB into CPO while the second are those refining CPO and palm kernel oil (PKO) into different refined palm oil products (Gandhi & Fumie, 2023). Moreover, the plantations in Sei Mangkei were equipped with oil palm plantations, the palm oil mill (POM), and the palm kernel oil mill (PKOM) which marked the early stages of development for industry as observed in similar regions in the country.

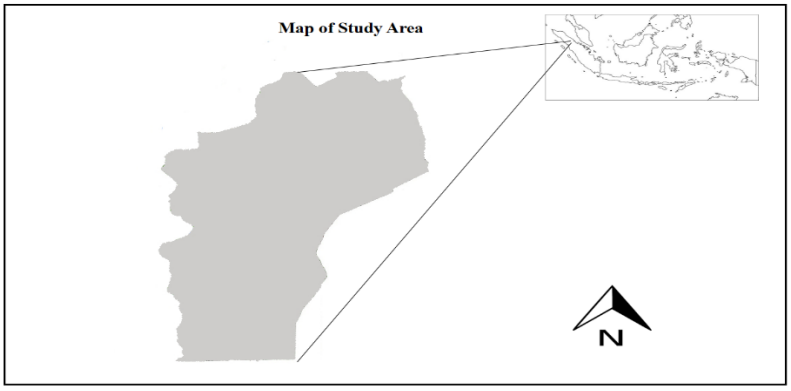


Figure 1. Map of Sei Mangkei SEZ

Source: Modified by Author from annual reports of the Indonesia SEZ Council (2024)

POM PTPN III Sei Mangkei is a state-owned enterprise (SOE) headquartered in Jakarta and Medan. It was constructed in 1996 with a capacity of 30 tons of FFB per hour which was increased to 75 tons in 2010. Meanwhile, PKOM Sei Mangkei was constructed in 2010 and started operations in 2011 with a capacity of 400 tons per day producing PKO and palm kernel meal (PKM). Both PTPN III and IV are SOEs but BPS data shows there are two other private oil palm plantations in Bosar Maligas District which are PT Plora Surya Lestari and PT Siswaa.

Table 1

List of Companies Invested at Sei Mangkei SEZ

Status	Tenant/Company	Land Area (Ha)	Product	Country
Established	PTPNIII (Palm Oil Mill and Palm Kernel Oil Mill)/2015	13.40 & 3.26	Crude Palm Oil, Palm Kernel Oil, Palm Kernel, Palm Kernel Meal	Indonesia
	PT Unilever Oleochemical Indonesia/2015	27.28	Fatty Acid, Surfactant, Glycerine, Soap Noodle	United Kingdom
	PT Industri Nabati Lestari/2015	7.46	Cooking Oil, Purined Fatty Acid, Stearin	Indonesia
	PT Aice Sumatera Industry/2021	4	Ice Cream	Singapore
	PT Alliance Consumer Product Indonesia/2023	4	Soap Packaging	India
	PT Alternative Protein Indonesia/2023	5	Chitine, Protein, Lipid	United Kingdom
	PT All Cosmos Biotek/2023	4	Bio-Fertilizer, Biotechnology, Industrial Solutions	Malaysia
Under construction	PT Weha Niaga Semesta	16	Fertilizer	Indonesia
	PT Simedarby Oils Sei Mangkei Refinery	16	Refinery	Malaysia
	PT Sheel Oils Indonesia	10	Oleochemical	India
	PT Unilever Oleochemical Indonesia (Marvel 3)	17	Fatty Acid, Surfactant, Glycerine, Soap Noodle	United Kingdom
	PT Industri Nabati Lestari (Development 2)	23.68	Cooking Oil, Purined Fatty Acid, Stearin, Biodiesel	Indonesia
	PT Evyap Sabun Indonesia	12	Oleochemical	Turkey
	PT Tanimas Uniresource Indonesia	4	Refinery	Indonesia

Source: Interview with SEVP Business Support PT KINRA (2023)

The Indonesian government appointed PTPN III as the Development and Management Agency for the Sei Mangkei SEZ in 2013 through Simalungun Regent Decree No. 188.45/193/BPPD/2013 dated January 30, 2013. As the designated entity, PTPN III is responsible for building and managing the Sei Mangkei SEZ through its subsidiary, PT KINRA. PTPN III operates POM PTPN III and PKOM PTPN III which produce CPO and PKO within the Sei Mangkei SEZ area.

