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Behavioral Responses to Fossil Fuel Subsidy Reform in Indonesia: A Systematic Review of Economic, Political, and Social Dimensions

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ABSTRACT
This study presents a systematic literature review on the behavioral changes following fossil fuel subsidy reforms in Indonesia, while also considering the broader economic, political, and social contexts. Using the PRISMA framework, the review analyses 17 selected studies from Scopus-indexed sources with additional reputable reports. The findings reveal significant shifts in household consumption patterns, transportation choices, and energy use, especially among low-income groups. These changes aren't driven by price signals alone, but also by institutional trust, compensatory mechanisms, and political narratives. The review emphasizes the importance of well-targeted reforms supported by transparent communication and reinvestment strategies to ensure fair and sustainable transitions.
Keywords: Fossil Fuel Subsidy Reform; Behavioral Change; Indonesia; Household Consumption; Political Economy; Systematic Literature Review.

1. Introduction

Indonesia, the world's fourth-most populous country, has for years been fiscally burdened by subsidies for oil consumption, ranked as the world's fourth-largest subsidizer of oil use (Burke et al., 2017; Dartanto, 2017). Subsidies became more significant fiscal burden by 2004 after Indonesia shifted into a net oil importer due to decreasing oil production and increasing consumption, which also triggered the long series of fossil fuel subsidy reform (Murjani, 2022; Hartono et al., 2020). At times, gasoline subsidy alone consuming up to 15% of total government expenditures (M. Akimaya & Dahl, 2022). During 1998 – 2013, fuel subsidies make up on average about 18% of government total spending with mostly middle and upper class make up to 63,8% of the total subsidies (Dartanto, 2013). Since 2013, reforms to fuel subsidies have been implemented, including price adjustments linked to international markets (Burke et al., 2017). **Pertamina**, Indonesia's state-owned oil company, plays a critical role in administering these reforms, as seen in its October 2024 adjustment of non-subsidized fuel prices (e.g., Pertamax Turbo reduced to Rp14,350/liter) (Menpan, 2024) and February 2024 price increase (e.g., Pertamax increased to Rp12,900/liter) (CNBC Indonesia, 2025).

Subsidy has been mainly utilized by the government to minimize adverse impacts and provide poor households with greater access to energy products with lower prices such as energy and transportation (Murjani, 2022; Dartanto, 2017; Jazuli et al., 2021). In the industrial sector, subsidy relieve the cost of energy production which ultimately leads to higher output, more employment, and better consumption overall households (Murjani, 2022). However, fuel subsidies tend to be the most pervasive form of many subsidies. When fuel subsidy imposed in a non-targeted fashion, the economic benefit of fuel subsidy tends to be more sided or disproportionately leaning to richer households because they consume more of the subsidized product than poorer households in the form of overuse of private vehicles and fossil fuel (Burke et al., 2017; Dennis, 2016; Hartono et al., 2020). Study revealed that top income quintile benefits six-fold the subsidy than the rest of quintile. This explains why fuel subsidy often judged as inefficient and inequitable while encouraging excessive fuel use (Dartanto, 2017; Solaymani & Kari, 2014; M. Akimaya & Dahl, 2022) and increase the depletion of limited

energy resources as well as environmental pollution (Yusma Bte Mohamed Yusoff & Ali Bekhet, 2016).

Fuel subsidy in Indonesia connected deeply to political interest further making subsidy reform challenging not only economically but socially and politically. The root cause stems from public resistance and potential loss of political support (M. Akimaya & Dahl, 2022). Parliamentary approval requirements slowed reforms (Ichsan et al., 2022). Additionally, Corruption within energy subsidy exacerbate the already challenging subsidy policy reform (Kyle, 2018).

Fuel subsidies are indeed a fiscal burden, however to reform fuel subsidy also has its own benefit. At a cost of welfare decrease especially in poorer households, the gained savings provide government greater space to reinvest in other essential spending on physical infrastructure, education, health and social protection (Dartanto, 2017; Jazuli et al., 2021).

