

Indonesia's Carbon Credit Trade as a Geopolitical Instrument in Domestic Governance and International Diplomacy

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ARTICLE INFO	ABSTRACT
Keywords: Carbon Credit Trading Carbon Markets Climate Diplomacy Green Economic Diplomacy Climate Politics How to cite: Marpaung, R (2026)" Indonesia's Carbon Credit Trade as a Geopolitical Instrument in Domestic Governance and International Diplomacy" 1(2),113.https://doi.org/10.876909khhkj Article History: Received: 30, August, 2026 Revised: 27, December, 2026 Accepted:29, December, 2026	Carbon credits have emerged as a market-based mechanism for mitigating greenhouse gas emissions while supporting sustainable economic development and international climate cooperation. This study examines Indonesia's carbon credit market as both a domestic climate governance instrument and a strategic tool of green diplomacy. Using a qualitative research approach, it analyzes Indonesia's carbon trading framework and evaluates its contribution to the country's geopolitical position within the evolving global climate governance architecture. The findings demonstrate that effective carbon markets depend on strong state institutions capable of ensuring transparency, regulatory certainty, and international credibility while encouraging active participation from the private sector. Beyond reducing emissions, carbon credit trading enhances bilateral and multilateral cooperation by facilitating climate finance, technology transfer, and institutional collaboration between developed and developing countries. Consequently, carbon credits function not only as economic incentives for decarbonization but also as diplomatic assets that strengthen Indonesia's engagement in international climate initiatives. The study estimates Indonesia's annual carbon credit potential at 74,696.04 tCO₂e, with an estimated annual transaction value of approximately US\$597,568. It further proposes strategies to expand Indonesia's carbon trading system through institutional strengthening, improved market governance, and greater access to international carbon markets. These measures could position Indonesia as a leading participant in the global green economy while advancing climate mitigation, sustainable development, and international cooperation.

1. Introduction

Climate change has accelerated the development of market-based mechanisms designed to reduce greenhouse gas (GHG) emissions while mobilizing investment toward sustainable development. Among these mechanisms, carbon markets have emerged as a central component of global climate governance by assigning economic value to emissions reductions and incentivizing low-carbon investment. The implementation of carbon trading is closely linked to the objectives of the Paris Agreement, under which Parties submit Nationally Determined Contributions (NDCs) to achieve long-term decarbonization and ultimately transition toward net-zero emissions (NZE).

Indonesia has played an increasingly important role in this global transition. Since 2010, the country has implemented the Reducing Emissions from Deforestation and Forest Degradation (REDD+) mechanism, which provides performance-based financial incentives for developing countries that reduce emissions from deforestation and forest degradation while enhancing forest carbon stocks. Through REDD+, Indonesia has strengthened its position as one of the leading developing countries in international climate mitigation. The country has successfully reduced emissions from the forestry and land-use sectors and has received international recognition through Results-Based Payments (RBP) totaling approximately USD 499.8 million, of which USD 340.7 million has already been disbursed. This support includes USD 103.8 million from the Green Climate Fund (GCF) through the United Nations Development Programme (UNDP) as the accredited entity. These achievements demonstrate Indonesia's commitment to fulfilling its obligations under the Paris Agreement while illustrating how transparent, evidence-based, and collaborative governance can generate measurable climate outcomes.

Indonesia's strategic importance within the global carbon market is further reinforced by its vast natural capital. With approximately 95.5 million hectares of forest, the third-largest tropical forest area worldwide, the country possesses exceptional potential to generate high-quality carbon credits while advancing its Forestry and Other Land Use (FOLU) Net Sink 2030 target, under which carbon removals are expected to exceed emissions from the forestry sector. Consequently, Indonesia is increasingly viewed not only as a supplier of nature-based carbon credits but also as a potential regional hub for sustainable climate finance and carbon market development.

The establishment of a national carbon market also represents an integral component of Indonesia's green economic transformation. Carbon trading functions alongside carbon taxation and other environmental fiscal instruments as part of a broader fiscal re-engineering strategy designed to support climate mitigation while enhancing economic competitiveness. Under its updated NDC, Indonesia has committed to reducing greenhouse gas emissions by 29% through domestic efforts and up to 41% with international support. Carbon pricing mechanisms, including emissions trading and carbon taxation, therefore constitute complementary policy instruments for achieving these national targets while strengthening Indonesia's participation in international climate diplomacy.

