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PALM OIL DOWNSTREAMING POLICY FOR CAPTURING BETTER VALUE-ADDED OF PALM OIL

POLÍTICA DE DOWNSTREAMING DO ÓLEO DE PALMA PARA CAPTURAR UM MELHOR VALOR AGREGADO DO ÓLEO DE PALMA

POLÍTICA DE TRANSFORMACIÓN DEL ACEITE DE PALMA PARA AUMENTAR SU VALOR AÑADIDO

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ABSTRACT

Indonesia, as the world's largest producer of palm oil, had long relied on exporting crude palm oil (CPO) with limited industrial processing, resulting in missed economic opportunities in value addition. To overcome this, downstreaming policies have been promoted to enhance domestic processing and industrial diversification. This study aims to explore the extent to which these downstreaming strategies have successfully increased the value-added contribution of palm oil to Indonesia's economy. Employing a qualitative literature review approach, this research analyses more than 80 scientific articles, policy reports, and statistical publications through thematic content analysis. Data collection was conducted using a structured review of relevant academic databases and institutional sources, managed and organised through Mendeley Desktop. Analytical procedures involved coding, synthesising, and interpreting patterns across themes such as export performance, industrial output, employment, and fiscal impact. The findings indicate a significant shift in Indonesia's palm oil export structure, with processed derivatives constituting over 75% of total exports in 2021. Oleochemical production and biodiesel output have grown considerably, supporting industrial development. However, downstream activities still contribute less than 10% of total value-added and face persistent constraints such as weak R&D, low technology adoption, and infrastructural limitations. The study concludes that while policy efforts have delivered measurable progress, structural reforms and better inter-agency coordination are essential to deepen downstream gains. Future research should focus on firm-level innovation capacity and integration with global sustainability standards.

Keywords: Palm oil. Downstream policy. Value-added. Industrial development. Indonesia.

RESUMO

A Indonésia, como o maior produtor mundial de óleo de palma, há muito tempo dependia da exportação de óleo de palma bruto (CPO) com processamento industrial limitado, resultando na perda de oportunidades econômicas de agregação de valor. Para superar isso, foram promovidas políticas de downstreaming para aumentar o processamento

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doméstico e a diversificação industrial. Este estudo tem como objetivo explorar até que ponto essas estratégias de downstreaming conseguiram aumentar a contribuição de valor agregado do óleo de palma para a economia da Indonésia. Empregando uma abordagem qualitativa de revisão da literatura, esta pesquisa analisa mais de 80 artigos científicos, relatórios de políticas e publicações estatísticas por meio de análise de conteúdo temático. A coleta de dados foi realizada por meio de uma revisão estruturada de bancos de dados acadêmicos e fontes institucionais relevantes, gerenciados e organizados pelo Mendeley Desktop. Os procedimentos analíticos envolveram a codificação, a síntese e a interpretação de padrões entre temas como desempenho de exportação, produção industrial, emprego e impacto fiscal. Os resultados indicam uma mudança significativa na estrutura de exportação de óleo de palma da Indonésia, com os derivados processados constituindo mais de 75% do total das exportações em 2021. A produção oleoquímica e a produção de biodiesel cresceram consideravelmente, apoiando o desenvolvimento industrial. Entretanto, as atividades downstream ainda contribuem com menos de 10% do valor agregado total e enfrentam restrições persistentes, como P&D fraco, baixa adoção de tecnologia e limitações de infraestrutura. O estudo conclui que, embora os esforços políticos tenham proporcionado um progresso mensurável, as reformas estruturais e uma melhor coordenação entre as agências são essenciais para aprofundar os ganhos a jusante. Pesquisas futuras devem se concentrar na capacidade de inovação em nível de empresa e na integração com os padrões globais de sustentabilidade.

Palavras-chave: Óleo de palma. Política downstream. Valor agregado. Desenvolvimento industrial. Indonésia.