The establishment of the Sei Mangkei SEZ was based on Government Regulation No. 29 of 2012 while the legal framework for SEZs in Indonesia was Law No. 39 of 2009 on SEZs. The operation started on January 27, 2015 on a total area of 1,933.8 hectares. A total of 1,226 workers were employed in 2009, the number increased to 2,427 in 2023, and is estimated to have the capacity of employing 83,304 workers by 2031. The number of workers employed in 2009 was 1,226, increasing to 2,427 in 2023. The export value of the products from the actors increased annually from US$335.08 million in 2020 to US$387.94 million in 2021 and US$364.07 million in 2022.

The field observations and semi-structured interviews conducted with the SEVP of Business Support at PT KINRA showed that there were 11 tenants or actors in the Sei Mangkei SEZ by 2023. It was reported that three of the tenants were from Indonesia while eight were from abroad. The SEZs policy of Indonesia offers fiscal and non-fiscal incentives to domestic and foreign companies investing in the SEZs areas. The companies and tenants investing received nine incentives with the fiscal aspects including the corporate income tax holiday, tax allowance, value-added tax (VAT) exemption, luxury goods sales tax exemption, customs duty exemption, and property ownership rights for foreigners. Meanwhile, the non-fiscal incentives relate to employment, immigration, land, and licensing as presented in the Appendix. The response provided to the interview showed information related to the status, land area, and products of each company as presented in Table 1.

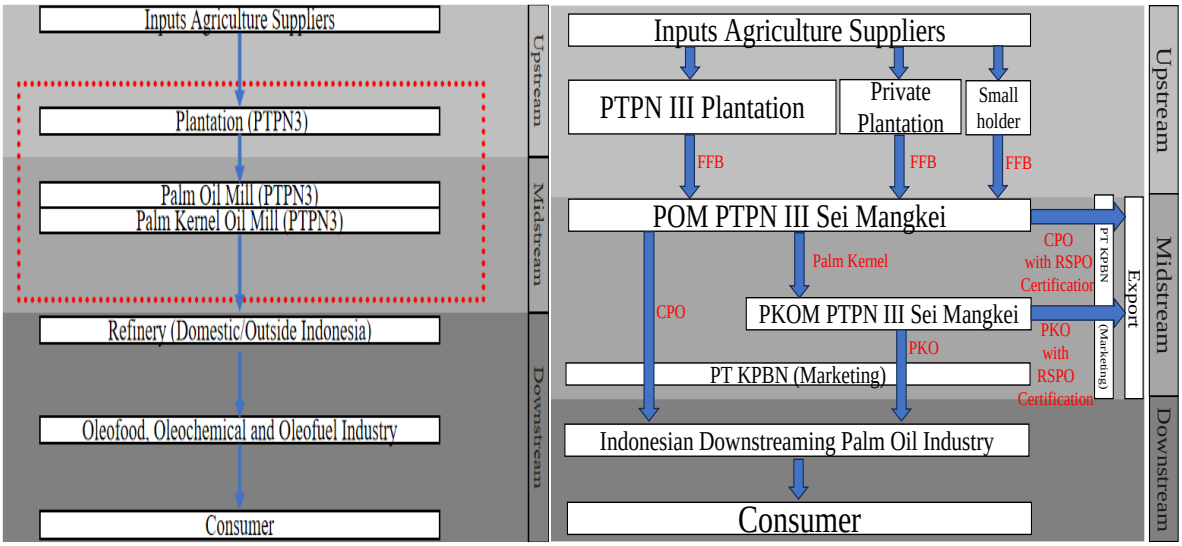
4. RESULTS

4.1. Palm oil value chain before the establishment of SEZ in Sei Mangkei

The semi-structured interviews and the annual reports of PTPN III from 2013–2014 showed that POM and PKOM PTPN III produced CPO and PKO for both export and domestic markets before the SEZs policy was established. POM PTPN III Sei Mangkei obtained FFB raw materials from PTPN III plantations that certified by the RSPO to produce for the export market. The RSPO-certified CPO produced was exported directly abroad through the Port of Belawan in Medan. It was also reported that PK was sent to PKOM PTPN III for the purpose of producing PKO. Both products were marketed by PT Kharisma Pemasaran Bersama Nusantara (PT KPBN)/Inacome established in 1968 as a SOE and a subsidiary of the PTPN I–XIV group (currently under the PTPN III Holding Company).

