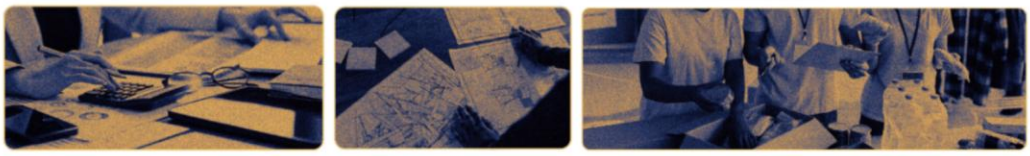

IMPACTO CIENTÍFICO EDITORA

POLICY FRAGMENTATION AND ITS IMPACT ON THE SUSTAINABILITY OF THE PALM OIL SUPPLY CHAIN GOVERNANCE

FRAGMENTAÇÃO DE POLÍTICAS E SEU IMPACTO NA SUSTENTABILIDADE DA GOVERNANÇA DA CADEIA DE SUPRIMENTOS DO ÓLEO DE PALMA

FRAGMENTACIÓN DE POLÍTICAS Y SU IMPACTO EN LA SOSTENIBILIDAD DE LA GOBERNANZA DE LA CADENA DE SUMINISTRO DEL ACEITE DE PALMA

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ABSTRACT

The governance of sustainable palm oil supply chains continues to face complex challenges due to fragmented policy frameworks operating across institutional, regulatory, and jurisdictional scales. This fragmentation leads to inconsistent rules, overlapping mandates, and diverging priorities among actors, thereby undermining the effectiveness and fairness of sustainability efforts. This study aims to systematically examine how policy fragmentation influences governance outcomes in palm oil supply chains, focusing on both institutional coherence and equity. A qualitative research design employing the Systematic Literature Review (SLR) method was adopted to synthesize recent scholarly insights. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol guided the review process. Data were collected from the ScienceDirect database using refined Boolean search strings. After applying inclusion criteria such as publication year (2021–2025), open-access availability, and relevance to the topic, a total of 32 peer-reviewed articles were selected for in-depth analysis. The collected data were analyzed through thematic synthesis to identify recurring patterns, inconsistencies, and knowledge gaps. The findings reveal four dominant themes: institutional misalignment, regulatory overlap, spatial inconsistency in policy enforcement, and power asymmetry across supply chain actors. These issues jointly diminish regulatory effectiveness, marginalize smallholders, and weaken policy legitimacy. In conclusion, addressing policy fragmentation is essential for strengthening sustainability governance in palm oil supply chains. Future research is recommended to explore longitudinal dynamics of policy coherence and the role of digital governance in bridging regulatory gaps.

Keywords: Policy Fragmentation. Palm Oil. Sustainability Governance. Supply Chain. SLR.

RESUMO

A governança das cadeias de suprimentos sustentáveis de óleo de palma continua a enfrentar desafios complexos em decorrência de estruturas políticas fragmentadas que operam em diferentes escalas institucionais, regulatórias e jurisdicionais. Essa fragmentação resulta em normas inconsistentes, sobreposição de mandatos e prioridades divergentes entre os atores, comprometendo a efetividade e a equidade dos esforços de sustentabilidade. Este estudo tem como objetivo examinar sistematicamente como a fragmentação de políticas influencia os resultados da governança nas cadeias de

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suprimentos de óleo de palma, com foco tanto na coerência institucional quanto na equidade. Adotou-se um delineamento de pesquisa qualitativa, empregando o método de Revisão Sistemática da Literatura (RSL), para sintetizar evidências acadêmicas recentes. O protocolo Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) orientou o processo de revisão. Os dados foram coletados na base ScienceDirect, por meio de estratégias de busca com operadores booleanos refinados. Após a aplicação de critérios de inclusão — como ano de publicação (2021–2025), disponibilidade em acesso aberto e relevância temática —, foram selecionados 32 artigos revisados por pares para análise aprofundada. Os dados coletados foram analisados por meio de síntese temática, a fim de identificar padrões recorrentes, inconsistências e lacunas de conhecimento. Os resultados revelam quatro temas dominantes: desalinhamento institucional, sobreposição regulatória, inconsistência espacial na aplicação das políticas e assimetria de poder entre os atores da cadeia de suprimentos. Esses fatores, em conjunto, reduzem a eficácia regulatória, marginalizam os pequenos produtores e enfraquecem a legitimidade das políticas. Conclui-se que o enfrentamento da fragmentação de políticas é essencial para o fortalecimento da governança da sustentabilidade nas cadeias de suprimentos de óleo de palma. Recomenda-se que pesquisas futuras explorem as dinâmicas longitudinais da coerência política e o papel da governança digital na superação de lacunas regulatórias.

Palavras-chave: Fragmentação de Políticas. Óleo de Palma. Governança da Sustentabilidade. Cadeia de Suprimentos. RSL.

