Transisi Bersih

MANDATORY BIODIESEL B50 IN INDONESIA

Energy Security at What Economic Cost

Transisi Bersih

Transisi Bersih, or the Financial Research Center for Clean Energy (FRCCE), is an independent think tank based in Indonesia specializing in economics and environmental policy. We focus on developing economic policy strategies that address two of Indonesia's most pressing challenges simultaneously: (1) building a high-value and equitable economy, and (2) safeguarding environmental sustainability.

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To realize a high-value, equitable, and sustainable Indonesian economy.

Mission

To formulate reliable, fair, and sustainable financing alternatives for the energy transition, based on domestic economic strengths and national resources.

To promote environmentally sustainable economic transformation through public policies that increase value added, raise environmental standards, and enhance long-term welfare.

To produce sharp and actionable policy research as a credible and consistent foundation for public decision-making.

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1. Executive Summary

This report examines the economic and structural implications of Indonesia's mandatory biodiesel policy, with particular emphasis on the planned implementation of the B50 mandate in July 2026. Drawing upon data from the Ministry of Energy and Mineral Resources (ESDM) and the Palm Oil Plantation Fund Management Agency (BPDPKS) for the period 2014–2024, the analysis identifies two principal challenges associated with the biodiesel program.

First, from the perspective of economic efficiency, the policy has generated persistently negative net benefits due to the substantial opportunity costs arising from reduced crude palm oil (CPO) export revenues, combined with the increasing economic burden of biodiesel subsidies. Over the 2015–2024 period, the cumulative deficit associated with the program is estimated to have exceeded IDR 409.6 trillion.

Second, from the perspective of commodity balance and structural sustainability, the analysis indicates that the implementation of B50 would require the diversion of approximately 36% of Indonesia's total palm oil production to the domestic energy market. Based on GAPKI 2025 data, Indonesia's total production of CPO and PKO is estimated at 52.762 million tons. The currently implemented B35 mandate already absorbs approximately 22% of national production for biodiesel purposes, while palm oil exports have declined by 11% relative to 2022 levels. Furthermore, the implementation of B40 in 2025 is projected to reduce exports to approximately 27.5 million tons, representing a decline of 17% compared to 2022. Under the B50 scenario, exports are projected to decline by approximately 43% relative to 2022 levels, potentially resulting in an estimated foreign exchange loss of USD 10–12 billion annually.

The findings indicate that B50 should only proceed once substantial productivity gains have been achieved in the national palm oil sector, prioritizing replanting programs, yield enhancement, and downstream efficiency over land expansion.

The key findings of this report are as follows:

- The net benefit of the mandatory biodiesel policy has been consistently negative since 2015, with a cumulative cost-benefit deficit exceeding IDR 409.6 trillion over 2015–2024. The largest deficit occurred in 2021 (−IDR 119.95 T) and continued into 2024 (−IDR 73.5 T). For every IDR 1 saved on diesel imports, the state incurs IDR 1.48 in CPO export loss and subsidy costs.
- CPO export loss is the largest cost component and is pro-cyclical: when CPO prices are high economic costs swell simultaneously. In 2024, CPO export loss reached

IDR 197.8 trillion, surpassing the diesel import savings of IDR 153 trillion in the same year.

- The diesel import ratio was successfully reduced from 36.4% (2012) to a low of 9.6% (2021), but has since risen back to 21.8% in 2024 due to domestic diesel consumption growth outpacing biodiesel expansion. In the geopolitical crisis scenario (Brent USD 115/bbl), the net benefit of B50 deteriorates further to −IDR 178.7 trillion as CPO and crude oil prices are positively correlated.

- BPDPKS fund allocation is highly inequitable: 93,28% flows to biodiesel subsidies benefiting fewer than 20 large-scale FAME producers, while the Smallholder Palm Replanting Programme (PSR) targeting 2.67 million smallholders received only 4,11% of the total budget.

- Actual GAPKI 2024–2025 data shows that B50 would redirect ≈36% of production (19 million tonnes out of 52.762 million tonnes) to biodiesel, reducing exports from 29.5 million tonnes (2024) to approximately 18.8 million tonnes (a 43% decline from 2022). B35 already absorbs 22% of production for biodiesel and exports have already fallen 11% from 2022. Based on GAPKI projections, B40 represents the economic viability ceiling

- Cost-benefit projections for B50 across three scenarios show a negative net benefit in every condition: −IDR 115.9 T to −IDR 191.7 T per year, two to three times the annual cost-benefit deficit recorded under B35. No commodity price or geopolitical scenario produces a positive net benefit for B50 under the current policy design.

Policy Recommendations:

- **Establish economic and CPO balance prerequisites before implementing B50**: three binding conditions must be met simultaneously: HIP formula reform, BPDPKS reallocation with minimum 25% for PSR, and independent verification that biodiesel volumes do not redirect more than 25% of national CPO output (equivalent to approximately B40). If the third condition is not met, B50 must be **cancelled**, not merely postponed.
- **Reform the biodiesel Market Index Price (HIP) formula** using the lower of two benchmarks: the domestic spot average, or the international FAME price minus export duties and BPDPKS levies. This severs the full pass-through mechanism that has left the state absorbing all global CPO price volatility.

- **Reform BPDPKS governance, mandate, and fund allocation** in an integrated manner: (i) restructure the Steering Committee so the Ministry of Finance holds proportionate authority; (ii) revise Presidential Regulation 24/2015 with binding allocation ceilings (PSR min. 25%, research/certification min. 10%, subsidy cap of 60%); (iii) reorienting from demand-side subsidies to upstream productivity investment; and (iv) ensure periodic public disclosure of BPDPKS subsidy realisation data.
- **Institutionalise an Automatic Correction Mechanism (ACM)** through a Presidential Regulation: if mid-year estimates show net benefit exceeding the threshold set by the Ministry of Finance, the blending rate is automatically reduced to the previous level. Any blending increase must be accompanied by an independent Comprehensive Cost-Benefit Analysis submitted to the House of Representatives (DPR).
- **Integrate biodiesel within a broader renewable energy diversification strategy**: biodiesel is retained as a component with a limited role, while the IDR 28–52 trillion/year currently paid by BPDPKS is equivalent to 5–10 GWp of solar PV investment. Solar, geothermal, and small-scale hydropower should be developed as complements that do not create exposure to agricultural commodity price volatility.

2. Background

2.1 Geopolitical Context and Energy Security

Geopolitical tensions in the Middle East, particularly the risk of energy supply disruptions from the potential closure of the Strait of Hormuz, pose a serious threat to global fuel supply chains. During escalation, world oil prices can spike by as much as 60%, placing severe pressure on countries dependent on energy imports from the region. For Indonesia, this is not merely an external risk; it represents a direct threat to national economic stability and energy security.

As a strategic response, the Indonesian Government plans to implement B50 from July 2026 — a fuel blending mandate of 50% biodiesel and 50% fossil diesel. This builds on the mandatory biodiesel policy that has been progressively implemented since 2018.

2.2 Evolution of the Mandatory Biodiesel Policy

Indonesia's mandatory biodiesel policy has been incrementally escalated as follows:

Policy	Year Implemented	Description
B20	2018	20% biodiesel + 80% solar
B30	2020	30% biodiesel + 70% solar
B35	2023	35% biodiesel + 65% solar
B40	2025	40% biodiesel + 60% solar
B50 (Planned)	**Juli 2026**	**50% biodiesel + 50% fossil diesel — Projected savings: ~IDR 175 T/year**

Indonesia's mandatory biodiesel policy rests on a multi-layered regulatory framework spanning statutory legislation, presidential regulations, ministerial decrees, and operational technical rules. This framework evolved incrementally alongside rising blending targets and the changing demands of national energy policy. Understanding this regulatory architecture is important because it demonstrates that the mandatory biodiesel policy is the product of deliberate legislative and regulatory processes, not ad hoc decisions, meaning that any reform requires an equally systematic approach at the same regulatory level.

The highest legal foundation of the biodiesel policy traces back to Law No. 30 of 2007 on Energy, which establishes the principle that national energy management must prioritise self-reliance and security by optimising all domestic energy resources, including renewables. This law provides a constitutional mandate to diversify the energy mix and reduce dependence on imported fossil fuels. It is within this context that palm-based biodiesel was positioned as a strategic energy security instrument consistent with the law's mandates.

At the presidential level, Presidential Regulation No. 5/2006 on the National Energy Policy set the initial target of a 5% biofuel share by 2025. Government Regulation No. 79/2014 raised ambitions considerably, targeting 23% renewable energy in the primary mix by 2025 and 31% by 2050, with biodiesel as a principal pathway. Presidential Regulation No. 24/2015 then completed the institutional architecture by establishing BPDPKS as the program's central implementing body.

Operational technical provisions are governed by a series of Ministerial Regulations of the Ministry of Energy and Mineral Resources (Permen ESDM), updated continuously as blending targets rise. Minister of Energy and Mineral Resources Regulation No. 32 of 2008 constituted the first formal regulatory framework mandating the utilization of biofuels in fuel blends for the transportation, industrial, and power generation sectors.

However, at the initial stage of implementation, the policy remained largely indicative in nature, with relatively modest blending targets. Subsequently, Minister of Energy and Mineral Resources Regulation No. 20 of 2014 strengthened the biodiesel blending obligation by establishing more detailed and sector-specific mandatory blending requirements. These provisions covered Public Service Obligation (PSO) transportation, non-PSO transportation, industrial and commercial sectors, as well as power generation.

Ministerial Regulation No. 12 of 2015 and its amendments is the most central regulation in the mandatory biodiesel ecosystem, as it governs the biodiesel Market Index Price (HIP) formula. This formula determines the incentive BPDPKS must pay biodiesel producers, which is the spread between the biodiesel HIP and diesel HIP and therefore directly determines the scale of economic costs borne by the state. The regulation uses global CPO prices as the primary input, a design choice that creates a full pass-through of commodity price risk to the state budget. The regulation has been revised multiple times to accommodate changes in pricing methodology.

