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Indonesia Carbon Credit Trading: Economic Opportunity or Environmental Liability?

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Abstract

On the 26th of September 2023, the 7th President of Indonesia, Joko Widodo, officially inaugurated the launch of the first carbon credit trading platform of Indonesia, IDXCarbon. The launch of this carbon credit trading has marked another stepping stone of Indonesia to its commitment to combating climate change and further strengthening its position in the global environmental conservation arena. The aim of this article is to critically evaluate the potential opportunities and benefits of the carbon trading scheme in Indonesia through the lens of Environmental Economics theory, while also assessing the potential challenges through the scope of Political Ecology theory . This article employs Environmental Economics theory in analyzing how the establishment of a carbon trading market presents potential benefits in addressing greenhouse gas emissions by implementing economic value in carbon reductions. The carbon trading adoption in the environmental policy framework in Indonesia aims to encourage low-carbon economic practices and innovations across various sectors. On the contrary, this article will also provide a critical examination towards the adoption of carbon trading in Indonesia through the lens of Political Ecology theory. Political Ecology theory will highlight the underlying power relations across state, private actors, local communities, and international stakeholders that raise skepticism regarding the credibility, governance, and the actual environmental impact of the carbon trading scheme in Indonesia. Furthermore, Political Ecology theory focuses on the potential challenges, such as fair implementation and preventing the marginalization of vulnerable communities involved in carbon trading practices. Overall, the establishment of a carbon trading market in Indonesia through IDXCarbon marked a revolutionary step in Indonesia's commitment to combat climate change. Through the comparative analysis of the potential opportunities and challenges in regards to the adaptation of carbon trading in Indonesia, this article argue that the adaptation of carbon trading in Indonesia requires a robust regulatory and environmental ethical framework in order to balance the potential benefits presented by the framework while mitigating the potential challenges that can further hinder the overall benefits of carbon trading.

Key Words

IDXCarbon, carbon credit, environmental economy, political ecology, climate change

1. Introduction

The global action to mitigate the impact of climate change has continuously sparked discussions and debates globally. One discussion in particular that has been argued to have a significant impact in mitigating climate change is the reduction and limitation of carbon emission through the carbon credit trading scheme. The origins of carbon credit can be traced back to the Kyoto Protocol in 1997. The Kyoto Protocol is the first international conference that aims to address and facilitate the development of systems and technologies to mitigate the long-projected

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impact of climate change. Around 192 countries participated in the ratifications of the protocol, one of the results of Kyoto Protocol is the creation of a new global traded commodity, which later will be known as carbon credit (Gupta, 2016). The establishment of carbon credit presents a market-based approach in mitigating the impact of climate change. The Kyoto Protocol established a fairly flexible mechanism as the method in order to achieve compliance to the protocol, assigning a certain amount of greenhouse gas emission reduction targets to industrial countries based on their historical emissions, allowing the contributing countries to trade carbon credits, enabling those who exceeded their targets to purchase credits from those who were behind on their targets, creating a financial incentive for emission reductions. In regards to the market-based approach of Kyoto Protocol, there were three main frameworks established, which stated in article 17 for emissions trading, article 6 for the joint implementation (JI), and article 12 for clean development mechanism (CDM). These frameworks provided flexibility for countries to meet their emission reduction targets in a cost-effective manner, promoting international cooperation in addressing climate change (Telesetsky, 1999, p.805). Unfortunately, many at the time argued that this market-based approach didn't necessarily address the issue of carbon emission reduction, particularly those from the developing countries. During the initial establishment of the carbon market mechanism, critics emerged in regards to the impracticality and the credibility of the monitoring system of the mechanism. This sparked fear among the developing countries, since the carbon market mechanism would likely only favor the developed countries, thus enhancing the systemic inequalities between global north and south.

It was not until 2015 that another major international climate change conference took place. Building upon the foundation laid by the Kyoto Protocol, the Paris Agreement which was passed during COP21, presented a more profound global approach on mitigating the impacts of climate change. The Paris Agreement has emphasized a divergent approach in regards to market-based mechanisms that was previously a more flexible approach adopted in the Kyoto Protocol. In the Article 6 of the Paris Agreement, all parties are required to take part in the mitigation measures communicated through each of their own Nationally Determined Contributions (NDCs), the NDCs not only 3 4w includes developed countries but also developing countries as well. The foundation of the NDCs of each participating country are calculated through a range of specified metrics and methodologies, allowing countries to organize their commitment of contribution based on their own particular capacities and capabilities in implementing their NDCs. The core foundation of the article 6 of the Paris Agreement is to establish a voluntary cooperation across the participating states, this allows for more feasible adaptations to their climate change mitigation actions allowing for further promotion of sustainable development and environmental conservation (Minas, 2022).