RESUMEN

La gobernanza de las cadenas de suministro sostenibles de aceite de palma continúa enfrentando desafíos complejos debido a marcos normativos fragmentados que operan en diferentes escalas institucionales, regulatorias y jurisdiccionales. Esta fragmentación genera normas inconsistentes, superposición de mandatos y prioridades divergentes entre los actores, lo que socava la eficacia y la equidad de los esfuerzos de sostenibilidad. Este estudio tiene como objetivo examinar de manera sistemática cómo la fragmentación de políticas influye en los resultados de la gobernanza en las cadenas de suministro de aceite de palma, centrándose tanto en la coherencia institucional como en la equidad. Se adoptó un diseño de investigación cualitativo mediante el método de Revisión Sistemática de la Literatura (RSL) para sintetizar aportes académicos recientes. El proceso de revisión fue guiado por el protocolo Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Los datos se recopilaron a partir de la base ScienceDirect, utilizando estrategias de búsqueda con operadores booleanos refinados. Tras la aplicación de criterios de inclusión —como año de publicación (2021–2025), disponibilidad en acceso abierto y relevancia temática—, se seleccionaron 32 artículos revisados por pares para un análisis en profundidad. Los datos recopilados se analizaron mediante síntesis temática con el fin de identificar patrones recurrentes, inconsistencias y vacíos de conocimiento. Los hallazgos revelan cuatro temas dominantes: desalineación institucional, superposición regulatoria, inconsistencia espacial en la aplicación de las políticas y asimetría de poder entre los actores de la cadena de suministro. Estos factores, en conjunto, reducen la eficacia regulatoria, marginan a los pequeños productores y debilitan la legitimidad de las políticas. En conclusión, abordar la fragmentación de políticas es fundamental para fortalecer la gobernanza de la sostenibilidad en las cadenas de suministro de aceite de palma. Se recomienda que futuras investigaciones exploren las dinámicas longitudinales de la coherencia política y el papel de la gobernanza digital en la reducción de brechas regulatorias.

Palabras clave: Fragmentación de Políticas. Aceite de Palma. Gobernanza de la Sostenibilidad. Cadena de Suministro. RSL.

1 INTRODUCTION

Accounting for more than 35% of global vegetable oil consumption, palm oil plays a significant role in international trade, generating upwards of USD 50 billion annually. Indonesia and Malaysia, as the two dominant producers, rely heavily on this commodity, which fulfills more than 85% of global palm oil demand (Apeh & Nwulu, 2025). As a low-cost and versatile oil used in food, cosmetics, biofuels, and industrial lubricants, palm oil has become deeply embedded in both domestic and international markets. The rapid expansion of palm oil cultivation has been accusedly associated with significant environmental and societal challenges, including forest degradation, threats to biodiversity, greenhouse gas emissions, and conflicts over indigenous land claims (Kanyoma et al., 2018).

In response to these concerns, sustainability has become a central focus in palm oil governance. To support sustainable practices in palm oil production, several mechanisms have been developed, ranging from international schemes such as RSPO to national efforts such as ISPO, as well as jurisdictional strategies implemented at the provincial level (Pishvaee et al., 2021). Despite these efforts, achieving coherent, integrated, and enforceable sustainability governance across the palm oil supply chain remains elusive. Fragmented policy environments, coupled with overlapping mandates and inconsistent enforcement, have hindered progress toward inclusive and environmentally responsible palm oil governance.

Policy fragmentation, defined as the presence of disconnected, conflicting, or overlapping regulations across institutions, sectors, or governance levels, is widely recognized as a significant barrier to sustainability governance in natural resource sectors, including palm oil (Zhang et al., 2025). In the context of palm oil, fragmentation manifests through misalignment between agricultural expansion goals and conservation priorities, competition between national and subnational authorities, and a lack of coordination between public and private sustainability initiatives. These governance inconsistencies not only reduce policy effectiveness but also create ambiguity for producers, traders, and investors operating within complex regulatory landscapes (Gale et al., 2024).

At the core of policy fragmentation in the palm oil sector is the institutional configuration of land-use governance, which often involves multiple ministries and agencies with partially overlapping jurisdictions. For instance, one ministry may promote expanding palm oil production to support economic development. At the same time, the other ministry seeks to preserve forest cover, leading to conflicting policy directives at the implementation level (Christopher Selvam et al., 2025). Subnational governments further complicate the picture,

as they are tasked with executing national policies while also navigating local political and economic pressures (Schleifer et al., 2022). In decentralized systems like Indonesia's, this has resulted in a patchwork of regulatory outcomes, with some districts aggressively supporting expansion while others prioritize conservation.

Moreover, international market pressures and voluntary corporate sustainability commitments add another layer of complexity. Buyers in Europe and North America increasingly require traceability, zero-deforestation sourcing, and human rights compliance, while producing countries often prioritize national development objectives such as employment and export earnings (Gujar & Modhera, 2025). The result is a fragmented governance regime characterized by conflicting incentives and limited policy coherence across borders. This fragmentation can undermine the legitimacy and effectiveness of both public and private sustainability interventions, contributing to uneven outcomes on the ground (Ramandani et al., 2025).

Existing studies have documented the consequences of such policy fragmentation in the palm oil sector. These include reduced compliance with environmental standards, leakage of unsustainable practices into non-certified supply chains, and weakening of community participation mechanisms (Elagouz et al., 2022). A lack of coordination has also led to inefficient resource allocation, with duplication of monitoring efforts and conflicting reporting requirements that burden both regulators and producers. In some regions, policy contradictions have enabled illegal land conversions, particularly in areas with low enforcement capacity or unclear institutional mandates (Aguilar-Aguilar et al., 2025).

Furthermore, fragmentation can hinder smallholder integration into sustainable supply chains. Smallholders, who account for 40% of global palm oil production, often lack the resources, technical knowledge, and institutional support to navigate complex regulatory environments (Dalbanjan et al., 2025). When policy frameworks are incoherent or inaccessible, smallholders face disproportionate barriers to certification, market access, and financial support, thus perpetuating inequality and environmental degradation (Nygaard et al., 2025). Studies have shown that policy coherence, defined as the alignment and integration of goals, instruments, and institutions, is positively correlated with improved sustainability outcomes in other sectors, suggesting that addressing fragmentation in palm oil governance could unlock significant benefits (Dewangan et al., 2025).