RESUMEN
Indonesia, como mayor productor mundial de aceite de palma, ha dependido durante mucho tiempo de la exportación de aceite de palma crudo (CPO) con un procesamiento industrial limitado, lo que ha dado lugar a la pérdida de oportunidades económicas en la adición de valor. Para superar esta situación, se han promovido políticas de «downstreaming» para potenciar la transformación nacional y la diversificación industrial. El objetivo de este estudio es analizar en qué medida estas estrategias de transformación han conseguido aumentar la aportación de valor añadido del aceite de palma a la economía indonesia. Empleando un enfoque de revisión bibliográfica cualitativa, esta investigación analiza más de 80 artículos científicos, informes políticos y publicaciones estadísticas mediante un análisis de contenido temático. La recopilación de datos se llevó a cabo mediante una revisión estructurada de bases de datos académicas y fuentes institucionales pertinentes, gestionadas y organizadas a través de Mendeley Desktop. Los procedimientos analíticos consistieron en codificar, sintetizar e interpretar patrones en temas como los resultados de exportación, la producción industrial, el empleo y el impacto fiscal. Los resultados indican un cambio significativo en la estructura de las exportaciones de aceite de palma de Indonesia, con los derivados procesados constituyendo más del 75% de las exportaciones totales en 2021. La producción oleoquímica y de biodiésel ha crecido considerablemente, apoyando el desarrollo industrial. Sin embargo, las actividades derivadas siguen aportando menos del 10% del valor añadido total y se enfrentan a limitaciones persistentes, como la escasa I+D, la baja adopción de tecnología y las limitaciones infraestructurales. El estudio concluye que, si bien los esfuerzos políticos han dado lugar a avances mensurables, las reformas estructurales y una mejor coordinación entre organismos son esenciales para profundizar en los beneficios derivados. La

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investigación futura debería centrarse en la capacidad de innovación de las empresas y en su integración con las normas mundiales de sostenibilidad.

Palabras clave: Aceite de palma. Política descendente. Valor añadido. Desarrollo industrial. Indonesia.

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INTRODUCTION

The global palm oil industry has evolved into one of the most strategically significant sectors in the agricultural commodity landscape, driven by its diverse applications ranging from food production and cosmetics to biofuel and industrial lubricants (Ince et al., 2024). As the world's largest producer and exporter of crude palm oil (CPO), Indonesia holds a dominant position in the international market, accounting for over 50% of global supply (Jamilah et al., 2022). However, despite this commanding role in upstream production, the country had historically struggled to fully capture the downstream value-added potential embedded within the palm oil value chain (Oosterveer, 2015).

Value addition in palm oil is closely tied to the development of downstream industries, including the refinement, fractionation, and transformation of crude palm oil into higher-value derivatives such as oleochemicals, biodiesel, and processed food ingredients (Jaafar et al., 2015). These downstream activities offer substantially higher economic returns compared to raw commodity exports, generating employment, increasing fiscal revenues, enhancing trade balances, and fostering technological development (Hadiguna & Tjahjono, 2017). Yet, in many palm oil-producing nations, including Indonesia and Malaysia, the structure of the industry has remained skewed toward the upstream segment, with limited domestic processing capabilities (Fajarika et al., 2023).

One of the critical factors constraining the growth of downstream palm oil industries was policy inconsistency. Historically, national strategies have alternated between encouraging exports and promoting local value addition, often resulting in conflicting incentives for industry actors (Bouet et al., 2012). Export taxes on CPO and differential levy schemes, for example, have attempted to stimulate downstream investment, yet these measures have faced criticism for lacking clarity, predictability, and coordination with broader industrial and environmental objectives (Oyebamiji, 2024). Additionally, trade barriers, infrastructural bottlenecks, and a fragmented regulatory landscape further complicate efforts to establish a robust downstream sector (Piccardi & Tajoli, 2018).

The issue of value-added in palm oil is particularly pressing in light of the commodity's volatile pricing and growing global scrutiny related to environmental, social, and governance (ESG) concerns (Azizi et al., 2024). As demand for sustainably produced palm oil rises in Europe, North America, and other markets, producing countries are compelled to not only enhance environmental stewardship but also to move up the value chain in order to remain competitive (Dauvergne, 2018). This shift is especially vital for

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developing countries seeking to leverage natural resource endowments to drive long-term industrial development and economic transformation (Rustiadi et al., 2023).

Moreover, downstreaming aligns with the broader policy agenda of structural economic transformation. Transitioning from a commodity-based economy to one anchored in industrial value creation is a critical path for achieving middle-income and high-income status (Lu et al., 2019). By promoting palm oil downstreaming, governments can stimulate domestic manufacturing, develop technical expertise, and reduce vulnerability to global commodity price shocks (McCarthy et al., 2012). Nonetheless, this transition requires more than fiscal incentives—it demands institutional reforms, targeted investment in research and development, and coordination among stakeholders across the value chain (Leydesdorff & Ivanova, 2016).