This study aims to examine the broad political and socio-economical aspects of reforming a fossil fuel subsidy and its effect on economic and/or consumption behaviour change particularly among Indonesian consumers. Following the PRISMA guidelines as recommended by BMJ (2021), this systematic literature review study ensure comprehensive reporting and thoroughly capturing all relevant studies ranging from political, economic, and societal perspectives on fuel subsidy reform in Indonesia enhancing its reliability and accuracy of the findings.

2. Research Method

In this research, the Systematic Literature Review (SLR) method is used to identify, gather, assess, and interpret relevant studies that met fuel subsidy reform topics. Most of the reference database acquired from Google Scholar with the assistance of Rapid Journal to filter Scopus indexed papers from the rest. Research question initially determined to decide suitable keywords before searching papers through database. With PICO (Population, Intervention, Comparison, Outcome) framework as shown in **Table 1**.

Therefore, based on **Table 1**, the keywords used to identify relevant or targeted papers are: *"fuel subsidy reform" OR "energy subsidy removal" AND "Indonesian consumers" OR "household expenditure" AND "economic response" OR "consumer behavior"*. The search within Google Scholar resulted in 80 with database labeled 'Scopus' as unindexed papers were not gathered. Following the screening criteria, 77 papers were rated relevant for further analysis. The selected papers filtered based on its content and those not discussing about "Indonesia" or "Developing Countries" and main topic about "non-subsidy" or "unrelated fiscal reforms" are excluded. Since the study focuses on the reform impact, papers that focus on oil production were also excluded. Additional information from trusted sources also included. This selection process is based on PRISMA guideline shown in **Figure 1**.

Table 1. PICO Framework to generate search keyword within database.

PICO Framework	Variables
Population	Indonesian Consumers
Intervention	Fossil fuel subsidy reform
Comparison	Pre-reform behavior, neighboring countries comparison, post-reform behaviors, alternative policies
Outcome	Economic responses, Behavioral change

