Investigates of the Effectiveness of the Paris Agreement to Promote Low Carbon Development in Indonesia

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Abstract. Indonesia is a Party to the Paris Agreement. To achieve Article 2 of the Paris Agreement, Indonesia is committed to low-carbon development through its long-term strategy, the LTS-LCCR 2050 document. This strategy includes enhancing Nationally Determined Contributions (NDCs) and effectively addressing greenhouse gas (GHG) emissions. This study employs a qualitative research method and utilizes effectiveness theory to assess the implementation of the Paris Agreement in Indonesia through a statute approach. The study aims to ensure that Indonesia's LTS-LCCR 2050 effectively integrates its Nationally Determined Contributions (NDCs) with greenhouse gas management strategies. This integration plays an important role in achieving significant emission reductions, promoting sustainable development, and meeting the commitments outlined in the Paris Agreement to combat climate change. Hopefully, this study will contribute to environmental policy, climate change mitigation, and sustainable development. It is also relevant to environmental science and urban planning, providing insights into effective low-carbon strategies and international cooperation..

Keywords: Low Carbon Development, Paris Agreement; Greenhouse.

1 Introduction

Indonesia is a signatory to the Paris Agreement, committing to significant climate action through its Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050). This strategy reflects Indonesia's dedication to achieving the goals outlined in Article 2 of the Agreement, which emphasizes limiting global temperature rise and enhancing resilience to climate impacts. Central to this commitment is enhancing Indonesia's Nationally Determined Contributions (NDCs), aimed at effectively addressing greenhouse gas (GHG) emissions while promoting sustainable development. The urgency of climate change necessitates a comprehensive approach that integrates environmental policy with economic growth. By employing qualitative research methods and effectiveness theory, this study assesses the implementation of the Paris Agreement in Indonesia through a statutory lens. The findings aim to contribute valuable insights into environmental policy, climate change mitigation strategies, and sustainable urban planning. This research highlights the importance of

international cooperation in combating climate change and underscores the need for innovative low-carbon strategies tailored to Indonesia's unique socio-economic context. In light of these objectives, this paper seeks to explore the effectiveness of Indonesia's climate commitments and their implications for future environmental governance. Analyzing the interplay between national policies and international obligations aims to provide a framework for understanding how Indonesia can navigate its path toward a low-carbon future while ensuring sustainable development for its citizens. Hence, this study is mainly to discuss on how effectively is Indonesia implementing the Paris Agreement through its long-term strategy (LTS-LCCR 2050) in achieving low-carbon development goals?

2 Methodology

The methodology of this research employs a qualitative approach, To assess the implementation of the Paris Agreement in Indonesia, specifically through a statute-based analysis. Utilizing effectiveness theory, The study is to evaluate how well Indonesia's legal frameworks and policies align with the goals of Article 2 of the Paris Agreement, which focuses on reducing greenhouse gas emissions and promoting low-carbon development. The statute approach, This study involves an in-depth examination of relevant laws, regulations, and policy documents, such as Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR 2050) and Nationally Determined Contributions (NDCs). By analyzing these legal instruments, the study seeks to provide insights into the effectiveness of Indonesia’s climate change mitigation efforts and their contribution to sustainable development.

3 Result and Discussion

3.1 Indonesia Legal Framework on the LTS-LCCR 2050 to ensure low carbon development

Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050) aligns with the constitutional mandate enshrined in Article 28 H of the 1945 Constitution of the Republic of Indonesia. Said Article stipulates the state's obligation to ensure a decent standard of living and a healthy environment for all its citizens. As such, the LTS-LCCR 2050 serves as an environmental strategy and embodies Indonesia's constitutional commitment to safeguarding its populace's welfare and quality of life. The LTS-LCCR 2050 also strongly aligns with the fundamental principles and objectives established in Law No. 32/2009 on Environmental Protection and Management. The LTS-LCCR demonstrates Indonesia's efforts to align domestic policies with the global goals agreed in the Paris Agreement. The strategy particularly embodies the law's principles of state responsibility, conservation and sustainability, and integration of environmental management. The LTS-LCCR 2050's three mitigation pathways (CPOS, TRNS, and LCCP) demonstrate Indonesia's commitment to the law's mandate of protecting the territory from

environmental damage while ensuring sustainable development. The LCCP pathway, which aims for net-zero emissions by 2060, specifically addresses the law's objectives of preserving environmental functions and anticipating global environmental issues. This alignment is further strengthened by the law's formal recognition of climate change as a serious systemic threat to Indonesia's environmental quality. The strategy's emphasis on forest management, emission reduction, and sustainable development directly supports Law 32/2009's goals of controlling natural resource utilization wisely and realizing sustainable development. Furthermore, the LTS-LCCR 2050's focus on stakeholder engagement, including consideration of vulnerable groups and local communities, reflects the law's principles of participation and local wisdom.[1]

3.2 Indonesia's implementation of the Paris Agreement through its long-term strategy (LTS-LCCR 2050) in achieving low-carbon development

Indonesia's implementation of the Paris Agreement through its Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050)[2] It is a significant step towards achieving its low-carbon development goals. This strategy outlines a comprehensive framework to reduce greenhouse gas (GHG) emissions while promoting sustainable economic growth and resilience to climate change impacts.

