

Evaluating the Implementation of Green Economy Policies in Addressing Deforestation to Support the Achievement of the Sustainable Development Goals (SDGs) in Indonesia

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Received 27 April 2026 ☐ Revised 27 July 2026 ☐ Accepted 31 July 2026

ABSTRACT

The green economy has emerged as a strategic policy framework for promoting sustainable development and accelerating the achievement of the Sustainable Development Goals (SDGs) in Indonesia. Despite the adoption of various green economy initiatives, deforestation remains a persistent environmental challenge, indicating a discrepancy between policy objectives and implementation outcomes. This study evaluates the effectiveness of green economy policies in addressing deforestation and examines their contribution to achieving the SDGs in Indonesia. A qualitative research design was employed using a systematic literature review of peer-reviewed journal articles, government publications, reports from international organizations, and official statistical data. The collected data were analyzed through thematic content analysis, guided by Ecological Modernization Theory (EMT) to examine the relationships among environmental governance, institutional reform, and forest conservation. The findings indicate that Indonesia has made measurable progress in reducing net deforestation through forest rehabilitation and restoration programmes. However, independent satellite-based monitoring by Global Forest Watch shows that forest cover loss continues in several regions, suggesting that current green economy policies have been more effective in mitigating the impacts of deforestation than in addressing its underlying drivers. The study identifies institutional fragmentation, inconsistent law enforcement, competing land-use interests, and limited governance capacity as the principal barriers to effective policy implementation. By integrating Ecological Modernization Theory with policy implementation analysis and complementary deforestation datasets from the Ministry of Environment and Forestry (KLHK) and Global Forest Watch, this study provides a more comprehensive framework for evaluating green economy policies and demonstrates that strengthening institutional coordination, governance effectiveness, and stakeholder collaboration is essential for advancing SDG 13 (Climate Action) and SDG 15 (Life on Land) in Indonesia.

Keywords : Green Economy; Deforestation; Ecological Modernization Theory; Environmental Governance; Sustainable Development Goals (SDGS)

INTRODUCTION

Sustainable development has become a central paradigm in global governance in response to growing environmental challenges, including climate change, biodiversity loss, ecosystem degradation, and socioeconomic inequality. Recognizing the limitations of conventional growth-oriented development models, the international community adopted the 2030 Agenda for Sustainable Development, establishing the Sustainable Development Goals (SDGs) as an integrated framework for balancing economic growth, social inclusion, and environmental protection (United Nations, 2015; Sachs et al., 2022).

Global climate action was further strengthened through the Paris Agreement, adopted in 2015 under the United Nations Framework Convention on Climate Change (UNFCCC), which encourages countries to reduce greenhouse gas emissions while promoting sustainable development (UNFCCC, 2015). Indonesia reaffirmed its commitment by ratifying the Agreement through Law No. 16 of 2016 and integrating climate objectives into national development policies, including the Enhanced Nationally Determined Contribution (Enhanced NDC), the Low Carbon Development Initiative (LCDI), the Forestry and Other Land Use (FOLU) Net Sink 2030 Strategy, and the Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050) (Bappenas, 2019; Ministry of Environment and Forestry, 2022). Together, these initiatives position the green economy as a key strategy for achieving SDG 13 (Climate Action) and SDG 15 (Life on Land).

The green economy promotes low-carbon growth, efficient resource use, ecosystem conservation, and social inclusion as complementary objectives (UNEP, 2011). However, implementing these principles remains challenging in developing countries where economic growth continues to rely heavily on natural resource exploitation (OECD, 2011). Indonesia represents a significant case because it possesses the world's third-largest tropical rainforest while depending on agriculture, mining, and infrastructure development as major economic sectors (FAO, 2020). Despite the implementation of various green economy policies, deforestation remains a critical environmental issue. According to the Status Hutan Indonesia 2024, Indonesia recorded 175.4 thousand hectares of net deforestation in 2024, while Global Forest Watch continued to report forest cover loss across several provinces, reflecting persistent pressures from agricultural expansion, mining, and infrastructure development (Ministry of Environment and Forestry, 2025; Global Forest Watch, 2025). These findings indicate that comprehensive environmental policies have not yet been fully translated into effective forest governance.