Source: Data Analysis, 2025

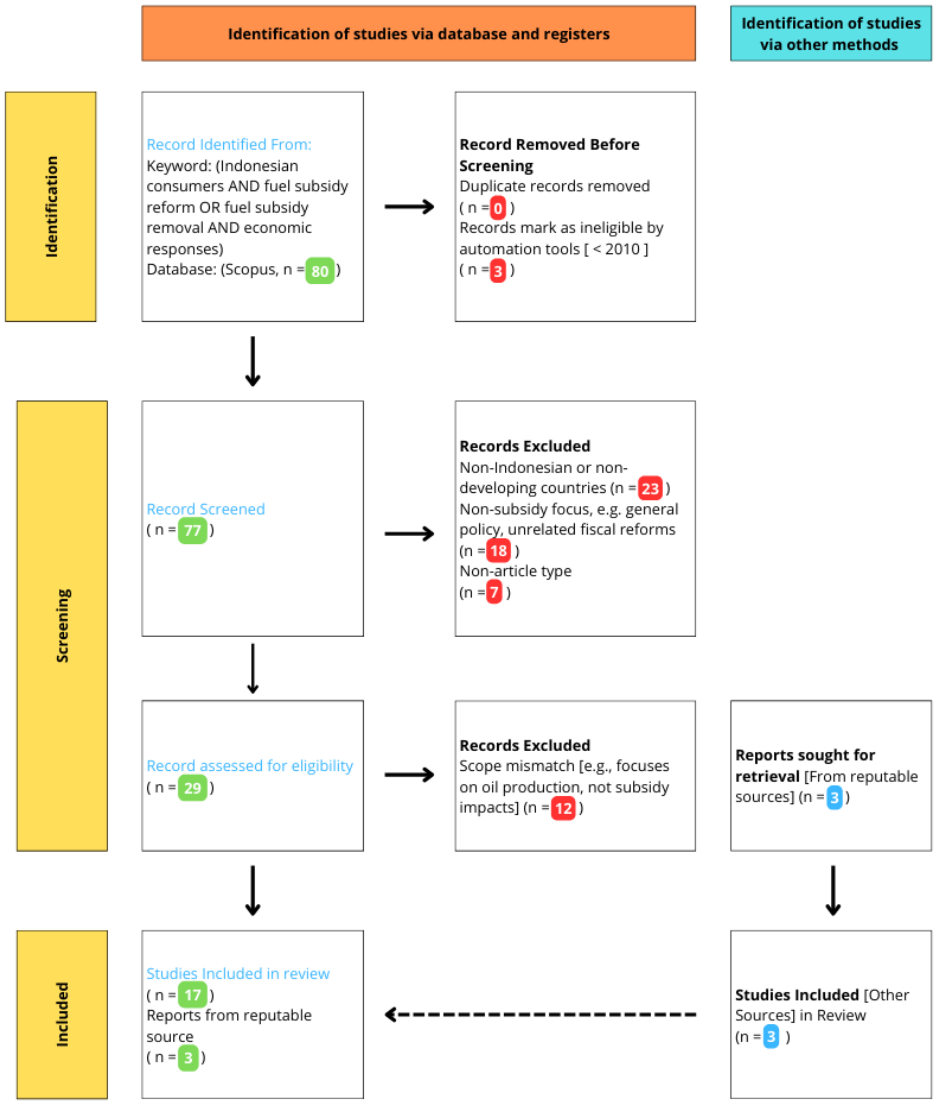

Figure 1. Systematic Literature Review with PRISMA guidelines.

From an initial 80 articles and 3 additional reports identified as relevant to the topic, 20 remains to be further reviewed. The analysis focused on the study as a whole and particular information on changing economic or consumption behavior after subsidy reform. Google Scholar was used as it's the most excel search engine and has a broad range of journals and repository.

3. Result and Discussion

The result is based on systematic literature review shown on **Table 2**.

Microeconomic Effects on Household Behavior: Transportation, Consumption and Behavioral Adaptation

Transportation Behavior Shifts

In Indonesia, Fuel subsidy reform has significantly impacted household transportation choices. People have reduced their use of private vehicle transportation and instead use public transportation as an alternative, especially in cities. Burke et al., (2017) found that a 10% increase in fuel price reduced toll road traffic by 1% and resulted in 2% reduction within a year. This gradual delay reduction demonstrates how people slowly adapt their behaviors. In

Jakarta, the post-2014 reform resulted in 15% increase in Commuter Line passengers, likely because mass transportation became a more affordable option than private vehicles. Households reduced non-essential travels, like leisure trips by 18% after reforms, alternatively, choosing ride-hailing apps and electric scooters. Still, upper-middle-class households which utilize private vehicles highly tend to have inelastic demand while they can absorb higher fuel cost without burdening their disposable income (Harsono et al., 2025).

Low-income groups, particularly in rural areas, experience higher risk due to their reliance on subsidized fuels for agriculture and transportation, especially in highly diesel dependent areas such as Papua and Sulawesi. In East Java, rural households allocated 22% of their income on fuel (which is twice the urban average) forcing them to cut spending in education and healthcare (Harsono et al., 2025). Motorcycle usage, which represent 85% of rural transport, saw an 8-12% decline limiting travel only to essential trips (Setyawan, 2014).

Consumption Adjustments and Substitution Effects

Subsidy reform has changed household spending patterns particularly for low-income groups. Dartanto (2013) CGE model estimated that a 25% subsidy removal without compensation reduces monthly households' consumption by 4,2% with the bottom quintile reducing food expense by 7%. Middle income households, on the other hand, decreased purchases of durable goods such as electronics while higher income households covered extra costs with their savings.

In the energy sector, people's consumption behavior is quite obvious. In urban areas, households began switching from subsidized kerosene to LPG post-2007 and reached 65% in overall urban households by 2016, reducing kerosene consumption by 40%. M. Akimaya & Dahl (2022) revealed a high elasticity of -0,895 between regular and premium gasoline. When subsidies for regular gasoline were reduced, households switched to premium gasoline if price difference wasn't too big, which prevented a sharp drop in gasoline usage. However, once both type of fuel became more expensive, total gasoline demand dropped by 9 – 12% (M. I. Akimaya, 2017).