The Article 6 of the Paris Agreement contains two main components in relation to the carbon credit market and trading, which is Article 6.2 and Article 6.4. Article 6.2 allows participating countries to deliberately contribute in a cooperative international approach through what is known as Internationally Transferred Mitigation Outcomes (ITMOs), allowing countries that manage to exceeds their carbon emission NDC target to trade their excess emission reductions to other countries having difficulties to meet their targets, therefore encouraging an efficient mitigation effort. On the other hand, Article 6.4 establishes a centralized mechanism, often regarded as the successor to the Clean Development Mechanism (CDM) from the Kyoto Protocol. Article 6.4 will open access to public and private entities to also participate in carbon emission trading under the supervision of the UN Body, executed in a centralized manner. The mechanism aims to not only promote carbon reduction through carbon trading but also further contribute to sustainable development, especially in developing countries (Michaelowa et al., 2019, pp. 1212-1217).

The establishment of a global carbon trading market is an evident pivotal point in the global climate change mitigation. Ever since the institution of the carbon credit trading scheme from the Paris Agreement, many countries have also constituted frameworks and regulations in regards to the issue. Indonesia in particular has also constituted their carbon trading market and regulation. The government officially launched the Indonesia Carbon Exchange (IDXCarbon) in 2023, marking a significant step toward achieving its climate targets under the Paris Agreement and its commitment to net-zero emissions by 2060. Through this platform, certified carbon credits can be traded, enabling industries to offset their emissions while promoting investment in renewable energy and sustainable land use. The regulatory framework, guided under Presidential Decree No. 98/2021 and its derivative policies, ensures transparency, verification, and alignment with international standards. This initiative not only supports Indonesia's climate ambitions but also positioned the country as an active participant in the global carbon market. Through the adoption of Presidential Decree No. 98 2021, Indonesia officially established a legal foundation for the implementation of the carbon economic value mechanism. This decree settles the body of infrastructures and framework for carbon credit trading and offset schemes (Agung et al., 2023). Furthermore, in 2023 Indonesia established another regulation to broaden and simplify the mechanism of carbon trading. Through POJK No. 14 2023, Indonesia formalizes the institution of IDXCarbon as the official administrator of the carbon market in Indonesia which acts to provide a transparent, efficient, and well-regulated carbon trading system. Currently, there are 4 carbon trading systems provided by IDXCarbon which include; Auction, Regular Trading, Negotiated Trading, and Marketplace (Kautsar, 2023).

Carbon credit market and trading is a revolutionary framework in addressing the global impact of climate change, while it offers many advantages in addressing climate change issues through market-based systems, many also argued that this system is prone to loopholes and regulatory gaps that would result in hindering the progress of combating climate change. The carbon trading system in Indonesia also isn’t an exception in regards to this potential criticism, while the institution of carbon credit Indonesia received praise as it shows the government commitment to environmental sustainability, concerns remain. These concerns include possible lack in monitoring systems, insufficient enforcement, and potential of greenwashing practice rather than contributing real positive impact in mitigating climate change.

The objective of this article is to evaluate both the opportunities and the possible challenges in regards to the adaptation of the carbon credit trading scheme in Indonesia. Moreover, the article will also suggest several possible actions to take in order to optimize the implementation, as well as mitigating the possible difficulties of the carbon credit trading scheme in Indonesia. The main theory utilized in the analysis of this article will consist of Environmental economics theory and Political Ecology theory. Environmental Economics theory will serve as the tools to highlight the potential opportunity of the carbon credit trading scheme in Indonesia, mainly revolving around its benefits to environmental sustainability efforts as well as possible opportunities in elevating economic benefits from the carbon trading system. On the other hand Political Ecology will serve to provide the framework to analyze the potential challenges in regards to the newly adopted carbon trading regulatory framework in Indonesia, this challenges will concentrate on the unequal power relation, potential weak framework, and the potential marginalization of local communities, all of which can directly hinder the potential progress intended from the establishment of the carbon credit trading scheme in the first place, both environmentally and economically. Furthermore, the underlying problem formulation of this article will consist of three main questions, which consist of:

1) What are the potential opportunities offered from the adoption of a carbon trading scheme in Indonesia?
2) Why does the implementation of a carbon trading scheme in Indonesia face significant challenges?
3) Why are strategic policy interventions necessary to optimize the implementation of carbon trading in Indonesia?

