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GREEN TAXATION IN INDONESIA: A CATALYST FOR INNOVATION IN CARBON OFFSET AND CARBON TRADING MECHANISMS

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Abstract

Global climate change demands comprehensive and innovative policy responses, one of which is through the green taxation approach as a fiscal instrument to curb greenhouse gas emissions and encourage the transformation of low-carbon technology. This study doctrinally analyzes the role of green taxation in supporting technological innovation through carbon offset and carbon trading mechanisms in Indonesia, and explores the legal and policy challenges in its implementation. This study also discusses the interaction between carbon tax and carbon offsets concerning environmental integrity and the effectiveness of emission reduction. The analysis results indicate that the implementation of a carbon tax, although still in its early stages, has provided financial incentives for the industrial sector to innovate in green technology. However, the effectiveness of this policy is hampered by institutional challenges, legal uncertainty, industrial resistance, and a lack of integration with international certification standards. Furthermore, the interaction between these fiscal and market instruments requires a strong legal framework, strict verification, and transparency to avoid compromising

environmental integrity. This study underscores the importance of regulatory reform, carbon price adjustments, and global integration to ensure that green taxation can be an effective catalyst in the transition towards a just and sustainable green economy in Indonesia.

A. INTRODUCTION

Climate change has become a pressing global challenge, prompting countries to seek effective solutions in reducing greenhouse gas (GHG) emissions. One approach gaining increasing attention is green taxation, which is the application of environmental taxes aimed at internalizing the external costs of pollution and encouraging environmentally friendly behavior. In this context, green taxation serves not only as a fiscal tool but also as a driver of innovation in carbon offset and carbon trading mechanisms. Indonesia, as a developing country with rising emissions and rich forest resources, presents an interesting case study on how green taxation and carbon markets can be implemented. The country is in the initial stages of implementing a hybrid "cap-and-trade-and-tax" system, which combines Emissions Trading Systems (ETS) for power plants with an upcoming carbon tax to penalize those exceeding emission limits (International Carbon Action Partnership, n.d.).

The Indonesian government frames this under the concept of Carbon Economic Value, which integrates carbon trading, results-based payments, and carbon levies (taxes) as pathways to achieve its climate targets (Baker McKenzie, 2022; PWC, n.d.). This policy is expected not only to cut emissions but also to spur technological innovation and new market mechanisms (such as a national carbon exchange and certified emission reductions).

A doctrinal study is needed to present an extensive review of green taxation and its role in fostering innovation in offset and carbon trading mechanisms. Such a study is expected to show that carbon pricing policies, including carbon taxes and ETS, are positively related to increased innovation in environmentally friendly technologies (Lim & Prakash, 2023). Furthermore, carbon trading can promote the efficiency of green innovation by increasing government subsidies, research and development investment, and addressing financing constraints (Wang et al., 2024). However, the interaction between carbon tax and carbon offset programs raises legal and policy questions, especially regarding environmental integrity and the effectiveness of emission reductions, including in Indonesia. Additionally, challenges in establishing effective and fair carbon prices across various jurisdictions add complexity to the implementation of these policies (UN, n.d.). It is necessary to address 3 (three) existing problems. First, what is the role of green

taxation in encouraging technological innovation in carbon offset and carbon trading mechanisms in Indonesia? Second, what are the legal and policy challenges faced in the effective and fair implementation of green taxation in Indonesia? Third, how does the interaction between carbon tax and carbon offset mechanisms affect environmental integrity and the effectiveness of emission reduction in Indonesia? Several previous studies are relevant to this research topic.

The following elaborates on the novelty contribution of this legal research compared to existing studies. First, the study by Lim & Prakash (2023) shows that carbon pricing policies, such as carbon taxes and ETS, are positively related to increased innovation in environmentally friendly technologies. However, this previous study has limitations in that it emphasizes economic aspects and technological innovation, without thoroughly discussing the legal implications of green taxation. The study by Wang et al. (2024), which assesses the impact of carbon trading policies on the green innovation efficiency of companies, found that carbon trading improves innovation efficiency through increased government subsidies, research and development (R&D) investment, and reduction of financing constraints. However, this previous research has limitations in its primary focus on green innovation efficiency at the corporate level, without exploring the role of green taxation in the legal and policy context. Then, the study conducted by Li et al. (2022), which analyzed the impact of carbon emission trading systems on green technological innovation using the differences-in-differences method, found that emission trading systems can encourage green technological innovation in Indonesian regions.

