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Are Current Petroleum Fiscal Terms Sufficient to Drive Indonesia's Energy Transition? A Systematic Review and Bibliometric Analysis

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ABSTRACT

This study investigates whether Indonesia's current petroleum fiscal terms are sufficient to drive the country's energy transition while maintaining investment competitiveness. Using a systematic literature review (SLR), bibliometric analysis, and regulatory review, the research analyzed 673 studies out of 891 initial records, covering both Indonesian and international experiences with Production Sharing Contracts (PSC). The transition from Cost Recovery (CR) to Gross Split (GS) PSC simplified administrative processes and reduced fiscal verification burdens but also transferred greater risks to contractors, weakening investment attractiveness in marginal fields. Regulatory revisions from 2017 to 2024 introduced variable splits, Enhanced Oil Recovery (EOR) incentives, and provisions for Carbon Capture and Storage (CCS). However, frequent changes created policy uncertainty, undermining investor confidence at a time when long-term stability is critical. Bibliometric mapping highlights PSC regimes as a growing global research hotspot, with increasing connections to ESG, carbon pricing, and low-carbon pathways. Comparative evidence from 15 jurisdictions shows that hybrid and sliding-scale PSCs provide a better balance between fiscal stability and transition incentives. The findings conclude that Indonesia must adopt a simplified hybrid model that integrates EOR, CCS, and ESG-related incentives to align its upstream sector with long-term net-zero targets.

Keywords: Bibliometric Analysis, Petroleum Fiscal Regime, Energy Transition, Energy Policy, Systematic Literature Review
JEL Classifications: Q40, Q35, Q38, L51

1. INTRODUCTION

The upstream oil and gas sector has long been central to Indonesia's economy, contributing significantly to national revenues and energy security (Mardiana, 2019). Since the 1970s, the sector has been governed primarily through the Production Sharing Contract (PSC), initially using the Cost Recovery (CR) scheme. Under CR, contractors were reimbursed for exploration and development costs before profit-sharing with the government, a model that successfully attracted foreign investment but created inefficiencies and fiscal burdens due to cost verification disputes (Rulandari, 2018). In 2017, the government introduced the Gross Split (GS) PSC under ministerial decrees ESDM No. 8/2017. Unlike CR, GS determines production shares upfront without cost recovery, simplifying administration but shifting all operational risks to contractors, thereby weakening investment attractiveness in marginal fields and volatile price conditions (Yi et al., 2019; Yuniza, 2020). Although subsequent revisions, including ministerial decrees ESDM 20/2019, 12/2020, and 13/2024, attempted to enhance flexibility and competitiveness (Giranza, 2018; Aprizal, 2022), Indonesia still experienced declining exploration activity and reduced FDI inflows (Masud, 2019; Ghazi, 2021; Bintoro, 2022).

Beyond fiscal terms, other factors have also influenced investment. Behavioral finance studies show that overconfidence and

familiarity bias significantly affect investor decision-making in Indonesia (Limanjaya, 2014). Ease of Doing Business indicators remain a major determinant for FDI inflows (Fibra, 2018; Setianto, 2020), while macroeconomic models highlight how structural and cyclical factors affect ASEAN FDI flows (Rahajeng, 2014). Empirical studies confirm that macroeconomic stability and policy certainty are crucial in shaping investment in Indonesia (Yuniarto, 2020). Corporate tax avoidance also underscores fiscal risks that may undermine PSC effectiveness (Debora and Joni, 2021). Comparative evidence from Nigeria, Myanmar, and other jurisdictions shows that rigid fiscal regimes reduce competitiveness (Ibrahim, 2018; Swe, 2018; Sedlar and Karasalihovic, 2017).

Globally, petroleum fiscal regimes have evolved toward hybrid and sliding-scale models, balancing government take with investor incentives (Nakhle, 2019; Eddassi, 2020). Studies from Tunisia, Brazil, and Malaysia emphasize that stability, fiscal certainty, and targeted incentives are essential for sustaining competitiveness (Lucchesi, 2019). Moreover, ESG factors increasingly shape upstream investment decisions (Chipalkatti et al., 2021; Khodijah, 2023). Investor surveys highlight that perceptions of regulatory stability and fiscal certainty strongly influence FDI inflows into Indonesia's upstream sector (Fernandez, 2020). Shale gas assessments further broaden Indonesia's energy outlook, with both domestic challenges in development (Simanjuntak, 2017) and international estimates of potential reserves (EIA, 2013) underscoring the long-term importance of fiscal flexibility. In Indonesia, upstream oil and gas investment continues to face structural and regulatory challenges (Muarofah, 2020). Economic evaluations using NPV and IRR have been widely applied in petroleum projects, providing essential tools for fiscal analysis of PSC regimes (Sabrie, 2019; Smith, 2018; Chen, 2022).

More recently, the fiscal debate has been reframed within the broader context of energy transition and decarbonization commitments. Indonesia has pledged to achieve net-zero emissions by 2060, with the oil and gas sector expected to play a dual role: Sustaining near-term energy supply while enabling low-carbon pathways through Carbon Capture and Storage (CCS) and Enhanced Oil Recovery (EOR) integration (IEA, 2024; IPCC, 2025). Fiscal regimes that fail to incentivize such investments risk undermining both investor confidence and climate targets. Global evidence shows that fiscal design increasingly incorporates transition-related incentives, such as carbon pricing, CCS cost recovery, and green investment credits (Bachu, 2008; Krevor and Blunt, 2019). These experiences highlight the urgency of assessing whether Indonesia's current PSC terms are adequate not only for attracting capital but also for aligning with energy transition imperatives.

However, despite extensive research on PSC reforms, there has been no integrated study combining systematic literature review, regulatory analysis, and bibliometric evidence to evaluate Indonesia's fiscal terms in the context of the energy transition. This study addresses that gap by examining whether current petroleum fiscal terms are sufficient to drive Indonesia's transition while maintaining investment attractiveness.