Internationally recognized carbon credits depend upon rigorous Measurement, Reporting, and Verification (MRV) systems to ensure environmental integrity, transparency, and credibility. MRV provides the technical foundation for quantifying emissions reductions, validating carbon projects, and ensuring consistency across jurisdictions. A robust MRV framework is therefore indispensable for integrating Indonesia into international carbon markets and facilitating cross-border carbon transactions under emerging global carbon governance arrangements.

Within Indonesia's emissions trading system, companies are assigned greenhouse gas emission caps and may trade unused emission allowances when actual emissions remain below their allocated limits. Conversely, firms exceeding their permitted emissions must either purchase additional carbon credits or incur regulatory penalties. This market-based approach creates financial incentives for emissions reductions while encouraging investment in cleaner technologies. In parallel, carbon trading contributes to public revenues through carbon taxation and market transactions, thereby linking environmental governance with broader economic and diplomatic objectives. In this respect, carbon trading extends beyond environmental policy to become an instrument of international economic diplomacy capable of strengthening Indonesia's geopolitical influence within the global low-carbon transition.

Indonesia's carbon pricing framework is grounded in the polluter pays principle (PPP) and the doctrine of strict liability, both of which establish that entities responsible for environmental harm should bear the associated economic costs regardless of fault. These principles are reflected in Law No. 7 of 2021 on the Harmonization of Tax Regulations, which introduced a carbon tax covering emissions of carbon dioxide (CO₂), nitrous oxide (N₂O), and fluorinated gases generated from economic activities, including fossil fuel consumption, cement production, pulp and paper manufacturing, and coal-fired power generation. The current carbon tax is set at IDR 30 per kilogram of CO₂ equivalent (IDR 30,000 per tonne CO₂e) under a floating-price mechanism linked to domestic carbon market prices.

Despite this regulatory foundation, Indonesia continues to face substantial implementation challenges. The existing carbon tax remains considerably lower than prevailing carbon prices in several developed economies, limiting its effectiveness in internalizing the environmental costs of greenhouse gas emissions. Furthermore, the successful implementation of carbon pricing depends upon public acceptance, industrial readiness, reliable emissions accounting, integration between carbon registries and taxation systems, and regulatory certainty. Fragmented institutional responsibilities, particularly between fiscal and environmental authorities, continue to create governance challenges that require greater policy harmonization and coordinated implementation.

Compared with more mature carbon markets, particularly those established in Europe, Indonesia remains in the early stages of market development. Previous studies suggest that successful carbon market implementation depends not only on regulatory quality but also on broader structural conditions, including foreign direct investment (FDI), industrial upgrading, institutional capacity, and human development. Industrial value-added reflects the degree of economic transformation and technological advancement, while foreign investment provides capital, technology transfer, and managerial expertise capable of accelerating low-carbon development. However, developing economies often face trade-offs between environmental protection and investment promotion, as governments may prioritize rapid industrialization despite the associated increase in greenhouse gas emissions. This dilemma has been widely documented across emerging economies, where financial and technological constraints frequently limit the adoption of cleaner production systems.

Human capital constitutes another critical determinant of long-term environmental performance. The Human Development Index (HDI), encompassing education, health, and living standards, influences environmental awareness, technological adoption, and public support for climate policies. Higher educational attainment generally promotes greater environmental consciousness, while improvements in public health reinforce recognition of environmental quality as a public good. Previous empirical studies have consistently demonstrated a negative relationship between human development and carbon emissions, suggesting that investments in human capital can contribute to long-term decarbonization. Within the context of carbon markets, higher levels of human development are expected to enhance market participation, improve regulatory compliance, and strengthen the effectiveness of market-based climate policies.

Against this background, this study examines Indonesia's readiness to position carbon credit trading as an instrument of both environmental governance and geopolitical diplomacy. Specifically, it analyzes how foreign direct investment, industrial value-added, and human capital collectively influence Indonesia's capacity to develop a competitive carbon market capable of supporting sustainable economic growth, attracting international climate finance, and strengthening the country's strategic position within the evolving architecture of global carbon governance. By integrating economic, institutional, and diplomatic perspectives, this study contributes to the growing literature on carbon markets in emerging economies and provides policy-relevant insights into Indonesia's transition toward a resilient, low-carbon development pathway.