The LTS-LCCR 2050 is a roadmap for Indonesia to align its national development objectives with global climate commitments. One of the critical aspects of this strategy is its ambitious target to peak national GHG emissions by 2030,[3] Aiming for a net sink in the forestry and land-use sector by that year.[4] The plan further envisions reaching 540 million tons of CO2 equivalent emissions by 2050, with aspirations for net-zero emissions by 2060 or sooner. This trajectory indicates a robust commitment to mitigating climate change effects while balancing economic growth and environmental sustainability. To facilitate the effective implementation of the Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050), Indonesia has identified three distinct mitigation pathways through the Current Policy Scenario (CPOS), the Transition Scenario (TRNS), and the Low Carbon Scenario Compatible with Paris Agreement (LCCP). Each pathway reflects different approaches to emission reductions and their respective implications for Indonesia's climate goals.

The Current Policy Scenario (CPOS) represents a trajectory where Indonesia continues with its existing policies without significant changes or enhancements. Under this scenario, emissions are projected to increase continuously beyond 2030. This pathway essentially reflects an extension of Indonesia's unconditional Nationally Determined Contribution (NDC) commitments, which aim for a 29% reduction in emissions compared to a business-as-usual (BAU) scenario by 2030, with a conditional target of up to 41% reduction if international support is provided. Implications of the CPOS indicate that without substantial policy reforms or additional measures, Indonesia will not meet the targets set by the Paris Agreement. The emissions from critical sectors such as energy, waste, and industrial processes are expected to rise significantly, leading

to increased greenhouse gas emissions that could undermine global climate goals. This scenario highlights the risks associated with complacency in climate policy.[5] The urgent need for proactive measures.

The Transition Scenario (TRNS) envisions a moderate shift in Indonesia's approach to emissions reduction. While this pathway anticipates some emissions reduction, it does not sufficiently align with the reductions required to meet the Paris Agreement targets by 2050. The TRNS incorporates more ambitious policies than CPOS but fails to achieve significant long-term climate goals. Key Features of The TRNS scenario include strategies such as diversifying energy sources, increasing energy efficiency, and implementing renewable energy projects. However, while it projects a decrease in emissions relative to CPOS, more is needed to achieve net-zero emissions or significant decarbonization by mid-century. Implications of this scenario serve as a bridge between current policies and a more aggressive low-carbon strategy. It underscores the importance of transitional measures that can pave the way for deeper cuts in emissions while allowing for economic growth and development. Furthermore, it highlights that merely transitioning without robust commitments will likely lead to continued reliance on fossil fuels and insufficient progress toward climate targets.[6]

The Low Carbon Scenario Compatible with the Paris Agreement (LCCP) represents Indonesia's most ambitious pathway towards achieving its climate commitments. This scenario aims for significant emissions reductions post-2030, ultimately leading to net sink conditions in the forestry sector and substantial decreases in energy-related emissions. Targets this scenario Under LCCP, Indonesia aims to peak national greenhouse gas emissions at approximately 1,240 million tons of CO2 equivalent by 2030 and reduce them to about 540 million tons by 2050.[7] This pathway envisions achieving net-zero emissions by 2060 or sooner through transformative changes across various sectors. Furthermore, the key strategies of the LCCP emphasize a shift from fossil fuels to renewable energy sources, enhancing energy efficiency across all sectors. It includes significant investments in carbon capture technologies and renewable energy infrastructure. Through forestry and land use, a critical component of this scenario is the transition of the forestry sector from a net emitter to a net sink by enhancing forest management practices, reducing deforestation rates, and increasing reforestation efforts. The LCCP aims for substantial carbon sequestration through sustainable land management practices. The implications of achieving the LCCP require comprehensive policy reforms, increased investment in clean technologies, and strong international cooperation. This pathway aligns with global climate objectives and supports sustainable economic growth and resilience against climate impacts.