2. METHODS

This study adopts a mixed-method design that integrates a systematic literature review (SLR), bibliometric analysis, and regulatory review. The SLR followed the PRISMA protocol to ensure transparent and replicable selection of studies (Moher et al., 2009). In total, 673 papers were reviewed, covering topics such as PSC design, fiscal regime reforms, FDI determinants, investment valuation, and the role of fiscal terms in facilitating energy transition. The review included both Indonesian studies and comparative analyses from ASEAN, Africa, and Latin America to provide a comprehensive perspective (Ibrahim, 2018; Swe, 2018; Tacuba, 2022). The research design, data sources, and keyword strategy are summarized in Table 1, while the document selection and screening process are illustrated in Figure 1.

Bibliometric analysis was conducted using the Bibliometric R package (Aria and Cuccurullo, 2017), a widely used tool for mapping research trends and citation networks in energy and economics (Chipalkatti et al., 2021). The analysis examined annual publication growth, keyword evolution, and thematic clusters related to PSC, fiscal regimes, and their intersections with energy transition, carbon management, and sustainability debates. The regulatory review encompassed 21 fiscal policies issued between 2011 and 2024, including ministerial decrees (Permen ESDM), finance ministry regulations (PMK), government regulations (PP), and presidential decrees (Perpres). Each regulation was coded for key fiscal variables such as government take, cost recovery or gross split mechanisms, tax treatment, and governance provisions. The review also assessed external risk factors—such as oil price cyclicality and fiscal stability (Mahmood, 2021; Balhasan, 2019)—as well as policy directions relevant to the energy transition, particularly the inclusion of CCS/CCUS incentives and ESG standards (Khodijah, 2023; BKF, 2018). This integrated approach allows the study to evaluate not only the competitiveness of Indonesia's petroleum fiscal terms in attracting investment but also their adequacy in supporting the country's long-term energy transition agenda.

3. RESULTS AND DISCUSSION

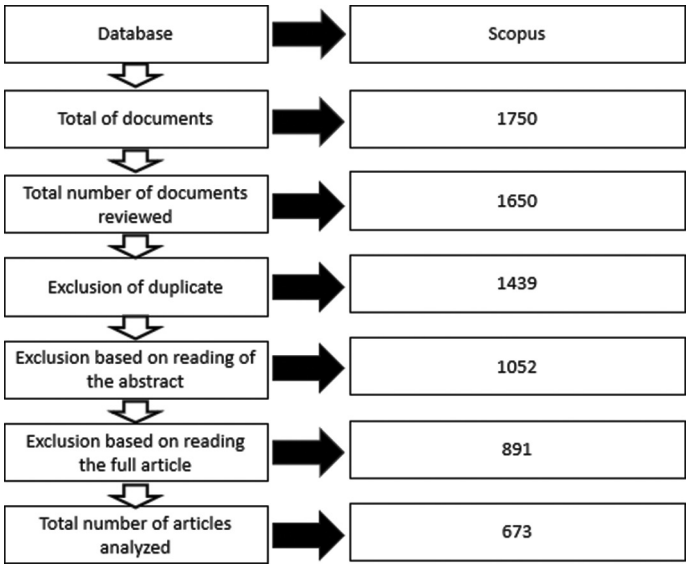
3.1. Systematic Literature Review: Petroleum Fiscal Regimes, Investment, and Energy Transition

The SLR provides consistent evidence that fiscal regimes exert a direct influence on investment attractiveness and broader energy transition objectives. Economic evaluations based on NPV and IRR demonstrate that the Gross Split (GS) scheme reduces contractor profitability relative to the Cost Recovery (CR) model, particularly in high-cost or marginal fields (Rulandari, 2018; Lucchesi, 2019). Comparative studies highlight that sliding-scale and hybrid regimes—widely adopted in Malaysia and Brazil—offer greater fiscal certainty and resilience against oil price volatility, whereas rigid models in Nigeria and Tunisia tend to discourage investment (Nakhle, 2019; Ibrahim, 2018). Sensitivity analyses of Brazilian PSCs further show that fiscal terms often exert greater influence on project returns than geological or technical uncertainties (Lucchesi, 2019).

Table 1: The research methodologies employed

Database	Search field	Keywords
Scopus	Title, abstract, keywords	["SLR" or "Energy Transition" or "Fiscal Regime"]

Figure 1: Summary of the search, screening, and bibliometric processing method conducted



In Southeast Asia, Indonesia's GS PSC has been perceived as less competitive compared to Malaysia and Vietnam, where hybrid models allow greater fiscal flexibility (Sabaris, 2020). Empirical studies also confirm that macroeconomic stability, investment climate, and governance reforms are crucial determinants of FDI inflows, reinforcing the importance of aligning fiscal reforms with broader economic reforms (Yuniarto, 2020). Moreover, Ease of Doing Business (EODB) and ESG considerations are increasingly shaping FDI flows, highlighting that competitiveness depends on both fiscal and non-fiscal conditions (Fibra, 2018; Setianto, 2020; Khodijah, 2023).

The literature further underscores that Indonesia's fiscal regime has undergone substantial transitions, particularly the shift from CR to GS PSC. While some studies interpret this as a necessary reform, others regard it as premature, producing mixed investment outcomes (Roach, 2018; Yuniza, 2020; Peng, 2020). Case studies on the ETB field and comparative simulations confirm that GS PSC increases cash-flow risks relative to CR (Karisma, 2021; Katiandago, 2021). Evidence from Nigeria, Tunisia, and Russia reinforces that rigid contractual terms, regulatory instability, and frequent revisions undermine fiscal competitiveness (Swe, 2018; Zhang et al., 2020).