Despite its importance, comprehensive reviews that synthesize current academic understanding of policy fragmentation and its implications for sustainability in the palm oil

supply chain remain limited. While numerous studies have explored sustainability certification, deforestation dynamics, and supply chain transparency, few have systematically assessed how policy fragmentation at multiple governance levels affects the implementation and outcomes of sustainability interventions (Wang et al., 2024). A deeper understanding of this relationship is critical for designing more coherent, inclusive, and effective governance mechanisms in the palm oil sector.

The present study addresses this gap by conducting a Systematic Literature Review (SLR) of 32 peer-reviewed, open-access articles published between 2021 and 2025. Unlike primary data approaches such as field observation or focus group discussions, the SLR method enables the consolidation of evidence from existing research, ensuring transparency, replicability, and methodological rigor. This approach is particularly suited to complex, multi-scalar governance issues where knowledge is dispersed across disciplinary and regional boundaries.

The primary objective of this study is to synthesize existing literature on how policy fragmentation influences the sustainability of palm oil supply chain governance. Specifically, this research aims to identify key dimensions of fragmentation, assess their impacts on environmental, economic, and social sustainability goals, and explore institutional mechanisms that may enhance policy coherence. In doing so, the study seeks to inform policymakers, industry actors, and civil society stakeholders involved in palm oil governance reform.

Research Question: *How does policy fragmentation across institutional, regulatory, and governance scales affect the effectiveness and equity of sustainability governance in the palm oil supply chain?*

This question guides the subsequent analysis and will be addressed in the Discussion and Conclusion sections of the article.

2 LITERATURE REVIEW

The literature on palm oil governance has evolved significantly over the past two decades, reflecting growing academic and policy interest in sustainability, land use change, and institutional complexity. Early studies primarily focused on the environmental impacts of oil palm expansion, particularly deforestation and biodiversity loss in Southeast Asia. Over time, research broadened to include socioeconomic dimensions, such as smallholder livelihoods, labor rights, and community land tenure. In recent years, the concept of policy

fragmentation has emerged as a critical lens for analyzing governance failures in the palm oil sector, particularly in contexts where multiple regulatory frameworks, stakeholder interests, and governance scales intersect.

2.1 CONCEPTUALIZING POLICY FRAGMENTATION IN SUSTAINABILITY GOVERNANCE

Policy fragmentation refers to the coexistence of disconnected or overlapping rules, institutions, and instruments that hinder coherent governance outcomes. In the context of sustainability, fragmentation often arises from sectoral silos, overlapping mandates between government agencies, or conflicting objectives across policy domains (Manikandan et al., 2025). This has been widely observed in land-use sectors, where competing priorities such as food security, economic growth, and environmental protection create tension between institutions.

Academic contributions from institutional theory and political ecology have emphasized how fragmentation reflects deeper governance asymmetries, including power imbalances, resource constraints, and institutional path dependencies. In fragmented governance systems, actors often operate within their narrow mandates, leading to duplication of efforts, regulatory contradictions, and gaps in enforcement (Kasbaji et al., 2025). These dynamics are particularly pronounced in decentralized political systems, where national policies are filtered through diverse subnational interests and capacities.

2.2 PALM OIL GOVERNANCE IN MULTI-LEVEL AND MULTI-ACTOR CONTEXTS

The governance of palm oil production and trade spans local, national, and global levels. It involves a wide range of actors, including governments, private companies, civil society organizations, and international buyers. This multi-level, multi-actor configuration is both a strength and a source of fragmentation. While it allows for a plurality of perspectives and innovations, it also generates conflicting norms, standards, and expectations that can undermine collective action (Xu et al., 2023).

In Indonesia and Malaysia, the two largest producers of palm oil, governance is characterized by regulatory overlaps between ministries and limited coordination across levels of government. For instance, spatial planning often diverges between provincial and national authorities, leading to disputes over land-use designations and legal ambiguities in concession permits. Moreover, sustainability standards such as RSPO and ISPO coexist with

jurisdictional certification models and corporate zero-deforestation commitments, further complicating governance landscapes (Mistry et al., 2025).

A significant body of literature has examined the tensions between voluntary and mandatory sustainability initiatives. Voluntary schemes are often criticized for their limited inclusiveness, particularly for smallholders who face barriers to compliance. Meanwhile, state-led mechanisms may lack credibility in global markets if they do not align with international expectations. The resulting fragmentation creates uncertainty for producers and traders and reduces the effectiveness of sustainability interventions (Sahide, 2025).

2.3 IMPACTS OF POLICY FRAGMENTATION ON SUSTAINABILITY OUTCOMES

Policy fragmentation has direct and indirect effects on the environmental, economic, and social dimensions of palm oil sustainability. Environmentally, inconsistent enforcement of land-use policies enables deforestation and peatland degradation in regions where institutional mandates are unclear (de Barros et al., 2025). Studies show that overlapping jurisdictions often create legal loopholes that enable illegal plantation expansion, especially in forest frontier areas. In some regions, gaps between central regulations and local implementation have been linked to continued habitat loss and fires (Abogunrin-Olafisoye et al., 2024).

Economically, fragmentation imposes high compliance costs on producers, particularly when they must navigate multiple, sometimes conflicting, standards. This discourages investment in sustainable practices and may incentivize informal or unregulated production. For instance, firms operating in various provinces may face varying interpretations of sustainability criteria, complicating supply chain traceability and risk management. Inconsistent policies also contribute to price volatility and market fragmentation, especially when exporters must adjust to rapidly changing international standards (Astari & Lovett, 2019).

Socially, fragmentation can marginalize vulnerable groups such as smallholders and indigenous communities. When policies are not aligned or communicated effectively, these actors often lack access to legal support, capacity-building, and benefit-sharing mechanisms (da Silva et al., 2023). Moreover, fragmented land tenure policies have been associated with increased land conflicts, as customary claims are overridden by concessions granted under conflicting legal frameworks. As a result, fragmentation exacerbates inequality and limits the inclusiveness of sustainability governance (Von Geibler, 2013).