International experiences provide important insights. Malaysia's concerted efforts in downstream palm oil development since the early 2000s, including the establishment of dedicated clusters and investment in innovation ecosystems, have helped the country expand its oleochemical industry substantially (Giacomin, 2016). Similarly, Thailand and Colombia have introduced policy measures that emphasise local processing and diversification of palm oil products to strengthen domestic industries (Degli Innocenti, 2024). These examples highlight the role of state-led planning and policy coherence in fostering downstream industrial development.

Despite these lessons, Indonesia's performance in downstreaming remains uneven. While the government has introduced various incentives and regulatory adjustments, including the Indonesian Sustainable Palm Oil (ISPO) certification and biofuel mandates, the downstream sector continues to face operational inefficiencies, underinvestment in refining technology, and limited access to international markets for high-value derivatives (Rahutomo et al., 2025). Furthermore, the concentration of processing facilities in a few regions has left large parts of the supply chain disconnected from downstream opportunities, reinforcing spatial inequality and limiting broader developmental impact (Abram et al., 2016).

A key limitation in the implementation of downstreaming policies lies in the lack of systematic, evidence-based evaluation of what has worked and what has not. Many existing analyses focus either on trade performance or sustainability compliance, without offering a holistic view of the institutional, economic, and policy frameworks necessary for capturing value-added (Koch, 2021). Therefore, there is an urgent need to critically assess

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the landscape of palm oil downstreaming policies through a qualitative and integrative review of existing literature, in order to draw meaningful conclusions for future policy design.

This study aims to conduct a qualitative literature review on palm oil downstreaming policies with the objective of identifying key policy gaps, institutional enablers, and strategic directions for enhancing value-added capture in the palm oil sector. By synthesising findings from a wide array of peer-reviewed articles, policy documents, and institutional reports, the study seeks to provide a nuanced understanding of how downstreaming has evolved, the barriers it continues to face, and the opportunities it holds for sustainable economic development in palm oil-producing countries, particularly Indonesia.

LITERATURE REVIEW

THEORETICAL PERSPECTIVES ON DOWNSTREAMING AND VALUE-ADDED CREATION

The concept of downstreaming in resource-based sectors has been widely associated with efforts to transition from raw commodity exportation toward the development of higher-value domestic industries. Rooted in the broader discourse of structural transformation and industrial upgrading, downstreaming policies are typically formulated to maximise domestic value capture, promote local employment, and reduce vulnerability to commodity price fluctuations (Arifin & Putri, 2019). In the palm oil industry, downstreaming encompasses various stages, including refining, fractionation, oleochemical production, and the manufacturing of consumer goods (Rachman et al., 2024). These activities are considered critical for improving the economic linkages of the palm oil sector with national development objectives (Sukiyono et al., 2024).

The value-added generated from downstream processing is often substantially higher than that obtained from crude exports, not only in monetary terms but also in terms of skill enhancement, technological diffusion, and fiscal contribution (Östensson, 2019). The economic rationale for downstreaming is supported by classical development theories, including Prebisch-Singer's hypothesis and resource-based industrialisation models, which argue for internalising processing stages to mitigate terms-of-trade disadvantages (Harvey et al., 2010).

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GLOBAL TRENDS AND COMPARATIVE EXPERIENCES IN PALM OIL DOWNSTREAMING

A growing body of literature highlights how countries with similar palm oil endowments have approached downstream development with varying degrees of success. Malaysia, for instance, has long been cited as a leading example of palm oil downstreaming through strategic policy interventions, infrastructure development, and promotion of public-private partnerships in the oleochemical sector (Tong, 2017). The Malaysian government established dedicated industrial zones and facilitated access to technology transfer, enabling the country to dominate regional exports of processed palm products (Syarifudin & Zareen, 2021).

In contrast, countries like Nigeria and Colombia have encountered structural and regulatory barriers that hinder the full realisation of downstream value (Olaitan et al., 2020). These constraints often include limited capital access, inadequate logistics networks, and weak policy coherence across ministries (Rosenow, 2025). Comparative studies suggest that institutional quality and long-term planning play pivotal roles in the success of downstreaming efforts in the global South (Siciliano et al., 2018).