POM PTPN III used FFB raw materials from private and smallholder plantations certified based on the ISPO standard for the domestic market. The CPO produced in addition to the PKO from the PKOM PTPN III using the PK supplied by POM PTPN III was sold as raw materials for the Indonesian palm oil downstream industry beyond North Sumatra Province and marketed by PT KPBN.

PKO and PKOM PTPN III operated on different weekly schedules in the process of producing CPO and PKO for export (RSPO-certified) and domestic (ISPO-certified) purposes. Generally, the prices of FFB, CPO, and PKO from RSPO-certified plantations were higher than those considered ISPO-certified. The palm oil value chain in Sei Mangkei before the establishment of the SEZ is presented in Figure 2.



(a) *(b)*

Figure 2. Palm Oil Supply (a) and Value Chain (b) Industry Activities before the establishment of SEZ in Sei Mangkei

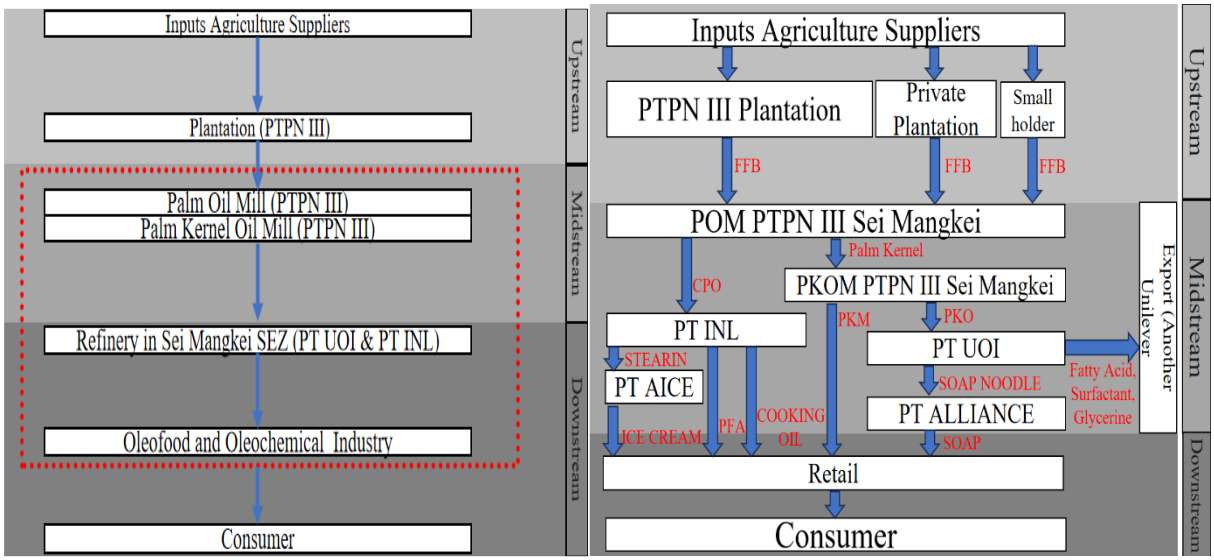
Source: Authors' field survey (2023)

4.2. Palm oil value chain after the establishment of SEZ in Sei Mangkei

The implementation of the SEZs policy changed the palm oil value chain in Sei Mangkei as presented in Figure 3. The POM and PKOM of PTPN III currently produce CPO and PKO using RSPO-certified FFB raw materials sourced from private, smallholder, and PTPN III plantations around the Sei Mangkei SEZ, North Sumatra Province.