In light of these objectives and the theoretical frameworks, this article aims to present a balanced and comprehensive assessment of Indonesia's carbon trading scheme. By integrating views from Environmental Economics and Political Ecology, the analysis process will not only emphasize the system's potential to contribute to environmental and economic benefit but also critically assess the socio-political and structural limitations that may undermine its effectiveness. The previous three guiding questions will serve as a guideline to explore how Indonesia can harness the full benefits, ensuring an effective, inclusive, economically equitable approach to climate policy. The article will be structured by the elaboration of the fundamental framework of the implemented theories. Furthermore, the article will continue to explain the carried out research method in the analysis of the article's topic. Moreover, the discussions of this article will be initiated with the analysis regarding the potential opportunities the adaptation of carbon trading in Indonesia through the lens of Environmental Economics theory, followed by the evaluation of of its potential challenges through the perspective of Political Ecology theory, and finally in the later parts of the analysis section this article will provide several strategic suggestions in order to ensure that the adaption of carbon trading in Indonesia brings out the most benefit economically and environmentally.

2. Literature & Theoretical Review

2.1. Enviromental Economic Theory

The emergence of environmental economics theory can be traced back after the event of the second world war. This theory initially presented itself as a sub-field of economic study. Environmental Economics theory came into prominence during the 1960s in which the rising concern of environmental pollution became a topic of discussion (Spash, 1999, p. 414). While the classical economic paradigm tends to neglect the importance of environmental factors in economic activities, Environmental Economics theory emphasizes the integration of environmental considerations into economics discussion and decision-making. The theory aims to address the restraints of traditional economics theory by considering the cost-benefit calculation associated with environmental resources (Hanley et al., 1997, pp. 1-3). Therefore, Environmental Economics theory advocates sustainable development practices, efficient usage of natural resources, and strategic policy-making such as taxes, subsidies, and regulations to address market failures and further promote environmental conservation.

Although Environmental Economics seems to simply integrate economic activities while addressing environmental issues, the theory itself is fairly specific regarding its framework of analysis. The key issues covered in the analysis of Economic Environmental theory includes the underlying economic and institutional challenges towards environmental problems; the loss of economic value caused by environmental degradation through pollution, exploitation, and other agents; as well as the benefits of efforts to prevent and remediate environmental harm, and the design of effective economic incentives and policies to enhance environmental quality and discourage further environmental damage (Fisher & Peterson, 1976). These frameworks not only aim to quantify the cost of environmental decline but more than that emphasize the importance of balancing economic activities with environmental sustainability, guiding decision makers

towards strategic decision making that will both support economic development and environmental conservation.

In the analysis process of this article, Environmental Economics will play a crucial role in analyzing the potential economic and environmental benefits in regards to the adoption of the carbon trading system in Indonesia. The analysis process towards the issue of this article will include two key concepts in the framework of Environmental Economics theory, the key concepts include:

1) Externalities: one of the core concepts in environmental economics that refers to the unforeseen impacts of economic activities on the environment that affect third parties who are indirectly involved in the economic activity. Externalities exist both positively and negatively. The negative externalities are the externalities that cause harmful effects towards the third party, such as pollution, deforestation, carbon emissions, and many more that might cause environmental degradation and further cause human harm. On the other hand, positive externalities are the positive impacts towards the third party of economic activities like environmental conservation and the improvement of ecological quality (Phaneuf & Requate, 2016).
2) Valuation of environmental goods: this concept in environmental economics refers to the process of assigning economic and monetary value to natural resources and ecological benefits that are not usually traded in markets (i.e. carbon credit). These valued goods can include common natural resources (clean air, water, and soil), biodiversity, and even climate regulation. Assigning economic value towards environmental goods enables stakeholders and decision-makers to engage in a cost-benefit analysis that is expected to balance economic necessity with environmental sustainability.

2.2. Political Ecology Theory

Political ecology is a cross-disciplinary theory that studies the intertwined relationship between political, economic, social factors, and environmental issues. The theory first emerged between 1960s and 1970s, the theory was a critical response to the earlier environmental study discussions that often tends to be apolitical in its approach. Political Ecology theory was heavily inspired by Marxist theory and critical development studies, highlighting how power dynamics and inequalities as well as economic structures can drive environmental degradations, particularly at the time for those living in vulnerable indigenous communities in Global South, in which many large-scale development projects affects the living of the local communities (McManus, 2009).

Although the term “Political Ecology” was first coined in 1935 by Frank Thorne in 1935, it only gained some attractions in the article “Ownership and Political Ecology" from anthropologist Eric R. Wolf in 1972. In the article, wolf shed lights on how local land ownership can arbitrate societal structures and local ecosystems, connecting the dot between ecological conservation with politic-economic constellation across multiple stages of analysis (Wolf, 1972). However, in 1980’s, the theory later refined by scholars Piers Blaikie and Harold Brookfield into a methodology that assimilates historical context to further understand environmental degradation and resource used within political and economic frameworks (Cuevas, 2015).

