



Sustainable Palm Oil Downstream Value Chain in Industrial Zones: A Case Study in Riau Province, Indonesia

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Abstract Indonesia, the world's top palm oil producer, yielded 46.99 million tons in 2023. The province of Riau, which leads in both production and plantation area, has initiated three industrial zones focused on palm oil cultivation. Of all the industrial estates, only the Dumai Industrial Estate (DIE) is implementing downstream processing by 2025, potentially enhancing the sector's value-added contribution. Although numerous studies have been conducted on the palm oil value chain in Indonesia, no research has focused on specific regions or examined the relationships between the entities within those regions. This study examines the structure and governance of the value chain in DIE. DIE has four distinct value chains: Wilmar International Group (WIG), First Resources Group (FRG), Permata Hijau Group (PHG), and Sumber Jaya Oleo Group (SJIOLEO). These four supply chains function independently with no horizontal integration. DIE specializes in palm oil-based products, including oleofood, oleochemicals, and oleofuel (biodiesel). Notably, only the WIG chain, through PT Wilmar Nabati Indonesia, employs RSPO-certified CPO for its export products. PT Wilmar Bioenergi Indonesia, operating within the WIG, FRG, PHG, and SJIOLEO chains, does not procure RSPO-certified CPO because its production of biofuels and oleochemicals primarily serves the domestic market. In DIE, not all downstream palm oil activities focus on exports, and value chain governance, whether based on RSPO or non-RSPO certification, follows a hierarchy type.

Keywords downstream, governance, industrial zones, palm oil industry, value chain

INTRODUCTION

Over the last ten years, palm oil has become the most widely produced vegetable oil globally. Valued for its high vitamin E content (Kuppithayanant et al., 2014), it represents around 40% of the global vegetable oil market (Gandhi and Takanashi, 2025). Southeast Asia leads the sector, producing over 80% of palm oil and nearly one-third of all vegetable oils (OECD/FAO, 2024). Over the past five years, Indonesia has established itself as the world's largest palm oil producer. In 2023, Indonesia produced 47.08 million tons of Crude Palm Oil (CPO) (BPS, 2024), sourced from 16.83 million hectares of palm oil plantations. Domestic palm oil consumption reached 23.13 million tons in 2023, an increase from 21.24 million tons in 2022 (GAPKI, 2024). This increase was largely attributed to the implementation of the biodiesel (B35) policy, which significantly increased domestic palm oil demand for biodiesel production. Conversely, Indonesian palm oil exports have steadily declined in the past five years. In 2023, exports totaled 38.23 million metric tons, with a value of USD 25.61 billion (Ministry of Agriculture, 2024). The palm oil industry is a vital component of Indonesia's economic development. However, growing international concerns regarding the environmental and social sustainability of its supply chain have intensified in recent years (Carmagnac et al., 2022). In

particular, regulatory and consumer pressures from the EU have compelled the industry to enhance transparency and align its operations with globally recognized sustainability standards. Few sectors actively promote certification participation among their members as strongly as the palm oil industry, particularly with schemes such as the Indonesian Sustainable Palm Oil (ISPO) and the Roundtable on Sustainable Palm Oil (RSPO). These initiatives play a significant role in shaping industry practices, as certification for product safety and differentiation has been shown to influence entire value chains across various sectors (Gereffi and Lee, 2009). Riau Province is a leading palm oil producer in Indonesia, with a total production of 8.79 million tons from 2.87 million hectares of plantations. As a key province in palm oil production, the Riau Provincial Government has established three industrial zones focused on the palm oil sector: Dumai Industrial Estate (DIE), Tanjung Buton Industrial Estate (TBIE), and Tenayan Industrial Estate (TIE). Among these, only DIE currently accommodates downstream palm oil industry. Although several studies have examined Riau's palm oil value chain, its structure and governance palm oil value chain remain largely unexplored.

OBJECTIVE

This study analyzes the structure and governance of the palm oil industry value chain in the DIE.

METHODOLOGY

The value chain describes the entire product creation chain (Porter, 1985). In a broader sense, value chain analysis refers to the activities within a single company to bring a product to market. Meanwhile, in a broad sense, the value chain looks at a series of vertically and horizontally complex activities carried out by various actors to bring raw materials and final products through the chain to the sales. Lazarrini developed the net chain concept, a critical theoretical framework in this study, to show vertical and horizontal value chain linkages (Lazarrini et al., 2001). Vertical integration reflects the flow of products and services from primary producers to final consumers (i.e., value chain or supply chain). The horizontal dimension represents the relationships between actors in the same chain. Gereffi and Fernandez-Stark (2016) identified five types (market, modular, relational, captive and hierarchy) of global value chain (GVC) governance: high to low levels of explicit coordination and power asymmetry between buyers and suppliers. The governance type is determined by four key variables: complexity of transactions, ability to codify transactions, capabilities in the supply base, and degree of explicit coordination and power asymmetry.