Subsequent blending target escalations were set through periodic Ministerial Regulations: Ministerial Regulation No. 41 of 2018 mandated B20 across all sectors, Ministerial Decree No. 227 of 2019 governed the technical implementation of B30, and Ministerial Regulation No. 2 of 2023 raised the mandate to B35. Each regulation not only set a new blending percentage but also expanded the range of obligated sectors and tightened monitoring and sanction mechanisms.

On the financing side, Ministry of Finance Regulations govern the CPO export levy that funds the biodiesel programme. PMK No. 80/2021 and its amendments established a progressive levy tied to the Ministry of Trade's CPO reference price. This mechanism, however, contains a structural paradox: high CPO prices simultaneously increase levy revenues and biodiesel subsidy costs such that programme sustainability does not automatically improve in high-price environments. The current instrument, PMK No. 9/2026, caps the CPO export levy at 12.5% of the reference price.

2.3 Operational Mechanism of the Mandatory Biodiesel Policy

The implementation of the mandatory biodiesel policy involves a long chain of actors with differing roles and incentives. A detailed understanding of this mechanism is essential to explain why the current policy design produces a disproportionate distribution of risks and benefits, as analysed throughout this report.

Production and Distribution Chain. Biodiesel production begins at palm oil plantations, where Fresh Fruit Bunches (FFB) are harvested and processed at palm oil mills to produce Crude Palm Oil (CPO). The CPO is then processed at FAME (Fatty Acid Methyl

Ester) facilities through transesterification. Technically, 1 tonne of CPO yields approximately 0.85–0.90 tonnes of biodiesel (FAME), or about 0.95 tonnes of CPO is required per KL of biodiesel. The resulting biodiesel is sold to fuel distribution companies, primarily Pertamina, which blends it with fossil diesel at the mandated percentage before distribution through the filling station network.

BPDPKS Incentive Mechanism. Because biodiesel is structurally more expensive than fossil diesel, the government through BPDPKS provides price differential incentive payments to biodiesel producers to keep their selling price to Pertamina competitive. The incentive is calculated as the difference between the biodiesel HIP and diesel HIP for the relevant period. The biodiesel HIP is set by the Ministry of Energy using a formula based on international CPO prices, methanol prices, and other production costs, while the diesel HIP tracks the relatively stable domestic diesel price. Incentive funds are disbursed from the levy collected by BPDPKS from CPO exporters.

Blending Obligation and Oversight. The blending obligation is imposed on fuel distribution companies (primarily Pertamina and other licensed fuel traders), which must ensure that the diesel they sell contains biodiesel at the prescribed percentage. Compliance monitoring combines periodic reporting obligations, independent audits by BPDPKS-appointed surveyors, and field inspections by the Directorate General of New, Renewable Energy and Energy Conservation. Companies that fail their blending obligations face administrative sanctions ranging from written warnings and licence suspension to outright licence revocation, making the blending mandate a legally enforceable obligation rather than merely an aspirational target.

2.4 Declared Policy Objectives and Their Rationale

The Indonesian Government has consistently advanced a set of official justifications for the mandatory biodiesel policy, drawn from policy documents, ministerial statements, and academic papers supporting the relevant regulations. Understanding these declared objectives is important as a reference point for evaluating, in the analytical chapters that follow, the extent to which the policy achieves each objective and at what economic cost.

First, foreign exchange savings and trade balance improvement. Diesel imports constitute a significant component of Indonesia's trade deficit. By substituting a portion of imported diesel with domestically produced biodiesel, the government argues the policy can achieve substantial foreign exchange savings. The government's stated savings target for B50 is approximately IDR 175 trillion per year, frequently cited in official communications as the primary justification for the programme.

Second, energy security and reduced dependence on fossil fuel imports. In an uncertain geopolitical environment, particularly given the risk of oil supply disruptions from the Middle East, the biodiesel policy is positioned as an energy supply diversification strategy that reduces Indonesia's exposure to global energy market volatility. Biodiesel produced from domestic CPO is regarded as a reliable energy substitute, not dependent on vulnerable international supply chains. Whether this reduction in diesel import dependence delivers genuine economic benefit is examined in this study.

Third, palm oil industry development and farmer welfare. As the world's largest CPO producer and exporter, Indonesia has a strategic interest in maintaining domestic CPO demand and price stability. Biodiesel creates a captive domestic market that absorbs surplus CPO supply when export market pressures mount, particularly from the EU Deforestation Regulation (EUDR) and growing sustainability requirements in key export markets. The government also argues that the biodiesel programme benefits smallholder palm oil farmers through stable Fresh Fruit Bunch (FFB) prices. This claim, particularly regarding the actual distribution of benefits between large corporations and smallholders, is examined critically in this report.

Fourth, greenhouse gas emission reduction and climate commitments. Biodiesel is widely regarded as producing lower lifecycle carbon emissions compared to fossil-based diesel fuel. Consequently, the mandatory biodiesel policy has been positioned as one of the strategic instruments supporting Indonesia's Nationally Determined Contribution (NDC) commitments under the Paris Agreement framework. In this context, Indonesia's target to reduce greenhouse gas emissions by 29–41% by 2030 places biodiesel among the key contributing measures within the energy sector.

The four declared objectives provide a rhetorically coherent justification for the mandatory biodiesel policy. The critical question at the heart of this report is: at the scale and design of the policy as it will be expanded through B50, are the economic costs borne commensurate with the benefits actually realised from each stated objective? The answer to this question, based on empirical data for 2014–2024, forms the central argument of this report.

3. Research Methodology

3.1 Analytical Approach

This study employs a quantitative-descriptive policy analysis approach within a cost-benefit analysis (CBA) framework to measure the economic impact of Indonesia's mandatory biodiesel policy over 2014–2024. The analytical framework rests on three core components: (1) estimated benefits in the form of diesel import savings; (2) estimated direct costs in the form of BPDPKS-managed biodiesel subsidies; and (3) estimated indirect costs in the form of CPO export loss, representing the opportunity cost of diverting CPO to the domestic market.

3.2 Data Sources

Data are drawn from several official government and international statistical sources, including: the Ministry of Energy and Mineral Resources (ESDM) for energy statistics and diesel import realisation data for 2012–2024; BPDPKS for biodiesel subsidy realisation and budget allocation data; the Handbook of Energy and Economy Statistics Indonesia for biodiesel consumption data in Thousand BOE; World Bank Commodity Price Data and Bloomberg for international CPO prices in USD/metric tonne; and Bank Indonesia for the IDR/USD exchange rate. Plantation area and employment data are sourced from Statistics Indonesia (BPS).

3.3 Cost-Benefit Analysis Framework

The Cost-Benefit Analysis in this study is defined as the difference between total quantifiable benefits and total economic costs arising from the policy, as formulated below:

Net Benefit (NB) = Diesel Import Savings – CPO Export Loss – Biodiesel Subsidy

Where:

Diesel Import Savings = Benefit
CPO Export Loss = Opportunity Cost
Biodiesel Subsidy = direct cost

Component **Diesel Import Savings** is calculated using actual biodiesel consumption. The volume consumed is assumed equivalent to the volume of diesel displaced, multiplied by the prevailing import price of diesel in the relevant year.

Component **CPO Export Loss** is calculated based on the CPO required for biodiesel production using a conversion ratio of 1 KL biodiesel ≈ 0.95 tonnes CPO. The export loss value is obtained by multiplying domestic CPO demand by the international CPO price (USD/metric tonne) and the prevailing exchange rate: CPO Export Loss = Biodiesel Volume (KL) × 0.95 × CPO Price (USD/tonne) × Exchange Rate (IDR/USD).

Component **Biodiesel Subsidy** uses annual budget realisation data published by BPDPKS, reflecting the difference between the biodiesel HIP and diesel HIP that must be covered by levy funds. These are actual figures drawn from audited BPDPKS accounting records.

3.4 Regression Analysis: Impact on Plantation Area and Employment

To analyse the association between biodiesel consumption and the expansion of palm oil plantation area and sector employment, Ordinary Least Squares (OLS) regression is used with biodiesel consumption (in KL) as the independent variable. The model specifications are as follows:

$$\text{Land Area (Thousand Hectares)} = a + b_1 \times \text{Biodiesel Consumption (KL)}$$
$$\text{Employment (Persons)} = a + b_2 \times \text{Biodiesel Consumption (KL)}$$

Both models yield high goodness-of-fit: $R^2 = 0.84$ for the plantation area equation ($n=13$, $F=56.85$, $p<0.001$) and $R^2 = 0.86$ for the employment equation ($n=13$, $F=24.09$, $p=0.008$), indicating that biodiesel consumption has statistically significant explanatory power for both dependent variables.

3.5 Methodological Limitations

This analysis has a number of limitations that must be explicitly acknowledged before interpreting the results, particularly regarding the OLS regression used to estimate the association between biodiesel consumption, plantation area, and employment.

First, the diesel import savings estimate assumes a one-to-one substitution relationship between biodiesel and diesel, which may not be fully accurate given differences in calorific value (biodiesel contains approximately 9–10% less energy per unit volume than diesel). This implies the reported import savings are likely slightly overestimated.

Second, and most critically, the OLS model used in Chapter 8 faces several limitations. (a) The sample size is very small: only 13 annual data points. With this number of observations, the resulting t-statistics and F-statistic have very low statistical power and cannot be relied upon for population-level inference. (b) OLS regression applied to two simultaneously trending time series almost invariably produces seemingly significant coefficients due to spurious regression — two variables may exhibit high correlation simply because both trends upward over time, not because of any genuine causal relationship. (c) The model excludes other control variables that theoretically influence plantation area and employment, such as FFB prices, plantation investment, land moratorium policy, and CPO export market conditions, meaning the biodiesel coefficient likely carries omitted variable bias.