The key concept of Political Ecology theory focuses around power, and inequality, particularly in socio-political and economic context regarding environmental policies. The Political Ecology theory argued that environmental degradations and exploitations do not have equal impact for all people. Political, social, and economic inequalities can result in an unequal share of environmental damages and benefits. According to the theory, any changes of environmental conditions often reinforce the existing inequalities across all stages of society.

Political Ecology theory emphasizes how environmental issues are deeply connected with struggles to power, access, and control, marking environmental policies and changes as a politically driven process (Robbins, 2019). Thus, Political Ecology theory presents a strong critique towards contemporary environmental narratives and policies by highlighting which interests are actually served and who become the victims to bear the burden of environmental degradation. The theory critically challenges the notion that separates between environmental and societal structure discussion (Karlsson, 2015).

In the case of this article, Political Ecology theory will serve as a critical tool in examining the political, economic, and societal structure implication towards the adoption of carbon trading policies in Indonesia. By using this framework, the analysis will evaluate how carbon trading, as market-based environmental policies, may enhance the existing societal and economic inequalities. This theory also allows a deeper examination towards the notion used to legitimize carbon trading schemes. Political Ecology questioned whether these policies are genuinely instituted for the purpose of sustainable development or whether instead they are only used for capital gain under the mask of environmental conservation. Overall, Political Ecology theory will aim to reveal the underlying challenges in regards to the adoption of carbon trading schemes in Indonesia.

3. Research Method

This article research method will be conducted in a mixed-method approach combining quantitative and qualitative assessment to explore Indonesia's carbon credit implication in regards to its economic potential as well as the potential to any environmental liability. The quantitative data will be gathered through primary sources from several stakeholders related to carbon credit trading in Indonesia, these data include the official carbon trading database from IDX carbon, transaction volumes, and credit prices. Additionally, this article will also incorporate other quantitative indicators such as the numbers of foreign direct investment (FDI), as well as the emission reduction resulting from the establishment of a carbon credit trading scheme in Indonesia. Descriptive quantitative analysis will be employed in order to review market trends to assess carbon credit trading economic returns relative to its social and environmental loss.

Furthermore, the qualitative research method will be employed with scholarly research focusing on thematic analysis to identify social patterns and implications in regards to the establishment of a carbon credit trading scheme in Indonesia. The data will be collected from the existing reports, new, and previous scholarly research from the internet, this method will help to understand broader non-quantifiable implications of the issue. Limitations of the study include the limited access to more detailed financial data.

4. Results and Discussions

Indonesia's carbon trading scheme offers various outcomes in its long-projected implementation and adaptation. Therefore, it is crucial to lay the foundation on where this project is headed towards. This section will dissect the potential opportunities, challenges and further suggest several strategic actions to take in order to ensure the project brings about the desired positive outcomes of carbon trading. This section will elaborate the potential opportunities offered form the adaptation of carbon trading in Indonesia through the lens of Environmental Economics theory.

4.1. Opportunities from Carbon Trading in Indonesia (Environmental Economics Perspective)

The adoption of carbon trading in Indonesia is a revolutionary breeze in regards to climate mitigation policy and framework in Indonesia, offering many opportunities that can both benefit

in economic impact as well as positive contribution in environmental sustainability.From the perspective of Environmental Economics theory, the adoption of a carbon trading scheme in Indonesia poses several promising opportunities and potential. First, carbon trading unlocks a new stream of revenue and investment, while also promoting sustainable development. Carbon credit trading scheme aligns with the concept of the valuation of environmental goods from Environmental Economics theory. The adoption of carbon credit trading in Indonesia allows for monetization of emission reductions and conservation efforts, turning it into a tradable commodity. During the short span from September 2024 to April 2025, the number of investments in emission reduction volume and its value have shown a very promising number.

Table 1. Carbon Trading Investment Data

Month	Listed Project	Total Value (In ton CO_2e)	Total Trading Value (In IDR)
Sept 2024	3	177,00	10.413.800,00
October 2024	3	290.885,00	13.393.155.200,00
November 2024	3	1.661,00	97.906.600,00
December 2024	3	1.578,00	88.344.800,00
January 2025	6	273.237,00	12.292.793.400,00
February 2025	7	397.188,00	14.322.200.100,00
March 2025	7	20.250,00	660.393.500,00
April 2025	7	57,00	3.413.200,00

Source: Data from IDXCarbon, monthly report (Sep 2024 - April 2025)

The data from table 1 indicates a significant number of investments resulted from the carbon trading activities in Indonesia. In the span of eight months alone, the number of projects has been steadily increasing with the addition of up to four newly established carbon credit participating projects. In addition to that, even though the total value of carbon emission occurred in a fluctuated state, the average number of monthly carbon values resulting from the trading activities reached a significant number of around 123.129 metric tons of CO2 emission reduction. Furthermore, the number of total trading value also shows very promising numbers, for the eight months between September 2024 and April 2025, the average number of total monthly trading value of carbon credit reached around 5.108.577.575 IDR in monetary value. Since the establishment of carbon trading scheme in late 2023, up until April 2025, the cumulative trading volume occurred Indonesia is estimated around 1,6 million tons of CO2 emission, with the total trading transaction valued around IDR 77 billion, outperforming other Asian countries such as Japan, Thailand, and Vietnam in regards to trading activities (Nurjani & Kurniawan, 2025).