Source: Modified from PT KID by authors (2024).

Fig. 1 Research area

Understanding GVC governance is crucial as it reveals power dynamics, affects risk and reward distribution, improves labor and environmental standards, and enables value chain upgrading. This study adopted a comprehensive case study approach. The chain analysis steps carried out in this study were data collection, value chain, and governance analysis. The researcher collected secondary data

from documents, statistical records, research studies, and reports related to the DIE. This data was analyzed by reviewing relevant documents in the study. This holistic approach ensures a comprehensive understanding of the subject matter. Primary data were collected through semi-structured interviews conducted during the field survey to examine the profiles of actors operating in DIE. DIE is located at Jl. P.Sumatera No.1, Dumai Industrial Area, Pelintung, Medang Kampai, Dumai City (Fig. 1). Dumai City is in Riau Province, Indonesia, on the East Coast of Sumatra Island. Dumai officially became a city on April 20, 1999, after being part of Bengkalis Regency. Dumai has an area of approximately 2,065.59 km² with 7-36 villages. In 2023, the population of Dumai is estimated to reach 338,064 people. Dumai is known as the "Oil City" because it has a rapidly growing oil and gas industry and serves as a center for palm oil processing. Dumai has a strategic port for international trade, especially with Malaysia and Singapore. The DIE plays a major role in Dumai's regional economic growth, with observable positive impacts on the GRDP and industrial diversification (Sumarno et al., 2001). The author conducted a study on DIE in September 2024.

RESULTS AND DISCUSSION

Entities Operating in Dumai Industrial Estate

DIE is the largest industrial area in the Riau Province, with a total land area of 1,792 ha. The basis of the Industrial Estate Policy regulation is Presidential Decree No. 53 of 1989. DIE was officially recognized as a National Vital Object in the Industrial Sector under Ministerial Decree No. 805/M-IND/Kep/12/2017. Eligible investors receive incentives such as reduced income tax, VAT exemption, and import duty reliefs. In addition to these fiscal benefits, non-fiscal incentives are available, including support for constructing and managing power plants. Regional tax incentives may include reductions, reliefs, or exemptions from land ownership taxes and street-lighting levies.

Table 1 List of companies invested in Dumai industrial estate

No	Company	Established	Product	Activity	Land area (ha)	Country
1	PT Sentana Adi Daya Pratama	1999	KCl (potassium chloride) crown fertilizer, Peruvian rock phosphate crown fertilizer, ZA (ammonium sulfate) crown fertilizer, TSP (triple super phosphate) crown fertilizer	Fertilizer production	16.63	Singapore
2	PT Murini Sam Sam II	2006	Palm kernel and CPO	Palm oil mill	7.18	Singapore
3	PT Wilmar Nabati Indonesia	2008	Olein, stearin and PFAD	Refinery, fractionation, oleochemical and flour mill	53.43	Singapore
4	PT Wilmar Bioenergi Indonesia	2008	Fatty acid methyl esters	Refinery for biodiesel	11.50	Singapore
5	PT Petro Andalan Nusantara	2008	Oil	Fuel oil trading	2.71	Singapore
6	PT Wilmar Chemical Indonesia	2008	Methanol	Methanol trading	1.81	Singapore
7	PT Ciliandra Perkasa	2009	FAME, PFAD, crude glycerine, fatty mater	Refinery for biodiesel	5.08	Singapore
8	PT Bumi Karyatama Raharja	2014	Activated clay/ bleaching earth	Chemical industry for mining	9.20	Singapore
9	PT Samator Indo Gas	2015	Nitogen	Nitrogen (N ₂) plant	3.01	Indonesia
10	PT Pelita Agung Industry	2019	FAME, PFAD, crude glycerine, fatty mater, palm kernel expeller	Refinery for biodiesel	21.20	Indonesia
11	PT Perusahaan Listrik Negara	2020	Electricity	Powerplant	40.60	Indonesia
12	PT Sumber Jaya Industri Oleo	2022	RBDO (refined, bleached, deodorized oil), PFAD, RBDPO (refined, bleached, deodorized palm olein)	Refinery	4.57	Indonesia

Source: Authors' field survey and document review (2024).

On August 31, 2010, the Indonesian Government designated DIE as a Palm Oil Industry Cluster, although it is also open to various other types of industries. In 2024, there are 12 tenants, four from Indonesia and eight from Singapore. Seven of the 12 companies are subsidiaries of the Wilmar International Group. The 12 tenants employ 9,524 permanent and 176 outsourcing workers. DIE is managed by PT Kawasan Industri Dumai (KID), a subsidiary of the Wilmar International Group Ltd.