The main product of PTPN III is CPO, produced by the POM, and 95% is sold to PT INL as a raw material for cooking oil, pure fatty acids, and stearin. PT INL subsequently sells the cooking oil and pure fatty acids to the domestic market and stearin to PT AICE located within the Sei Mangkei SEZ for use in ice cream production. This comprehensive distribution strategy ensures PTPN III products reach both domestic and international markets in order to maximize profits and reach.

Approximately 90% of the PKO produced by the Sei Mangkei PKOM is sold to PT UOI. It is distributed through pipelines which is considered a cost-effective and efficient method. The process is beneficial to PT UOI by ensuring the product is obtained at the lowest transportation costs compared to other consumers of the Sei Mangkei PKOM.



(a) *(b)*

Figure 3. Palm Oil Supply (a) and Value Chain (b) Industry Activities after the Establishment of SEZ in Sei Mangkei

Source: Authors' field observations, semi-structured interviews, and document review (2023)

The Sei Mangkei SEZ has a dry port facility connected to the Kuala Tanjung and Belawan Ports through railway and highway. The dry port facilitates the distribution of products to serve both export and domestic needs. It is also considered part of the most prominent infrastructures in the Sei Mangkei SEZ and the only dry port on Sumatra Island with a capacity of 2,300 TEUs. The port is managed by PT Sei Mangkei Nusantara Tiga which is a subsidiary of PT KINRA.

4.3. Main stakeholders in the palm oil value chain at Sei Mangkei SEZ

Sei Mangkei SEZ Managing Company

PT KINRA is a subsidiary of PTPN III responsible for managing, developing, and marketing the Sei Mangkei SEZ. The company focuses on managing industrial areas and property assets. The aim is to provide a modern, competitive, and environmentally friendly industrial area while promoting both domestic and foreign investment.

The infrastructure managed by PT KINRA includes A 150 KV and 60 MVA power plant, a biomass power plant with a capacity of 3.5 megawatts, road access within the Sei Mangkei SEZ area, a 75 MMSCFD gas supply system, a water treatment facility capable of processing 250 m^3 per hour, a 6,000-ton PKO storage tank, a 25,000-ton CPO storage tank, a fiber optic network, as well as waste and garbage management facilities. The biomass power plant processes industrial waste from the PTPN III POM as an initiative of PT KINRA to support circular economic activities in addition to ensuring sustainable and environmentally friendly development in the Sei Mangkei SEZ.

FFB Producers

The ownership of the oil palm land in Simalungun Regency (2022) is divided between different plantations. The state-owned is 16% covering 13,580 hectares, private have 37% covering 30,393 hectares, and smallholders own 47% covering 38,867 hectares. The trend showed that both private plantations and

smallholders have the potential to supply FFB to POM PTPN III. However, there is a need for POM PTPN III to obtain RSPO certification in the process of using FFB as a raw material.

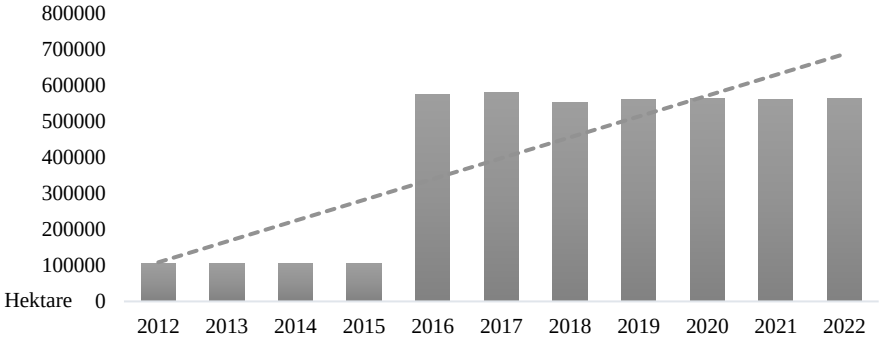


Figure 4. PTPNIII land area from 2012 to 2022
Source: PTPNIII (2023)

Figure 4 shows the land area owned by PTPN III from 2012 to 2022, and a promising upward trend is observed since the implementation of the SEZ policy in Sei Mangkei in 2015. The primary factor that influenced the expansion was the policy issued by the Indonesian government on October 2, 2014 to designate PTPN III as a holding company overseeing 13 other PTPNs.