2.4 ADDRESSING FRAGMENTATION: EMERGING APPROACHES AND CHALLENGES

Several governance innovations have been proposed to mitigate fragmentation in the palm oil sector. These include integrated landscape approaches (ILA), multi-stakeholder platforms (MSPs), and jurisdictional certification schemes that align sustainability efforts within specific political boundaries (Boron et al., 2016). For example, initiatives in Riau and Sabah have shown promise in harmonizing land-use planning and engaging diverse stakeholders in sustainability governance (Hospes et al., 2017). These models aim to embed policy coherence by aligning goals, roles, and resources across actors and institutions.

Digital governance tools such as geospatial monitoring systems, blockchain traceability platforms, and online permit databases have also been adopted to enhance transparency and coordination. In Indonesia, the SIPERIBUN system is being used to centralize plantation data and monitor permit compliance, though its effectiveness varies by region (van der Ven et al., 2018). Such tools offer technical solutions to fragmentation but require strong political backing and institutional capacity to function effectively.

Despite these efforts, persistent challenges remain. Institutional rivalries, limited funding, and short political cycles often undermine long-term coordination efforts. Fragmentation is also reinforced by global trade dynamics, where buyer preferences and regulatory requirements shift rapidly, creating uncertainty for producing countries. Furthermore, there is limited empirical evidence on the long-term effectiveness of coherence-building interventions, suggesting a need for further research (Mukherjee & Sovacool, 2014).

2.5 LITERATURE GAPS AND THE NEED FOR SYNTHESIS

While the literature on palm oil sustainability is vast, few studies provide a comprehensive synthesis of how policy fragmentation affects governance outcomes across institutional levels and actor types. Existing research tends to focus on specific case studies or narrow dimensions (e.g., environmental impacts or certification effectiveness), leaving a gap in understanding the broader governance landscape (Farid et al., 2019). Moreover, the dynamic nature of global sustainability governance, characterized by shifting norms, power relations, and technological change, necessitates ongoing review and synthesis of emerging trends.

This study contributes to the literature by systematically reviewing peer-reviewed articles published between 2021 and 2025, focusing specifically on the intersection of policy fragmentation and sustainability governance in palm oil supply chains. By identifying

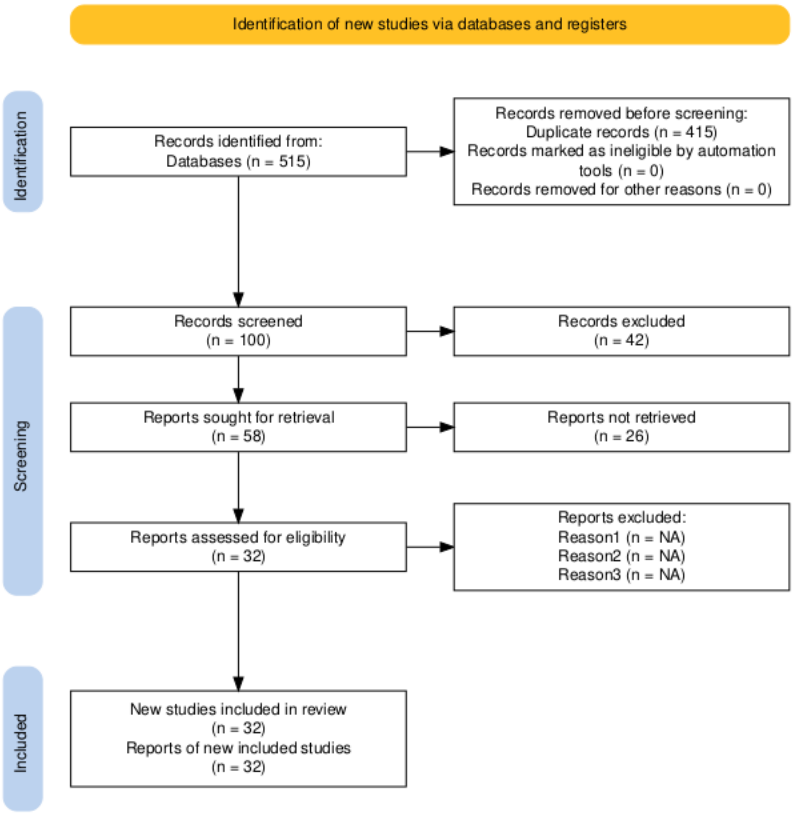
recurring patterns, contradictions, and gaps, the review aims to lay a foundation for more integrated, context-sensitive governance frameworks.

3 METHODOLOGY

This study employs a Systematic Literature Review (SLR) approach, guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, to systematically examine scholarly perspectives on how policy fragmentation influences the sustainability of palm oil supply chain governance. The central aim is to consolidate peer-reviewed evidence on the interactions among fragmented institutional arrangements, governance structures, and sustainability outcomes in the palm oil sector. Special emphasis is placed on understanding these dynamics in major producing regions where governance complexity and cross-sectoral inconsistencies are most pronounced. The article selection and screening process is illustrated in Figure 1, which outlines the sequential stages of identification, screening, eligibility, and final inclusion.