B. ANALYSIS AND DISCUSSION

1. The role of green taxation in encouraging technological innovation in carbon offset and carbon trading mechanisms in Indonesia

Green taxation is a fiscal instrument designed to internalize the external costs of economic activities that damage the environment (Yang, 2024). In Indonesia, the implementation of a carbon tax as part of green taxation aims to reduce greenhouse gas emissions and encourage innovation in environmentally friendly technology. The application of a carbon tax provides a price signal that encourages industry players to develop and adopt low-carbon technologies to reduce their tax burden (Yang, 2024). Studies show that green taxation significantly promotes regional green growth and enhances green innovation. Revenue from carbon taxes can be allocated to fund research and development of environmentally friendly technologies, such as renewable energy and carbon capture technology (United Nations

Development Programme, 2025). This creates a positive cycle between taxation and technological innovation.

Indonesia began implementing a carbon tax on April 1, 2022, with an initial tariff of IDR 30 per kg CO_2e, first applied to coal-fired steam power plants (Mafira, 2021). This tax is designed to align with domestic carbon market prices and can be adjusted based on market developments. Indonesia launched the Indonesia Carbon Exchange (IDXCarbon) in September 2023 to facilitate carbon credit trading. This exchange allows companies to buy and sell carbon credits as part of their emission reduction efforts. The Indonesian government plans to initiate carbon offset trading from the forestry sector, including forest conservation and reforestation projects. The potential transaction value from this sector is estimated to reach IDR 3.2 trillion by 2025 (Reuters, 2025). One of the challenges Indonesia must address regarding green taxation is the low carbon price. The current carbon price in Indonesia is relatively low compared to international standards, which may reduce the incentive for companies to invest in low-carbon technologies.

Another challenge is the need for international certification standards. Lack of recognition for international certification standards such as Verra and Gold Standard could hinder Indonesia's participation in the global carbon market. Given that green taxation plays a crucial role in driving technological innovation in Indonesia through financial incentives and research funding, Indonesia needs to take several important steps, including gradually increasing the carbon price to reflect the social cost of greenhouse gas emissions, adopting and integrating international certification standards to enhance the credibility of Indonesian carbon credits, and allocating carbon tax revenues to support research and development of environmentally friendly technologies.

2. Legal and policy challenges faced in the effective and fair implementation of green taxation in Indonesia

The implementation of green taxation, particularly carbon tax, in Indonesia aims to internalize the external costs of greenhouse gas emissions and encourage a transition towards a low-carbon economy (Pramita et al., 2024). However, the implementation of this policy faces several complex legal and policy challenges. First, regulatory and institutional uncertainty. Although Law Number 7 of 2021 concerning the Harmonization of Tax

Regulations (HPP Law) has established the legal basis for carbon tax, the absence of comprehensive implementing regulations causes uncertainty in its implementation. This includes a lack of clarity regarding emission calculation mechanisms, tax rates, and the responsible supervisory body (Lembayung, 2023). Second, resistance from industry players. The imposition of a carbon tax can increase production costs, especially for industries reliant on fossil fuels. This leads to resistance from industry players who are concerned about the competitiveness of their products in domestic and international markets (Universitas Widya Mataram, 2024). Third, social impact and justice. Carbon tax has the potential to be regressive, where low-income households bear a proportionally larger burden. Studies show that without adequate compensation mechanisms, this policy could exacerbate social inequality (Pramita et al., 2024). Fourth, integration with international carbon markets. The lack of recognition for international certification standards such as Verra and Gold Standard hinders Indonesia's participation in the global carbon market. This raises doubts about the credibility of Indonesian carbon credits in the eyes of international investors.

These complex legal and policy challenges need to be addressed through strengthening the legal framework, facilitating industrial transition, social compensation mechanisms, and international standardization. Strengthening the legal framework can be done by drafting and enacting clear implementing regulations regarding carbon tax mechanisms, including emission calculations and tax rates (Pratama, 2024). Then, facilitating industrial transition is carried out by providing incentives and technical support to industries to switch to low-carbon technologies to reduce resistance and negative economic impacts. As for social compensation mechanisms, this involves developing compensation schemes or cross-subsidies to protect low-income community groups from the regressive impacts of carbon tax. Furthermore, international standardization is done by adopting and integrating international certification standards into the domestic carbon trading mechanism to enhance credibility and participation in the global market.

The implementation of green taxation in Indonesia faces significant legal and policy challenges. To achieve effectiveness and fairness, it is necessary to strengthen the legal framework, support industry players, provide social

protection for vulnerable communities, and integrate with international standards in carbon trading.