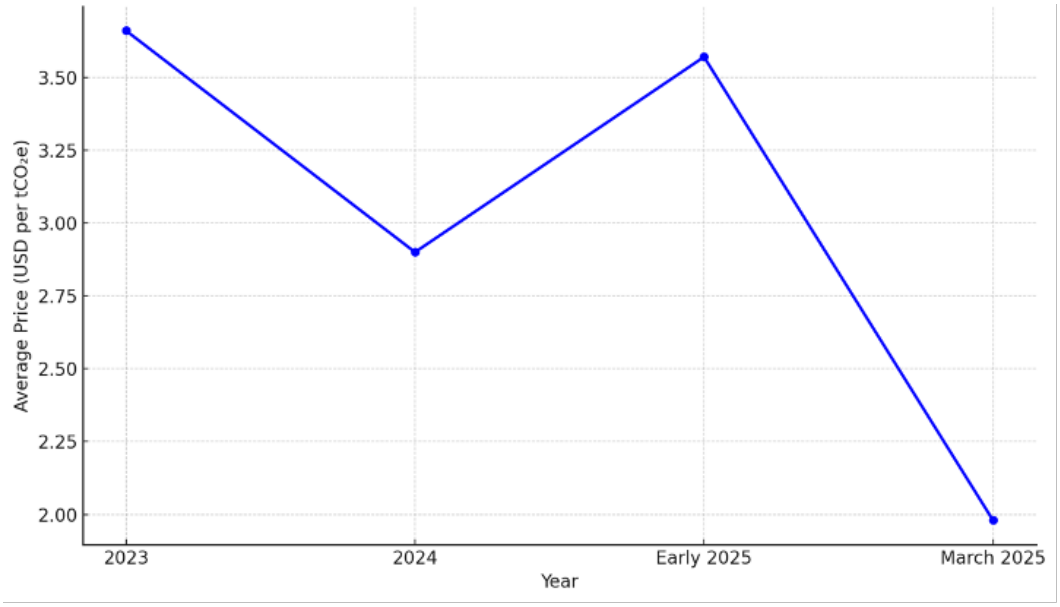

Figure 1. Average Carbon Credit Prices in Indonesia (2023-2025)
Source: Compiled by the author from publicly available data across IDXCarbon, Ministry of Environment and Forestry, and related news portals (2023–2025).

However, throughout the recent years there have been some instabilities in terms of the average carbon credit stock prices in Indonesia ever since its establishment. The figure above shows the fluctuated dynamics on the carbon stock prices in the national Indonesian national market. As seen in figure 1, the average price of carbon credit in Indonesia begins at roughly USD 3,6 (IDR 58.000) per ton CO2 emission (ICAP, 2023). In 2024 the average price experienced a decrease to USD 2,9 (IDR 47.000) per ton CO2, this is possibly due to the low demand from the private sector, as well as several adjustments in policy framework. In 2025 however, the carbon credit market opened at an increasing price to around USD 3,5 (IDR 57.000) per ton CO2. Unfortunately, in March 2025 the price went down considerably to USD 2 (IDR 32.000) per ton CO2, this is likely due to the oversupply occurring within the verified carbon credits, followed by regulatory uncertainty, and a weak penalty for the pollution emitters (LII, 2025). This case of price instability shows the vulnerability of the newly established carbon credit architecture in Indonesia. The price fluctuation not only affects investor's trust but can also hinder the environmental integrity of the carbon trading scheme itself.

Nevertheless, despite the existing market instability particularly in regards to the price reliability of the carbon credit stock exchange, Indonesia's carbon market presents promising quantitative metrics in terms of carbon reduction volume, value, and increase in participating parties. Therefore, policy-makers must recognize that to allow the market to optimally benefit in economic and environmental objectives, a profound regulatory framework and stable market are crucial.