Behavioral Inertia and Long-Term Adaptation

Households often don't change their consumption behavior so sudden due to price increase. Setyawan (2014) input output analysis showed that while fuel price increase immediately raised transportation sector cost by 7,8%, households took 6 – 8 months to fully adjust their behavior. The adjustments included things like moving to closer places to their workplaces. Similarly, rural households' adjustments to energy-efficient appliances, such as biogas stoves, remained low (<10%) primarily because of expensive upfront cost despite long-term benefits (Toft Christensen et al., 2022).

Role of Compensatory Mechanisms

Targeted interventions have successfully softened some of the negative behavioral changes. Indonesia's reforms between 2014 – 2016 combined subsidy cuts with unconditional cash transfers (UCTs) or *batuan langsung tunai* (BLT). These transfers covered a significant portion between 60-70% of the financial losses to the poorest 20% of households (Jazuli et al., 2021). As a result, recipients were able to maintain their pre-reform spending on essential needs like rice and cooking oil preventing a sharp rise in poverty.

Subsidized alternatives such as the government's LPG subsidy program, from 2015 to 2020, led to a 30% reduction in kerosene use. Households that switched to LPG were then able to reallocate their savings into transportation and education (Ichsan et al., 2022). A subsidy cut without compensation (such as cash-transfers) increased poverty percentage at certain point

in CGE simulation, while reallocating savings to cash-transfers (compensation) mitigate this impact (Dartanto, 2013).

Corruption and Transparent Communication Factors

Behavioral responses are also shaped by trust in the institution and people's perception in fairness. For instance, in corruption vulnerable regions like Sumatra, households resisted reforms because they were skeptical about compensation programs. In a high corruption village, 38% of beneficiaries actually rejected cash transfers (Kyle, 2018). However, during 2014 reforms, with transparent communication, especially the clear information of reform savings would be transferred to healthcare, significantly boosting public acceptance, even among car owners (Jazuli et al., 2021).

Macroeconomics Impacts of Subsidy Reform

Fossil fuel subsidy reforms in Indonesia have resulted in significant macroeconomic changes, particularly in fiscal stability and inflation dynamics. The subsidy removal, historically, reduced fiscal burdens, as demonstrated by the reduction of government subsidy expenditure from 11% to 2,7% over 2 years (2014 – 2016) (Ichsan et al., 2022). These savings gave more room for reallocation spending to infrastructure, education, social programs.

Econometric analyses show that subsidy reform directly influence inflation, with short-term price elasticity of traffic flows dropping by 1% for every 10% fuel price increase, while overtime, this effect can indirectly lowering fuel consumption and emission created (Burke et al., 2017). However, sudden reform changes could cause cost-push inflation, as producers put higher energy cost burden to consumers, disproportionately affecting low-income households (Murjani, 2022). CGE models further highlight mixed macroeconomics outcomes. While Malaysia has seen GDP growth post-reform, household welfare declined due to rising expenses (Solaymani & Kari, 2014). In Indonesia, simulations suggest that reallocating 50% of fiscal savings to targeted transfers could reduce poverty by 0,277%, however, pricing tactics like mark-ups can undermine these benefits, distorting the market (Dartanto, 2013). Another interesting point is, subsidy removal alone is not enough to achieve long-term energy transition goals, it has to be complementary with investments strategy to achieve renewable energy infrastructure requirements (Yusma Bte Mohamed Yusoff & Ali Bekhet, 2016; Hartono et al., 2020; Maulidia et al., 2019).