Persistent deforestation has significant implications for Indonesia's sustainability commitments. Forest loss increases greenhouse gas emissions, weakens carbon sequestration, and accelerates biodiversity decline, thereby constraining progress toward SDG 13 (Climate Action) and SDG 15 (Life on Land) as well as Indonesia's commitments under the Paris Agreement and the Enhanced NDC (IPCC, 2023; United Nations, 2024). Consequently, evaluating green economy policies requires assessing not only the existence of policy instruments but also their effectiveness in strengthening environmental governance and reducing deforestation.

Previous studies have examined green economy implementation, sustainable development, and forest conservation from different perspectives. Loiseau et al. (2016) discussed the conceptual development of the green economy, while Barbier (2012) highlighted its role in sustainable economic transformation. In Indonesia, recent studies have focused on low-carbon development strategies (Faiq et al., 2025), forest governance reforms (Maryudi et al., 2022), and the socioeconomic drivers of deforestation (Austin et al., 2019). Although these studies provide valuable insights, they generally examine policy formulation, governance, or environmental

outcomes separately, offering limited understanding of how institutional capacity, governance quality, technological innovation, and stakeholder participation collectively influence the effectiveness of green economy policies in reducing deforestation while supporting SDG achievement.

This limitation highlights the need for an analytical framework that explains not only whether environmental policies are effective but also why implementation outcomes often differ from policy objectives. Ecological Modernization Theory (EMT) provides such a framework by emphasizing that environmental improvement can be achieved alongside economic development through institutional reform, technological innovation, market-based instruments, stakeholder participation, and adaptive environmental governance (Mol & Spaargaren, 2000; Mol, 2003). Compared with conventional policy evaluation approaches, EMT offers a broader perspective for assessing the institutional transformations required to reconcile economic growth with environmental sustainability. It is therefore particularly relevant for evaluating whether Indonesia's green economy policies have generated the governance reforms necessary to reduce deforestation and fulfil national climate commitments.

Accordingly, this study evaluates the effectiveness of green economy policy implementation in addressing deforestation and examines its contribution to achieving the Sustainable Development Goals in Indonesia. By integrating Ecological Modernization Theory with evidence from official government statistics and independent forest monitoring data, this study provides a more comprehensive assessment of how institutional governance, technological capacity, and policy implementation influence the effectiveness of green economy policies. The findings contribute to the literature on ecological modernization while offering evidence-based recommendations to strengthen sustainable forest governance and support Indonesia's commitments to the SDGs and the Paris Agreement.

Research Methodology And Theoretical Framework

This study employed a qualitative research approach using a systematic literature review to evaluate the implementation of green economy policies in addressing deforestation and supporting the achievement of the Sustainable Development Goals (SDGs) in Indonesia. A qualitative approach was selected because it enables an in-depth understanding of environmental governance, policy implementation, and institutional challenges through the synthesis of evidence from previous studies (Snyder, 2019). The literature search was conducted systematically using several academic databases, including Scopus, ScienceDirect, Google Scholar, and official publications issued by the Ministry of Environment and Forestry (KLHK), Ministry of National Development Planning (Bappenas), Statistics Indonesia (BPS), the United Nations (UN), the United Nations Environment Programme (UNEP), the Food and Agriculture Organization (FAO), the World Bank, and Global Forest Watch (GFW). The search employed combinations of the keywords "green economy", "deforestation", "forest governance", "Ecological Modernization Theory", "Sustainable Development Goals", and "Indonesia" using Boolean operators (AND/OR) to obtain literature relevant to the research objectives.

To ensure the relevance and quality of the reviewed literature, this study applied predefined inclusion and exclusion criteria. The inclusion criteria consisted of peer-reviewed journal articles, books, official government publications, reports from international organizations, and statistical documents discussing green economy, deforestation, environmental governance, sustainable forest management, and SDGs in Indonesia. Publications published between 2015 and 2025 were prioritized because this period reflects major global and

national policy developments following the adoption of the Paris Agreement and the 2030 Agenda for Sustainable Development. Earlier publications were included only when they provided the theoretical foundation for Ecological Modernization Theory. Publications lacking scientific credibility, duplicate documents, opinion articles, and literature unrelated to the research objectives were excluded from the analysis.