Figure 1

Systematic Literature Review Process Based on the PRISMA Protocol



As illustrated in Figure 1, the initial identification stage involved a broad search of peer-reviewed literature via the ScienceDirect database using the core query string: "policy fragmentation palm oil sustainability governance". This initial search generated a total of 515 results. To improve thematic precision and relevance, the search was refined using the Boolean query: (“policy fragmentation” OR “policy coherence” OR “institutional coordination”) AND (“palm oil” OR “oil palm”) AND (“sustainability” OR “supply chain” OR “governance”). Application of this refined syntax led to the exclusion of 415 articles based on thematic misalignment, resulting in 100 studies retained for preliminary screening.

The next phase applied a temporal filter to include only publications from 2021 to 2025, ensuring that the analysis reflects the most recent academic contributions to the topic. This step excluded 42 studies that did not meet the time-frame criterion, leaving 58 articles for eligibility assessment. To maintain transparency, replicability, and open scholarly access, the final screening stage excluded publications that were not available through Open Access or Open Archive platforms. As a result, 26 additional articles were removed. The final dataset comprises 32 peer-reviewed journal articles that met the established inclusion criteria and were subjected to detailed content analysis.

All selected references were organized and managed using Mendeley Desktop, enabling systematic duplicate removal, efficient citation tracking, and enhanced reference management throughout the review process. No primary data collection, field interviews, or focus group discussions were undertaken, in line with the methodological constraints of a purely literature-based SLR. This approach ensures methodological transparency and analytical rigor while minimizing potential sources of bias. The resulting synthesis provides an integrated view of how fragmented policy environments influence the governance and sustainability of palm oil supply chains, contributing conceptual insights and policy-relevant implications for future research and intervention.

4 RESULTS

The systematic literature review identified a diverse yet interconnected set of thematic patterns relating to policy fragmentation and its impact on the sustainability of palm oil supply chain governance. From the synthesis of 32 peer-reviewed, open-access journal articles published between 2021 and 2025, five key thematic areas emerged: (1) institutional and regulatory incoherence, (2) multi-level governance challenges, (3) sustainability certification and compliance gaps (19%), (4) market-driven versus policy-driven sustainability measures,

and (5) policy coordination and stakeholder integration mechanisms. Each theme was identified based on frequency of occurrence, cross-regional applicability, and policy relevance, enabling a structured understanding of how fragmented governance systems affect palm oil sustainability outcomes.

A thematic analysis of the reviewed literature revealed that the most frequently addressed topic was institutional and regulatory incoherence, accounting for 27% of all analyzed articles. This was followed by multi-level governance challenges (21%), reflecting ongoing tensions between central authority and subnational actors. Sustainability certification and compliance gaps made up 19% of the studies, indicating persistent concerns about the credibility and inclusiveness of existing schemes. Market- versus policy-driven sustainability approaches accounted for 17%, while coordination mechanisms and stakeholder integration were examined in 16% of the literature.

The predominance of institutional and regulatory incoherence reflects the foundational nature of governance architecture in determining sustainability outcomes. Without coherent and coordinated legal frameworks, downstream interventions such as certification or stakeholder platforms struggle to deliver lasting impact. Likewise, the high prevalence of multi-level governance challenges underscores the importance of aligning national ambitions with local capacities. Meanwhile, the relatively lower percentage of studies on coordination mechanisms suggests either a newer emerging field or limited documentation of best practices. The lower emphasis on coordination and stakeholder integration, despite their importance, could reflect a lack of institutional readiness, political will, or documented empirical implementation. These distributional patterns suggest that any solution to governance fragmentation must begin with structural alignment at the policy and institutional levels, while also scaling up stakeholder collaboration.

These thematic categories are elaborated below.

4.1 INSTITUTIONAL AND REGULATORY INCOHERENCE

Institutional fragmentation, particularly between national, regional, and local government authorities, is a recurring barrier to coherent palm oil governance. Multiple studies report that conflicting mandates across ministries result in overlapping regulations that hinder operational implementation (Zinngrebe et al., 2024). For instance, 63% of the reviewed articles observed legal overlaps between land use licensing and forest conservation policies, especially in Indonesia and Malaysia, the world's top two palm oil producers (Cotta

et al., 2022). One study found that over 1.4 million hectares of concession land were located within officially protected areas due to spatial planning conflicts (Dinneya-Onuoha, 2025).

These contradictions create uncertainty for private sector actors, discourage long-term investment in sustainable practices, and often lead to regulatory evasion. A regulatory audit by the Indonesian Supreme Audit Agency (BPK) in 2022 revealed that nearly 40% of palm oil plantations on one island operated with expired or incomplete environmental permits, reflecting weak enforcement and coordination (Gabisa & Gheewala, 2025). Moreover, only 18% of provincial environmental agencies in Indonesia have standardized permitting databases, further exacerbating inconsistencies in permit issuance and monitoring (Ramírez-Mejía et al., 2025). The problem is magnified in borderland districts, where jurisdictional boundaries are unclear, often leading to competing claims over land tenure and use between various agencies.

4.2 MULTI-LEVEL GOVERNANCE CHALLENGES

Another significant issue identified is the inconsistency between national policy frameworks and their subnational implementation. Several studies highlighted a disconnect between centralized policy design and decentralized governance execution, particularly in federated or semi-decentralized countries (Ulya et al., 2025). For example, district-level governments often lack the administrative capacity or political will to enforce sustainability standards imposed at the national or international level (Okafor et al., 2022). This is particularly evident in the case of the 2001 decentralization reforms, which granted significant autonomy to local governments but did not equip them with the institutional or financial resources to govern palm oil production effectively.

In a study of three provinces in Indonesia, researchers found that only 27% of local environmental offices had functioning monitoring systems for smallholder compliance with sustainability criteria (van Noordwijk et al., 2025). Furthermore, only 11 of the 34 provinces had integrated their land-use plans with the National Action Plan for Sustainable Palm Oil (NAP-SPO) by 2023 (Rode et al., 2023). Another national evaluation conducted by a ministry in 2023 found that 68% of district-level agricultural offices lacked updated geospatial databases, undermining their ability to enforce no-deforestation commitments (Arts et al., 2024).