Third, BPDPKS biodiesel subsidy data may not capture all implicit economic costs not recorded in official financial reports, such as regulatory compliance, monitoring, and environmental externality costs. Given all limitations above, the regression results in

Chapter 8 should be read as directional indicators and interpreted with proportionate caution.

4. Diesel Import Trends and Policy Impact

4.1 Diesel Import Ratio Against Domestic Consumption

Since the introduction of B20 in 2018, the diesel import ratio against domestic consumption has declined significantly. From levels above 35% during 2012–2014, the import ratio fell sharply to 12.3% in 2019 and reached a low of 9.6% in 2021. However, after 2021 the trend reversed, climbing back to 21.8% by 2024, driven primarily by a surge in overall domestic diesel consumption.

Year	Actual Diesel Imports (KL)	Import Share (%)	Policy
2012	12.455.009	36.4%	-
2013	11.946.708	35.1%	-
2014	11.474.700	35.1%	-
2015	7.318.129	25.1%	-
2016	5.707.622	20.4%	**Introduction of B20**
2017	6.882.498	23.5%	-
2018	6.498.799	21.0%	**B20**
2019	3.872.804	12.3%	-
2020	3.181.936	10.6%	**B30**
2021	3.189.951	9.6%	-
2022	5.270.481	14.9%	-
2023	5.145.275	13.7%	**B35**
2024	8.300.000	21.8%	-

Sumber: Statistik Energi Kementerian ESDM, diolah

4.2 Diesel Import Savings

Diesel import savings can be estimated using actual biodiesel consumption. The mandatory biodiesel policy has demonstrably generated substantial foreign exchange savings. In 2022, these savings exceeded IDR 163.8 trillion.

This approach is, however, partial: it captures only the benefit side (diesel import savings) without accounting for the full economic costs incurred, namely CPO export loss and biodiesel subsidies.

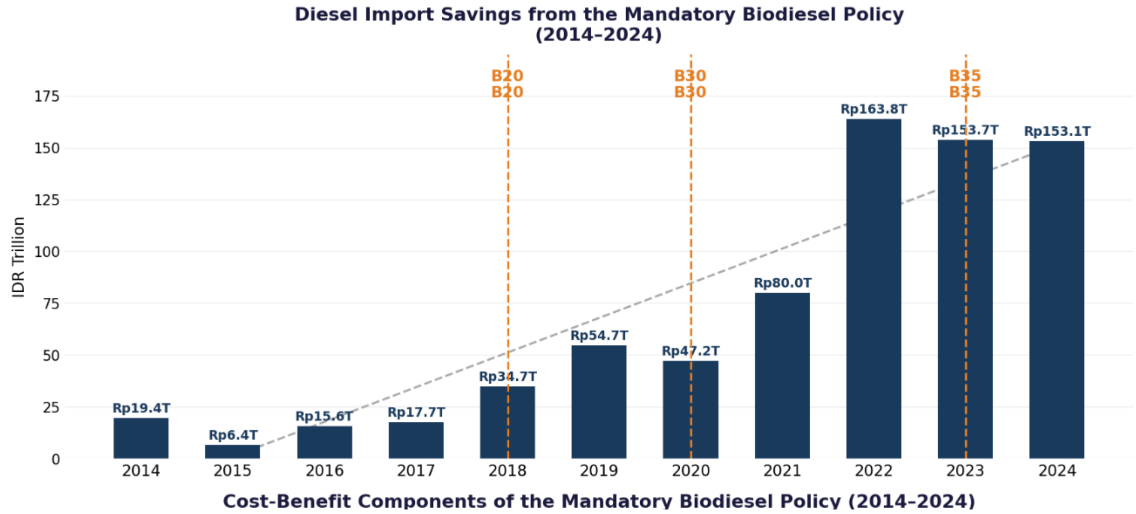

Figure 4.1: Diesel Import Savings and Cost-Benefit Components of the Mandatory Biodiesel Policy, 2014–2024 (IDR Trillion)

5. Cost-Benefit Analysis of the Mandatory Biodiesel Policy

5.1 Cost Component: CPO Export Loss

Diverting CPO for domestic biodiesel production indirectly reduces Indonesia's potential export earnings. As the world's largest CPO producer, Indonesia stands to gain more foreign exchange when global CPO prices rise. Yet the mandatory biodiesel policy redirects a growing share of CPO supply to the domestic market.

Technically, FAME biodiesel production requires approximately 1 tonne of CPO to yield 0.85–0.90 tonnes of biodiesel. As biodiesel consumption rose from 3.87 million KL (2018) to 13.57 million KL (2024) — a 251% increase — domestic CPO demand surged from 3.67 million to 12.89 million tonnes, causing CPO export loss to escalate non-linearly in line with global CPO price dynamics and exchange rate movements.

5.2 Cost Component: Biodiesel Subsidy

U To support the biodiesel programme, the government provides subsidies bridging the gap between biodiesel prices (which are structurally higher) and diesel prices. This scheme is managed by BPDPKS through the Market Index Price (HIP) mechanism, which tracks global CPO prices. When CPO prices rise, the biodiesel HIP spikes while the diesel HIP remains relatively stable, widening the gap the state must cover — creating a full pass-through of CPO price volatility risk to the government.

5.3 Net Benefit: 2014–2024

The following table summarises the benefit and cost components of the mandatory biodiesel policy comprehensively (in IDR Trillion):

Year	Diesel Import Savings (IDR)	CPO Export Loss (IDR)	Biodiesel Subsidy (IDR)	Net Benefit (IDR)
2014	+Rp 19.40 T	-Rp 18.10 T	Rp 0	**+Rp 1.32 T**
2015	+Rp 6.37 T	-Rp 8.01 T	Rp 0	**-Rp 1.64 T**
2016	+Rp 15.60 T	-Rp 29.00 T	-Rp 10.70 T	**-Rp 24.10 T**
2017	+Rp 17.70 T	-Rp 25.40 T	-Rp 10.30 T	**-Rp 18.10 T**
2018	+Rp 34.70 T	-Rp 33.60 T	-Rp 5.66 T	**-Rp 4.53 T**
2019	+Rp 54.70 T	-Rp 53.60 T	-Rp 3.07 T	**-Rp 1.93 T**
2020	+Rp 47.20 T	-Rp 90.60 T	-Rp 28.00 T	**-Rp 71.40 T**
2021	+Rp 80.00 T	-Rp 148.00 T	-Rp 51.90 T	**-Rp 120.00 T**
2022	+Rp 164.00 T	-Rp 195.00 T	-Rp 34.60 T	**-Rp 66.10 T**
2023	+Rp 154.00 T	-Rp 164.00 T	-Rp 18.30 T	**-Rp 28.30 T**
2024	+Rp 153.00 T	-Rp 198.00 T	-Rp 28.80 T	**-Rp 73.50 T**

Source: Ministry of Energy and Mineral Resources (ESDM) and BPDPKS, processed by author. Note: T = Trillion Rupiah

The data show that the net benefit of the mandatory biodiesel policy has been consistently negative since 2015, with the sole exception of 2014. The largest cost-benefit deficit occurred in 2021 (–IDR 119.95 trillion) when the surge in global CPO prices coincided with high biodiesel consumption volumes. Although there was some improvement in 2022–2023, 2024 recorded a further deficit of IDR 73.48 trillion.

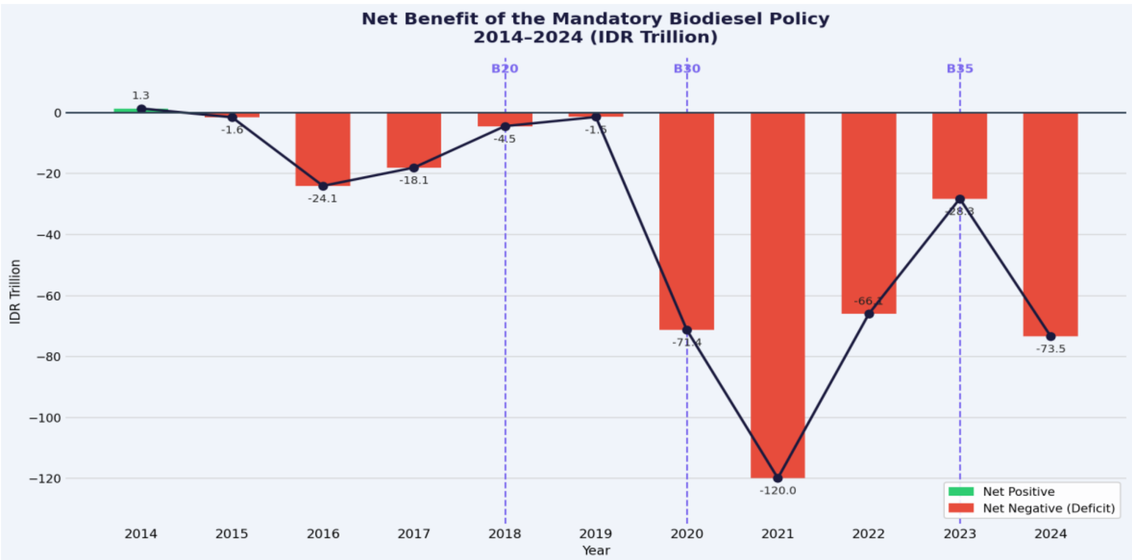

Figure 5.1: Net Benefit of the Mandatory Biodiesel Policy, 2014–2024 (IDR Trillion)