Data were collected through document analysis, involving the processes of reading, classifying, comparing, and synthesizing information obtained from the selected literature. Information extracted from each source included policy objectives, implementation mechanisms, institutional arrangements, governance challenges, technological innovation, stakeholder participation, and environmental outcomes related to green economy implementation. The collected data were analyzed using the interactive model developed by Miles, Huberman, and Saldaña (2014), consisting of data condensation, data display, and conclusion drawing and verification. During the data condensation stage, relevant information was coded and categorized according to recurring themes identified in the literature. The categorized findings were subsequently compared and interpreted to identify patterns, consistencies, and differences regarding the implementation of green economy policies and their influence on deforestation and SDG achievement.

The interpretation of the findings was guided by Ecological Modernization Theory (EMT), which argues that environmental sustainability can be achieved through institutional reform, technological innovation, market-based environmental instruments, stakeholder participation, and effective environmental governance (Mol & Spaargaren, 2000; Mol, 2003). EMT was selected because this study seeks not only to evaluate whether green economy policies have contributed to reducing deforestation but also to examine how institutional and governance transformations influence policy effectiveness. Therefore, the analytical dimensions of EMT provide a comprehensive framework for interpreting the relationship between economic development, environmental governance, and sustainable forest management in Indonesia.

Results And Discussion

1. Green Economy Policy Implementation: Progress and Institutional Challenges

Indonesia has made substantial progress in integrating green economy principles into its national development agenda through a series of strategic policy initiatives. These include the Low Carbon Development Initiative (LCDI), the Forestry and Other Land Use (FOLU) Net Sink 2030 Strategy, the Enhanced Nationally Determined Contribution (Enhanced NDC), renewable energy development programmes, and the incorporation of low-carbon development principles into the National Long-Term Development Plan (RPJPN) 2025–2045 (Bappenas, 2019; Ministry of Environment and Forestry, 2022). These policies reflect Indonesia's commitment to fulfilling its obligations under the Paris Agreement while simultaneously advancing the Sustainable Development Goals, particularly SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), and SDG 15 (Life on Land) (UNFCCC, 2015; United Nations, 2024).

The establishment of these policy instruments demonstrates that environmental sustainability has increasingly become an integral component of Indonesia's development planning. However, the existence of comprehensive regulatory frameworks should not automatically be interpreted as evidence of successful environmental transformation. From a policy implementation perspective, the effectiveness of green economy initiatives depends not only on policy formulation but also on the extent to which these policies influence land-use decisions, institutional behaviour, and environmental governance. The persistence of

deforestation despite increasingly comprehensive environmental regulations suggests that significant implementation gaps remain between national policy commitments and local governance practices.

This discrepancy becomes evident when official government achievements are compared with independent environmental monitoring. According to the Status Hutan Indonesia 2024, Indonesia recorded 175.4 thousand hectares of net deforestation in 2024 following reforestation and rehabilitation efforts (Ministry of Environment and Forestry, 2025). Nevertheless, satellite-based monitoring by Global Forest Watch continues to identify forest cover loss across several provinces, particularly in regions experiencing agricultural expansion, mining activities, and infrastructure development (Global Forest Watch, 2025). Rather than indicating contradictory evidence, these findings illustrate that policy effectiveness depends heavily on the measurement approach employed. While government statistics emphasize net forest recovery through rehabilitation programmes, satellite observations reveal that pressures driving primary forest conversion remain substantial. Consequently, evaluating green economy implementation solely through declining net deforestation may overestimate policy success because it does not fully capture the structural drivers of forest degradation.