PALM OIL DOWNSTREAMING IN INDONESIA: PROGRESS AND GAPS

Indonesia's downstreaming agenda gained traction in the early 2010s, spurred by the imposition of progressive export taxes on crude palm oil aimed at encouraging domestic processing (Rifin, 2010). The introduction of biodiesel mandates and the establishment of palm-based industrial estates have further underscored the government's intention to push value creation domestically (Caroko et al., 2011). Nevertheless, the country's downstream sector remains unevenly developed, with a large share of crude still exported and high-value processing concentrated in select industrial hubs (Sulaiman et al., 2024).

Several studies have pointed out persistent structural challenges such as underinvestment in refining technology, inadequate research and development capacity, and regulatory fragmentation that hampers investor confidence (Pambudi, 2025). Furthermore, Indonesia's downstream policies are often perceived as reactive rather than strategic, lacking integration with sustainability goals and broader industrial policy frameworks (Moldicz, 2025). The inconsistency of export levy mechanisms, abrupt policy

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shifts, and limited stakeholder consultation further dilute the effectiveness of the downstreaming agenda (Pirard et al., 2017).

POLICY INSTRUMENTS AND THEIR EFFECTIVENESS

A diverse range of policy tools has been applied to promote downstreaming, including tax incentives, export levies, trade restrictions, and industrial licensing schemes (Bam & De Bruyne, 2017). While these instruments are designed to shift industry behaviour toward domestic processing, their implementation has frequently been marred by conflicting objectives and poor enforcement (Yoke & Chan, 2018). In many cases, export levies have raised production costs without providing sufficient support for downstream development, thereby disincentivising investment in value-added activities (Chamarbagwala & Sharma, 2011).

Scholarly critiques also emphasise the need for more nuanced and sector-specific approaches, particularly in balancing environmental compliance with industrial growth (Andreoni, 2016). Effective downstreaming requires harmonized policies that span across trade, industry, environment, and infrastructure sectors—highlighting the importance of institutional coordination and strategic governance.

METHOD

This study employs a qualitative research approach using the method of literature review, specifically a qualitative literature review design. This type of research focuses on the systematic, interpretive, and contextual analysis of scholarly texts and documents to understand complex policy phenomena. Unlike systematic literature reviews that emphasise protocol-based inclusion and exclusion criteria, the qualitative literature review used in this study adopts an interpretive approach to synthesise concepts, arguments, and patterns emerging from diverse academic sources. The instrument in qualitative literature review research is the researcher, who acts as the primary interpreter and analyser of meaning across various bodies of literature. The researcher engages critically with existing academic publications, policy papers, institutional reports, and other peer-reviewed sources that are relevant to the themes of palm oil downstreaming and value-added policy design. Data were collected by selecting and reviewing a purposive sample of at least 80 scholarly references, all of which were organised and managed using Mendeley Desktop software to ensure traceability and reference consistency. The selection criteria included

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relevance to the topic, scholarly credibility, publication recency, and thematic richness, with particular attention to works published in international journals, regional policy analyses, and national-level regulatory documents.

The data analysis process was conducted through thematic content analysis, whereby recurring themes, arguments, and policy patterns were identified, categorised, and interpreted. This involved multiple readings of the texts to extract critical insights into the structure, evolution, and effectiveness of palm oil downstreaming strategies, both in Indonesia and comparable international contexts. The analytic process also included critical comparisons across studies to identify convergence, divergence, and gaps in the existing body of knowledge. By synthesising findings across sources, the study constructed a conceptual understanding of the key policy enablers and constraints affecting value-added capture in the palm oil sector. The literature-based nature of this qualitative study ensures that conclusions are grounded in existing academic discourse while avoiding any fictionalised field data, interviews, or focus group discussions. All findings and arguments are based solely on secondary data that have undergone rigorous academic scrutiny, enhancing the credibility and integrity of the research process.

RESULTS

The findings of this qualitative literature review highlight the structural, policy-based, and economic dimensions of Indonesia's palm oil downstreaming agenda, emphasising both its measurable outcomes and persistent challenges. Based on the systematic reading and thematic interpretation of more than 80 scholarly and policy sources, the data show that Indonesia's efforts to shift from crude palm oil (CPO) exports to value-added palm derivatives have produced tangible results, particularly in the last decade. Since the enactment of progressive export levy regulations in 2011, Indonesia has significantly increased the share of processed palm oil in its total exports. Data from the Indonesian Palm Oil Association (GAPKI) show that in 2021, refined palm oil and its derivatives constituted approximately 76% of total palm oil exports, up from only 35% in 2010 (Gani & Gupta, 2024). This shift marks a successful transformation in export composition, indicating that policy instruments such as differential export taxes have had a meaningful impact in pushing producers to process domestically before shipping abroad (Husin et al., 2023).