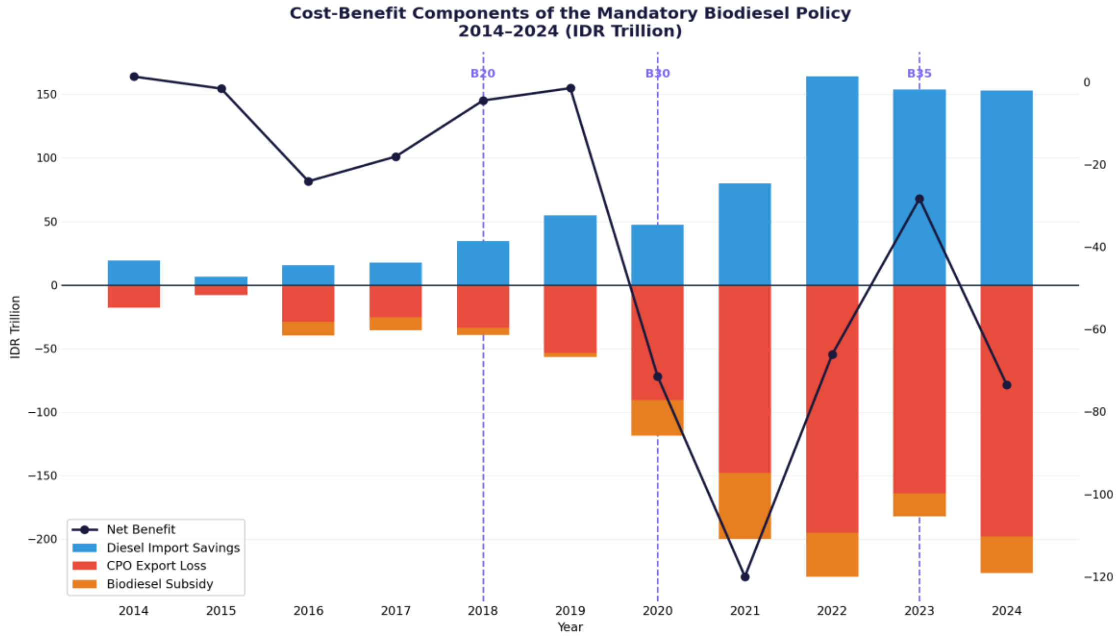

Figure 5.2: Cost-Benefit Components of the Mandatory Biodiesel Policy, 2014–2024 (IDR Trillion)

6. The State as Risk Absorber

6.1 Risk Redistribution Mechanism: From Market to State

A decade of cost-benefit data reveals a core paradox. The mandatory biodiesel policy, conceived as a mechanism to conserve foreign exchange, has functioned instead as a systematic redistribution of commodity price risk, shifting exposure from the industrial sector onto the state. Progressive blending mandates, from B20 through B35 and toward B50, have each enlarged the state's vulnerability to global price volatility without adequate limiting mechanisms in place.

From a political economy perspective, this can be understood as a form of rent protection architecture, which is a policy framework that structurally shields strategic sectors from external shocks, but with the consequence that the state bears the price differential between global market realities and domestic stability needs. The practical implication is clear: the biodiesel industry operates within a guaranteed margin zone, while price uncertainty is entirely absorbed by state revenues through the BPDPKS mechanism.

The mechanism operates through the biodiesel HIP regulation under Ministerial Regulation No. 12/2015. The biodiesel HIP formula takes global CPO prices as its primary input, making it highly responsive to world market movements. The diesel HIP, by contrast, tracks a domestically subsidized price structure and remains comparatively stable. It is the spread between these two reference prices that BPDPKS is obligated to cover, an obligation that widens automatically whenever global CPO prices rise.

In incentive design terms, the arrangement functions as an uncapped pass-through: global CPO price risk is transferred entirely to the state, with no ceiling on the obligation and no mechanism to share risk with industry. Producers face no feedstock price pressure, since rising production costs are compensated in full. This generates a structurally asymmetric outcome, private losses are minimized while public cost exposure accumulates without bound.

6.2 Pro-Cyclicality of Commodity Prices and Subsidy Policy

The fundamental design flaw of the mandatory biodiesel policy is its pro-cyclicality with respect to commodity prices. Rather than benefiting from high global CPO prices, the state faces growing fiscal pressure through two simultaneous channels: rising export losses, as the opportunity cost of each tonne diverted domestically increases, and rising subsidy costs, as the biodiesel HIP moves with global CPO prices while the diesel HIP remains anchored to a domestic, subsidized structure.

Empirical data for 2020–2022 clearly confirm this mechanism. When global CPO prices surged due to global supply chain disruptions and post-pandemic demand recovery, the net benefit of the biodiesel policy deteriorated sharply: from −IDR 71.41 trillion (2020) to −IDR 119.95 trillion (2021), then −IDR 66.06 trillion (2022). Ironically, this was precisely when Indonesia should have been maximising foreign exchange earnings from CPO exports. Instead, the economic costs borne by the state reached their peak.

Falling CPO prices reduce subsidies but do not proportionally improve net benefits, since export losses also decline and import savings remain stable. Rising prices, however, inflict a simultaneous double hit, where the export losses and subsidy costs spike together. The asymmetry is non-linear: losses in high-price environments far outweigh gains in low-price ones. The state absorbs the downside of price volatility without capturing its upside.

Exchange rate dynamics compound the problem. CPO export losses are denominated in USD, so rupiah depreciation automatically increases their IDR equivalent without any change in underlying CPO prices or diversion volumes. The state's risk exposure is therefore not limited to commodity price volatility, and it also bears exchange rate risk structurally embedded in the globally-anchored HIP formula.

6.3 Demand Domestication: A Survival Strategy Amid Global Market Pressures

To fully understand the logic of this policy, it must be placed in the context of external pressures facing Indonesia’s palm oil industry. The European market — one of the largest CPO export destinations — has progressively tightened palm oil access regulations through sustainability requirements: deforestation-free supply chains, low carbon footprints, and strict traceability systems under the EU Deforestation Regulation (EUDR). These requirements effectively raise compliance costs and create significant non-tariff barriers for CPO exporters. The mandatory biodiesel policy then serves as a demand domestication strategy: the state actively creates a guaranteed domestic buyer so the palm oil industry is not entirely dependent on an increasingly uncertain global market.

In the context of commodity political economy, this approach is commonly referred to as domesticated price stabilization, whereby the state internalizes global price risks into the domestic policy domain through the creation of a captive market insulated from external market pressures. Within this framework, biodiesel functions as a “safety valve” for surplus CPO production that cannot be fully absorbed by export markets. This mechanism has proven effective in maintaining domestic demand stability and preventing sharp declines in CPO prices arising from oversupply conditions. However, the implications are significant: risks that were previously distributed across multiple global market actors become increasingly concentrated within the state’s capacity and policy framework.

This demand domestication strategy is not distributionally neutral. Its benefits flow primarily to large-scale industrial players with biodiesel production capacity, while the costs are borne by all Indonesian citizens — through the state budget or through levy funds that could otherwise support smallholder palm development. The state thus functions not only as a macroeconomic risk absorber, but as a benefit redistributor whose distributional outcomes do not consistently serve the broader public interest.

6.4 Distribution of Benefits and Costs Under the Biodiesel Policy

The official narrative of energy security obscures a deeply inequitable reality: benefits have systematically accrued to the biodiesel corporate sector while costs have been socialized. The cumulative deficit over 2014–2024 exceeds IDR 409.6 trillion — nearly twice the 2024 Ministry of Education budget, or enough to build some 1.5 million affordable housing units. The opportunity cost is rarely acknowledged: what poverty reduction, child nutrition, or rural infrastructure programmes could have been financed with a decade's worth of biodiesel subsidies?

Indonesia’s biodiesel industry is highly concentrated. Based on data from the Ministry of Energy and GIMNI (the Indonesian Vegetable Oil Industry Association), national biodiesel production is dominated by a small number of large companies affiliated with Indonesia’s largest palm oil conglomerates. National biodiesel production capacity, exceeding 15 million KL per year, is concentrated in fewer than 20 FAME producers, the majority of which are vertically integrated entities spanning palm plantations, CPO mills, and biodiesel production facilities. This concentration has serious implications: BPDPKS subsidies are not distributed evenly across market participants, but flow proportionally to those with the largest production capacity. The greater the capacity, the greater the subsidy received.

The policy effectively guarantees biodiesel producers both a captive market and a protected selling price. The blending mandate secures demand; the HIP formula absorbs feedstock cost increases. Producers face virtually no market risk, while the state bears the full cost differential that is funded through the CPO export levy and ultimately at society's expense. Such a risk-free operating environment is scarcely found in any other sector of the Indonesian economy.

Nothing illustrates the inequity more clearly than the BPDPKS budget allocation between biodiesel subsidies and the Smallholder Palm Replanting Programme (PSR). PSR serves millions of smallholders including the palm oil value chain's most vulnerable participants, with no price-setting power, no export market access, and full exposure to FFB price volatility. Yet it receives just 4.11% of BPDPKS funds, against the 93.28% directed to biodiesel subsidies that largely benefit large corporations. The data leave little room for interpretation: public policy systematically protects industry while neglecting smallholders.

The inequitable distribution is structural, not incidental. The policy is designed to guarantee large producers' margins by collecting levies that are largely recycled back to those same producers as subsidies, while smallholders remain entirely outside this protection. B50 will not reform this dynamic; it will amplify it. Greater volumes mean larger transfers to the same parties and a heavier fiscal burden on the state and citizens.

Temuan krusial dari analisis ini adalah bahwa manfaat bersih yang negatif bukan merupakan anomali yang disebabkan oleh kondisi pasar yang tidak biasa, melainkan merupakan konsekuensi logis yang dapat diprediksi dari desain kebijakan itu sendiri. Terdapat tiga karakteristik struktural yang menjadikan defisit ini bersifat menetap: pertama, manfaat (penghematan impor solar) bersifat rigid karena dibatasi oleh kapasitas konsumsi energi domestik; kedua, biaya (*CPO export loss* dan subsidi) bersifat volatil dan dinamis mengikuti pergerakan harga global; ketiga, tidak ada mekanisme yang dapat membatasi *esposur* biaya ekonomi ketika kondisi pasar memburuk.