This finding provides a more nuanced understanding of policy effectiveness than previous studies. Austin et al. (2019) identified agricultural expansion, particularly oil palm development, as one of the principal drivers of deforestation in Indonesia. Similarly, Maryudi et al. (2022) argued that fragmented forest governance continues to undermine sustainable forest management. However, the present study demonstrates that these institutional and economic factors should not be interpreted independently. Instead, they interact in ways that reduce the capacity of green economy policies to produce meaningful environmental outcomes. The persistence of land-use conversion despite comprehensive policy frameworks indicates that institutional coordination, rather than regulatory quantity, constitutes the principal determinant of implementation effectiveness.

From the perspective of Ecological Modernization Theory (EMT), these findings suggest that Indonesia has successfully initiated policy modernization but has not yet achieved institutional modernization. EMT argues that sustainable development requires structural transformation through institutional reform, technological innovation, market-based environmental instruments, stakeholder participation, and effective environmental governance (Mol & Spaargaren, 2000; Mol, 2003; Julkovski et al., 2021). Although Indonesia has introduced numerous environmental policies and strengthened forest monitoring systems, institutional fragmentation remains evident through overlapping responsibilities among ministries, inconsistent enforcement across administrative levels, and competing development priorities between economic growth and environmental conservation. These conditions indicate that policy reform has progressed more rapidly than governance reform, thereby limiting the practical effectiveness of green economy implementation.

The findings also reveal that Indonesia's continued dependence on resource-based economic sectors presents a structural challenge to ecological modernization. The plantation, mining, and infrastructure sectors continue to contribute significantly to national economic growth and regional fiscal revenues. Consequently, local governments frequently encounter conflicting incentives between promoting investment and protecting forest ecosystems. This institutional dilemma suggests that environmental regulations alone are insufficient to alter land-use decisions unless accompanied by stronger economic incentives for sustainable production and more coherent coordination between national and regional authorities. Therefore, the principal challenge of green economy implementation lies not in the absence of environmental

policies but in ensuring that governance structures effectively align economic incentives with sustainability objectives.

These findings extend the application of Ecological Modernization Theory within the Indonesian context. Previous studies have primarily used EMT to explain the compatibility between economic development and environmental protection. This study demonstrates that such compatibility depends fundamentally on the quality of institutional governance. The analysis therefore suggests that ecological modernization should be understood as a process of governance transformation rather than merely the introduction of environmental regulations or technological innovations. Consequently, strengthening institutional coordination, improving regulatory consistency, and aligning economic incentives with environmental objectives are essential prerequisites for improving the effectiveness of green economy policies.

The implications of these findings extend beyond forest conservation to the broader achievement of the Sustainable Development Goals. Continued deforestation reduces forest carbon sequestration capacity, thereby constraining Indonesia's progress toward SDG Target 13.2, which emphasizes integrating climate action into national development strategies (United Nations, 2024). Simultaneously, forest degradation threatens biodiversity conservation and ecosystem restoration under SDG Targets 15.2 and 15.5, while indirectly influencing SDG 6 (Clean Water and Sanitation) through watershed degradation and SDG 12 (Responsible Consumption and Production) through unsustainable resource utilization (FAO, 2022; UNEP, 2021). These interconnected impacts indicate that the effectiveness of green economy policies should be evaluated not only by environmental indicators but also by their capacity to generate institutional transformation capable of supporting multiple sustainability objectives simultaneously.

2. Evaluating the Effectiveness of Green Economy Policies through Deforestation Trends

The effectiveness of green economy policies cannot be assessed solely through the existence of environmental regulations or policy commitments; rather, it should be evaluated based on measurable environmental outcomes. Among the most widely recognized indicators of environmental performance is the trend in deforestation, as forest loss reflects the cumulative impacts of land-use change, natural resource exploitation, and environmental governance. Within the context of a green economy, declining deforestation should indicate that economic development has become increasingly compatible with ecosystem conservation. Conversely, persistent forest loss suggests that policy implementation has not yet succeeded in transforming development practices toward sustainability (UNEP, 2011; OECD, 2011). Therefore, analysing deforestation trends provides an important empirical basis for evaluating whether Indonesia's green economy policies have effectively reconciled economic growth with environmental protection.