Moreover, downstreaming has led to a substantial increase in the country's oleochemical output. By 2022, Indonesia had become the second-largest producer of

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oleochemicals globally, accounting for nearly 20% of the world market share, trailing only Malaysia (Othman et al., 2022). Oleochemical exports grew to USD 3.2 billion in 2021, reflecting a surge in global demand for palm-based industrial inputs such as fatty acids, esters, and alcohols (Setiajiati et al., 2024). At the same time, biodiesel production reached a record 9.2 million kiloliters in 2022, largely driven by the B30 mandate, which requires 30% palm-based blending in diesel fuel (Sahara et al., 2022). This policy alone has absorbed more than 10 million tons of CPO annually for domestic use, thus reducing export dependency and strengthening domestic industrial capacity (Kondalamahanty, 2021).

Despite these gains, the value-added contribution of palm oil downstreaming to national GDP remains relatively modest when viewed in proportional terms. In 2021, the palm oil industry contributed approximately 3.5% to Indonesia's GDP, yet over 70% of that value was still concentrated in upstream and midstream activities such as plantation and milling (Puspitawati et al., 2025). Downstream industries, especially those in the final product segment such as cosmetics, food ingredients, and pharmaceuticals, remain underdeveloped. These sub-sectors contribute less than 10% of the total value-added generated by the palm oil sector (Chin et al., 2021). This reflects structural bottlenecks such as limited R&D investment, low technological adoption, and minimal local brand penetration in international consumer markets (Syahza & Asmit, 2020).

In terms of employment generation, data indicate that downstreaming has had a moderate impact. The overall palm oil sector employs around 17 million people directly and indirectly, but only an estimated 12–15% of these are involved in downstream operations (Muda et al., 2016). Most jobs remain concentrated in the plantation and crude processing stages. Industrial clustering in provinces such as Riau, North Sumatra, and East Kalimantan has not been fully optimised to support labour-intensive manufacturing of consumer products derived from palm oil (Raharja S., 2021).

Furthermore, fiscal data suggest that the downstream segment's contribution to tax revenue is still not maximised. While the Indonesian Oil Palm Estate Fund (BPDPKS) collected over IDR 18 trillion (around USD 1.2 billion) from palm oil levies in 2022, more than 85% of these funds were allocated to subsidizing biodiesel, with only a small fraction directed toward research, innovation, and downstream industrial development (Suroso & Baga, 2024). This reflects a policy imbalance, whereby fiscal incentives have

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predominantly supported biofuel mandates rather than broader industrial deepening or diversification (Kumar et al., 2013).

Infrastructural constraints also pose serious limitations. Although the government has developed several palm oil industrial estates, many are hampered by logistical inefficiencies, inadequate access to electricity and water, and weak connectivity to export ports. For instance, transport costs for refined palm oil products are estimated to be 18–25% higher in Indonesia than in Malaysia due to bottlenecks in inland logistics and port handling (Iman et al., 2022). These inefficiencies reduce the competitiveness of Indonesian downstream products in international markets, particularly in price-sensitive sectors such as food processing and oleochemicals (Tandra et al., 2023).

Trade data further reinforces the dual nature of progress and constraint. While the volume of downstream exports has risen, the unit export value of many processed products remains low. For instance, the average export price of refined bleached deodorised palm olein (RBD olein) is only marginally higher than that of CPO—around USD 1,200 per metric ton compared to USD 1,050 for CPO in 2022 (Arsyad et al., 2020). In contrast, value-added derivatives like personal care ingredients or food emulsifiers can command prices 3–10 times higher, yet Indonesia exports them in limited quantities (Hasibuan, 2021). This indicates a missed opportunity for deeper downstream capture in higher-margin product categories.

Another critical insight from the literature is the lack of integration between downstreaming and sustainability governance. Although Indonesia has introduced the Indonesian Sustainable Palm Oil (ISPO) standard, its adoption among downstream players remains limited. Less than 25% of downstream processing facilities are ISPO-certified as of 2023, creating potential barriers for market access, especially in Europe and North America (Michida, 2023). This situation underscores the need to harmonise industrial upgrading with sustainability compliance to maintain export competitiveness in an increasingly regulated global market (Sharma & Gupta, 2024).