Data menunjukkan bahwa dari 11 tahun periode analisis (2014–2024), hanya pada tahun 2014 manfaat bersih mencatat nilai positif (+Rp1,32 Triliun). Seluruh tahun berikutnya konsisten negatif, dengan tren yang cenderung memburuk seiring meningkatnya volume *blending* dan fluktuasi harga CPO. Temuan ini adalah refleksi dari ketidakseimbangan desain yang dibahas di atas: manfaat yang statis berhadapan dengan biaya yang dinamis.

Implikasi dari sifat struktural ini sangat penting bagi rencana implementasi B50. Jika pola yang sama berlanjut maka peningkatan volume biodiesel ke level 50% hanya akan memperbesar skala kerugian, bukan mengubah arahnya. Peningkatan kebutuhan CPO domestik sebesar ~43% dari level B35 akan secara proporsional memperbesar *CPO export loss*, sementara subsidi yang harus dibayarkan BPDP juga akan meningkat seiring volume yang lebih besar. Oleh karena itu, reformasi arsitektur kebijakan adalah prasyarat mutlak agar B50 tidak menjadi beban biaya ekonomi struktural yang lebih berat bagi Indonesia.

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7. Inequitable Allocation of BPDPKS Funds

The CPO levy is a charge on palm oil exports managed by BPDPKS to fund various strategic programmes. Under Ministry of Finance Regulation No. 9 of 2026, the maximum levy rate on CPO and its derivatives is 12.5% of the Ministry of Trade's CPO reference price. However, BPDPKS budget realisation data reveals a stark structural inequity:

Program	Budget Allocation	Share (%)
Biodiesel Subsidy	Rp 29,38 Triliun	93,28%
Smallholder Palm Replanting (PSR)	~Rp 1,29 Triliun	4,11%
Human Resource Development	~Rp 0,31 Triliun	0,99%
Research & Development	~Rp 0,11 Triliun	0,36%
Partnership	~Rp 0,14 Triliun	0,45%
Infrastructure & Facilities	~Rp 0,13 Triliun	0,40%
TOTAL	**Rp 31,50 Triliun**	**100%**

Source: BPDPKS Annual Performance Report, processed by author

The overwhelming dominance of biodiesel subsidies in levy allocation (93.28%) reflects minimal commitment to sustainable palm oil development. The smallholder palm replanting programme, which is crucial for improving productivity and preventing new land expansion, received only 4.11% of the total budget. This risk driving further palm oil plantation expansion, hampering productivity improvement efforts in the upstream sector, and creating inequitable benefit distribution whereby fund flows are skewed towards large-scale industry players rather than smallholder farmers.

8. Impact on Palm Oil Plantation Area and Employment

This study also evaluates the association between rising biodiesel consumption and palm oil plantation area expansion and employment. Regression Model 1 tests the effect of biodiesel consumption on plantation area. The results show a positive coefficient of 0.000533, indicating that higher biodiesel consumption is associated with greater plantation area. As the dependent variable is measured in thousands of hectares and the independent variable in kilolitres (KL), the interpretation is: every 1,000 KL increase in biodiesel consumption is associated with an additional 0.533 thousand hectares (533 hectares) of palm oil plantation. This is economically plausible, as rising biodiesel demand creates incentives for plantation expansion given that palm oil is the primary feedstock.

Regression Model 2 examines the association between biodiesel consumption and employment in the palm oil industry. The results show a coefficient of 0.1284, meaning every 1 KL increase in biodiesel consumption is associated with approximately 0.1284 additional workers. Expressed more meaningfully, every 1,000 KL increase in biodiesel consumption is associated with approximately 128 additional jobs in the palm oil sector. This positive association suggests that rising biodiesel consumption drives industry expansion and broader employment along the supply chain. The regression analysis shows strong correlation (R^2 = 0.84 for plantation area; R^2 = 0.86 for employment) between biodiesel consumption and both dependent variables.

Variable	Regression 1 (Y = Plant areas)	Regression 2 (Y = employment)
A. Coefficients		
Constant	10.569,944***	5.802.106,443***
	(20,227)	*(20,964)*
Biodiesel Consumption	0,000533***	0,1284**
	(7,540)	*(4,908)*
B. Model Statistics		
R^2 (R-Squared)	0,8379	0,8576
Adjusted R^2	0,8231	0,8220
F-statistik	56,846***	24,088**
Observasi (n)	13	13

Source: Ministry of Energy and Mineral Resources and Statistics Indonesia (BPS), processed by author

However, while these regression results suggest that the mandatory biodiesel policy is positively associated with palm oil sector employment, the risk of excessive plantation expansion — and the resulting environmental damage — must be carefully watched if productivity improvement and replanting do not keep pace.

9. Projected Impact of B50 Implementation

This section presents quantitative cost-benefit projections for B50 implementation across three scenarios, each using different actual price data: the baseline scenario uses full-year average actual data for 2025; the escalation scenario uses peak data from the Iran–US crisis in April 2026; and the geopolitical de-escalation scenario uses post-ceasefire projections. The estimates use a biodiesel volume of approximately 20 million

KL, consistent with a 50% blending assumption applied to projected national diesel consumption of approximately 40 million KL in 2026. The calculation methodology is identical to the historical 2014–2024 analysis in previous chapters, enabling direct comparison between projected and actual data.

9.1 Data Basis and Scenario Assumptions

The three scenarios are constructed from verifiable primary data sources.

Scenario I – Baseline (2025 Actual Data) uses a 2025 annual average CPO price of USD 955/metric tonne (IMF FRED), an average 2025 Rupiah exchange rate of IDR 16,475/USD (source: ValutaFX, exchange-rates.org), and an average 2025 Brent crude price of USD 72/bbl (Statista). This scenario reflects market conditions prevailing before the escalation of the Iran–US conflict that began in February–March 2026.

Scenario II – Geopolitical Escalation (Iran–US Crisis Peak, April 2026) uses the most current actual data available at the time of writing. The Iran–US conflict that erupted in early 2026 and closed the Strait of Hormuz caused the largest recorded global oil supply disruption, sending Brent prices surging to USD 103–120/bbl by end-April 2026 (source: EIA Short-Term Energy Outlook, April 2026). Malaysian CPO prices over the same period held around MYR 4,500–4,520/tonne, equivalent to approximately USD 1,000–1,100/tonne (source: Trading Economics, Bursa Malaysia), supported by spillover effects from the crude oil price surge. This scenario uses CPO at USD 1,100/tonne, an exchange rate of IDR 17,200/USD, and Brent at USD 115/bbl.

Scenario III – Geopolitical De-escalation (Post-Ceasefire Projection) uses EIA projections forecasting Brent to fall below USD 90/bbl in Q4 2026 and average USD 76/bbl in 2027 as production normalises. Following historical patterns, oil price normalisation would pull CPO down to around USD 820/tonne and allow the rupiah to strengthen to approximately IDR 16,950/USD. This scenario represents the gradual recovery conditions expected to materialise after a ceasefire is reached.

9.2 Projection Results: Three B50 Cost-Benefit Scenarios

The following table summarises the cost-benefit projection results for all three scenarios:

Component	Baseline 2025	Iran–US Escalation	Geopolitical De-escalation
CPO (USD/ton)	$955 (actual)	$1,100 (actual Apr 2026)	$820 (projected)
IDR/USD Exchange Rate	16,475 (actual)	17,200 (actual/projected)	16,950 (projected)
Brent Crude Price (USD/bbl)	$72 (actual)	$115 (actual/EIA projected)	$85 (EIA projected)

Diesel Import Savings (IDR T)	**+Rp 149,2 T**	**+Rp 248,8 T**	**+Rp 181,2 T**
CPO Export Loss (IDR T)	**-Rp 298,9 T**	**-Rp 359,5 T**	**-Rp 264,1 T**
Biodiesel Subsidy (est., IDR T)	-Rp 42,0 T	-Rp 68,0 T	-Rp 33,0 T
NET BENEFIT	**-Rp 191,7 T**	**-Rp 178,7 T**	**-Rp 115,9 T**

Source assumptions: CPO 2025: IMF FRED (PPOILUSDQ Q4-2025: $998, annual average Jan–Dec $955). Exchange rate 2025: ValutaFX/exchange-rates.org (annual average $1=IDR 16,475). Brent 2025: Statista (average Jan–Jun 2025: $71.91/bbl). Iran–US Escalation: EIA STEO April 2026 (Q2-2026 peak: $115/bbl), Trading Economics (Brent 29 April 2026: $120.30/bbl), CME Group CPO April 2026 ($914.50/tonne + crisis premium), Wise (exchange rate IDR 16,900–17,000/USD). Biodiesel subsidy estimated based on historical ratio to CPO export loss. Biodiesel volume: ~20 million KL.