Figure 5 shows that raw materials are sufficient for palm oil production in the Sei Mangkei SEZ in 2022. This is possible because the availability of RSPO-certified FFB is part of the major factors often considered by investors when investing in Sei Mangkei in addition to the incentives provided by the Indonesian government. However, there is a need to consider potential challenges for PTPN III such as ensuring the continued availability of raw materials and maintaining sustainable practices.

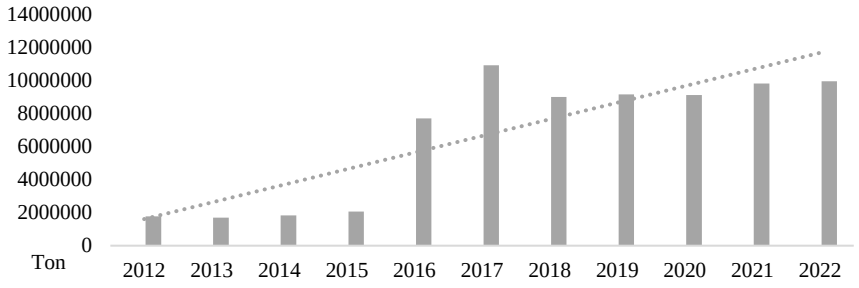


Figure 5. FFB Produced by PTPNIII from 2012 to 2022
Source: PTPNIII (2023)

Approximately 96% of the raw material used by POM PTPN III in 2023 was sourced from PTPN III plantations while 1.5% was from smallholders and 2.5% from private plantations. This shows that most FFB from PTPN III plantations are used as raw material for the POM compared to private plantations and smallholders who do not have RSPO certification. The significant contribution to the raw material supply chain shows the role of PTPN III in the upstream palm oil industry within the Sei Mangkei SEZ.

PTPN III primarily accepts FFB from its plantations to maximize profits. This is in addition to the fact that only a few community and private plantations around the Sei Mangkei SEZ area are RSPO-certified. Meanwhile, statistical data showed that palm oil land owned by the community and private plantations was

approximately 84% or 69,260 hectares. The land is significantly larger than the hectares owned by state-owned plantations.

The interviews conducted with six smallholders and the manager of the Bersatu Makmur Jaya Cooperative showed that most smallholders faced challenges in adopting RSPO certification. The issues were related to land certification as well as the lack of information and knowledge related to the RSPO certification process. The same trend was observed to have been reported in several previous studies (Brandi et al., 2015; Morgans et al., 2018; Watts et al., 2021).

POM and PKOM PTPN III

PTPN III operates 12 POMs and one PKOM in Indonesia which are all RSPO- and ISPO-certified. There is one POM with a processing capacity of 75 tons of FFB per hour and one PKOM with a production capacity of 400 tons per day within the Sei Mangkei SEZ. It was observed that three mechanism changes occurred since the SEZ was established. The first is that there is no longer a production schedule distinguishing between CPO and PKO from RSPO-certified and non-certified FFB. The schedule was in place before the establishment of the SEZ but the absence when using the same facilities enhanced product traceability. This assists in eliminating the risk of mixing RSPO-certified as well as non-certified CPO and PKO.

The second is that PTPN III POM no longer exports or sells CPO outside Simalungun Regency but supplies to PT INL located within the Sei Mangkei SEZ. The same trend is observed for PKO which is currently supplied to PT UOI. The third change is that PT KPBN/Inacom no longer directly markets CPO and PKO produced by PTPN III POM and PKOM in Sei Mangkei.

The traceability of sustainable palm oil production in line with the RSPO standards is considered ideal. This is because the products are physically separated from uncertified palm oil starting from the production site to the port (Ramli et al., 2020).