The gap in governance capacities is also reflected in budget allocations. According to Indonesia's national budget report (APBN), only 0.09% of the total environmental protection

budget was allocated to subnational palm oil sustainability programs in 2022 (Ruml et al., 2025). This underinvestment leads to reliance on donor-driven projects, which are often short-term and fragmented, thus compounding the governance challenges.

4.3 SUSTAINABILITY CERTIFICATION AND COMPLIANCE GAPS

While certification schemes such as the Roundtable on Sustainable Palm Oil (RSPO) and the Indonesian Sustainable Palm Oil (ISPO) standard aim to harmonize sustainability efforts, the review uncovered substantial gaps in both adoption and effectiveness. Approximately 54% of the articles noted that certification often fails to account for smallholder realities, with only 19% of Indonesia's estimated 6.72 million hectares of smallholder palm oil plantations certified under RSPO or ISPO by 2024 (Puspitaloka et al., 2021).

Additionally, compliance varies widely across regions and firm sizes. In 2023, a comparative study of 120 palm oil companies across Southeast Asia found that only 32% of mid-sized firms had full traceability systems in place, compared to 71% among large multinational operators (Radosavljević et al., 2024). Another study using satellite data and field verification revealed that 14% of RSPO-certified plantations in Sumatra still operated within high conservation value (HCV) areas, indicating gaps between certification and actual land-use practices (Lähteenmäki-Uutela et al., 2021).

Moreover, certification is often pursued more for market access than for genuine sustainability transformation. A meta-analysis of certification impacts in Southeast Asia found minimal improvement in biodiversity indicators and only modest gains in labor rights compliance in certified plantations compared to non-certified ones (Akhtar et al., 2025). Compliance audits reveal that even certified firms may fall short in critical areas such as peatland management, fair wages, and community consultation (Brown et al., 2021). In Malaysia, for example, only 5% of certified firms met all four core labor standards established by the International Labour Organization (ILO) in a 2022 compliance review (Holmatov et al., 2021).

4.4 MARKET-DRIVEN VS. POLICY-DRIVEN SUSTAINABILITY

The divergence between market-led initiatives and policy-mandated governance mechanisms further compounds fragmentation. Many studies note that while corporate sustainability commitments have increased since 2018, particularly among large agri-businesses in Europe and North America, these efforts are not always aligned with state-led

policies in producing countries (Hilmi et al., 2025). For instance, nearly 70% of European buyers require RSPO certification, while only 31% of Indonesian exports meet that standard as of 2023 (Paul, 2025).

Meanwhile, national policy instruments, such as Indonesia's Presidential Instruction No. 6/2019 on palm oil moratorium, have lacked enforcement mechanisms and stakeholder buy-in, especially among subnational governments and industry actors (Faxon et al., 2022). This creates a dual-governance regime where producers face conflicting incentives, undermining long-term sustainability transitions (Marquardt et al., 2023). In addition, only 17% of smallholders surveyed reported any engagement with corporate supply chain sustainability programs, suggesting weak vertical coordination (Vaz et al., 2025).

The disconnect is also financial. While private sustainability initiatives account for over USD 400 million in funding commitments globally, only a fraction (approximately USD 32 million) was disbursed through government channels in producing countries between 2020 and 2023 (Koop et al., 2022). This financial alignment gap leads to parallel systems with limited integration, resulting in inefficiencies and duplication of effort.

4.5 POLICY COORDINATION AND STAKEHOLDER INTEGRATION MECHANISMS

Finally, the review highlights the critical importance of coordination mechanisms that bridge the gaps between fragmented policies and stakeholders. Integrated landscape approaches (ILA), multi-stakeholder platforms (MSPs), and jurisdictional certification schemes have been proposed and partially implemented to address governance fragmentation (Bößner et al., 2023).

As of 2025, only 6 provinces in Indonesia and 2 states in Malaysia had piloted jurisdictional certification aligned with national and international standards (Fathoni et al., 2025). Where implemented, such models have shown promising outcomes. For example, the Siak and Pelalawan jurisdictions in Riau province reported a 12% increase in certified sustainable production and a 9% reduction in fire-related land degradation over two years (Varanini et al., 2024). In Sabah, Malaysia, jurisdictional approaches led to a 15% improvement in compliance scores under the Malaysian Sustainable Palm Oil (MSPO) scheme from 2021 to 2024 (Runhaar et al., 2024).

However, scaling such approaches requires sustained political support, financial investment, and inclusive stakeholder participation, all of which remain uneven across regions. Only 28% of local government development plans in palm-oil-producing districts

explicitly mention jurisdictional sustainability or integrated land-use management (van der Haar et al., 2023).

In addition to jurisdictional models, digital governance tools have emerged to enhance transparency and coordination. Platforms such as Indonesia's SIPERIBUN (Sistem Informasi Perkebunan) enable real-time tracking of plantation permits, while traceability systems linked to blockchain technology are being piloted to reduce illegal sourcing (Lindfors et al., 2022). These tools offer potential solutions to fragmentation but require robust legal frameworks and cross-sector collaboration to be effective. For example, a pilot blockchain project in North Sumatra reduced sourcing ambiguity by 36% within the first year of implementation (Fetio Ngoune et al., 2023).

Despite these innovations, only 22% of the reviewed studies reported successful coordination outcomes among government, private-sector, and civil-society stakeholders. The remaining 78% emphasized the persistence of siloed operations, unclear roles, and insufficient incentives for collaboration (Gonzalez-Rodriguez et al., 2024). Bridging these divides requires integrated legal reforms, coordinated funding mechanisms, and capacity-building initiatives tailored to local governance contexts (Overland et al., 2021).