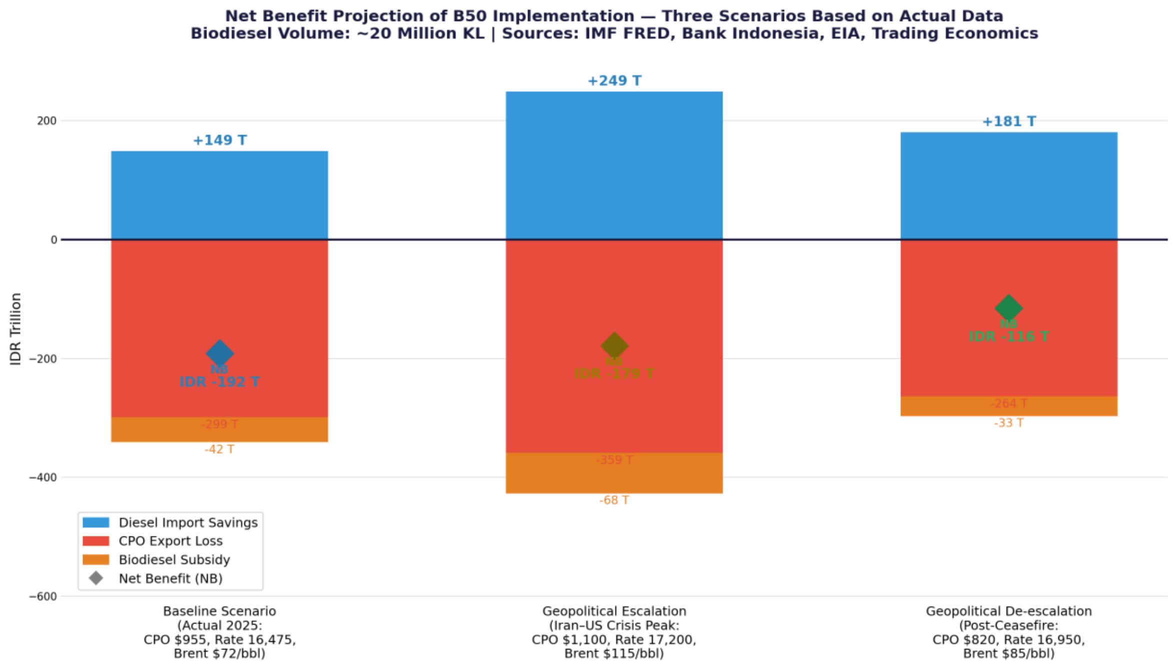

Figure 9.1: B50 Cost-Benefit Projections – Three Scenarios Based on 2025 Actual Data and the Iran–US Crisis (IDR Trillion)

9.3 Interpretation: The Geopolitical Paradox

The projections yield a counterintuitive finding: B50's net benefit is less negative under the geopolitical escalation scenario (–IDR 178.7 trillion) than the baseline (–IDR 191.7 trillion). Higher oil prices lift diesel import savings from IDR 149.2 trillion to IDR 248.8 trillion, partially offsetting the rise in CPO export loss from IDR 298.9 trillion to IDR 359.5 trillion. The energy security case for biodiesel thus gains partial support in crisis conditions but the net outcome remains substantially negative. This exposes a structural limitation: CPO and crude oil prices are positively correlated, so the conditions that maximize biodiesel's import savings benefit simultaneously maximize its export loss cost. The two move in tandem, capping the policy's net upside even in high oil price environments.

9.4 Renewable Energy Potential as Energy Security Diversification

The preceding cost-benefit analysis raises a more fundamental question: whether CPO-based biodiesel represents Indonesia's most efficient energy security instrument, or whether more sustainable and economically viable alternatives exist. This section addresses that question through a comparative analysis of Indonesia's renewable energy potential and its implications for policy, including an assessment of the optimal CPO allocation ceiling for biodiesel.

9.4.1 Indonesia’s Renewable Energy Potential

Indonesia holds one of the world's largest untapped renewable energy endowments, yet utilization remains negligible relative to potential. According to Ministry of Energy and Mineral Resources data and the 2025 National Electricity General Plan (RUKN), solar PV technical potential reaches 3,286 GW against installed capacity of just 0.92 GW in 2024 or less than 0.03% of potential. Wind potential stands at 155 GW with 0.15 GW installed; hydropower at 95 GW with 6.1 GW; geothermal at 23.8 GW with 2.67 GW. Non-CPO biomass from agricultural residues, palm oil mill effluent, and municipal solid waste carries a potential of 55.7 GW (RUKN 2025), with approximately 3.7 GW currently installed through PLN's co-firing programme.

The 2025–2034 Electricity Supply Business Plan (RUPTL) targets 42.6 GW of new renewable capacity over the next decade requiring approximately USD 183 billion in investment. That figure is roughly equivalent to a decade of net fiscal losses that unreformed B50 would generate under the geopolitical escalation scenario alone.

9.4.2 Generation Cost Comparison: Biodiesel vs. Other Renewables

From a Levelised Cost of Energy (LCOE) perspective, B50 biodiesel is the least competitive among all energy sources analysed. Based on IRENA Renewable Power Generation Costs 2023 data, global average utility-scale solar PV costs have fallen to USD 0.044/kWh (an 89% decline since 2010), onshore wind to USD 0.033/kWh, and geothermal to approximately USD 0.075/kWh. By comparison, calculations based on BPDPKS’s 2024 HIP formula show that the effective energy production cost from B50 biodiesel from USD 0.14 to 0.18/kWh, roughly three to four times more expensive than solar PV and onshore wind.

The cost differential has significant policy implications. Every IDR 1 trillion invested in utility-scale solar PV yields approximately 100–120 MWp of capacity, delivering clean energy over a 25–30 year lifespan with no exposure to commodity price volatility. The same amount allocated as a biodiesel subsidy produces only current-year import savings, while generating implicit CPO export loss costs that outweigh the subsidy value.

9.4.3 Optimal Ceiling for CPO Allocation to Biodiesel

The question of what proportion of CPO can be optimally allocated to biodiesel without compromising food security, export competitiveness, and economic sustainability must be answered through a commodity balance analysis. Indonesia's total palm oil output in 2024 reached 52.762 million tonnes (CPO and PKO). Based on GAPKI 2025 data, domestic food consumption accounted for 10.205 million tonnes (19%), oleochemicals for 2.207 million tonnes (4%), and biodiesel for 11.447 million tonnes (22%). GAPKI data confirm that the B35 mandate absorbed approximately 11.447 million tonnes of CPO, equivalent to 22% of total national production, and has already contributed to an export decline of approximately 11%, from 33.15 million tonnes in 2022 to 29.535 million tonnes in 2024.

B50 is projected to require approximately 19 million tonnes of CPO, or around 36% of total national production, reducing exports to an estimated 18.8 million tonnes. GAPKI has also noted that B40 implementation in 2025 has already reduced exports by roughly 17% relative to 2022, to approximately 27.5 million tonnes. This level represents the minimum threshold at which CPO export levy revenues remain sufficient to finance subsidy requirements. On the basis of the actual commodity balance, the economic viability ceiling of the biodiesel programme appears to lie around B40 and the current B35 mandate has already entered cautionary territory.

9.4.4 Feasibility Matrix: Selecting the Most Viable Renewable Energy Sources

Based on technical potential, generation costs, technology readiness, and suitability to Indonesia's geographic conditions, the comparative feasibility assessment is as follows. Solar PV is the most feasible source for large-scale development in the short to medium term: lowest cost (USD 0.044/kWh), largest technical potential (3,286 GW), rapid construction timelines (6–18 months), and no dependence on a high-value export commodity. Its main challenge is intermittency, which requires battery energy storage systems (BESS) for baseload capacity, along with grid upgrades and infrastructure investment.

Geothermal energy represents the most feasible renewable energy source for baseload power generation to replace coal-fired electricity, as it is capable of operating continuously on a 24/7 basis with a capacity factor of approximately 85–95%. Unlike solar and wind energy, geothermal power generation is not affected by weather variability. Indonesia possesses the world's second-largest geothermal potential, estimated at 23.8 GW, including approximately 14.4 GW of proven reserves.

Nevertheless, geothermal development continues to face several major challenges, including high exploration and drilling costs (estimated at USD 3–5 million per well), significant geological risks, and the fact that the majority of geothermal resources are located within forest areas that require special permitting arrangements. However, the

2024 regulatory reform removing geothermal activities from the classification of mining activities has expanded access to conservation forest areas and improved the regulatory environment for geothermal investment.

Large-scale hydropower also offers substantial potential, estimated at approximately 95 GW. However, its development is constrained by social and environmental concerns associated with large reservoir inundation and land conversion. Consequently, the sector's future relevance is likely to lie more in small- and medium-scale run-of-river hydropower projects, which are generally considered more environmentally sustainable. Wind energy remains at an early stage of development in Indonesia. Nevertheless, the projected compound annual growth rate (CAGR) of 55.95% during the 2026–2031 period indicates considerable future potential, particularly in regions such as South Sulawesi and East Nusa Tenggara.

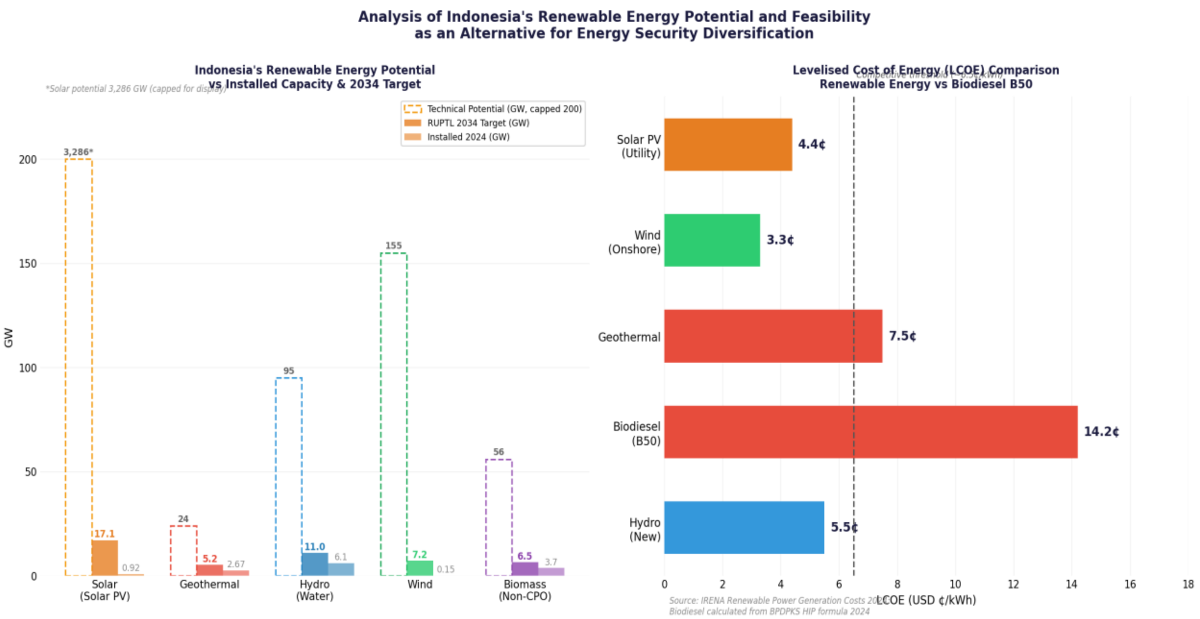

Figure 9.2: Indonesia's Renewable Energy Potential and LCOE Comparison vs. Biodiesel B50

The implication is that Indonesia's optimal energy strategy does not lie in maximising CPO biodiesel blending, but in diversifying its renewable energy portfolio to leverage the comparative advantage of each source: solar PV for distribution-scale and industrial energy during daylight hours, geothermal for 24-hour baseload, hydro for system regulation, and wind as a complement in high-potential regions. Within this framework, CPO biodiesel can be retained as one component, but with a more limited role bounded by a clear net benefit threshold, not as a single energy security instrument to be endlessly expanded without a ceiling.