The second potential opportunity offered from the establishment of a carbon credit market in Indonesia is providing a market-based mechanism to internalize the externalities impacts of the carbon emission. From the view of Environmental Economics theory, the recently adopted carbon trading scheme in Indonesia serves as a strategic market-based approach intended to rectify negative externalities, also known as the involuntary impact affected by the third parties as the result of economic activities. Carbon emission is a prime example of negative externalities, when an economic activity emits carbon emission to the environment, it imposes negative effect to the environment, as well as imposing societal cost such as health impacts, natural disasters,

and agricultural disruption, these costs is not accounted in the market price of their goods or services (Stern, 2007). The carbon trading addresses this issue by assigning the price to the carbon emission, further internalizing the external cost of pollution resulting from economic activities. By requiring economic actors to purchase credits to each ton of CO2 they emitted, the system safeguards the third party from the societal cost of emissions of the business operations.

Instead of solely sanctioning polluters towards regulation enforcement, Indonesia carbon markets allow companies with low carbon emissions to sell their carbon surplus as an economic commodity to those facing shortage in carbon credits. Overall, this scheme will allow Indonesia to efficiently reach its climate goals while also promoting economic growth. On that note, Indonesia has committed to cut its national carbon emissions by 31% by 2030 and eventually reach net-zero emissions by 2060. A well-established carbon market can drive progress towards Indonesia's Nationally Determined Contributions (NDCs) by utilizing a market-based approach towards environmental sustainability.

Finally, the carbon credit market can encourage green technology transfer and modernization across industries in Indonesia. Under the carbon credit mechanism, industries will be stimulated to invest in cleaner technologies and practices to lower their carbon emission cost or can sell their credit surplus for profits, while on the other hand, polluters that exceed their carbon emission cap will face a financial sanction. This dynamic allows industries to embrace low-carbon technologies. Gradually, the investment can increase productivity and create green jobs. For instance, the renewable energy sector is projected to experience significant growth; it is estimated that transition to renewable energy can increase national employment up to two million jobs by 2030 (Aditya et al., 2025). Therefore, the carbon credit market not only presents as a market-based solution towards environmental conservation, but also allows for the creation of productive economic opportunities and technological modernization.

4.2. Challenges in Implementing Carbon Trading in Indonesia (Political Ecology Perspective)

Despite the potential benefits, the implementation of the carbon trading scheme in Indonesia also comes with considerable challenges. Political Ecology theory will help to understand how power relations, institutional capacities, and social inequality can interfere with the effectiveness of market-based environmental policy frameworks. The key challenges in regards to the implementation of carbon trading in Indonesia includes; political resistance and transparency issues; social and environmental justice concerns.

Political resistance and transparency issues persist as a crucial limitation to implement carbon trading and carbon pricing schemes effectively in Indonesia. Similar to many cases from other environmental reforms, carbon pricing has encountered some difficulties in dealing with big corporations and governmental actors. From the lens of Political Ecology, this resistance showcases more than just a bureaucratic hurdle, but also reveals the underlying power dynamics and structural inequalities in the systems. Environmental policy frameworks like carbon trading not only serve as bureaucratic tools, they also serve as a politically contested apparatus, where actors compete over controls, interest, and access to environmental value. Political Ecology argued that corporate lobbying and elite control can influence the architecture of carbon trading regulatory frameworks (Robbins, 2019).

Under the administration of President Prabowo, the government has proposed a blockchain-based carbon registry to boost data credibility. In particular, some stakeholders in Indonesia's carbon trading system tend to not fully comply in terms of transparency, resisting clear disclosure such as blockchain-based carbon registry for public trading records. Meanwhile, high transparency in the emission and transactions reports could really help in revealing non-compliance and environmental harm (Nugraha, 2024). In addition to that, there have been

several cases of corporate lobbying to influence the carbon market policy framework. Numerous powerful business groups, including big forestry and big oil corporations have actively lobbied to push favorable policies towards corporate interest. These corporations have secured illegitimate forest land acquisition for carbon projects and advocated for loose policies. This raises concerns that climate policies will only benefit the interest of the elites (Sari & Siahaan, 2025). This complicated dynamic showcases a classic Political Ecology challenge. In this regard, policymakers have to understand the balance between economic interest and environmental integrity. The carbon market could slowly deteriorate its legitimacy if "big players" are allowed to just circle around the system. Furthermore, such problems can take away public support for the carbon trading scheme.