3. The interaction between carbon tax and carbon offset mechanisms in influencing environmental integrity and emission reduction effectiveness in Indonesia

Indonesia has adopted a dual approach in its greenhouse gas emission reduction policy, namely through the implementation of a carbon tax and carbon offset mechanisms. Carbon tax is imposed to internalize the external costs of GHG emissions, while carbon offsets allow entities to compensate for their emissions by supporting projects that reduce or absorb emissions. The interaction between these two instruments has significant implications for environmental integrity and the effectiveness of emission reduction.

The interaction of carbon tax and carbon offset mechanisms needs to be managed by doing several things. First, synergy in achieving emission targets. Carbon tax provides financial incentives for companies to reduce their emissions. However, in some cases, direct reduction may not be technically or economically feasible. This is where carbon offset mechanisms play a role, allowing companies to meet their emission obligations by supporting emission reduction projects in other sectors. For example, companies unable to reduce emissions directly can purchase carbon credits from reforestation or renewable energy projects. Thus, the combination of carbon tax and carbon offsets can enhance flexibility and efficiency in achieving national emission reduction targets. Second, challenges to environmental integrity. Although carbon offset mechanisms offer flexibility, there are concerns that their excessive use could reduce incentives for direct emission reductions. Moreover, the quality and credibility of offset projects are crucial to ensure that emission reductions actually occur and are additional. In Indonesia, these challenges include the need to ensure that offset projects meet international standards and have a robust verification system. Without effective oversight mechanisms, there is a risk that the carbon credits generated do not reflect real emission reductions, which could undermine the environmental integrity of the entire system.

The interaction of carbon tax and carbon offset mechanisms is expected to strengthen the regulatory and supervisory framework, integration with international standards, and transparency and reporting. Strengthening the regulatory and supervisory framework refers to government efforts to develop a clear and comprehensive regulatory framework to govern the interaction between carbon tax and carbon offset mechanisms, including setting quality standards for offset projects, independent verification systems, and oversight mechanisms to prevent abuse (Aptasari et al., 2024). Integration with international standards refers to the adoption and integration of international standards such as Verra and Gold Standard, which can enhance the credibility of Indonesian offset projects in the global market. This will also facilitate Indonesia's participation in international carbon trading and attract foreign investment. Then, transparency and reporting refer to the importance of increasing transparency in emission reporting and the use of carbon credits (Firmansyah & Irawan, 2025). Companies should be required to openly report their use of offsets in meeting their emission obligations, including information about the supported offset projects.

The interaction between carbon tax and carbon offset mechanisms in Indonesia has the potential to increase the effectiveness of emission reduction if managed well. However, to ensure environmental integrity, a strong regulatory framework, high-quality standards for offset projects, and an effective oversight system are necessary. Thus, Indonesia can utilize both instruments synergistically to achieve national emission reduction targets and contribute to global efforts in tackling climate change.

C. CONCLUSION

Based on doctrinal study and policy analysis, this research concludes the following three main findings. First, green taxation as a driver of technological innovation. The carbon tax that has begun to be implemented in Indonesia has the potential to be an effective fiscal instrument to encourage environmentally friendly technological innovation, particularly through market incentives and research fund allocation. This implementation, if accompanied by an adequate carbon pricing policy and integration into the national carbon market such as IDXCarbon, can strengthen the transformation of low-carbon technology in various sectors. Second, the implementation of green taxation in Indonesia still faces structural obstacles in the form of regulatory uncertainty, resistance from the industrial sector, potential socially regressive impacts, and a lack of international certification standards. The absence of comprehensive

implementing regulations from the HPP Law, as well as weak social compensation mechanisms, complicates the fair and effective implementation of the carbon tax. Clear derivative regulations, industrial transition mechanisms, and social protection for vulnerable groups are needed. Third, the interaction between carbon tax and carbon offsets has the potential to create efficiency in achieving national emission targets. However, the main challenge lies in maintaining the environmental integrity of offset projects through independent verification, international standardization (Verra, Gold Standard), and transparency in the use of offsets by companies. Without a strong regulatory and oversight framework, the risk of greenwashing will increase and weaken the overall effectiveness of the system. This doctrinal study recommends a reformulation of carbon tax policy that includes adjusting carbon prices to reflect the social cost of greenhouse gas emissions, full integration with international offset standards to ensure credibility and global participation, drafting detailed implementing regulations to ensure legal certainty, and applying principles of social justice in fiscal design to avoid excessive burdens on low-income communities. Through a holistic and law-based approach, green taxation can be transformed into a strategic foundation in climate change control and sustainable development in Indonesia.

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