Cross-country analyses further emphasize how oil price volatility, fiscal cyclicality, and growing climate policy pressures intensify investment risks under inflexible regimes (Tacuba, 2022; Mahmood, 2021). Several recent studies note that fiscal policy must also account for the global low-carbon transition by integrating carbon pricing mechanisms and CCUS incentives into petroleum fiscal terms (Fernandez, 2020; Zhang et al., 2020). To illustrate these findings, Table 2 summarizes 20 representative studies from the 673 articles reviewed, outlining their methodologies, contexts, and key implications for Indonesia's petroleum fiscal regime in the context of energy transition.

3.2. Bibliometric Findings: Global Trends in Petroleum Fiscal Regimes and Energy Transition

Bibliometric analysis reveals a steady increase in PSC-related research since 2015, with publication spikes following the introduction of the Gross Split (GS) PSC in Indonesia in 2017. Keyword clustering highlights five dominant themes: fiscal regime competitiveness, PSC evaluation methods, FDI determinants, governance, and ESG. Influential journals include Energy Policy, Energy Economics, and IJEEP, with frequently cited authors such as Lucchesi, Nakhle, Masud, and Roach. Sankey diagrams confirm strong linkages between "PSC," "investment," and "Gross Split," reflecting sustained academic and policy attention to fiscal competitiveness.

Beyond these patterns, bibliometric mapping also reveals a growing but still modest body of literature connecting petroleum fiscal regimes to energy transition imperatives. Since 2019, keywords such as "CCS," "carbon pricing," and "energy transition" have appeared more frequently, often intersecting with governance and ESG clusters (Chipalkatti et al., 2021; Khodijah, 2023). This shift indicates that while traditional project valuation using NPV and IRR remains prominent (Sabrie, 2019; Smith, 2018; Chen, 2022), there is increasing recognition of the role fiscal regimes play in enabling decarbonization strategies. These trends reinforce the need for fiscal flexibility and regulatory stability not only to attract investment but also to support Indonesia's long-term transition toward a low-carbon energy system.

3.2.1. Annual scientific production

The bibliometric analysis reveals that publications related to Production Sharing Contracts (PSC) and petroleum fiscal regimes have shown a significant upward trend since the early 2000s, with a marked acceleration after the introduction of the Gross Split (GS) PSC in 2017. As illustrated in Figure 2 (Annual Scientific Production), despite year-to-year fluctuations, the overall trend indicates a steady increase, underscoring the continuous academic and policy relevance of fiscal regime debates in the upstream oil and gas sector. The surge of publications following 2017 aligns closely with Indonesia's fiscal policy transition from the Cost Recovery (CR) scheme to the GS PSC and subsequent revisions under ministerial decrees ESDM 20/2019, 12/2020, and most recently 13/2024. This pattern demonstrates that regulatory reforms in Indonesia resonate globally, attracting scholarly attention both as a case study and as part of broader discussions on investment competitiveness in petroleum fiscal systems. More recently, post-2020 publications indicate an additional trend: fiscal regime debates are increasingly framed within the context of energy transition and sustainability. The frequency of studies connecting PSC terms with low-carbon development, Carbon Capture and Storage (CCS), and Environmental, Social, and Governance (ESG) considerations has grown, reflecting the

Table 2: Representative studies on petroleum fiscal regimes and implications for energy transition

Title	Author/Year	Method	Key Findings	Relevance to Indonesian PSC
Application of Depreciation, NPV and IRR in Engineering Projects	Sabrie (2019)	Literature Review	NPV and IRR are reliable methods for evaluating engineering projects and investment decisions	Provides fundamental economic tools for evaluating PSC fiscal regimes
Investor Behavior in Indonesia	Limanjaya (2014)	Survey	Overconfidence and familiarity bias significantly affect investor decisions	Explains behavioral context of investors relevant to upstream oil and gas
Factors Affecting Inward FDI in ASEAN	Grace (2019)	Panel Data Analysis	GDP and trade openness have positive effects, while human capital and interest rates have negative impacts on FDI	Serves as a benchmark for Indonesia's FDI competitiveness
New Orientation of Oil and Gas Contracts in Indonesia	Yi et al. (2019)	Case Study	Gross Split PSC improves administrative efficiency but penalizes high-cost contractors	Highlights weaknesses of GS PSC and its investment implications
Determinants of FDI in Indonesia	Ghazi (2021)	Time Series Analysis	Only trade openness is statistically significant (negative effect)	Suggests institutional factors are more influential than openness
Corporate Tax Avoidance in Manufacturing Firms	Debora and Joni (2021)	Empirical Study	High levels of tax avoidance practices observed in Indonesian firms	Indicates risk of fiscal base erosion relevant to GS PSC tax design
Impact of Fiscal Regime Changes on Investment Decisions	Masud (2019)	Comparative Analysis	Flexible fiscal regimes encourage more investment compared to rigid ones	Supports arguments for fiscal flexibility in PSC reform
Competitiveness of Upstream Petroleum Fiscal Regimes	Nakhle (2020)	Cross-country Benchmarking	Countries with hybrid and sliding-scale regimes attract more FDI	Provides comparative perspective for Indonesia's PSC design
Production Sharing Contracts in Nigeria	Iledare (2004)	Policy Review	Nigerian PSC shows declining investment attractiveness under rigid terms	Parallels Indonesia's challenge in maintaining competitiveness
Assessment of Tunisia's Fiscal Regime	Nakhle (2019)	Case Study	Tunisia revised PSC terms to balance government take and contractor incentives	Demonstrates policy learning for Indonesia's PSC reforms
Valuation of PSC with Cost Recovery vs. Gross Split	Yuniza (2020)	Simulation	GS reduces administrative costs but creates cash flow risks for contractors	Empirical evidence of GS shortcomings in Indonesia
Production Sharing and Risk Allocation	Lucchesi (2019)	Policy Review	Fair risk-sharing mechanisms increase long-term investment commitments	Suggests Indonesia should rebalance GS risk allocation
Oil and Gas Governance in Indonesia	Roach (2018)	Qualitative Review	Governance reforms are crucial for PSC effectiveness	Links governance with PSC fiscal performance
PSC and Investor Risk Perception	Chipalkatti et al. (2021)	Survey and Bibliometric	Investors favor regimes with transparent and stable terms	Confirms Indonesia's weakness in fiscal/regulatory stability
Assessing Petroleum Fiscal Systems in ASEAN	Ibrahim (2018)	Comparative Study	Malaysia's sliding-scale PSC deemed more attractive	Provides ASEAN benchmark for Indonesia
Indonesian Upstream Governance for Sustainability	Khodijah (2023)	Case Review	Integration of ESG and fiscal incentives essential for long-term competitiveness	Provides policy recommendation for Indonesia's PSC reform