3.3 Assessing the Efficacy of LTS-LCCR 2050 through the Lens of Effectiveness Theory

The effectiveness theory in climate change response represents a complex and multifaceted framework encompassing various interpretations across different scales and contexts.[8] At its core, this theoretical approach seeks to understand and evaluate the success of climate action initiatives through multiple lenses, including environmental impact, social equity, and economic efficiency. The practical

perspective, which focuses on cost-benefit analysis and risk reduction, forms a significant component of this theoretical framework. However, it has faced criticism for potentially oversimplifying the multidimensional nature of climate change impacts on human well-being. The theory emphasizes the importance of measurable outcomes while acknowledging the inherent challenges in establishing clear causal relationships between climate actions and their long-term effects.

In practical application, the theory of effectiveness guides the development and implementation of climate policies through systematic evaluation frameworks that consider both quantitative and qualitative metrics. These frameworks must balance multiple objectives, including adaptation investments, risk reduction outcomes, and the development of adaptive capacity within communities.[9] The theory recognizes that successful climate action requires finding a middle ground among various stakeholders while focusing on environmental sustainability goals. This approach acknowledges that effectiveness cannot be measured through a single metric but must consider the interplay between social, economic, and environmental factors.

Implementing effectiveness theory in climate change faces several significant challenges, particularly in measurement and evaluation.[10] These challenges include the difficulty of establishing clear causality between specific actions and their outcomes, the complexity of measuring long-term impacts, and the need for comprehensive assessment systems that can capture both immediate results and broader societal impacts. The theory emphasizes that effective climate change response must be context-specific, considering local needs and conditions while avoiding maladaptation. This understanding has led to the development of more sophisticated evaluation frameworks that acknowledge the complexity of climate change responses while providing practical guidance for implementation strategies. These frameworks increasingly incorporate nature-based solutions and technological innovations, recognizing that effective climate action requires a diverse toolkit of responses adapted to specific contexts and needs.

The effectiveness of Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050) can be assessed through its alignment with international legal obligations under the Paris Agreement and its capacity to achieve measurable outcomes in reducing greenhouse gas (GHG) emissions. The strategy delineates three distinct pathways—Current Policy Scenario (CPOS), Transition Scenario (TRNS), and Low Carbon Scenario Compatible with the Paris Agreement (LCCP)—each reflecting varying degrees of compliance with Indonesia’s climate commitments. The LCCP, which is the most ambitious and legally consistent with the Paris Agreement, appears to be the most effective regarding long-term environmental sustainability. This scenario envisions a peak in national emissions by 2030 and a reduction to 540 million tons of CO2 equivalent by 2050, aiming for net-zero emissions by 2060 or sooner.[11] However, its effectiveness is contingent upon executing comprehensive policy reforms, significant investments in clean technologies, and adherence to international cooperation frameworks. The reliance on carbon capture technologies and transforming the forestry sector into a net sink is pivotal to achieving these targets. Therefore, the effectiveness of the CPOS and TRNS scenarios is limited by their insufficient alignment with Indonesia’s international

obligations under the Paris Agreement. The CPOS, which extends current policies without substantial modifications or enhancements, is unlikely to meet Indonesia's binding commitments, as it projects an increase in emissions beyond 2030. The TRNS scenario, while more progressive than CPOS, does not adequately address the reductions required to meet long-term climate goals. Both scenarios may facilitate economic development in the short term but fail to provide a legally sufficient response to the urgency of climate change mitigation. As such, while LTS-LCCR 2050 offers a comprehensive framework for low-carbon development, its overall legal effectiveness will depend on Indonesia's capacity to transition from moderate policy adjustments (TRNS) towards more aggressive actions (LCCP) that fully comply with its international climate obligations.

4 Conclusion

In conclusion, Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050 presents a comprehensive approach combining mitigation and adaptation to address climate change challenges. Through three distinct mitigation pathways—CPOS, TRNS, and LCCP—Indonesia explores different levels of ambition in reducing greenhouse gas emissions, with LCCP representing the most aligned pathway with global climate commitments. By setting ambitious GHG reduction targets and emphasizing stakeholder engagement, Indonesia seeks to fulfill its Paris Agreement commitments. The effectiveness of these strategies can be evaluated using the practical perspective, which focuses on cost-benefit analysis and risk reduction and forms a significant component of this theoretical framework. However, it has faced criticism for potentially oversimplifying the multidimensional nature of climate change impacts on human well-being. This approach allows for a nuanced assessment of policy effectiveness, acknowledging the complexity of climate policymaking and the need for reflexivity in challenging policies' means and goals. However, the success of these pathways will require strong political will, sufficient funding, technological innovation, and international cooperation. A robust policy framework and inclusive stakeholder involvement will be essential to achieving a low-carbon, resilient economy that prioritizes social equity and environmental sustainability.

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Competing Interests. All authors declare that they have no competing interests.

Data Availability Statement. The corresponding author can provide the data of this study upon reasonable request.

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