PT UOI/Manufacturing

PT UOI is a subsidiary of Unilever Global and has invested IDR 2.765 trillion in the Sei Mangkei SEZ based on the report from 2021. The company has employed approximately 600 direct workers and 2,000 indirect workers since its establishment in the area. PT UOI specializes in producing oleochemical products such as fatty acids, glycerin, soap, natural surfactants, and Dove-related products using vegetable oil as a raw material. It has purification, separation, glycerin purification, fermentation, surfactant factory, and pilot plant facilities for the esterification process. An important information is that 100% of the PKO raw materials are sourced from PKOM PTPN III through contracts renewed in accordance with world market prices. Moreover, PT UOI collaborates with PT Alliance for the packaging of soap noodles.

The products of the company are shipped as ingredients to 42 countries where Unilever operates factories for the purpose of producing cosmetics or processed foods. PT UOI has recorded import and export activities for products requiring RSPO certification with major buyers including Peter Cremer North America and Hindustan Unilever Ltd. The most important importing countries are India, the United States, and the Philippines.

Unilever Global has a policy called the Unilever Sustainable Palm Oil Sourcing Policy (USPOSP) which aims to drive change in the palm oil supply chain (Unilever, 2016). The aim is to ensure FFB and palm oil adhere to the principles of no deforestation, no peat, and no exploitation (NDPE). In 2019, Unilever set a target to source 100% sustainable palm oil from certified sources that were also traceable to their origin. Another effort implemented to achieve the commitments outlined in the USPOSP was the signing of a memorandum of understanding (MoU) on the produce-protect model cooperation with PTPN III on January 25, 2018. This produce-protect model of cooperation aimed to accelerate the production of

sustainable palm oil while protecting the environment. In 2017, 63 smallholders who were members of UD Lestari in North Sumatra successfully obtained RSPO certification which was facilitated by PT UOI (Unilever, 2017).

PT INL/Manufacturing

PT Industri Nabati Lestari (PT INL) is a subsidiary of PTPN III established to use CPO produced as a by-product from the POM activities. This subsidiary was established to maximize profits beyond the sale of PKO to PT UOI. PT INL processes CPO produced by POM into different derivative products but the main one is cooking oil under the Salvaco, INL, Nusakita, and Minyakita brands. The company also sells by-products from the cooking oil production process such as Olein, Stearin, RBDPO (Refined, Bleached, Deodorized Palm Oil), and PFAD (Palm Fatty Acid Distillate).

PT INL has two cooking oil factories in Simalungun, North Sumatra and sells cooking oil to the domestic market with a yearly production capacity of 600,000 metric tons. Olein, Stearin, RBDPO, Purine Fatty Acids, and Stearin are sold domestically and for export. An example of the consumers of Stearin is PT Aice which is located in the Sei Mangkei SEZ.

Linkages between Stakeholders in Value Chain

A vertical linkage value chain exists in the palm oil industry within the Sei Mangkei SEZ as observed between PTPN III Plantation, POM/PKOM PTPN III, and PT UOI for oleochemical products. This shows a collaborative relationship within value chain of the SEZ. Moreover, the collaboration between PTPN III and PT UOI contributed to the upgrading of the palm oil value chain in the area.

The collaborative relationships between stakeholders in geographically integrated industrial areas offer several benefits such as enhanced resource utilization and efficiency, economies of scale, optimized spatial equity, resilience to external shocks, improved stakeholder engagement, and support for sustainable development (Ali & Haapasalo, 2023; Liu et al., 2023; Ma et al., 2023). This further leads to fair treatment of trading partners, transparent communication, and sustainable practices to build trust and competitiveness. The efforts to leverage the benefits allow geographically integrated industrial areas to provide a more competitive, innovative, and sustainable ecosystem.