dual challenge of maintaining investment attractiveness while supporting net-zero pathways. This suggests that the evolution of Indonesia's fiscal regime is no longer viewed solely in terms of competitiveness but also as a crucial component of its long-term energy transition strategy.

3.2.2. Thematic linkages: Sankey diagram

The Sankey diagram analysis (Figure 3) illustrates the interconnections between authors' keywords (DE), authors (AU), and cited references (SO). Prominent keywords include "production sharing contracts," "taxation," "petroleum industry," and "investment decisions," frequently linked to influential authors such as Iledare, Onwuka, Echendu, Zhang, and Wang, and to key journals such as Energy Policy, Energy Economics, Journal of Cleaner Production, and the International Journal of Energy Sector Management. This triangular mapping highlights that PSC research is not confined to technical and economic dimensions but increasingly extends to governance, fiscal competitiveness, and sustainability. Notably, emerging linkages appear between fiscal regime studies and themes such as "energy transition," and "CCS," reflecting a gradual expansion of the research frontier. While these transition-related linkages remain smaller in volume compared to traditional PSC–investment clusters, their presence underscores a growing recognition that fiscal regimes must be evaluated not only for investment competitiveness but also for their role in supporting decarbonization and ESG objectives. This evolution is directly relevant for Indonesia as it seeks to maintain upstream investment while advancing its net-zero commitments.

Figure 2: Annual scientific publication on petroleum fiscal regimes, production sharing contracts, and their linkages to energy transition

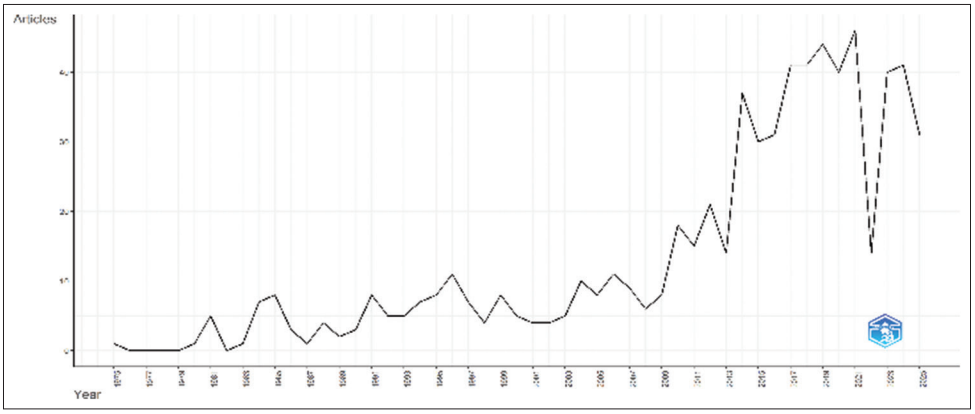
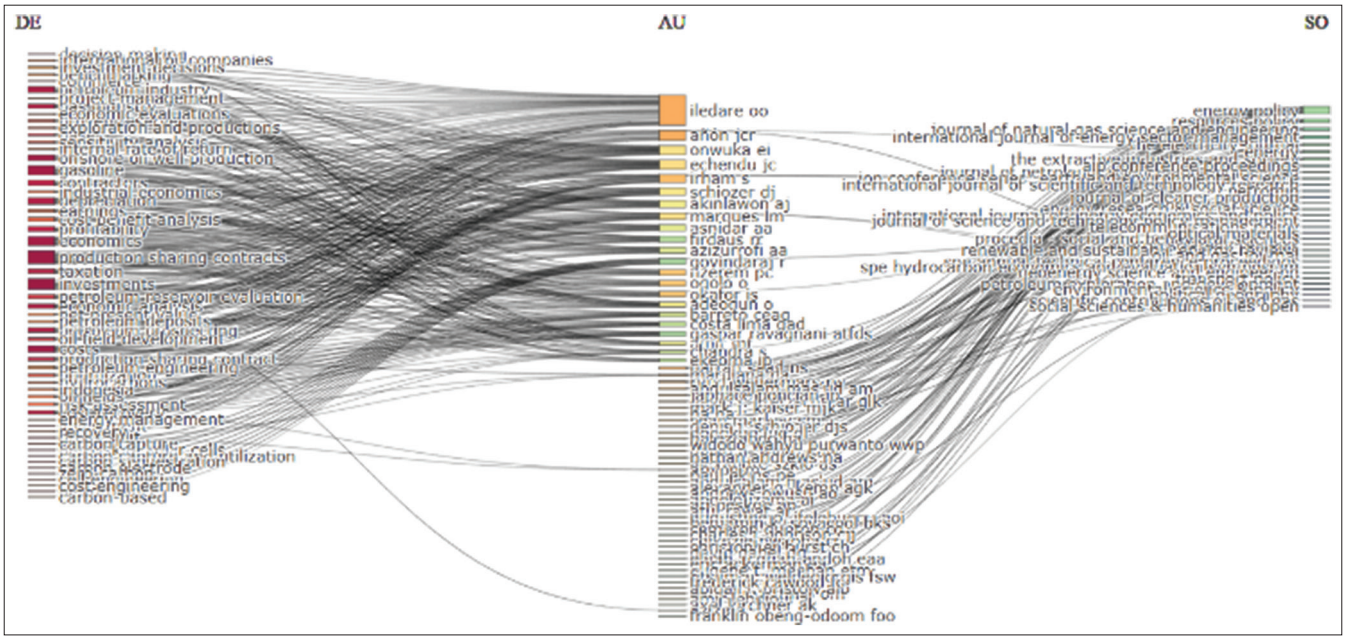