Subsidies Favor the Rich, Harm the Poor

In Indonesia, the vast majority of fuel subsidies (72% of fuel subsidy) actually go to the wealthiest 30% of the population while the poorest 20% receive a small 7% subsidy portion (Dartanto, 2013). Wealthier households consume more fuel for cars, air conditioning, and luxury items. On the contrary, poorer households uses significantly smaller amount just for basic needs, such as cooking and transportation (Ichsan et al., 2022; Harsono et al., 2025).

These disproportionate subsidies eventually drain crucial funds away from programs designed to help the poor. For instance, Indonesia spent 64% of its total subsidy budget in fuel between 1998 – 2013, and yet poverty levels remain constant due to its poor targeting. The impact of cutting these subsidies will impact poor households the most. A 25% reduction, in CGE simulation led to a 0,26% increase in poverty (Dartanto, 2013).

Political Economy and Institutional Challenges

The political economy of subsidy reform is driven by powerful institutional interests and strategic policy making. Despite Indonesia becoming a net oil importer, National Oil Companies (NOCs) like Pertamina continues subsidy policies. Because of their operation in both the upstream and downstream sectors, they develop careful interests, making structural

reforms such as separating business units which is essential to bring down system barriers (Ichsan et al., 2022). Political narratives also influence reform feasibility. Crises, such as the 1998 financial collapse or during rupiah depreciation often drive changes by gathering problem awareness, policy solutions and political will. For instance, during Joko Widodo's administration, reform was implemented with low global oil prices in 2014 – 2016 leverage minimizing public backlash (Jazuli et al., 2021). Game theory models highlight government dilemma, while subsidy removal brings fiscal relief, political power depends on public trust forcing trade-offs like gradual reforms and compensation (M. Akimaya & Dahl, 2022). Securing parliamentary approval remains a challenge, as seen in pre–2014 subsidy reform that faced delays due to the need for legislative consensus (Ichsan et al., 2022). These institutional and political complexity reveal how urgent decision making interacts with broader policy planning.

Socio-Cultural Responses and Public Perception

Public perception about subsidy reforms is highly influenced by society's past socio-cultural policy experiences. Surveys among Jakarta's university students showed strong support for reform (70%) if the savings were redirected to public goods. However, 17% still threatened protest regardless, showcasing the complicated feelings of the youth (Burke & Resosudarmo, 2012). Rural communities, on the other hand, have a greater resistance to reform due to heavy reliance on fuel subsidies fearing that transportation cost will disrupt their livelihoods (Harsono et al., 2025). The fear of corruption, when highly perceived, also reduces trust. In such villages, households resisted reforms because of the concern whether the compensatory efforts would be poorly managed (Kyle, 2018).

In contrast, effective communication strategies, such as framing reforms as a vital and important national development, strengthened public acceptance during the 2014 – 2016 reforms (Jazuli et al., 2021). Cultural factors, such as reliance in motorcycles for urban travel, also play a role in shaping behavioral responses to reform. For instance, areas that are heavily dependent on diesel, take Papua for instance, face significant challenges transitioning to renewable energies emphasizing the needs for decentralized energy solution (Maulidia et al., 2019). These socio-cultural factors require culturally sensitive policies that consider local needs while also encouraging broader social acceptance.

Policy Recommendations

To maximize the benefits of subsidy reforms, policy makers should adopt comprehensive, ramified strategies. First, gradual implementation of subsidy reforms along with compensatory measurers, such as UCTs or subsidized LPG, can help mitigate short-term economic shocks (Jazuli et al., 2021; Ichsan et al., 2022). Second, institutional reforms are crucial to break political reluctance in change or status quo bias. These include decentralizing Pertamina's operation and significantly improving transparency (Ichsan et al., 2022). Third, reinvesting savings into renewable energy infrastructure, such as geothermal and solar energy projects, can help Indonesia address energy trilemma, which involves balancing affordability, security and sustainability (Hartono et al., 2020; Toft Christensen et al., 2022). For instance, reallocation IDR 166 – 261 trillion annually from fossil subsidies reform savings could cover 33 – 50% of renewable investment needs (Toft Christensen et al., 2022). Finally, stakeholder engagement, such as NGOs, Islamic organizations, and private sectors inclusion in policy making can help in building legitimacy and collective consensus (Jazuli et al., 2021). With these steps, along with strong data collection to monitor mark-up pricing and behavioral changes, will ensure subsidy reforms deliver fair and sustainable success.