9.5 Additional Cost Risks Beyond the Core Projections

The quantified projections do not fully capture B50's risk profile. Two unquantified factors are material. First, a 50% blend requires infrastructure modifications to blending and distribution systems, with adjustment costs likely borne largely by Pertamina. Second, higher blend compositions risk vehicle engine performance derating and if confirmed, the resulting warranty claims, legal disputes, and compensation liabilities could be substantial, though their magnitude remains difficult to estimate.

10. Policy Recommendations

The recommendations below are derived directly from the empirical findings and structural analysis set out in the preceding chapters.

10.1 Establishing CPO Balance Prerequisites Before B50 Implementation

Chapter 9 projections confirm that B50 generates a negative net benefit in every scenario, ranging from −IDR 115.9 trillion under the most favourable conditions to −IDR 178.7 trillion under geopolitical escalation. The CPO balance analysis in Section 9.4.3 points to a more fundamental problem: even with full institutional reform, B50 would divert 19 million tonnes, or around 36% of national CPO and PKO output, to the domestic market, surpassing the economic viability ceiling that GAPKI's own projections place at B40, where exports already fall 17% below 2022 levels.

The first recommendation is therefore to establish measurable and binding prerequisites prior to the implementation of B50. These prerequisites consist of three conditions that must be fulfilled simultaneously:

1. Reform of the Market Index Price (HIP) formula to establish a more balanced risk-sharing mechanism between the government and biodiesel producers;
2. Reallocation of BPDPKS funds, with a minimum allocation of 25% for the Smallholder Palm Replanting (PSR) program formally stipulated in the approved annual Work Plan and Budget; and
3. Limitation of biodiesel volumes such that domestic biodiesel demand does not divert more than 25% of total national CPO production to the domestic market, equivalent to an estimated blending ceiling of approximately B40 under current CPO production levels.

The first two conditions are institutional in nature and can therefore be addressed through regulatory reform. The third condition, however, constitutes a physical production constraint that cannot be resolved through policy intervention alone.

The policy implications are therefore distinct. If the first and second conditions remain unmet, B50 implementation should be postponed pending completion of the necessary reforms. However, if the third condition is not satisfied namely, if CPO yield per hectare has not increased sufficiently to accommodate additional domestic biodiesel demand without materially reducing exports — B50 should not merely be postponed, but suspended until the national CPO balance permits such expansion. Any future increase in the blending mandate beyond the current CPO balance threshold should only be reconsidered on the basis of updated production data demonstrating significant improvements in productivity per hectare, rather than through further land expansion, which would generate additional environmental externalities and sustainability risks.

10.2 Fundamental Reform of the Biodiesel Market Index Price Formula

The net benefit deficit traced in this study has a single root cause: a pricing formula that automatically transfers all cost impacts to the state when palm prices rise, with no binding limit on the obligation. This produces the severely asymmetric risk allocation documented in Chapter 5, where producers are insulated from market risk while the state bears all economic costs. The arrangement contradicts the risk allocation efficiency principle, under which risk should be borne by the party best positioned and incentivised to manage it.

We recommend that the biodiesel HIP formula be determined based on the lower value (minimum) of the following two reference prices:

Reference Price 1	: The domestic spot average price of biodiesel formed in the domestic market during the relevant period.
Reference Price 2	: The international biodiesel price (FAME FOB Rotterdam or an equivalent reference) minus CPO/biodiesel export duties and the applicable BPDPKS levy.

The fundamental principle is that the state should not pay a biodiesel price higher than the price genuinely available in the market after accounting for relevant cost components.

The current HIP formula uses global CPO prices as the single input directly transmitted into subsidy costs, creating a full pass-through mechanism that leaves the state absorbing all global commodity price volatility. The proposed formula breaks this one-sided transmission in three ways:

1. Creating a natural price ceiling. When global CPO prices spike, the net international price also rises, but the increase is dampened because the progressive export duty rises alongside the reference price, making the deduction component larger. As a result, the HIP does not rise as quickly as the raw CPO price, and the subsidy burden does not track commodity volatility linearly.

2. Create efficiency incentives for producers. Setting the HIP at a competitive market-based level allows efficient producers with costs below the HIP to earn higher margins, while preventing inefficient producers from relying on state-guaranteed margins. This mechanism encourages greater efficiency across the biodiesel industry.

3. Reflect the actual opportunity cost. The net international price (international price less export duties and levies) represents the effective revenue producers would obtain from exports. Using this value as the HIP ceiling ensures that state incentives do not exceed the true opportunity cost of diverting CPO to the domestic market, thereby aligning the policy framework more closely with the opportunity cost analysis presented in this report.

10.3 Governance Reform, Mandate Revision, and BPDPKS Fund Reorientation

Chapter 6 identifies two interconnected failures within BPDPKS: weak oversight enabling unchecked subsidy growth, and a distribution structure that funnels almost all resources to large producers. Addressing one without the other is insufficient. Governance reform and fund reallocation must proceed together, each reinforcing the other. This recommendation tackles both within a single integrated framework spanning four levels.

At the governance level, the composition and authority of the BPDPKS Steering Committee must be restructured so that the Ministry of Finance holds authority commensurate with its cost control responsibilities. Sound public policy design requires that the institution responsible for a programme's economic sustainability has authority proportionate to those with sectoral interests in its expansion. Without this change, allocation ceilings set at the mandate level remain vulnerable to revision under industry pressure.

At the mandate level, Presidential Regulation No. 24/2015 should be revised to expand BPDPKS's mandate from biodiesel incentive administration to strategic fund management aimed at strengthening the competitiveness and welfare of the broader palm oil sector, including smallholders. This expanded mandate should be operationalised through legally binding minimum allocation thresholds: at least 25% for the Smallholder Palm Replanting Programme (PSR), at least 10% for research, development, and sustainability certification, and a biodiesel subsidy cap of no more than 60% of the annual budget. These thresholds should be legally enforceable and not subject to discretionary reallocation without DPR approval.

At the allocation level, the revised mandate should drive a strategic shift from demand-side subsidies toward upstream productivity investment. BPDPKS 2024 data show that 93.28% of the IDR 31.50 trillion budget was directed to biodiesel subsidies benefiting fewer than 20 large-scale FAME producers, while the PSR programme serving approximately 2.67 million smallholders received only 4.11%.

Priority measures should therefore include accelerated PSR implementation, subsidised RSPO and ISPO certification to improve smallholder access to premium export markets, and investment in raising CPO yield per hectare. Over the long term, this approach would reduce pressure for further land expansion and mitigate environmental externalities insufficiently captured in current program cost calculations.

Fourth, at the transparency level, all biodiesel subsidy realisation data, including recipient identities, subsidy volumes, pricing structures, and the basis for HIP determination, should be disclosed periodically through standardised public reporting mechanisms. Transparency is essential not only for accountability, but also for ensuring effective oversight of allocation ceilings and reform implementation. Without institutionalised transparency, reforms at the preceding levels risk remaining largely procedural and difficult to verify independently.

10.4 Institutionalising an Automatic Correction Mechanism

One of the most significant design flaws of the mandatory biodiesel policy is the absence of any feedback mechanism between the programme's economic performance and subsequent policy decisions. Over ten years of implementation, consistently negative and deepening net benefits have never automatically triggered a correction to the blending percentage. This absence structurally severs the link between empirical evidence and policy decision-making, allowing the programme to be continuously expanded even as its economic cost burden grows.

The recommendation is to institutionalise an Automatic Correction Mechanism (ACM) through a Presidential Regulation. The ACM operates by establishing an annual net benefit threshold, determined through an economic capacity analysis conducted by the Ministry of Finance. If mid-year estimates show that net benefit has exceeded the established threshold, the biodiesel blending rate for the following year is automatically reduced to the previous level, and a return to a higher level may only occur once the required reforms have demonstrably reduced the economic cost burden.

10.5 Integrating Biodiesel Policy within a Broader Renewable Energy Diversification Strategy

Historical data analysis reveals the intrinsic limitations of an energy security strategy centred on a single commodity. Although the mandatory biodiesel policy successfully pushed the diesel import ratio down to 9.6% in 2021, it has since risen back to 21.8% in 2024, even as the programme continued. This indicates that palm-based biodiesel lacks the capacity to guarantee long-term energy security, being vulnerable to domestic consumption growth dynamics that outpace biodiesel production expansion. Moreover, concentrating risk in a single commodity creates mutually reinforcing vulnerabilities: when geopolitical conditions worsen and oil prices rise, CPO prices rise in tandem, causing both the benefit (diesel import savings) and the costs (CPO export loss, biodiesel subsidies) to swell simultaneously.