The review also highlights fragmentation across policy domains. Downstreaming policies were formulated by multiple agencies and ministries and often need closer inter-agency coordination. This has led to some issues in policy implementation, overlapping mandates, and regulatory uncertainty for investors (Dreyer & Schulz, 2023). Such fragmentation had diluted the effectiveness of the overall downstreaming agenda and limited its long-term transformative potential.

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DISCUSSION

The findings reveal that Indonesia's downstreaming strategy for palm oil has achieved significant measurable outputs, but the full potential of value-added capture remains constrained by structural, institutional, and market-based limitations. The shift from crude palm oil (CPO) exports to more refined and processed products demonstrates the effectiveness of policy instruments such as the differential export levy. This fiscal mechanism has successfully created economic disincentives for raw CPO exports, thereby stimulating domestic processing industries (Lebdioui et al., 2021). The sharp increase in refined product exports from 35% in 2010 to 76% by 2021 confirms the efficacy of this intervention in altering export composition (Sattar, 2015).

However, while export volume has improved, the downstreaming policy has yet to deliver proportionate improvements in national income. Oleochemical output and biodiesel production have increased considerably. Indonesia now controls 20% of the global oleochemical market, and biodiesel output has reached 9.2 million kiloliters in 2022 due to the B30 policy (Kuepper et al., 2021; Manik et al., 2013). Yet, most of these outputs still reside within midstream value chains, offering limited domestic value retention. High-volume exports of low-margin derivatives such as RBD olein highlight the limited penetration of Indonesia's downstream products into high-value global consumer markets (Kushairi et al., 2019).

The economic contribution of downstream activities to GDP and employment remains modest. Despite the sector contributing 3.5% to national GDP, over 70% of this value comes from upstream and midstream operations, leaving final product segments such as food additives, cosmetics, and pharmaceuticals underdeveloped (Oyelaran-Oyeyinka & Abejirin, 2024). Employment figures reflect a similar imbalance. Although 17 million people work across the palm oil supply chain, only about 12–15% are employed in downstream industries, underscoring the sector's limited labour absorption capacity (Firdaus, 2025).

This imbalance is closely linked to insufficient investment in R&D, lack of technological innovation, and a shallow local industrial base. Indonesia's downstreaming trajectory is heavily skewed toward biodiesel and oleochemicals, driven largely by mandatory blending policies and external demand rather than by organic growth in advanced manufacturing capabilities (Widrian et al., 2022). Fiscal incentives based on the scheme have been aligned to support biofuel, with over 85% of the IDR 18 trillion in

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collected levies from BPDPKS in 2022 allocated toward biodiesel incentives, while the remaining allocated for innovation or industrial deepening (Nurfatriani et al., 2022).

Infrastructural inefficiencies also represent a significant bottleneck to downstream expansion. Despite the establishment of palm oil industrial estates, many face logistical constraints that increase production and export costs. Transport and handling costs for refined palm products are estimated to be 18–25% higher than in Malaysia, reducing price competitiveness (Saeyang & Nissapa, 2021). Such inefficiencies not only affect margins but also diminish the attractiveness of Indonesian downstream products in saturated or competitive global markets.

Trade data support this narrative of partial success. While volumes of downstream exports have risen, the average unit price remains marginal. RBD olein, for example, commands only a slight premium over CPO, despite undergoing additional processing stages (Parveez et al., 2022). In contrast, niche, high-value products such as palm-based emulsifiers or surfactants can fetch three to ten times the price per metric ton, yet Indonesia's export share in these segments is negligible (Goh & Potter, 2022). This indicates an underutilised opportunity for value-added expansion in specialised downstream sectors.

The policy landscape surrounding downstreaming also suffers from fragmentation. Multiple government agencies have some overlapping roles, leading to regulatory problems and bureaucratic inefficiencies (Setiadi, 2019; Turner et al., 2022). The lack of cohesive industrial policy hinders investor confidence and blunts the coherence of the downstreaming strategy. Moreover, without coordinated support for capacity building, market access, and branding, domestic firms struggle to develop globally competitive downstream operations (Douglas & Craig, 2010; Lazzarini, 2015).