2. Research Method

This study employs a descriptive-analytical research design to examine, in a comprehensive and context-specific manner, the opportunities and challenges confronting Indonesia in the evolving global carbon market. The descriptive approach provides a systematic framework for capturing the current landscape of Indonesia's carbon market, including its regulatory architecture,

institutional arrangements, policy instruments, and the country's comparative potential in carbon credit development.

Building upon this descriptive foundation, the analytical component critically evaluates the available evidence to generate multidimensional insights into carbon credit trading strategies within the broader context of international diplomacy. The analysis seeks to assess how Indonesia can leverage its natural capital, policy framework, and diplomatic engagement to strengthen its position as a leading actor in the global carbon market.

The study relies exclusively on secondary data collected from official government publications, international organizations, policy reports, legal and regulatory documents, and peer-reviewed academic literature. These sources are systematically reviewed and synthesized to ensure analytical rigor and contextual validity. The collected data are subsequently examined using a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analytical framework, enabling a structured assessment of Indonesia's strategic position in cross-border carbon credit trade and carbon market diplomacy. This framework facilitates the identification of key internal capacities and external dynamics that influence Indonesia's competitiveness and its potential to exercise greater leadership within the international carbon market

3. Result and Discussion

The findings indicate that geopolitical uncertainty has accelerated the emergence of carbon credit trading not only as a market-based climate mitigation instrument but also as an increasingly important component of international economic diplomacy. In this context, Indonesia possesses a significant comparative advantage owing to its extensive forest resources. The country currently maintains approximately 95.5 million hectares of forest cover, representing around 51.1% of its total land area, while the officially designated forest estate encompasses approximately 120–125 million hectares.¹ This includes roughly 56–68 million hectares of production forests, 29–29.6 million hectares of protected forests, and 21.9–22.1 million hectares of conservation forests.² These ecological assets position Indonesia as one of the world's most strategically important suppliers of nature-based carbon credits and provide a strong foundation for long-term participation in the global carbon market.

The rapid expansion of carbon markets has transformed carbon credits into an increasingly valuable strategic commodity capable of attracting long-term investment while supporting environmental sustainability. However, the global carbon market remains institutionally fragmented, with significant disparities in regulatory frameworks, market maturity, and international participation.³ Consequently, carbon trading has evolved beyond a purely environmental policy instrument to become a mechanism of economic diplomacy through which states strengthen bilateral and multilateral cooperation while enhancing their geopolitical influence. For tropical countries such as Indonesia and Brazil, whose comparative advantage lies in abundant natural carbon sinks, this transition creates substantial opportunities to generate economic value through ecosystem conservation while simultaneously contributing to global climate mitigation.⁴ Nevertheless, unequal market development and persistent uncertainty surrounding international climate governance continue to constrain the realization of these opportunities.

¹ Republic of Indonesia. *Minister of Environment and Forestry Regulation No. 7 of 2021* (Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor 7 Tahun 2021 tentang Perencanaan Kehutanan, Perubahan Peruntukan dan Fungsi Kawasan Hutan, Serta Penggunaan Kawasan Hutan)

² Republic of Indonesia. *Minister of Environment and Forestry Regulation No. 7 of 2021* (Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor 7 Tahun 2021 tentang Perencanaan Kehutanan, Perubahan Peruntukan dan Fungsi Kawasan Hutan, Serta Penggunaan Kawasan Hutan)

³ Katadata Insight Center. *Indonesia Carbon Trading Handbook*. Katadata Insight Center (2022).

⁴ Republic of Indonesia. *Law No. 32 of 2009 on Environmental Protection and Management* (Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup).