Figure 3: Sankey diagram of authors (centre), authors' keywords (left side), and cited references (right side) in petroleum fiscal regime and energy transition research



3.2.3. Keyword's frequency over time

The temporal frequency analysis (Figure 4) demonstrates a consistent rise in the use of terms such as production sharing contracts, petroleum industry, economics, economic analysis, and investment since 2010, with sharp growth after 2015. This surge corresponds to the heightened global debate on fiscal regime competitiveness, contractor–government balance, and the role of PSCs in shaping investment outcomes. Notably, the increased frequency of the keyword production sharing contracts aligns with Indonesia's fiscal shift from the Cost Recovery to the Gross Split PSC in 2017, while terms such as economic analysis and investment reflect the growing scholarly reliance on quantitative evaluation methods such as Net Present Value (NPV), Internal Rate of Return (IRR), Payout Time (POT), and Profitability Index Ratio (PIR).

In addition, emerging terms such as energy transition and ESG began to appear more frequently after 2020, signaling a research shift toward linking fiscal regimes with sustainability and low-carbon pathways. This evolution highlights that petroleum fiscal regime research is no longer confined to maximizing government take or investor profitability but increasingly addresses broader policy questions on how fiscal instruments can support Indonesia's long-term energy transition goals.

3.2.4. Tree map of keyword distribution

Figure 5 presents a tree map of keyword distribution across the reviewed literature, providing a visual overview of thematic prominence. The largest cluster investments (66), production sharing contracts (55), cost recovery (17), profitability (18), and taxation (16)—indicate that fiscal performance and investment considerations remain the dominant focus of petroleum fiscal regime studies. Other significant keywords include petroleum industry, economic analysis, gas industry, and depreciation, reflecting the financial and operational dimensions of PSC governance.

Notably, emerging terms such as carbon capture, zero-carbon, energy policy, and carbon cycle—though smaller in frequency—

signal a gradual integration of petroleum fiscal regime debates with sustainability, ESG, and low-carbon transition agendas (Chipalkatti et al., 2021; Khodijah, 2023). This visualization confirms that while fiscal issues remain at the core of scholarly attention, the linkage between PSCs and energy transition is increasingly gaining relevance in global discourse.

3.3. Research Methods

Table 3 summarizes the methodologies employed in the reviewed studies. The majority (46%) adopted qualitative approaches, particularly case studies of fiscal regime reforms in Indonesia and other resource-rich economies. Quantitative methods accounted for 38%, with a strong representation of statistical and econometric analyses focusing on foreign direct investment (FDI), fiscal take, and contractor profitability. Mixed-method approaches were less common (9%), while conceptual or normative policy studies contributed 7%.

This distribution reflects the predominance of empirical research in evaluating PSC and petroleum fiscal regimes. However, there is a notable trend toward integrated frameworks that combine economic modeling with policy analysis, especially in relation to sustainability and energy transition goals. For instance, recent studies increasingly employ hybrid models that link fiscal terms with environmental, social, and governance (ESG) indicators or carbon pricing mechanisms, reflecting the broader shift in academic inquiry from purely financial metrics to long-term energy transition considerations.

3.4. Regulatory Review: Energy Policy Dimensions and Policy Implications

Building on the SLR findings, the regulatory review evaluates how Indonesia's PSC reforms align with international practices, investor expectations, and energy transition imperatives. The regulatory trajectory from 2017 to 2024 reflects iterative

Figure 4: Trends in keyword frequency: PSC, fiscal regimes, and energy transition

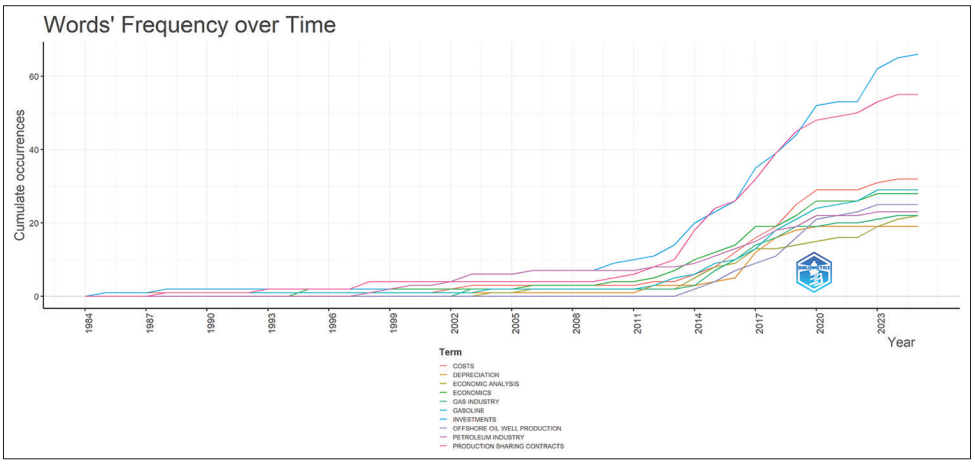


Figure 5: Tree map of keyword distribution linking petroleum fiscal regimes with energy policy and energy transition research

Table 3: Methods for studying the application of SLR technique

Method	Frequency	Relative Frequency %	Accumulated Frequency %
Qualitative empirical research	310	46	46
Quantitative empirical research	255	38	84
Mixed empirical research	61	9	93
Conceptual research	47	7	100
Total	673	100	100

experimentation rather than structural certainty. The GS PSC was first introduced under ministerial decree ESDM No. 8/2017 with base splits of 57:43 for oil and 52:48 for gas. Subsequent revisions (ministerial decrees ESDM 20/2019, 12/2020) added variable and progressive splits, including incentives for deepwater projects, enhanced oil recovery (EOR), and carbon capture and storage (CCS).