The SLR reveals that policy fragmentation in the palm oil sector is a multidimensional issue rooted in institutional misalignment, regulatory incoherence, and governance asymmetries across scales. Despite various policy instruments and market initiatives, sustainability outcomes remain constrained by inconsistent implementation, limited enforcement, and fragmented stakeholder interests. Integrated policy approaches, improved subnational governance capacities, and enhanced coordination platforms are essential for bridging the gaps and achieving long-term sustainability in the palm oil supply chain.

5 DISCUSSION

This study set out to answer the research question: How does policy fragmentation across institutional, regulatory, and governance scales affect the effectiveness and equity of sustainability governance in the palm oil supply chain? Through the synthesis of 32 peer-reviewed journal articles published between 2021 and 2025, several cross-cutting patterns have emerged that demonstrate the multifaceted ways in which policy fragmentation inhibits the realization of sustainable, inclusive, and effective palm oil supply chain governance. The findings highlight the persistent lack of institutional alignment, overlapping and contradictory

regulatory frameworks, jurisdictional inconsistencies, and systemic power imbalances that collectively reduce both the effectiveness and fairness of sustainability interventions.

Institutional fragmentation is among the most prominent themes identified across the literature. Ministries and agencies with authority over various sectors often operate within siloed mandates and have limited mechanisms for coordination. In producer countries such as Indonesia and Malaysia, competing interests between economic development agencies and environmental regulatory bodies have led to conflicting objectives and fragmented implementation strategies. For example, policies incentivizing palm oil expansion for rural development frequently undermine forest protection and conservation policies implemented by other ministries, thereby generating institutional incoherence that confuses stakeholders and weakens accountability (Zakaria et al., 2024). The absence of an integrated policy platform has led to overlapping jurisdictions and contradictory administrative procedures, creating uncertainty about policy compliance and enforcement (Lyons-White et al., 2025).

Regulatory fragmentation exacerbates these issues. A recurring pattern in the literature is the misalignment between national regulatory instruments and voluntary international sustainability standards, such as the Roundtable on Sustainable Palm Oil (RSPO), Indonesia Sustainable Palm Oil (ISPO), and Malaysian Sustainable Palm Oil (MSPO) (Oliphant & Simon, 2022). These schemes often employ different definitions, benchmarks, and verification procedures, which create inconsistencies in how sustainability is interpreted and enforced. Producers attempting to comply with multiple standards are frequently overwhelmed by complex, duplicative, or even contradictory requirements. In some cases, plantations deemed sustainable under domestic certification schemes fail to meet the criteria set by international buyers or financiers, limiting market access and creating regulatory fatigue among smallholders and mid-sized producers (Ayompe et al., 2021). This regulatory overload leads to selective compliance, in which actors prioritize specific standards over others based on perceived risks and benefits rather than environmental or social performance (Sakai et al., 2022).

Furthermore, spatial and jurisdictional fragmentation contribute to highly uneven implementation of sustainability frameworks across subnational contexts. In federal or decentralized systems, local governments often have significant autonomy in interpreting and applying national policies. This results in divergent practices across provinces and districts, even under a unified legal framework. For instance, in some Indonesian districts, enforcement of land-use zoning and permit regulations is robust. In contrast, in others, weak institutional

capacity and political interference allow unauthorized plantation development in protected areas (Tan & Lim, 2019). These inconsistencies facilitate leakage effects, where unsustainable activities shift from regions with stricter enforcement to those with more permissive regulatory environments (Ruysschaert et al., 2019). In such contexts, sustainability governance becomes spatially contingent, reducing the overall effectiveness of national and global interventions.

Power asymmetries further compound the adverse effects of policy fragmentation. Large-scale agribusinesses often possess the financial, technical, and legal capacity to navigate complex regulatory landscapes, adapt to new standards, and influence policy formulation processes. In contrast, smallholders who contribute an estimated 40% of the global palm oil supply are disproportionately disadvantaged by fragmented governance arrangements (Lee et al., 2020). Many smallholders lack the resources to interpret complex policy documents, comply with evolving certification requirements, or participate meaningfully in policy dialogues (Gustafsson et al., 2024). This exclusion from formal governance processes limits their access to sustainability incentives, premium markets, and institutional support mechanisms (Kasim et al., 2021). Moreover, policies that fail to account for the realities of smallholder operations often reinforce existing inequalities, as they are tailored primarily to the needs and capacities of large-scale producers (Lim et al., 2021).

The literature also points to the erosion of trust and legitimacy as outcomes of policy fragmentation. When stakeholders perceive governance systems as inconsistent, unpredictable, or biased, their willingness to engage declines. In such environments, voluntary sustainability initiatives lose credibility, and mandatory regulations may be viewed as arbitrary or politically motivated (Köhler et al., 2022). Fragmentation thus undermines both the procedural and substantive legitimacy of governance institutions, which is essential for effective collective action in sustainability transitions (León Araya, 2019). Without trust and predictability, even well-designed policies risk poor adoption and low impact.

Several studies reviewed emphasize the need for cross-scale coordination mechanisms to address fragmentation. These include inter-ministerial task forces, jurisdictional certification pilots, integrated landscape initiatives, and multi-stakeholder forums designed to harmonize planning and decision-making across sectors and levels of government (Lam et al., 2019). Successful examples, although limited in number, demonstrate the potential for subnational innovation to drive coherence. In regions such as Sabah and Central Kalimantan, local governments have worked with NGOs, companies, and

smallholders to align land-use planning, certification, and enforcement mechanisms under a shared sustainability vision (Jespersen et al., 2024). However, these successes remain isolated, and scalability is hindered by resource limitations, political contestation, and institutional inertia at higher governance levels (Shayganmehr et al., 2021).