One notable example is the emerging cooperation between Indonesia and Singapore on cross-border carbon trading. Although both governments have expressed a shared commitment to protecting regional ecosystems and promoting high-integrity carbon markets, implementation remains at an early stage. The proposed collaboration, established within the framework of Article 6 of the Paris Agreement, reflects a strategic effort to position both countries within a credible international carbon market architecture. The partnership emphasizes environmental integrity, climate finance, and equitable social outcomes while establishing mechanisms for technical cooperation, institutional capacity building, joint research initiatives, expert exchanges, and pilot projects designed to strengthen regional carbon market governance.⁵

The implementation framework further incorporates internationally recognized mechanisms governing the authorization, verification, and transfer of Internationally Transferred Mitigation Outcomes (ITMOs), together with the application of corresponding adjustments to prevent double counting of national greenhouse gas emission reductions. These governance mechanisms are essential for ensuring transparency, environmental credibility, and compatibility with emerging international carbon market standards.⁶ Successful implementation would significantly strengthen Indonesia's credibility in operationalizing its Carbon Economic Value (Nilai Ekonomi Karbon) framework while enhancing investor confidence and facilitating greater participation in international carbon markets.⁷

The findings also highlight Indonesia's strategic role within both regional and global carbon market development. Owing to its abundant tropical forests, extensive peatlands, and rich biodiversity, Indonesia possesses one of the world's largest terrestrial carbon reserves. According to the Ministry of Environment and Forestry, Indonesia contains approximately 25% of global tropical carbon stocks, distributed across tropical rainforests, mangrove ecosystems, and peatlands that perform critical functions within the global carbon cycle. Indonesia's peatlands alone cover approximately 20 million hectares and store more than 50 gigatonnes of carbon, equivalent to roughly twice current annual global greenhouse gas emissions.⁸ If effectively conserved and restored, these ecosystems provide Indonesia with exceptional capacity to function as a major global carbon sink.

This ecological advantage substantially enhances Indonesia's competitiveness within international carbon markets, particularly through the implementation of Reducing Emissions from Deforestation and Forest Degradation (REDD+) and other nature-based climate solutions. Beyond its global significance, Indonesia also occupies a central position within Southeast Asia's emerging regional carbon market.⁹ As one of ASEAN's largest economies, with a population exceeding 280 million, Indonesia possesses the economic scale necessary to integrate domestic carbon markets with regional and international trading systems. Moreover, considerable potential exists to generate additional carbon credits through renewable energy expansion, particularly in solar, wind, and

⁵ United Nations Framework Convention on Climate Change (UNFCCC). *Paris Agreement*. United Nations (2015).

⁶ Larasati, R. A., Aditia, D. & Gunawan, C. I. Regulatory analysis and governance mechanisms of carbon capture and storage (CCS) in Indonesia's carbon trading system. *Jurnal Penelitian IPTEKS* 11(1), 9–27 (2026).

⁷ Larasati, R. A., Aditia, D. & Gunawan, C. I. Regulatory analysis and governance mechanisms of carbon capture and storage (CCS) in Indonesia's carbon trading system. *Jurnal Penelitian IPTEKS* 11(1), 9–27 (2026).

⁸ Republic of Indonesia. *Law No. 32 of 2009 on Environmental Protection and Management* (Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup).

⁹ Indonesia.go.id. *Indonesia Accelerates Carbon Trading* (1 June 2024). Available at: <https://indonesia.go.id/kategori/editorial/8252/indonesia-akselerasi-perdagangan-karbon?lang=1> (Accessed XX Month 2026).

geothermal energy projects, which simultaneously reduce dependence on fossil fuels while supporting low-carbon economic development.¹⁰

Despite these considerable opportunities, the analysis identifies several structural constraints that continue to limit Indonesia's ability to maximize its participation in international carbon markets. First, technological limitations remain a significant challenge. Reliable systems for measuring, monitoring, reporting, and verifying greenhouse gas emissions remain underdeveloped, reducing the credibility of emissions reduction projects and limiting access to international carbon markets. Second, renewable energy infrastructure has yet to expand sufficiently to support a large-scale transition away from fossil fuel dependence, thereby constraining future carbon credit generation.