5. DISCUSSION

The results showed that the palm oil value chain in Sei Mangkei was upgraded since the implementation of the SEZs policy. The first improvement identified was enhanced traceability because the entire PKO and FFB production process has become traceable due to compliance with RSPO standards. This was observed from the fact that CPO and PKO production activities depended on FFB from plantations not RSPO-certified before the establishment of SEZ and investment of PT UOI. RSPO certification is a key traceability indicator in the palm oil industry because plantations and mills are required to fulfill seven principles. The third principle focuses on optimizing productivity, efficiency, and traceability of the supply chain (Roundtable on Sustainable Palm Oil, 2018). PT UOI facilitated the acquisition of RSPO certification for 63 smallholder members of UD Lestari in North Sumatra in 2017. The second improvement was product diversification related to derivatives within the Sei Mangkei SEZ. This is observed from the fact that CPO and PKO are currently processed into different palm oil derivative products by PT UOI and PT INL instead of being exported as raw materials. The third improvement was the demand certainty for PKO of PTPN III Sei Mangkei by PT UOI. This shows there is no need for PTPN III to market PKO through PT KPBN/Inacom which is the situation before the establishment of SEZ.

The upgrading of the palm oil value chain is driven by both internal and external factors. The internal factor includes actors within value chain, particularly Unilever Global (PT UOI) which implements the Unilever Sustainable Palm Oil Sourcing Policy (USPOSP) to drive change in the palm oil supply chain toward greater sustainability (Unilever, 2016). This has motivated Unilever to commit toward ensuring FFB and palm oil comply with the principles of No Deforestation, No Peat, and No Exploitation (NDPE). Meanwhile, the external factor is the RSPO certification held by existing industry players such as PTPN III. The USPOSP policy requires PT UOI to find partners producing PKO using FFB that meet sustainable standards in terms of the environment and in accordance with the NDPE principles. A suitable example is PTPN III which owns plantations in North Sumatra as well as an RSPO-certified POM and PKOM in Sei Mangkei.

The upgrading of value chain in the Sei Mangkei SEZ has several impacts. The first is increased investment and stakeholder engagement. This is achieved by attracting foreign companies which leads to an increase in the number of stakeholders operating in the palm oil industry value chain in the region. For example, PT Alliance packages the soap noodles of PT UOI through the establishment of operations in the region. The second is the utilization of by-products through the establishment of PT INL using the CPO produced by PTPN III POM as raw material for cooking oil in order to maximize profits. The third is the economic benefits for PTPN III due to increased marketing efficiency for PKO and CPO through the disengagement of the services provided by PT KPBN/Inacom.

The first and most significant foreign investor in Sei Mangkei was PT UOI which collaborated with PTPN III to enhance the palm oil value chain in order to establish the region as a key production and logistics hub for the global oleochemical product supply chain of Unilever. The inclusion of PTPN III in the production and logistics hub led to the integration of the company into the GVCs of palm oil. This was in line with the results of the studies conducted by Zeng (2016) and the United Nations Conference on Trade and Development (2019).

The SEZ offers both fiscal and non-fiscal incentives which further enable PT UOI to build a large, high-tech factory with a significant investment of IDR 2.765 trillion (2021). Furthermore, PT UOI does not have to bear the cost of building infrastructure such as highways, lighting, railways, and ports for exports because the facilities are funded by the Indonesian government. Most oil palm plantations in the country are located in rural areas with poorer infrastructure access compared to urban areas. Moreover, the establishment of plantations, POMs, PKOMs, and export-oriented manufacturing industries requires significant investment in infrastructure development. The SEZ allows PT UOI to avoid infrastructure development costs which leads to a reduction in overall investment expenses compared to other locations.

PT UOI could have invested in the region without the SEZ but the investment value would not have been as substantial. This is due to the need for the company to finance infrastructure development as well as the absence of fiscal and non-fiscal incentives.

The analysis conducted in this study showed that both internal actors including USPOSP policy and PT UOI strategy as well as external actors in the form of sustainability certification or RSPO were significant in upgrading and shaping new value chain (Jespersen et al., 2014; Tran et al., 2013). The results complemented the report of Perdana (2019) concerning the factors that contributed to the upgrading of the palm oil industry value chain in Indonesia. It also supported the observation of Chiriacò et al. (2022) regarding the RSPO certification scheme which promoted sustainable practices in different palm oil industries.