Complementary fiscal rules such as PP No. 53/2017 and PMK No. 122/2019 established tax treatment for the GS scheme, while domestic gas pricing interventions (ESDM No. 8/2020; Perpres 40/2016) capped prices at USD 6 per MMBtu for priority industries, further complicating contractor economics. The most recent reform, ministerial decree ESDM No. 13/2024, introduced a simplified GS model with only five variables and optionality between GS and CR. While this partially aligns with hybrid approaches recommended in global literature, the frequency of revisions signals regulatory volatility.

The regulatory analysis confirms that Indonesia's repeated GS adjustments were intended to enhance flexibility but inadvertently created instability. Similar experiences are observed globally: Libya's EPSA reforms and Russia's petroleum tax amendments both triggered investor hesitation due to unpredictable government intervention (Balhasan, 2019; Zhang et al., 2020). Domestically, studies show that taxation—through both targeted incentives and dividend treatment—directly shapes perceptions of PSC attractiveness (Taufiq, 2022; Rohali, 2022).

Institutional reports further stress that governance discipline and fiscal transparency are essential for sustaining competitiveness over the project life cycle (BKF, 2018; SKK Migas, 2020). In the context of energy transition, this suggests that fiscal reforms must go beyond profitability calculations, incorporating mechanisms to support carbon pricing, low-carbon technology deployment, and ESG accountability to ensure long-term alignment with Indonesia's net-zero commitments. A detailed summary of these reforms, their fiscal parameters, and investment implications is presented in Table 4.

3.5. Synthesis and Policy Implications for Investment and Energy Transition

The integrated findings from the systematic literature review, regulatory analysis, and bibliometric mapping highlight several key dimensions of Indonesia's petroleum fiscal regime. Bibliometric evidence shows that global academic attention to PSCs accelerated after 2017, coinciding with Indonesia's Gross Split reform. Thematic convergence between PSCs, investment, and governance demonstrates that debates have expanded beyond technical economic evaluations to address long-term fiscal stability, sustainability, and transition pathways. Keyword trends further confirm a shift from narrow financial metrics toward frameworks that integrate ESG and carbon management considerations.

The review underscores that while the GS PSC improved administrative efficiency, it weakened investment incentives in high-cost and marginal fields. Frequent regulatory revisions created uncertainty, undermining investor confidence in Indonesia's upstream sector. Comparative lessons from Malaysia, Brazil, and other jurisdictions demonstrate that hybrid or sliding-scale regimes provide a more balanced allocation of risk and reward, ensuring fiscal competitiveness under volatile oil price cycles.

For Indonesia, restoring competitiveness requires moving toward a simplified yet flexible hybrid PSC that combines the administrative strengths of GS with the cost-recovery balance of CR. Fiscal variables should be streamlined, and targeted incentives introduced for Enhanced Oil Recovery (EOR), Carbon Capture and Storage (CCS), and low-carbon technologies. Such reforms would not only align Indonesia's fiscal regime with international best practices but also strengthen its ability to attract sustainable FDI and support the country's broader energy transition agenda.

3.6. Comparative Petroleum Fiscal Regimes in Other Jurisdictions

The comparative analysis of petroleum fiscal regimes across different jurisdictions provides valuable benchmarks for Indonesia in refining its PSC framework. While Indonesia has oscillated between Cost Recovery (CR) and Gross Split (GS) models, international evidence demonstrates a wide spectrum of fiscal designs—ranging from rigid service contracts to flexible hybrid and royalty–tax systems (Eddassi, 2020). In the Middle East, Iran and Iraq rely heavily on service and buy-back contracts, maximizing state control but offering limited incentives for efficiency or frontier exploration. While such models secure predictable state revenues, they provide little alignment with global investment trends or energy transition priorities. In contrast, Qatar and Saudi Arabia integrate service-based arrangements with long-term LNG or concession frameworks, ensuring stable revenues but offering limited flexibility to incorporate low-carbon incentives. Latin American countries such as Colombia and Peru employ royalty–tax regimes that emphasize transparency and adaptability, while Brazil and Mexico combine PSCs with sliding-scale royalties or licenses, balancing risk-sharing but occasionally complicated by political interventions. Brazil's model is particularly instructive for Indonesia as it includes incentives for deepwater development and potential integration with CCS projects.