Palm Oil Value Chain and Governance in Dumai Industrial Estate

1. The Wilmar International Group (WIG): The WIG, founded on April 1, 1991, has grown from a small trading company into Asia's leading agribusiness group. Today, WIG is a global leader in agribusiness with over 500 manufacturing plants worldwide and a diverse portfolio including oil palm cultivation, edible oils refining, oilseeds crushing, consumer products, specialty fats, oleochemicals, biodiesel manufacturing, sugar milling, and refining with its headquartered in Singapore. The WIG Value Chain involves four companies located in the DIE. Three companies, PT Murini Sam Sam II (POM), PT Wilmar Nabati Indonesia (Refinery), and PT Wilmar Bioenergi Indonesia (Refinery) are in the downstream palm oil industry. Meanwhile, PT Sentana Adi Daya Pratama (PT SADP) is involved upstream as a supplier of agricultural inputs in the form of fertilizers for oil palm plantations owned by WIG outside the DIE. POM PT Murini Sam-Sam II (PT MSSII) obtains RSPO-certified Fresh Fruit Bunches (FFB) from Wilmar plantations and non-RSPO-certified FFB from private plantations and smallholders. PT MSSII produces RSPO-certified CPO for PT Wilmar Nabati Indonesia (PT WNI), which is used as a raw material for oleofood production. PT MSSII also produces non-RSPO-certified CPO for PT Wilmar Bioenergi Indonesia (PT WBI), which is used as a raw material for oleofuels. To meet its production needs, in addition to PT MSSII, PT WBI and PT WNI also obtain CPO supplies from WIG's POMs located outside the DIE. In DIE, PT WBI produces Fatty Acid Methyl Ester (FAME), which is sold domestically to PT Pertamina as biodiesel. PT WNI produces Olein, Stearin, and Palm Fatty Acid Distillate (PFAD), which are exported to WIG subsidiaries in Singapore, Malaysia, Germany, and China. In the WIG value chain, there are no horizontal or vertical relationships with tenants outside the WIG, indicating that Wilmar International manages its transactions independently from upstream to downstream.

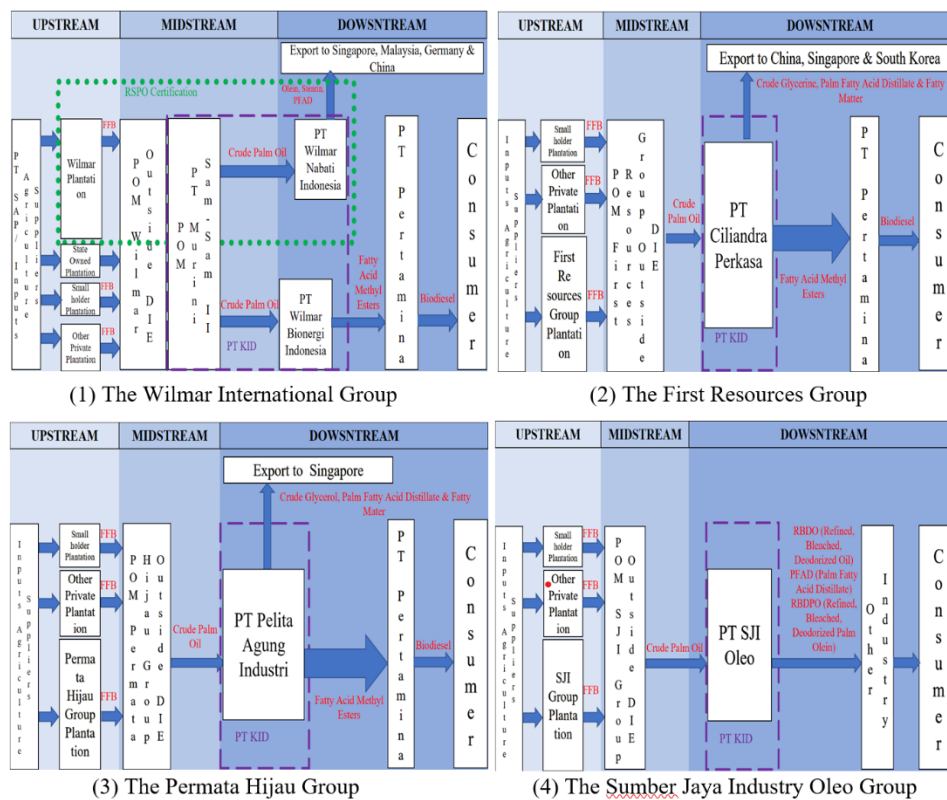
2. The First Resources Group (FRG): The FRG was established in 1992 and has been listed on the Singapore Exchange since 2007. FRG is a leading palm oil producer in Southeast Asia, headquartered in Singapore. The company manages over 200,000 hectares of oil palm plantations across Indonesia's Riau, East Kalimantan, and West Kalimantan Provinces. The core business activities include oil palm cultivation, harvesting, and CPO and PK processing. The FRG has one DIE refinery company, PT Ciliandra Perkasa (PT CP). PT CP obtains its CPO supply from POM FRG, which is located outside the DIE. PT CP produces Crude Glycerine, PFAD, and Fatty Mater, which are exported to China, Singapore, and Korea. In addition, PT CP produces FAME, which is sold domestically to PT PERTAMINA as a biodiesel. PT CP (FRG Value Chain) does not utilize RSPO-certified raw materials and has no horizontal or vertical relationships with other tenants in the DIE.