Official statistics published by the Ministry of Environment and Forestry (KLHK) demonstrate encouraging progress in reducing net deforestation. According to the Status Hutan Indonesia 2024, Indonesia recorded 216.2 thousand hectares of gross deforestation in 2024. Following reforestation and forest rehabilitation covering 40.8 thousand hectares, net deforestation declined to 175.4 thousand hectares (Ministry of Environment and Forestry, 2025). These figures indicate that government-led rehabilitation programmes have contributed positively to restoring degraded forest areas and reducing overall net forest loss.

Table 1. Gross and Net Deforestation in Indonesia (2024)

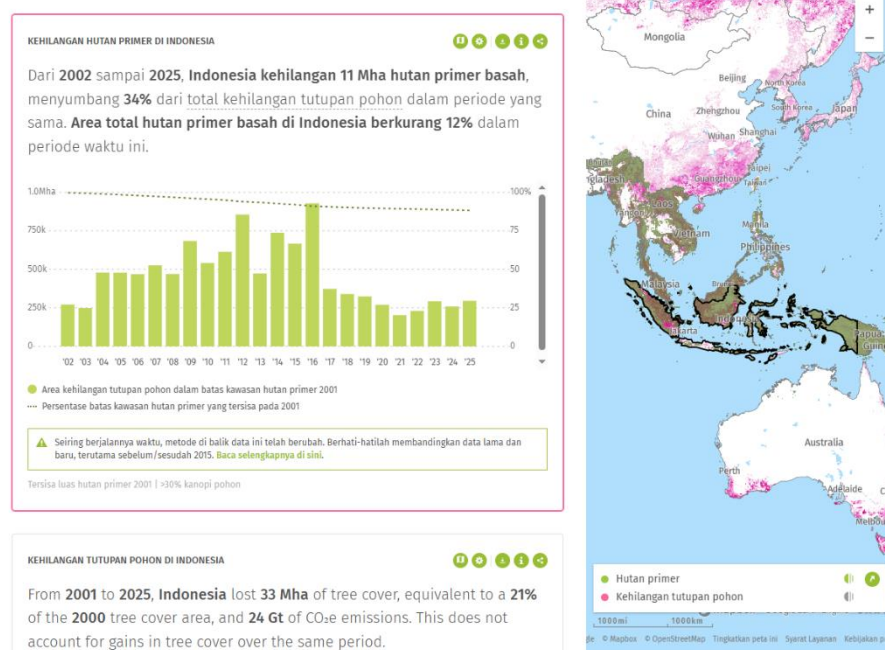
Indikator	Luas (ribu ha)
Deforestasi Bruto	216,2
Reforestasi	40,8
Deforestasi Netto	175,4

Source : Ministry of Environment and Forestry (KLHK)2025

Although these data demonstrate measurable progress, they should not be interpreted as conclusive evidence that deforestation has been effectively controlled. Net deforestation reflects the balance between forest loss and forest recovery rather than indicating the complete cessation of forest conversion. Consequently, declining net deforestation may result from successful rehabilitation efforts while forest clearing continues in other areas. This distinction is important because environmental restoration and environmental protection represent different dimensions of policy effectiveness. While rehabilitation programmes help recover degraded ecosystems, they do not necessarily eliminate the structural factors driving ongoing deforestation.

To complement the official government statistics, this study also incorporates independent satellite-based observations from Global Forest Watch (GFW). Unlike KLHK, which calculates net deforestation by considering both forest loss and forest recovery, Global Forest Watch measures forest cover loss using satellite imagery without accounting for reforestation or natural regeneration (Hansen et al., 2013; Global Forest Watch, 2025). Consequently, the two datasets are not intended to produce identical estimates but rather to provide complementary perspectives on forest dynamics in Indonesia.

Figure 1. Forest Cover Loss in Indonesia According to Global Forest Watch



Sumber: Global Forest Watch (2025)

Figure 1 illustrates the spatial distribution of forest cover loss detected through satellite observations. Unlike the official statistics published by KLHK, which evaluate net changes in forest area after considering rehabilitation programmes, Global Forest Watch continuously records forest cover loss regardless of subsequent forest recovery. The figure indicates that forest cover loss remains evident in several regions despite the decline in national net deforestation. This finding suggests that environmental pressures associated with land-use change continue to persist even as rehabilitation efforts improve overall forest recovery.