Table 2. Systematic Literature Review summary of each paper

No	Author (Year)	Methodology	Variables / Sample / Population	Key Findings
1	Burke et al., 2017	Distributed-lag regression; ARDL model	Toll-road traffic data (Jasa Marga); Independent: fuel prices; Dependent: traffic volume	A 10% fuel price increase reduces traffic volume by ~1-2%, with effects materializing over months. Opportunities exist for integrated mass transportation and electric vehicles. Price elasticity and behavioral shifts are consistent across controls (infrastructure, public transport).
2	Murjani, 2022	Autoregressive Distributed Lag (ARDL)	Macroeconomic variables (energy subsidies, CPI, money supply)	Energy subsidy cuts cause short-term inflation and long-term cost-push effects. Adverse impacts include fiscal burdens and regressive distribution. Policy recommendations: targeted cash transfers and compensatory mechanisms to mitigate reforms' social costs.
3	Dartanto, 2017	Qualitative policy analysis	Macroeconomic/fiscal data (fuel consumption, subsidy budgets, GDP, inflation)	Fuel subsidies are fiscally unsustainable, disproportionately benefiting high-income groups. Reforms driven by fiscal crises rather than environmental concerns. Compensation mechanisms (e.g., cash transfers) minimize poverty impacts.
4	Dennis, 2016	Computable General Equilibrium (CGE) model	20 developing countries; household consumption, subsidy policies	Uncompensated reforms reduce non-fuel consumption for middle-income groups. Compensated reforms improve welfare across income levels. Fiscal savings from reforms can fund targeted redistribution, achieving Pareto improvements.

No	Author (Year)	Methodology	Variables / Sample / Population	Key Findings
5	Solaymani & Kari, 2014	CGE model	Malaysia's economy; transportation sector, households, emissions	Low-income households face disproportionate welfare losses. Gradual reforms allow behavioral adjustments. Savings (10,4% GDP) enable reallocation to public spending. Increased public transport usage observed post-reform.
6	Yusma Bte Mohamed Yusoff & Ali Bekhet, 2016	Multi-sector CGE model; Social Accounting Matrix (SAM)	Industrial energy consumption (crude oil, natural gas, coal, electricity)	Removing subsidies reduces industrial energy use by 3.59%. Reinvesting savings into public services offsets negative impacts. Price signals drive industrial shifts to alternative energy sources. GDP increases (5.74%) with reduced fiscal burden.
7	Hartono et al., 2020	CGE model	Macroeconomic data, input-output tables, SAM	Uncompensated reforms reduce welfare, especially for low-income groups. Fiscal savings enable reinvestment in renewables and infrastructure. Standalone subsidy removal is insufficient for energy mix transition; complementary clean energy policies are critical.
8	Jazuli et al., 2021	Qualitative analysis (multiple-policy stream framework)	Policy decisions, macroeconomic data, political responses	Successful reforms combine gradual implementation, targeted transfers, and clear communication. Timing reforms during high public trust (e.g., early presidential terms) increases acceptance. Compensation programs (e.g., UCTs) act as social shock absorbers.
9	Ichsan et al., 2022	Qualitative case study	Government documents, Pertamina records, media reports, interviews	Subsidy reforms reduced government expenditures (11% to 2.7% of budget, 2014–2016). Higher prices led to demand reduction and shifts to LPG/biodiesel. Structural inefficiencies in NOCs hinder reform efficacy. Low global oil prices aided 2014–2016 reforms.