3. The Permata Hijau Group (PHG): PHG is a fully integrated palm oil corporation founded in 1984, with its headquarters in Medan. The company's core business is palm oil plantations, and it has since expanded to cover the entire palm oil value chain. PHG's operations span from upstream plantation to midstream and downstream industries and produce value-added products. PHG manages a total land area of 24,500 ha for oil palm cultivation. PHG operates six POMs, six refineries, five palm kernel oil mills, three biodiesel plants, two oleochemical plants, and a specialty fat plant, all of which are located in Indonesia. PHG has a refinery company located in DIE, PT Pelita Agung Industri (PT PAI). PT PAI obtains its raw material supply as CPO from POM PHG outside the DIE. PT PAI produces Crude Glycerine, PFAD, Fatty Mater, and Palm Kernel Expeller (PKE), which are exported to Singapore. In addition, PT PAI produces FAME, which is sold domestically to PT PERTAMINA as a biodiesel. The PT PAI (PHG Value Chain) does not utilize RSPO-certified raw materials and has no horizontal or vertical relationships with other tenants in the DIE.

4. The Sumber Jaya Industry Oleo Group (SJIOLEO): SJIOLEO is an Indonesian-based fully

integrated palm oil company focusing on downstream operations, with its head office in Jakarta. The company's scope ranges from producing, sourcing, refining, and trading palm oil and its products. SJIOLEO has a refinery company located in DIE, PT Sumber Jaya Industri Oleo (PT SJIOLEO). PT SJIOLEO is the newest company to operate in DIE in 2022. PT SJIOLEO obtains its raw materials from POM PT SJIOLEO outside the DIE. PT SJIOLEO produces Refined, Bleached, Deodorized Oil (RBDO), PFAD, and Refined, Bleached, Deodorized Palm Olein (RBDPO), which are sold to the domestic oleochemical and oleo food industries. PT SJIOLEO does not utilize RSPO-certified raw materials and has no horizontal or vertical relationships with other tenants of DIE.

Based on the four palm oil value chains in DIE (Fig.2), value chain governance in DIE can be divided into two types: governance with RSPO certification and without RSPO certification (Fig. 3). The majority of industries in DIE use non-RSPO certification (ISPO) because they are domestically oriented. The types of interactions between actors in RSPO and non-RSPO palm oil value chain governance vary significantly at the upstream, midstream and downstream levels. Overall, at the upstream and downstream levels, these two types of value chain governance differ. However, at the midstream level, both follow a hierarchical structure. The discussion primarily focuses on midstream value chain governance because this study was conducted in DIE.



Source: Authors' field survey and document review (2024).

Fig. 2 Four palm oil value chains in DIE

RSPO Certification Value Chain Governance at DIE

At DIE, the interaction between PT MSSII and PT WNI involves the transaction of RSPO-certified CPO as a raw material for producing RSPO-certified oleofood ingredients. The production process must comply with seven RSPO sustainability requirements, necessitating actors with specialized capabilities. This leads to high transaction complexity in terms of linkages, capabilities, codification and product/process specifications. However, because the commodities already meet RSPO standards, the ability to codify transactions is low. Both companies are subsidiaries of Wimar International (WI), with top management control exercised through WI's head office in Singapore,

CONCLUSION

Based on the results and discussion, it is known: Firstly, DIE has four distinct value chains: WIG, FRG, PHG, and SJIOLEO. These four chains operate independently and are not horizontally integrated into each other. Secondly, only PT WNI in the WIG chain uses RSPO-certified CPO. PT WBI in the WIG, PT CP in the FRG, PT FAI in the PHG, and PT SJIOLEO in the SJIOLEO group chain do not use RSPO-certified CPO because they produce biofuels and oleochemicals that are primarily used domestically. Not all downstream palm oil activities in the DIE are export-oriented. Thirdly, the value chain governance type that uses RSPO or non-RSPO certification in DIE is hierarchical.

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