The integration of both datasets strengthens the validity of this study through data triangulation. KLHK statistics provide official information regarding the outcomes of government rehabilitation and restoration programmes, whereas Global Forest Watch offers an independent assessment based on satellite monitoring. Rather than presenting conflicting evidence, these datasets complement one another by capturing different dimensions of forest dynamics. Their combined use therefore provides a more comprehensive basis for evaluating the effectiveness of green economy policies than relying on a single source of information. The comparison between official government statistics and satellite-based observations provides an important insight into the effectiveness of Indonesia's green economy policies. The decline in net deforestation demonstrates that rehabilitation and restoration programmes have produced measurable environmental benefits. However, the continued forest cover loss detected by Global Forest Watch indicates that the underlying drivers of deforestation remain active. This suggests that current policy interventions have been more successful in mitigating the environmental impacts of deforestation than in preventing forest conversion itself. Consequently, policy effectiveness should be assessed not only through improvements in rehabilitation outcomes but also through the ability to reduce the structural pressures driving forest loss.

These findings are consistent with previous studies while providing a broader interpretation of policy effectiveness. Austin et al. (2019) identified agricultural expansion, particularly oil palm plantations, together with mining and other extractive industries, as major drivers of deforestation in Indonesia. Likewise, Maryudi et al. (2022) argued that fragmented forest governance and inconsistent policy implementation continue to constrain sustainable forest management. The present study extends these findings by demonstrating that economic expansion and governance challenges are not independent factors but mutually reinforcing processes. Although Indonesia has introduced increasingly comprehensive environmental regulations, institutional capacity to coordinate land-use governance has not developed at the same pace. As a result, improvements in environmental policy have not always translated into proportional improvements in environmental outcomes.

From the perspective of Ecological Modernization Theory (EMT), these findings indicate that Indonesia has made substantial progress in policy modernization but has yet to achieve institutional modernization. EMT argues that sustainable development requires institutional reform, technological innovation, market-based environmental instruments, stakeholder participation, and effective environmental governance (Mol & Spaargaren, 2000; Mol, 2003; Julkovski et al., 2021). In Indonesia, environmental policies and forest monitoring systems have improved considerably, yet fragmented institutional authority, inconsistent law enforcement, and competing development priorities continue to limit policy implementation. These findings suggest that strengthening governance institutions is equally important as expanding environmental regulations in achieving sustainable forest management.

The persistence of deforestation also has important implications for Indonesia's commitment to sustainable development. Continued forest loss reduces carbon sequestration capacity and contributes to greenhouse gas emissions, thereby slowing progress toward SDG

Target 13.2, which emphasizes integrating climate action into national policies and planning (Intergovernmental Panel on Climate Change [IPCC], 2023; United Nations, 2024). Simultaneously, biodiversity degradation and habitat fragmentation threaten SDG Targets 15.2 and 15.5, which promote sustainable forest management and biodiversity conservation (Food and Agriculture Organization [FAO], 2020). Forest degradation further affects SDG 6 (Clean Water and Sanitation) through declining watershed functions and SDG 12 (Responsible Consumption and Production) through unsustainable patterns of natural resource utilization (FAO, 2022; UNEP, 2021). Moreover, persistent deforestation poses challenges to Indonesia's Enhanced Nationally Determined Contribution (Enhanced NDC) under the Paris Agreement because the forestry sector remains one of the country's largest opportunities for reducing greenhouse gas emissions (Bappenas, 2019; Ministry of Environment and Forestry, 2022).