No	Author (Year)	Methodology	Variables / Sample / Population	Key Findings
10	M. Akimaya & Dahl, 2022	Game theory model (Nash bargaining, selectorate theory)	Political power dynamics, fiscal burden of subsidies (up to 15% of expenditures)	Political capital (public trust) is decisive for reforms. Loss aversion drives public resistance despite small income impacts. Subsidy removal risks political instability but frees funds for growth.
11	Dartanto, 2013	CGE model	Fuel subsidy levels, household consumption, fiscal balance	Richest 20% capture 72% of subsidies. Uncompensated reforms worsen poverty; direct transfers are less effective than infrastructure investments. Behavioral adjustments are limited in the short term. 50% reallocation of funds saved in the simulation decrease poverty by 0,277%
12	Maulidia et al., 2019	Qualitative literature review, policy analysis	Energy policies, institutional frameworks, market dynamics	Post-2014 reforms reduced fossil fuel subsidies (30% to lower budget share), reallocating funds to health/education. Regulatory volatility (e.g., FiT cancellations) undermines investor confidence. Decentralized renewables needed for remote areas. Low-income households and SMEs face higher energy cost. Constant diesels demand due to lack of alternatives in remote areas
13	Burke & Resosudarmo, 2012	Student survey (University of Indonesia)	437 students; questionnaire on subsidy reform support	70% support reforms if savings fund public goods. Opposition correlates with private car usage. Economics students show higher support due to understanding opportunity costs. Urban youth perspectives reflect broader political challenges.
14	M. I. Akimaya, 2017	Game theory (Nash bargaining, selectorate theory)	Government/public income preferences, political power shifts	Subsidy reallocation reduces costs by 11.5% ($950M) and boosts welfare ($650M). Cross-price elasticity drives consumption shifts to premium gasoline. Political power dynamics critically influence optimal subsidy cuts.

No	Author (Year)	Methodology	Variables / Sample / Population	Key Findings
15	Harsono et al., 2025	ARDL, vector error correction models (VECM)	Rural/urban poverty levels, energy/non-energy subsidies (2008–2022 quarterly data)	Rural areas are more subsidy-dependent and vulnerable to reforms due to agricultural dependence to fuel. Non-energy subsidies (fertilizer, credit) are more effective in rural poverty alleviation. Phased, compensatory approaches mitigate economic turmoil.
16	Setyawan, 2014	Input-Output (IO) table analysis	66 economic sectors (transportation, energy, manufacturing); fuel price simulations	Fuel price increase disproportionately impacts transportation and energy sectors (e.g., 7.81% cost increase for road transport). Compensation measures (cash transfers) are critical to offset inflationary poverty risks. IO model limitations exclude behavioral adjustments.
17	Kyle, 2018	Multivariate regression (ordered logit), Coarsened Exact Matching (CEM)	1,940 households; corruption (Raskin subsidy gaps), reform support	Local corruption reduces reform support among eligible poor households. Trust in institutions, not self-interest, drives attitudes. Indonesia's 2013–2014 reforms succeeded due to improved compensation targeting and low oil prices.
18	Toft Christensen et al., 2022	Mixed methods (policy analysis, financial modelling, case studies)	Fossil fuel subsidies, Renewable Energy (RE) investment gaps, PT PLN data, remote islands	Reallocating fossil fuel subsidies could fund 33–50% of Indonesia's 2025 RE target. Policy barriers include low FiTs and land acquisition delays. Redirecting subsidies to decentralized RE improves energy access and industrial efficiency (e.g., 50% cost savings from LED projects).

Source: Various studies from selected Scopus-indexed databases

4. Conclusion

Indonesia's experience with reforming fossil fuel subsidies highlights the challenges of balancing fiscal, social, and environmental goals. While these reforms offer fiscal savings and environmental benefits, it's crucial to also consider other factors such as microeconomic weaknesses, political opposition and socio-cultural trust. The Changes to subsidies reveal a complicated economic picture, affecting everything from how people travel to changes in how much people spend. While urban households adapt by switching fuels or using public transportation, rural population encounters infrastructural limitations, which only makes their situation worse. By combining phased reforms, targeted compensation, and investments in

renewable energy, Indonesia can manage its energy transition while ensuring prevalent growth.

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