In Africa, Angola and Ghana successfully apply sliding-scale PSCs, where government take increases with production or profitability, ensuring investor incentives alongside state benefits. Conversely, Nigeria's rigid PSC framework, characterized by frequent revisions and high government take, illustrates how instability and over-

Table 4: Regulatory reforms of Indonesia's petroleum fiscal terms and their implications for investment and energy transition

Regulation	Key Clauses	Variables	Implications for PSC/Investment
Ministerial decrees No. 8/2017 – Gross Split PSC	Base split: 57:43 (oil), 52:48 (gas); introduction of variable and progressive components	Gross Split	Replaced the Cost Recovery scheme; simplified administration but shifted cost and risk burden to contractors; initial reluctance from investors
Ministerial decrees No. 52/2017 – Terminated Field Assignment	Guidelines for transfer of terminated working areas to Pertamina or new contractors	Governance	Provided legal certainty for the state; opposed by investors due to limited flexibility
Ministerial decrees No. 20/2019 – Revision of GS PSC	Adjustment of variable splits (+10% for EOR, offshore, deepwater, and marginal fields)	Gross Split	Increased flexibility of GS PSC and introduced more tailored incentives
Ministerial decrees No. 12/2020 – Revision of GS PSC	Updated variable and progressive splits; refined fiscal terms	Gross Split	Attempted to improve investment attractiveness through additional incentives
Ministerial decrees No. 23/2021 – Expired Block Management	Extended contract term up to 20 years before block expiry	Contract Governance	Provided certainty for contractors regarding contract extension
Ministerial decrees No. 3/2019 – Gross Split Guidelines	Detailed technical guidelines for GS implementation	Gross Split	Enhanced clarity but did not fully address investor concerns
Ministerial decrees No. 47/2017 – Termination of Cooperation Contracts	Mechanism for returning working areas after contract expiry	Governance	Ensured state control over expired assets; increased uncertainty for investors
Ministerial decrees No. 47/2018 – Domestic Market Obligation (DMO)	Obligation to allocate part of oil and gas for domestic market	Domestic Market Obligation	Secured national energy supply; reduced contractor profitability
Ministerial decrees No. 10/2020 – Power Purchase Agreements	Provisions on electricity price and contracts	Governance	Strengthened governance in energy markets; indirect impact on oil and gas investment climate
Ministerial decrees No. 26/2017 – Renewable Energy and Pricing	Renewable energy pricing policy	Energy Transition	Signaled government's commitment to renewables; influenced investor expectations in upstream oil and gas
PMK No. 122/2019 – Tax Treatment for PSC	Tax provisions for Gross Split contracts	Taxation	Clarified fiscal obligations; supported investor understanding of tax liabilities
PMK No. 89/2019 – Government Revenues	State revenue management rules	Fiscal Governance	Improved fiscal transparency; moderate impact on PSC attractiveness
PMK No. 258/2015 – State Receivables	Regulations on receivables and state revenues from oil and gas	Fiscal Governance	Enhanced fiscal administration; limited effect on investor incentives
PMK No. 257/2011 – Tax Provisions for PSC	Taxation and cost recovery mechanism	Taxation	Provided detailed tax rules; applied under CR regime
PMK No. 256/2014 – Government Take	Adjusted fiscal regime and government take	Fiscal Terms	Reinforced government revenue share; reduced investor margins
PP No. 27/2017 – Environmental Permits	Environmental licensing for upstream projects	Governance/ ESG	Increased compliance requirements; aligned with ESG standards
PP No. 53/2017 – Gross Split Implementation	Legal basis for implementing GS PSC	Gross Split	Formalized GS regime; marked shift from CR
Presidential decrees No. 40/2016 – Natural Gas Pricing	Regulated natural gas price for domestic industries	Pricing	Enhanced affordability for industry; reduced profitability for gas contractors
Ministerial decrees No. 2/2023 – CCS/CCUS	Guidelines for Carbon Capture, Utilization, and Storage	ESG / Low Carbon	Introduced fiscal and regulatory framework for CCUS; supported energy transition goals

taxation can deter new foreign investment despite abundant reserves. In Asia-Pacific, Malaysia, Vietnam, and India have adopted hybrid PSCs that incorporate cost recovery with performance-based incentives, attracting investment in deepwater and frontier basins. Malaysia's PSC design has also begun integrating ESG and CCUS considerations, making it highly relevant for Indonesia. Meanwhile, Australia's profit-based Petroleum Resource Rent Tax (PRRT) represents an alternative emphasizing transparency, aligning government take with actual project profitability while offering potential for low-carbon adaptation.

As summarized in Table 5, these international experiences underscore three key policy lessons for Indonesia:

- Flexibility and balance matter – hybrid and sliding-scale models mitigate risks for both state and investors, unlike Indonesia's current rigid GS PSC
- Stability is critical – frequent revisions, as seen in Nigeria, undermine investor confidence even in resource-rich environments
- Alignment with global transition trends – integrating ESG, CCUS, and renewable-linked incentives into fiscal terms will better position Indonesia within international investment flows.

Taken together, global evidence suggests that Indonesia's PSC reform must move beyond the binary of CR versus GS. Instead, a simplified hybrid PSC—combining selective cost recovery or tax-deductibility, sliding-scale adjustments, and targeted incentives for energy transition—would provide a more competitive, stable, and future-proof fiscal regime.

3.7. Energy Policy-Oriented Insights for Energy Transition

The comparative evidence summarized in Table 5 demonstrates that petroleum fiscal regimes worldwide are increasingly evolving to balance state revenue with investor incentives while explicitly addressing the energy transition. Countries such as Brazil and Malaysia have successfully implemented sliding-scale or hybrid PSCs that combine fiscal flexibility with targeted incentives for Enhanced Oil Recovery (EOR) and frontier exploration (Lucchesi, 2019; Nakhle, 2019). In Latin America, Colombia and Peru have adopted royalty–tax regimes that prioritize transparency and investment certainty, while simultaneously allowing fiscal

Table 5: Comparative petroleum fiscal regimes in selected jurisdictions and their relevance for investment and energy transition