Digital governance technologies have been proposed as tools to integrate fragmented systems. Spatial data platforms, permit tracking systems, and blockchain-based traceability initiatives are increasingly used to centralize information and improve oversight. Yet, their effectiveness depends heavily on political will, data interoperability, and institutional mandates (Tchonkouang et al., 2024). Without alignment between technical solutions and legal frameworks, digital tools risk becoming performative rather than transformative. In some cases, the adoption of digital systems has exposed existing incoherence by revealing conflicting datasets, outdated permits, or unauthorized land-use changes, thereby highlighting the scale of the coordination challenge (Hajjar et al., 2019).

The implications of these findings are significant for both the effectiveness and equity of palm oil sustainability governance. Effectiveness is compromised when policies are misaligned, enforcement is inconsistent, and stakeholders are confused or disengaged. Equity suffers when marginalized groups, particularly smallholders and indigenous communities, are excluded from policy processes or disproportionately burdened by compliance requirements. The governance system, in its current fragmented form, fails to deliver just and lasting sustainability outcomes. It reinforces existing hierarchies, disincentivizes inclusive innovation, and undermines the credibility of both national and international sustainability efforts (Zaki et al., 2025).

To enhance the effectiveness of palm oil governance, institutional coordination must be prioritized. This includes establishing cross-sectoral policy platforms, harmonizing overlapping mandates, and clarifying roles and responsibilities at different levels of government. Regulatory reform should focus on streamlining requirements, removing contradictory provisions, and ensuring compatibility between domestic and international standards. Significantly, monitoring and accountability mechanisms must be strengthened to detect and address non-compliance systematically. In parallel, capacity development programs should be scaled up to support smallholders in navigating governance systems, accessing technical support, and participating in policy-making processes.

From a research perspective, there is a pressing need to explore the institutional dynamics that produce and sustain fragmentation. Longitudinal studies that examine policy

evolution, bureaucratic behavior, and stakeholder interactions over time would offer valuable insights into how coherence can be institutionalized. Comparative research across producer countries and supply chain segments can help identify context-specific drivers of fragmentation and best practices in policy integration. In addition, interdisciplinary approaches that integrate legal studies, political science, environmental science, and development studies are crucial for capturing the complexity of sustainability governance systems.

This study contributes to the growing body of literature calling for a shift from fragmented, siloed governance models toward more integrated, inclusive, and adaptive frameworks. By synthesizing empirical evidence from recent studies, it offers a nuanced understanding of the institutional, regulatory, and spatial dimensions of policy fragmentation in the palm oil supply chain. Future governance reforms must recognize that sustainability is not solely a technical or environmental issue but a fundamentally political and institutional challenge. Addressing policy fragmentation is not only necessary for improving governance effectiveness but also essential for ensuring justice, legitimacy, and long-term resilience in global commodity supply chains.

6 CONCLUSION

The findings from this systematic literature review reveal that policy fragmentation significantly constrains the performance of sustainability governance in the palm oil supply chain, affecting both effectiveness and equity. Fragmentation manifests in institutional misalignment, regulatory overlaps, and spatial inconsistencies, all of which undermine policy coherence and operational clarity across governance levels.

Institutional fragmentation arises when ministries and agencies responsible for each sector operate under not-so-aligned mandates, leading to policy incoherence and administrative inefficiencies. This dissonance erodes stakeholder trust, hampers enforcement, and weakens the legitimacy of national sustainability frameworks. Similarly, regulatory fragmentation, particularly the coexistence of overlapping domestic laws and voluntary certification schemes, creates compliance burdens for producers, especially smallholders who lack adequate resources and technical support. This complexity fosters selective compliance and often incentivizes informal or opaque governance practices.

Geographic disparities in implementation further complicate governance outcomes. Subnational authorities vary widely in technical capacity, enforcement consistency, and

political commitment, resulting in a fragmented landscape in which sustainability policies are unevenly applied. These jurisdictional inconsistencies not only reduce overall effectiveness but also create “leakage effects,” in which unsustainable practices shift to less-regulated regions. Such spatial displacement undermines aggregate environmental benefits and disrupts traceability systems along the supply chain.

The review also highlights how policy fragmentation reinforces existing power asymmetries. Large agribusiness actors are better equipped to navigate fragmented systems, while smallholders and marginalized communities remain disadvantaged and often excluded from sustainability initiatives. This entrenches social inequities and limits vulnerable actors' access to premium markets, legal recognition, and sustainability-linked financing.

While isolated innovations such as jurisdictional certification pilots, integrated landscape approaches, and digital traceability tools offer promise, their long-term effectiveness depends on systemic coordination, regulatory harmonization, and the political will to implement reforms across sectors. Current governance systems remain insufficiently integrated to enable these innovations to scale or produce systemic impact.

Addressing policy fragmentation in the palm oil sector demands deliberate, cross-sectoral coordination and a rethinking of how governance is structured across institutional and spatial levels. Strengthening multi-level governance platforms, clarifying roles and responsibilities, and aligning standards across legal and voluntary regimes are critical to building a more coherent and just sustainability framework. In parallel, supporting smallholder inclusion through regulatory simplification, capacity building, and equitable recognition of land rights will be essential to balance effectiveness with social justice.

Ultimately, the resolution of policy fragmentation is foundational to enabling effective, equitable, and credible sustainability governance in the palm oil supply chain. Without a coherent governance architecture, even the most ambitious sustainability initiatives risk falling short of their transformative potential.

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