Social and environmental justice concerns is another matter highlighted by the Political Ecology theory. While carbon trading initially intended to incentivize carbon emission reductions through a market-based approach, Political Ecology pushes us to critically examine who benefits and who bears the cost from such a policy scheme. In the Indonesian context, many of the proposed and ongoing carbon offset projects take place on lands owned by local and indigenous communities. These communities tend to be vulnerable to land dispossessions and disputes. As the result of societal and economic inequalities, this situation becomes a breeding ground for powerful actors to assert control over forested areas under the guise of carbon conservation (Fairhead et al., 2012). This particular case is very prominent in Indonesia where the status of forest and indigenous communities often disputes with corporate interest. Indonesia's forest is a prime hub for conservation and carbon offset projects, but at the same time it is also a home for many local and indigenous communities with non-legal but customary land ownership. Ambiguous land tenure has been a prolonged problem in Indonesia's forestry sector, the disputes between legal and customary ownership of the land claim makes it very complicated to definitively assign carbon projects (Virgy, 2025). As a result of this discrepancy, the risk of powerful actors exploiting the land of marginalized communities remains. Previous cases of REDD+ (Reducing Emissions from Deforestation and Forest Degradation) in Indonesia is a clear example on how the lack of safeguards can turn into prolonged legal and societal disputes between the elites and the marginalized.

Many leaders from these marginalized communities have voiced their concerns that the existing disputes could harm indigenous rights and their traditional livelihoods. This is not a plausible clause but rather a fact, many actors engaged in carbon credit trading are proven to have an unsatisfactory reputation related to environmental damage and social conflict. The monetization of carbon emission might only become "another revenue stream" for these big corporations, rather than genuinely contribute to environmental conservation efforts (Hans Nicholas, 2024). This dynamic relation between policy-maker, big corporations, and indigenous communities can put environmental integrity at stake. Instead of delivering real climate contributions, it could instead only benefit the emitters itself, profiting from the produced carbon offset. The challenge is to identify the balancing point between generating revenue through the promotion of carbon trading, maintaining the rights and societal equality towards indigenous and local communities, while also maintaining carbon trading's credibility to generate and trade.

4.3. Strategic Actions for Optimizing Indonesia's Carbon Trading Potential

To seize the opportunity of carbon trading while mitigating its challenges, Indonesia must employ a set of strategic actions. These strategies aim to combine the economic incentive, and strengthen governmental institutions and policy implementation, accounting perspectives from both Environmental Economics and Political Ecology theory. The key suggestions include;

Strengthening regulatory enforcement and expanding market coverage; Enhancing transparency and integrity through technology and oversight; and Build capacity and inclusive participation.

Strengthening regulatory enforcement and expanding market coverage should sit at the top of the list to create a robust carbon trading and market ecosystem. The Indonesian government should wrap up and strictly enforce the cap-and-trade system, across all industry sectors of carbon emitters. This means to gradually follow up the existing national Emission Trading Scheme (ETS) not solely to the power and energy sector, setting a clear emission cap (maximum level of carbon emission) to industries such as construction, mining, and forestry (Phillip, 2025). In addition to that, expanding the market coverage of the carbon credit trading in Indonesia is also very crucial. The increased number of participations and transactions could definitely increase demands and value liquidity of carbon credit in Indonesia. For instance, the first quarter of 2025 receive around 690.675 CO2 tons of carbon credit traded, surpassing even the total volume traded in 2024 and in 2023, this is due to the policy adjustment allowing transaction to also occurred internationally, marking IDXCarbon with the largest numbers of transactions in the ASEAN region (Asean Exchange, 2025).

In the follow up to this momentum, all of the major carbon emitters should be mandated or at least incentivized to participate in IDXCarbon. A broader market will not only enhance value liquidity but also improve price credibility itself, making carbon credit more appealing as an investment instrument. As enforcement gets stricter, industries will realize that carbon emission indeed comes with a cost, encouraging them to actively participate in carbon emission reduction initiatives, thus energizing the market nationally and further globally.

Enhance transparency and integrity through technology and oversight is crucial to address the governance issues in regards to the execution and implementation of carbon trading in Indonesia. Indonesia should focus on improving their oversight mechanism. One possible suggestion is the adaptation of the already proposed blockchain-based carbon registry, to accurately record all the credit values occurred. By adopting the system, authorities as well as the public can trace the origin, ownership, up until the retirement of the carbon credit, lowering the risk of fraudulent practice and double counting (Vilkov & Tian, 2023).

The strengthening of transparency can also be implemented through the establishment of an independent overseeing body. This type of institution can establish a board member that includes government regulators, technical experts, and civil society representatives. This institution will act to monitor transactions, ensuring strict compliance to the regulations and mediating any conflicts. The initiation of this institution will only safeguard carbon trading transparency practices in Indonesia but also leverage Indonesia's credibility among international partners and future investors. This comprehensive approach from both digital innovation and strong institutional governance could considerably lower the risk of corruption, enhance investor's trust, and ensure that Indonesia's carbon trading aligns with both environmental goals and equitable development outcomes.

Building capacity and inclusive participation is essential to address the knowledge and equity gaps. The Indonesian government should possibly be able to initiate a training and outreaching campaign, aiming to educate and empower local governments, small and medium enterprises (SMEs), and local communities. The program could educate stakeholders on carbon trading, how to develop eligible projects, and how to handle emission data. By increasing the capacity of carbon trading knowledge to a broader audience, more domestic actors can contribute significantly rather than just letting all the benefits go into the pocket of big corporations.