6. CONCLUSION

In conclusion, the palm oil value chain was upgraded following the implementation of the SEZ policy in Sei Mangkei. Although not the main driver of value chain upgrading, the introduction of SEZ policy led to enhanced traceability, product diversification, and improved stakeholder integration. Traceability improved due to the adoption of RSPO certification standards, ensuring that palm oil products are traceable from plantation to end product. After the SEZ was established in Sei Mangkei, product diversification occurred because CPO and PKO began to be processed into derivative products, instead of previously being exported solely as raw materials.

The Sei Mangkei SEZ facilitated the integration of local actors, especially PTPN III and its subsidiaries, into GVC, attracting major foreign investors such as Unilever Global (PT UOI). Collaborative relationships between domestic and international stakeholders fostered innovation, efficiency, and compliance with international sustainability standards.

Internal drivers included Unilever corporate policy such as USPOSP, which mandates sustainable and traceable raw material sourcing in line with NDPE principles. External drivers were regulatory and certification requirements, notably RSPO certification, which became a prerequisite for market access and investment.

The SEZ model reduced barriers for investors by providing fiscal and non-fiscal incentives, making Sei Mangkei an attractive hub for palm oil processing and export. The success of the Sei Mangkei SEZ offers a model for other regions seeking to balance economic growth with environmental and social sustainability in the palm oil sector.

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APPENDIX

Fiscal incentives for investors in SEZ

Scope	Facility and Easiness (PMK 33/2021)
Income Taxes	1. Tax Holiday :
	Income tax reduction of up to 100% with a minimum investment of Rp 100.000.000.000 (100 Billion).
	The duration provisions are as follows:
	- Income tax reduction for ten years with a total investment of 100 billion – less than 500 billion.
	- Income tax reduction for 15 years with a total investment of 500 billion – less than 1 trillion.
	- Income tax reduction of 20 years with a total investment of 1 trillion and beyond.
	2. Tax Allowance:
	- Reduction of Net Income by 30% for six years.
	- Accelerated Depreciation.
	3. Income tax on dividend for 10% = Compensation for loss of 5-10 years.
Value Added Tax (VAT) and Luxury Sales Taxes	1. Import (not levied).
	2. Input from other places in the customs area to SEZ (not levied).
	3. Output from SEZ to other places in the customs area (not levied).
	4. Transaction among enterprises in SEZ (not levied).
	5. Transaction with enterprises in other SEZs (not levied).
Customs	From SEZ to domestic market: import duty using Certificate of Origin (CoA).
Property Ownership for Foreigner	1. Foreigners / foreign enterprises may have residential / property in SEZ (house site or apartment unit).
	2. Owner occupancy/property is given a residence permit with a guarantee from the Managing Enterprises of SEZ.
	3. Exempted for VAT and luxury Sales Taxes.
For main activities in the tourism sector	1. May be granted for tax reduction by 50-100% on the first development.
	2. May be granted for entertainment tax reduction by 50-100%.

Source: Regulation of the Minister of Finance of the Republic of Indonesia No. 33 of 2021.

Non-fiscal incentives for investors in SEZ

Scope	Facility and Easiness (PMK 33/2021)
Employment	1. A wage council and tripartite cooperation institution will be established in SEZ.
	2. Only one worker union in every company.
	3. Ratification and extension planning of foreign worker utilization in SEZ.
	4. Permit extension using foreign workers in SEZ.
Immigration	1. Visitation facility in the form of visa upon arrival for 30 days and can be extended five (5) times each 30 days.
	2. Multiple visas valid for one year.
	3. Residence permits for foreigners that have property in SEZ.
	4. Residence Permits elderly foreigners living in SEZ tourism.
Land	1. SEZ, which private enterprises propose, is given building using rights, and the extension is given directly in granting rights.
	2. SEZ's Administrator can give land service.
License	1. Administrator responsible for issuing licenses and permits through the principle of one-stop service in SEZ.
	2. Permit publishing acceleration by (in case all requirements are completed).
	3. Implementation of the licensing and nonlicensing requirement compliance (checklist).
	4. Process and completion of licensing and non-licensing of immigration, labor, and land in SEZ's Administrator.

Source: Regulation of the Minister of Finance of the Republic of Indonesia No. 33 of 2021.