Country	Contract Model	Key Features	Strengths	Weaknesses	Relevance for Indonesia
Iran	Buy-Back/Service Contracts	Fixed fee per barrel; no equity for IOCs	Maximizes state control; predictable revenues	No investor upside; weak incentives	Not suitable; but highlights trade-off between sovereignty vs FDI
Iraq	Technical Service Contracts (TSC)	Remuneration fee linked to production	Low geological risk; strong state take	Contractors have limited incentives	Lesson: unsuited for marginal/complex basins
Qatar	Service Contracts with LNG-linked pricing	Integrated with LNG export terms	Stable LNG revenues; long-term security	Not flexible for volatile oil markets	Shows importance of contract-price alignment
Saudi Arabia	Concession/Service hybrids	State retains reserves; IOC gets service fee	Stable revenue base	Little investor upside	Benchmark for strong state dominance
Brazil	PSC + Sliding-Scale Royalties	State participation + royalties adjust with profitability	Balances investor incentives and government take	Complex design may deter small IOCs	Deepwater incentives + potential integration with CCS
Mexico (PEMEX)	PSC and License mix	PSCs with risk service elements; state oil company involvement	Attracts FDI; shares risk	Political reversals reduce stability	Lesson: avoid frequent politicization of contracts
Colombia	Royalty–Tax System	Royalties based on production + corporate tax	Transparent, adaptable	Relies on strong tax admin	Inspires simpler fiscal system in Indo with reforms
Peru	Royalty–Tax Regime	Royalties vary by price and volume	Flexible and transparent	Lower incentives for frontier areas	Model for flexible revenue capture
Angola	Sliding-Scale PSC	State take increases with output	Encourages exploration, fair sharing	Sensitive to oil price swings	Benchmark for balancing incentives with state take
Ghana	Sliding-Scale PSC	Progressive fiscal terms with profitability	Attracts high-risk exploration	Complex fiscal administration	Relevant for frontier Indonesian basins
Nigeria	Rigid PSCs	High government take, frequent revisions	Secures state revenues	Instability deters new FDI	Negative lesson: stability is critical
Malaysia	Risk-Sharing PSC (CR + Incentives)	Cost recovery + profit tranches	Suits deepwater projects	More admin burden	Hybrid PSC adaptable for ESG and CCUS
Vietnam	PSC with Frontier Incentives	Enhanced recovery ceilings in frontier basins	Attracts FDI in high-risk areas	Fiscal burden in downturns	Useful for Indonesia's eastern frontier
India	New Exploration Licensing Policy (NELP) PSCs	Incentives for frontier and marginal fields	Promotes risk exploration	Bureaucratic complexity	Shows how frontier incentives attract FDI
Australia	Royalty–Tax (PRRT)	Profit-based resource rent tax	Transparent, profit-linked	Needs strong governance	Profit-based tax system transparent and supportive of green transition

space for environmental and low-carbon considerations (Tacuba, 2022). Similarly, advanced producers like Australia employ profit-based taxation (PRRT) that ensures revenue stability while aligning government take with actual project profitability, a model regarded as transparent and adaptable to energy transition objectives (Eddassi, 2020). These experiences illustrate that fiscal regimes are no longer only about maximizing revenue but are increasingly becoming instruments of energy transition policy.

Policy lessons from these jurisdictions reveal three important implications for Indonesia. First, flexibility—through hybrid or sliding-scale models—is critical to balancing contractor incentives with stable state revenue, reducing investor exposure to downside risks under volatile oil and gas prices (Lucchesi, 2019; Ibrahim, 2018). Second, stability of fiscal terms is essential; frequent revisions, as seen in Nigeria, demonstrate that regulatory unpredictability can outweigh even resource abundance in shaping investment decisions (Ibrahim, 2018; Zhang et al., 2020). Third, adaptability to the low-carbon transition has become a defining feature of globally competitive regimes. Fiscal incentives for CCS, EOR, and ESG integration, embedded within fiscal contracts, are increasingly used by countries to attract climate-aligned investment while safeguarding energy security (Chipalkatti et al., 2021; Khodijah, 2023).

For Indonesia, these lessons underscore the urgency of moving beyond the binary debate between Cost Recovery and Gross Split PSCs. A simplified hybrid model, selectively incorporating cost recovery, sliding-scale adjustments, and targeted transition incentives, would balance fiscal stability with both investor expectations and Indonesia's long-term net-zero commitments. Such a design would not only restore investor confidence but also position Indonesia as a regional leader in aligning petroleum fiscal policy with global decarbonization pathways.

4. CONCLUSION

This study provides an integrated evaluation of Indonesia's petroleum fiscal regime through a systematic literature review, bibliometric mapping, and regulatory analysis. The evidence highlights that while the Gross Split (GS) PSC introduced in 2017 simplified administration and reduced the fiscal verification burden for the state, it also transferred disproportionate risks to contractors, reducing investment attractiveness in marginal fields and during periods of low oil prices. The regulatory reforms introduced between 2017 and 2024 demonstrate the government's responsiveness to industry challenges but also reveal frequent revisions that undermine stability—an essential factor for sustaining long-term upstream commitments. The bibliometric findings confirm that PSC-related research has accelerated since 2017, reflecting global attention not only to Indonesia's reforms but also to the broader discourse on fiscal competitiveness, governance, and ESG integration. The thematic convergence of keywords such as "PSC," "investment," and "governance" illustrates that fiscal debates are no longer confined to technical economic considerations. Instead, they increasingly emphasize policy credibility, regulatory predictability, and alignment with global energy transition goals. This suggests that fiscal frameworks must evolve beyond revenue maximization toward sustainability and long-term competitiveness. Overall, the findings conclude that Indonesia must move beyond a binary choice between Cost Recovery (CR) and GS PSC models. A simplified hybrid PSC that balances government take with investor incentives, reduces fiscal complexity, and incorporates targeted measures for Enhanced Oil Recovery (EOR), Carbon Capture and Storage (CCS), and ESG compliance is essential. By adopting such a model, Indonesia can strengthen fiscal stability, restore investor confidence, and attract sustainable foreign direct investment—ensuring both energy security and alignment with its long-term transition objectives. Thus, reforming Indonesia's fiscal terms is not only about maintaining investment competitiveness but also about strategically positioning the country within global decarbonization pathways and its commitment to the energy transition.

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