In addition to that, empowering indigenous and local communities is also crucial, particularly in the forestry sector. The Indonesian government should be able to refine the land ownership regulations in forest areas to avoid the local and indigenous communities being discriminated

against by the big corporations. One suggestion is to implement a benefit-sharing scheme. This scheme will be conducted as follows; for every carbon credit generated from a land with customary ownership status, a portion of the revenue generated from the transaction should flow to local and indigenous communities. This proposed action not only will resolve the societal and economic injustice issues but also improves the execution of the project since the local and indigenous communities are more likely to support the project in the first place. Overall, broadening participation through capacity building and increasing inclusivity will gradually establish a socially equitable carbon market, resulting in economic benefits, environmental conservation, and empowerment of local communities.

One prime example of a carbon trading program that has significantly succeeded in fostering economic growth through the implementation of all of these strategic initiatives is The California Cap and Trade Program. The California Cap and Trade Program showcases how strategic enforcement, transparency, and inclusive governance can work collectively to establish a profitable, high-functioning carbon market. In terms of regulatory enforcement and market coverage, California enforces a binding cap on carbon emissions that declined over the time. This cap is applied across several sectors including electricity, industrial and fuel distribution. This broad market reach secures a high market liquidity, and increases demand in carbon credit, while quarterly auctions with minimum price floors safeguard against price volatility—an issue that still plagues Indonesia's market.

The California Cap and Trade program also illustrates the strategic implementation of technological and institutional transparency through the use of a centralized registry operated by the Western Climate Initiatives (WCI). This registry accurately tracks credit offsets from issuance to retirement, with accessible data provided to the public, therefore reducing chances to fraud and ensuring traceability. Such robust oversight is crucial for Indonesia, where governance challenges and lack of transparent verification remain critical weaknesses (Schmalensee & Stavins, 2017).

Finally, the program also promotes inclusive participation and benefit-sharing through targeted reinvestment of the financial benefit of the carbon revenues. As per 2023, it is estimated that over USD 20 billion raised from the offset auctions has been directed into Greenhouse Gas Reduction Fund, empowering and supporting local communities, clean energy innovation, as well as climate mitigation projects. This reflects the potential benefits that could have been achieved from the Indonesia carbon trading scheme through benefit sharing with local and indigenous communities, particularly those affected by the forest-based projects. California’s model aligns with both Environmental Economics and Political Ecology perspectives—providing incentives for emissions reduction while addressing social justice and power asymmetries.

5. Conclusion

The adaptation of carbon trading in Indonesia through IDXCarbon marked a significant milestone in Indonesia’s effort to balance economic incentives with environmental sustainability commitment. Through the lens of Environmental Economics theory, it is clear that carbon credit trading presents a strong potential for economic growth, emission reduction, and further environmental conservation. The monetization of carbon emissions not only attract
significant financial revenue nationally but also internalizes environmental externalities, as well as providing measurable metrics of contribution towards Indonesia’s climate targets, eventually facilitating broader participation in global carbon finance mechanisms.

The implementation of carbon credit trading in Indonesia through IDXCarbon signifies a crucial step in aligning economic incentives with environmental sustainability goals. Drawing from Environmental Economics theory, it is evident that carbon markets offer promising avenues

for economic growth, emission reduction, and green technological transformation. The monetization of carbon emissions not only internalizes environmental externalities but also provides measurable contributions toward Indonesia's climate targets and facilitates broader participation in global carbon finance mechanisms.

However, Political Ecology theory reminded us that these opportunities are followed with its own potential risk. Problems such as corporate exploitation, weak enforcement, and possible marginalization of vulnerable communities highlight the socio-political and economic complexities rooted in the carbon trading schemes. Neglecting the structural inequalities and governance gaps can result in the risk of carbon trading only becoming a tool for elite corruption rather than genuinely contributing to environmental conservation.

In order to truly savor the full benefit of carbon trading, it is crucial for Indonesia to implement strategic reforms focused on robust regulation, transparency through digital oversight, and inclusive stakeholder engagement. In addition to that, strengthening institutional capacity and credibility, ensuring equitable benefit particularly for indigenous and local communities, will be essential to safeguard the environmental and societal integrity of the carbon trading system.

Overall, while the carbon trading market in Indonesia offers a fairly promising economic-environmental potential, the success of this scheme and policy framework ultimately depends on Indonesia's capability to traverse into the delicate balance between market efficiency, environmental sustainability, and socio-political justice. The path to its bright future not only depends on economic rationale but also on ethical strong governance followed by inclusive policy-making.

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