Overall, the analysis demonstrates that Indonesia's green economy policies have contributed to reducing net deforestation, particularly through rehabilitation and restoration programmes. Nevertheless, the continued forest cover loss identified by independent satellite monitoring indicates that significant environmental pressures remain. These findings suggest that the effectiveness of green economy policies should not be evaluated solely through declining deforestation statistics but also through their ability to strengthen institutional governance, improve policy coordination, align economic incentives with environmental objectives, and prevent future forest conversion. Consequently, this study argues that successful ecological modernization depends not only on expanding environmental regulations but also on transforming governance institutions capable of integrating economic development with long-term forest conservation. This interpretation represents the principal conceptual contribution of the present study and extends the application of Ecological Modernization Theory in evaluating green economy implementation within developing countries.

3. Institutional and Governance Challenges in Green Economy Implementation: An Ecological Modernization Perspective

The findings of this study indicate that Indonesia has made substantial progress in integrating green economy principles into national development through policies such as the Low Carbon Development Initiative (LCDI), the Forestry and Other Land Use (FOLU) Net Sink 2030 Strategy, the Enhanced Nationally Determined Contribution (Enhanced NDC), and the incorporation of low-carbon development into the National Long-Term Development Plan (RPJPN) 2025–2045 (Bappenas, 2019; Ministry of Environment and Forestry, 2022). These initiatives demonstrate that environmental sustainability has become an important component of national development planning. Nevertheless, the persistence of deforestation indicates that policy formulation alone is insufficient to generate sustainable environmental outcomes. This discrepancy suggests that evaluating green economy policies requires attention not only to the existence of environmental regulations but also to the institutional conditions that determine how those policies are implemented. In this regard, Ecological Modernization Theory (EMT) provides an appropriate analytical framework because it emphasizes that environmental transformation depends on the interaction among institutional reform, technological innovation, environmental governance, stakeholder participation, and market-based policy instruments (Mol & Spaargaren, 2000; Mol, 2003).

From the perspective of institutional reform, the findings reveal that Indonesia has established an increasingly comprehensive regulatory framework for sustainable development, yet institutional coordination remains fragmented. Forest governance involves multiple ministries and different levels of government with overlapping responsibilities, often resulting in

inconsistent policy implementation and conflicting development priorities. Similar observations were reported by Maryudi et al. (2022), who argued that fragmented governance reduces the effectiveness of sustainable forest management in Indonesia. These findings indicate that institutional reform should not be measured solely by the number of regulations introduced but also by the extent to which institutions are capable of coordinating environmental policies across sectors and administrative levels. Consequently, the effectiveness of green economy policies depends on strengthening institutional integration rather than continuously expanding regulatory instruments. The analysis also highlights the central role of environmental governance in determining policy effectiveness. Indonesia has strengthened forest governance through improved environmental regulations, spatial planning policies, and monitoring systems. However, governance effectiveness remains constrained by inconsistent law enforcement, unequal institutional capacity among regions, and limited coordination between environmental and economic development agencies. These governance challenges reduce the ability of environmental regulations to influence land-use decisions and weaken public confidence in policy implementation. Therefore, the findings suggest that governance quality represents a critical determinant of successful ecological modernization because effective institutions are necessary to translate environmental commitments into measurable environmental outcomes.

Another important dimension of EMT concerns technological innovation. Indonesia has significantly improved its forest monitoring capacity through the development of systems such as SIMONTANA, satellite-based monitoring managed by the Ministry of Environment and Forestry, and independent observation platforms including Global Forest Watch. These technologies have increased transparency, improved the availability of environmental information, and strengthened the government's ability to identify changes in forest cover. Nevertheless, the findings demonstrate that technological innovation alone cannot substantially reduce deforestation if monitoring results are not followed by timely law enforcement and corrective policy actions. This indicates that technology functions primarily as an enabling instrument rather than as a direct solution to environmental degradation. Accordingly, technological advancement contributes to ecological modernization only when integrated with effective governance and institutional accountability.

The findings further emphasize the importance of stakeholder participation, another key principle of Ecological Modernization Theory. Sustainable forest governance requires collaboration among government institutions, private companies, local communities, Indigenous peoples, and civil society organizations. Although Indonesia has increasingly promoted participatory approaches in forest management, stakeholder involvement remains uneven across regions. In areas where land-use decisions are strongly influenced by commercial interests, local communities often have limited opportunities to participate in environmental decision-making (FAO, 2022). This imbalance reduces policy legitimacy and limits the effectiveness of conservation initiatives because long-term environmental protection depends not only on government intervention but also on broad societal engagement.