Third, institutional and governance challenges continue to undermine policy effectiveness. Competing interests between environmental conservation and resource-intensive industries—including oil palm plantations and mining—continue to drive deforestation and increase greenhouse gas emissions, thereby reducing Indonesia's carbon sequestration capacity. Weak coordination between national and subnational governments further complicates policy implementation, while fragmented regulatory responsibilities create uncertainty for investors and project developers.¹¹ Although Presidential Regulation No. 98 of 2021 on Carbon Economic Value establishes the legal foundation for Indonesia's carbon market, implementation remains constrained by incomplete institutional integration, limited incentives for private-sector participation, and regulatory uncertainty.¹²

Economic and market-related barriers further complicate market development. Volatile carbon prices, uncertainty regarding international trading mechanisms, and limited financial incentives reduce investor confidence. High capital costs associated with low-carbon technologies continue to discourage industrial decarbonization, particularly among firms with limited financial capacity. At the same time, relatively low public awareness and limited understanding of carbon market mechanisms among businesses restrict broader participation in emissions reduction projects, thereby slowing market expansion.¹³

Taken together, these findings suggest that Indonesia possesses exceptional natural, economic, and geopolitical advantages capable of supporting its emergence as a leading actor in the global carbon market.¹⁴ However, realizing this potential requires comprehensive institutional reform, stronger regulatory integration, greater investment in measurement and verification infrastructure, accelerated renewable energy deployment, and enhanced coordination among governmental institutions, private-sector stakeholders, and international partners. Addressing these structural constraints will be essential for transforming Indonesia's comparative ecological advantage into sustained leadership within international carbon markets and positioning carbon trading as a strategic instrument of climate diplomacy, sustainable finance, and long-term economic development.

¹⁰ Wibowo, A. Indonesia's opportunities in the global carbon market: Strategies for becoming a key player in Southeast Asia. *Proceedings of the 6th Social, Political, Business, Accounting and Engineering Seminar (SoBAT)* **242**, (2024).

¹¹ Wibowo, A. Indonesia's opportunities in the global carbon market: Strategies for becoming a key player in Southeast Asia. *Proceedings of the 6th Social, Political, Business, Accounting and Engineering Seminar (SoBAT)* **242**, (2024).

¹² California Air Resources Board. *Cap-and-Trade Program*. California Air Resources Board (2021).

¹³ California Air Resources Board. *Cap-and-Trade Program*. California Air Resources Board (2021).

¹⁴ Republic of Indonesia. *Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Economic Value for Achieving Nationally Determined Contribution Targets and Greenhouse Gas Emission Control in National Development* (Peraturan Presiden Nomor 98 Tahun 2021 tentang Penyelenggaraan Nilai Ekonomi Karbon untuk Mencapai Target Kontribusi yang Ditetapkan Secara Nasional dan Pengendalian Emisi Gas Rumah Kaca dalam Pembangunan Nasional).

4. Conclusion

Indonesia's emerging carbon market possesses significant potential to become a strategic pillar of the country's green investment ecosystem while strengthening its position within the global carbon economy. Beyond reducing greenhouse gas emissions, carbon credit trading can mobilize sustainable finance, stimulate green employment, and reinforce Indonesia's role in international climate governance. However, the market remains in an early stage of development, with regulatory fragmentation, limited infrastructure, and low public and business awareness continuing to constrain its effectiveness.

This study finds that Indonesia's readiness to utilize carbon trading as an instrument of climate diplomacy depends on the interaction between foreign direct investment, human capital, and institutional capacity. Among these factors, long-term investment in human capital emerges as the most influential driver of sustainable emissions reduction. Indonesia's demographic advantages, combined with improved technical expertise, environmental governance, and institutional quality, can provide a competitive advantage in the global carbon market. At the same time, industrial decarbonization should be accelerated through greater access to renewable energy, while investment policies should increasingly prioritize environmental performance alongside economic growth.

The effectiveness of Indonesia's carbon market also requires an integrated regulatory framework governing carbon reporting, verification, payment mechanisms, and carbon taxation. Stronger coordination among government institutions, supported by a national carbon authority, would improve policy consistency and market governance. Furthermore, complementary fiscal measures—including green tax incentives, carbon tax credits, and investment incentives for low-carbon technologies—would enhance market participation and encourage private-sector investment.

As the market expands, the credibility of carbon allowances (PTBAE-PU) and carbon credits (SPE-GRK) will depend on a robust Measurement, Reporting, and Verification (MRV) system integrated with the National Registry System (SRN). High standards of transparency, accountability, and data interoperability will be essential to strengthening investor confidence and ensuring compliance with international carbon market standards. Greater integration between compliance and voluntary carbon markets, together with alignment with the electricity sector, would further improve pricing efficiency and market liquidity.

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