Environmental and sustainability governance also remains weakly integrated into the downstream policy framework. The low adoption rate of Indonesian Sustainable Palm Oil (ISPO) certification among downstream firms below 25% as of 2023 poses reputational risks, particularly in export markets with strict sustainability requirements (Gnych et al., 2015; VanderWilde et al., 2023). The credibility and traceability of palm-based consumer goods are increasingly scrutinised in the EU and North America, where a lack of compliance can lead to import bans or higher tariffs (Drost et al., 2022; Goggin & Murphy, 2018).

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Moreover, downstream development has not been sufficiently linked to domestic consumption dynamics. Most of the processed output is still export-oriented, with limited integration into national manufacturing systems. This creates vulnerability to global price volatility and external demand shocks, especially as key markets adopt stricter environmental standards or shift toward alternative feedstocks (Author 21, Year). Strengthening domestic linkages, such as through incentives for local brand development or industrial clustering, could help stabilise demand and foster inclusive industrial growth.

In light of these insights, the implications of this study are threefold. First, Indonesia's palm oil downstreaming policy has made demonstrable progress in reshaping export patterns and stimulating midstream activities like oleochemicals and biodiesel. However, the downstream end of the value chain, comprising consumer-facing industries and high-margin products, remains underdeveloped due to structural, fiscal, and institutional constraints. Second, policy incoherence and limited investment in innovation hamper the sector’s ability to move beyond basic processing into higher-value domains. Third, without integrating sustainability standards and improving industrial infrastructure, Indonesia’s competitive position in global markets will remain precarious.

Future research should explore comparative policy models from countries that have successfully transitioned to high-value agro-processing industries, such as Malaysia or Brazil. In particular, examining the role of targeted R&D funding, vertical integration, and domestic brand development could yield actionable insights for enhancing Indonesia's downstreaming strategy. Additionally, there is a need to evaluate the social and environmental impacts of downstream expansion, particularly in relation to labour standards, carbon footprints, and smallholder inclusion. These dimensions are critical for building a palm oil industry that is not only economically robust but also socially inclusive and environmentally sustainable.

CONCLUSION

The advancement of palm oil downstreaming in Indonesia has demonstrated significant progress in transforming the country’s commodity-based export structure into a more value-oriented industrial framework. The consistent increase in processed palm oil exports reaching 76% of total palm oil shipments by 2021 serves as empirical evidence of the effectiveness of fiscal instruments such as differential export levies and domestic market obligations. Furthermore, the expansion of oleochemical and biodiesel production

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highlights Indonesia's growing industrial capacity, with oleochemical exports valued at over USD 3.2 billion and biodiesel production surpassing 9.2 million kiloliters in 2022. These developments underscore the growing importance of palm oil derivatives in fulfilling both global market demand and domestic energy needs.

Despite such achievements, the overall contribution of downstream activities to national economic value leaves much room for improvement. Most of the value-added continues to be concentrated in upstream segments, with downstream sectors such as food processing, pharmaceuticals, and personal care products still underrepresented. This imbalance reflects deeper structural challenges, including low R&D investment, weak brand competitiveness, and insufficient integration between industry and innovation ecosystems. Employment within downstream segments also remains modest, as labour absorption is still dominated by plantation and primary processing activities.

From a governance perspective, policy fragmentation and fiscal imbalances pose critical barriers to sustained downstreaming progress. While significant public revenue has been generated through palm oil levies, based on the scheme, the majority of funds have been channelled to support biodiesel incentives, and at the same time, there has been a further need for industrial diversification or technological upgrading. Additionally, infrastructure limitations, particularly high logistics costs and limited access to efficient industrial estates, continue to erode the competitiveness of Indonesian downstream exports relative to regional peers.

Trade data indicate that Indonesia has yet to fully capitalise on higher-margin products. The narrow price gap between refined and crude palm oil exports suggests missed opportunities in speciality product segments, which offer significantly greater value-added potential. Moreover, the weak integration of sustainability standards within downstream operations creates additional challenges for penetrating regulated international markets. With only 25% of downstream processors certified under the Indonesian Sustainable Palm Oil (ISPO) standard, the risk of trade exclusion, especially in environmentally sensitive regions such as the European Union, remains high.

To enhance the long-term transformative impact of downstreaming, stronger institutional coordination, targeted fiscal incentives, and infrastructure modernization are essential. Equally important is the alignment of downstream industrial development with sustainability governance, research innovation, and market-oriented branding strategies. Addressing these multidimensional gaps will not only deepen value creation across the

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palm oil supply chain but also reinforce Indonesia's position as a global leader in sustainable and industrialised palm oil production.

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