The recommendation is to integrate the biodiesel policy within a more comprehensive energy security strategy, incorporating solar, geothermal, and small-scale hydropower development as complements that reduce dependence on fossil fuel imports without creating exposure to agricultural commodity market volatility. As a comparative calculation: the IDR 28–52 trillion per year in biodiesel subsidies currently paid by BPDPKS is equivalent to investment in 5–10 GWp of solar energy capacity — capacity that, once operational, generates energy output independent of both CPO price dynamics and global oil markets. This comparison is not an argument for abolishing the biodiesel programme, but an illustration of the opportunity cost that must be explicitly considered in national energy security planning.

11. Conclusions

This chapter presents a structured assessment of Indonesia's mandatory biodiesel policy against the four objectives declared by the government, as outlined in Section 2.4, based on the empirical data for 2014–2024 analysed comprehensively throughout this report. The assessment is balanced: proven achievements are acknowledged, unmet objectives are documented with data, and inconsistencies between official claims and empirical reality are identified explicitly.

11.1 Assessment of the First Objective: Foreign Exchange Savings and Trade Balance Improvement

Partial Achievement with Substantial Implicit Costs. The foreign exchange savings objective is achieved only at the level of the visible benefit component (diesel import savings), but fails entirely when calculated comprehensively to include the implicit cost component (CPO export loss) that has consistently been excluded from official government claims.

Diesel import savings are substantial in absolute terms, from IDR 6.37 trillion in 2015 to IDR 153 trillion in 2024, and have served as the government's primary programme justification. A full cost-benefit analysis produces a starkly different picture: only 2014 recorded a positive net benefit, with a cumulative deficit of over IDR 409.6 trillion across 2015–2024. In 2024 alone, the IDR 153 trillion import saving was outweighed by IDR 197.8 trillion in CPO export loss and IDR 28.8 trillion in subsidies, yielding a net benefit of −IDR 73.5 trillion. The cost-to-benefit ratio of 1.48 means every IDR 1 of diesel import savings generates IDR 1.48 in total economic costs.

From a trade balance perspective, the foreign exchange savings claim requires qualification. Diverting CPO from export markets to the domestic biodiesel market reduces CPO export revenues, such that the net impact on the overall trade balance is far less favourable than claimed. In 2024, CPO requirements for biodiesel reached 12.89 million tonnes: at a CPO price of USD 963/tonne and an exchange rate of IDR 15,926/USD, the unrealised export foreign exchange from this diversion amounted to IDR 197.8 trillion — exceeding the diesel import savings achieved.

11.2 Assessment of the Second Objective: Energy Security and Import Dependence Reduction

Temporary Achievement with Remaining Structural Vulnerabilities. In terms of reducing the diesel import ratio, the biodiesel policy records a measurable but unsustainable achievement. Data show a sharp decline in the diesel import ratio from 36.4% in 2012 to 9.6% in 2021 — a technically significant achievement aligned with the import dependency reduction objective. However, this trend reversed after 2021: the import ratio rose again to 14.9% in 2022, 13.7% in 2023, and 21.8% in 2024 or approaching pre-B20 levels. This occurred because overall domestic diesel consumption growth outpaced biodiesel expansion, revealing that the biodiesel programme does not address the structural problem of energy consumption growth.

More critical from an energy security perspective is the paradoxical finding from the geopolitical scenario analysis: precisely when geopolitical conditions deteriorate and oil prices spike, the economic costs of the biodiesel programme also swell simultaneously. In the Iran–US escalation scenario with Brent at USD 115/bbl, B50's net benefit is projected at −IDR 178.7 trillion. This occurs because CPO and crude oil prices are positively correlated, meaning that when oil prices rise, CPO prices rise in tandem, causing the opportunity cost (CPO export loss) to surge alongside diesel import savings. As a result, the biodiesel policy fails to provide adequate economic efficiency precisely when energy price pressure is most acutely felt. The energy security objective is, under the existing policy design, achieved only partially and conditionally.

11.3 Assessment of the Third Objective: Palm Oil Industry Development and Farmer Welfare

Achieved for Large Corporations, Not Achieved for Smallholders. The third objective contains two components that must be evaluated separately: overall palm oil industry development (where the biodiesel programme demonstrably succeeds) and smallholder welfare improvement (where the policy claim is not supported by resource allocation data).

In terms of aggregate industry development, the data show a strong correlation between the biodiesel programme and palm oil sector expansion. Regression analysis (R^2=0.84) confirms that rising biodiesel consumption is significantly correlated with palm oil plantation area growth, from 14.33 million hectares in 2018 to 16.83 million hectares in 2024 (a 17.4% increase) and with employment growth from approximately 6.79 million workers in 2019 to 7.55 million in 2023. The biodiesel programme has successfully created a domestic captive market absorbing CPO production and providing demand stability for the industry, particularly amid regulatory pressures from European export markets (EUDR).

However, these industry benefits are very unevenly concentrated. BPDPKS 2024 budget allocation data show that of the total IDR 31.50 trillion, 93.28% was used for biodiesel subsidies whose benefits flow primarily to large-scale FAME producers. Meanwhile, the Smallholder Palm Replanting Programme (PSR), directly targeting approximately 2.67 million smallholders with an average landholding of less than 2 hectares, received only IDR 1.29 trillion or 4.11% of the total budget. The gap between policy rhetoric and actual resource allocation is increasingly stark. The farmer welfare improvement objective is, on this evidence, not proportionally achieved.

11.4 Assessment of the Fourth Objective: Greenhouse Gas Emission Reduction

Partially Verified for Direct Emissions, Unverified for Total Emissions. The GHG emission reduction claim can only be partially confirmed. At the level of direct combustion emissions, biodiesel does produce approximately 15–20% lower CO_2 emissions per unit of energy generated compared to fossil diesel. At the 2024 biodiesel consumption volume of 13.57 million KL, this direct emission reduction is estimated at approximately 7–10 million tonnes of CO_2 equivalent per year, a significant contribution in the context of national climate targets.

However, this objective becomes problematic when contextualised against the upstream impacts of the policy. The biodiesel programme has driven palm oil plantation area expansion of 17.4%

between 2018 and 2024, from 14.33 million to 16.83 million hectares. If part of this expansion occurred on peatlands or forest land, it generates land-use change (LUC) emissions that are scientifically documented to far exceed the emission savings from fossil diesel substitution. The Indonesian Government does not publish full life-cycle assessment (LCA) calculations incorporating LUC emissions in its biodiesel programme evaluation, meaning that the overall GHG emission reduction claim cannot be independently verified with currently available data.

11.5 Synthesis: Policy Achievement Matrix

The following table summarises the assessment of the mandatory biodiesel policy against all four declared objectives, based on all data and analysis presented in this report:

Policy Objective	Key Indicator	Achievement 2018–2024	Verdict
Foreign Exchange Savings	Diesel import ratio (%)	36.4% (2012) → 9.6% (2021); rebounded to 21.8% (2024)	**✓ Partially Achieved**
	Cumulative Net Benefit	−IDR 409.6 T deficit (2015–2024)	**✗ Not Achieved**
Energy Security	Diesel import risk	Import ratio declined but rose back to 21.8% in 2024	**⚠ Partial**
	Net Benefit during geopolitical crisis	Larger biodiesel volumes deepen the deficit when CPO prices rise	**✗ Paradox**
Palm Oil Farmer Welfare	PSR allocation from BPDPKS	Only 4.11% of the IDR 31.5 T BPDPKS 2024 budget	**✗ Not Achieved**
	Subsidy to large producers	93.28% of levy funds flow to biodiesel subsidies (large producers)	**✗ Inequitable**
GHG Emission Reduction	Direct emissions: biodiesel vs. diesel	Biodiesel ~15% lower per kWh (excl. LUC)	**⚠ Partial / Contested**
	Land-use change (LUC) emissions	Palm plantation expansion +17% (2018–2024); LUC emissions not officially calculated	**✗ Unverified**

Source: Ministry of Energy and Mineral Resources, BPDPKS, Statistics Indonesia, processed by author.
✓ = Achieved/Partial, ⚠ = Partial / Contested, ✗ = Not Achieved.

Overall, this evidence-based assessment indicates that none of the four stated policy objectives has been fully and unconditionally achieved. The foreign exchange savings objective is achieved only at the level of visible import substitution, but not when assessed comprehensively through net economic calculations. The energy security objective has been achieved only temporarily and remains constrained by the same underlying structural limitations.

The smallholder welfare objective has generated benefits primarily for a limited number of large industry actors rather than for the majority of smallholders who constitute the policy's principal social justification. Meanwhile, the emissions reduction objective appears valid only within a narrow accounting framework, while its broader environmental impact remains insufficiently verified and may, under certain conditions, prove counterproductive.

11.6 Implications for B50 Policy

These findings have significant implications for the planned implementation of B50 in July 2026. Under the current policy framework, B50 would predictably magnify existing outcomes: the limited gains from diesel import substitution would increase only marginally, while the already substantial economic and structural costs would rise proportionally. Projections estimate B50 net benefits at between negative IDR 115.9 trillion and negative IDR 191.7 trillion annually, even under favourable assumptions.

In parallel, GAPKI 2025 data show a sustained decline in palm oil exports, from 33.15 million tonnes in 2022 to 29.5 million tonnes in 2024, with exports projected to fall further to 27.5 million tonnes in 2025 — a cumulative decline of approximately 17% within three years as a direct consequence of biodiesel expansion.

Based on these findings, Transisi Bersih concludes that B40 represents the highest blending level that remains economically justifiable under current conditions. B50 should proceed only if three conditions are simultaneously met: significant productivity gains through replanting and yield improvement; reform of the biodiesel pricing formula so that the state no longer absorbs the full CPO price risk; and meaningful reallocation of BPDPKS funds toward smallholders.

Absent these conditions, B50 should not merely be postponed, but cancelled until the underlying structural constraints are resolved. Proceeding under the current framework would entail materially larger foreign exchange losses while the principal economic gains remain concentrated among a limited number of large-scale producers.

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