The analysis also indicates that market-based environmental instruments have not yet generated sufficient incentives to encourage sustainable land-use practices. Indonesia has introduced several initiatives, including carbon trading mechanisms, environmental financing schemes, and green investment policies. However, economic returns from oil palm plantations, mining, and large-scale infrastructure development continue to exceed the financial benefits associated with sustainable forest management. Consequently, market incentives continue to favour forest conversion over forest conservation. These findings suggest that the success of ecological modernization depends not only on introducing environmental markets but also on

creating economic conditions in which sustainable production becomes more competitive than environmentally destructive activities. Although Ecological Modernization Theory provides a valuable framework for analysing environmental transformation, several scholars have argued that the theory tends to place considerable emphasis on institutional reform and technological innovation while giving less attention to structural political and economic constraints (Christoff, 1996; Blowers, 1997). This critique is particularly relevant to developing countries such as Indonesia, where economic development continues to rely heavily on natural resource-based industries. Under these conditions, institutional reforms may improve environmental governance, but their effectiveness is often constrained by competing development priorities and persistent dependence on resource extraction. Therefore, ecological modernization should be understood as a gradual process of structural transformation rather than an outcome that can be achieved solely through environmental regulation or technological advancement.

Overall, the findings demonstrate that Indonesia has entered a process of ecological modernization through policy reform, technological innovation, and the integration of sustainability principles into national development planning. However, the modernization process remains incomplete because progress in institutional coordination, governance quality, stakeholder participation, and economic restructuring has not advanced at the same pace as policy development. This study therefore argues that the effectiveness of green economy policies should be evaluated not only by their environmental outcomes but also by their ability to transform governance systems capable of integrating economic development with environmental conservation. This represents the principal conceptual contribution of the present study, extending Ecological Modernization Theory by demonstrating that, in developing countries, the success of green economy implementation depends less on the existence of environmental policies than on the institutional capacity to coordinate governance, align economic incentives, and sustain cross-sectoral collaboration.

CONCLUSION

This study examined the implementation of green economy policies in Indonesia in addressing deforestation and supporting the achievement of the Sustainable Development Goals (SDGs) through the perspective of Ecological Modernization Theory (EMT). The findings indicate that Indonesia has made significant progress in integrating sustainability principles into national development through various green economy initiatives. However, the persistence of deforestation demonstrates that the effectiveness of these policies cannot be measured solely by the existence of environmental regulations, but also by their ability to strengthen institutional governance, improve policy implementation, and reduce environmental pressures. From the perspective of Ecological Modernization Theory, the findings suggest that Indonesia's ecological modernization process remains incomplete due to institutional fragmentation, inconsistent law enforcement, competing economic interests, and limited stakeholder coordination. This study also shows that combining official deforestation statistics from the Ministry of Environment and Forestry (KLHK) with independent monitoring from Global Forest Watch provides a more comprehensive assessment of policy effectiveness by capturing both forest rehabilitation outcomes and ongoing forest cover loss.

Based on these findings, several policy recommendations can be proposed. The government should strengthen coordination among relevant institutions to improve policy consistency, enhance environmental law enforcement, integrate satellite-based monitoring into forest management, expand incentives for sustainable land-use practices such as carbon markets and sustainable forestry, and encourage greater participation of local communities, Indigenous

peoples, and the private sector in forest governance. These measures are expected to improve the effectiveness of green economy implementation while supporting the achievement of SDG 13 (Climate Action) and SDG 15 (Life on Land). This study is limited by its reliance on secondary data and a systematic literature review, which does not directly examine policy implementation at the local level. Future research is therefore encouraged to employ field-based or mixed-method approaches to evaluate the effectiveness of green economy policies across different regions in Indonesia and to examine the impacts of emerging policy instruments, such as carbon markets and ecosystem service incentives, on sustainable forest management.

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