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Regulating Carbon Markets Under International Law: Effectiveness, Legal Challenges, and the Role of National Enforcement

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ABSTRACT

Carbon markets have become one of the principal market-based responses of international environmental law to climate change, because they allow emission reductions to be priced, traded and counted across borders. The Kyoto Protocol and the Paris Agreement, particularly Article 6 of the latter, institutionalised carbon trading on a global scale, with the aim of securing cost-effective mitigation while supporting sustainable development. Their implementation, however, has raised persistent legal and regulatory difficulties. Weak transparency, uneven monitoring and verification, the double counting of reductions and the absence of effective enforcement have all diminished their practical value. The Clean Development Mechanism (CDM) in particular has been criticised for inefficiency, poor environmental integrity and inadequate regulatory supervision. A study prepared for the European Commission concluded that eighty-five per cent of the projects it surveyed had a low likelihood of ensuring that reductions were additional and were not over-estimated. This study evaluates the effectiveness of the international legal frameworks governing carbon markets, examines how those frameworks attempt to reconcile economic efficiency with environmental protection, and considers how problems such as phantom credits and over-crediting bear on the legitimacy of carbon markets. It seeks to identify the structural and regulatory shortcomings of the present regime and to argue for greater legal consistency, sharper accountability and stronger enforcement.

Keywords: carbon markets, Paris Agreement Article 6, Kyoto Protocol, Clean Development Mechanism, internationally transferred mitigation outcomes, corresponding adjustments, additionality, phantom credits, over-crediting, environmental integrity, monitoring reporting and verification, national enforcement

I. INTRODUCTION

Carbon markets have emerged as one of the most significant market-based instruments in international environmental law for addressing climate change, because they put a price on

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greenhouse gas emissions and so make mitigation a matter of cost as well as of obligation. Developed under the Kyoto Protocol¹ and extended by the Paris Agreement,² particularly Article 6,³ these frameworks aim to achieve global emission reductions through emissions trading, the Clean Development Mechanism and cooperative approaches involving internationally transferred mitigation outcomes (ITMOs)⁴

The central legal logic of carbon markets is to combine economic efficiency with environmental protection. By allowing reductions to be traded across borders, these systems ensure that mitigation occurs where it is cheapest, lowering the overall cost of climate action and encouraging investment in low-carbon technology.⁵ At the same time, the international rules attempt to safeguard environmental integrity through requirements of additionality, monitoring, reporting and verification (MRV), transparency standards and accounting rules designed to prevent double counting.⁶

Despite this carefully constructed balance, carbon markets face persistent legal and regulatory challenges. Weak enforcement, fragmented national implementation, and problems such as over-crediting and phantom credits raise the question whether the environmental objectives of these systems are genuinely being met.⁷ The effectiveness of carbon markets therefore depends not only on their economic design but on the strength of international legal governance and of domestic enforcement.

II. THE EFFECTIVENESS OF EXISTING INTERNATIONAL LEGAL FRAMEWORKS

The effectiveness of the international legal frameworks regulating carbon markets is best assessed through the Kyoto Protocol and the Paris Agreement, which together form the foundation of global carbon market governance. Both have succeeded in establishing legal mechanisms for international emissions trading, in encouraging investment in low-carbon

¹ Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 162 [hereinafter Kyoto Protocol].

² Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104, 3156 U.N.T.S. 79 [hereinafter Paris Agreement].

³ Paris Agreement, *supra* note 2, art. 6.

⁴ Kyoto Protocol, *supra* note 1, arts. 6, 12, 17 (establishing joint implementation, the clean development mechanism and international emissions trading respectively).

⁵ WORLD BANK, THE ECONOMIC POTENTIAL OF ARTICLE 6 OF THE PARIS AGREEMENT AND IMPLEMENTATION CHALLENGES 1 (2019), <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/215681585753172514/the-economic-potential-of-article-6-of-the-paris-agreement-and-implementation-challenges>.

⁶ Paris Agreement, *supra* note 2, art. 13; CMA, *Modalities, Procedures and Guidelines for the Transparency Framework for Action and Support Referred to in Article 13 of the Paris Agreement*, Dec. 18/CMA.1, U.N. Doc. FCCC/PA/CMA/2018/3/Add.2 (Dec. 15, 2018).

⁷ Majid Asadnabizadeh & Espen Moe, *A Review of Global Carbon Markets from Kyoto to Paris and Beyond: The Persistent Failure of Implementation*, 12 FRONTIERS ENV'T SCI. 1368105 (2024), <https://doi.org/10.3389/fenvs.2024.1368105>.

projects and in promoting cooperation on mitigation. Through international emissions trading, joint implementation, the Clean Development Mechanism and the carbon market provisions of Article 6, states have been given flexible tools with which to meet emission reduction targets at lower cost.⁸

The major achievement of these frameworks is the creation of a legal and institutional structure that recognises carbon credits as tradable units and facilitates cross-border cooperation in emission reduction. The Kyoto Protocol pioneered market-based climate governance by permitting developed countries to meet part of their obligations through trading and through investment in emission reduction projects in developing countries.⁹ The Paris Agreement builds on that approach through the Article 6 mechanisms, which are intended to widen participation and to raise ambition through cooperative arrangements.¹⁰

These achievements are real, but the effectiveness of international carbon market regulation remains limited by a set of legal and practical difficulties, which are considered in turn.

A. Weak Enforcement Mechanisms

The most significant limitation of international climate law is the absence of strong enforcement. Compliance depends largely on the willingness of states to implement and enforce their obligations domestically. Unlike national legal systems, international climate agreements generally lack binding sanctions for non-compliance. The Paris Agreement makes the point explicit: its compliance committee is expert-based and facilitative, and is required to function in a manner that is non-adversarial and non-punitive.¹¹ Even the Kyoto Protocol, whose enforcement branch was the more robust of the two regimes, ultimately relied on consequences that were largely reputational and accounting-based.¹² The result is a gap between international commitment and actual emission reduction.

⁸ Kyoto Protocol, *supra* note 1, arts. 6, 12, 17; Paris Agreement, *supra* note 2, art. 6.

⁹ Clean Development Mechanism, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism> (last visited Sept. 9, 2026).

¹⁰ Article 6: Cooperative Approaches, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-paris-agreement/article-6> (last visited Sept. 9, 2026).

¹¹ Paris Agreement, *supra* note 2, art. 15(2); see also CMA, *Modalities and Procedures for the Effective Operation of the Committee to Facilitate Implementation and Promote Compliance*, Dec. 20/CMA.1, U.N. Doc. FCCC/PA/CMA/2018/3/Add.2 (Dec. 15, 2018).

¹² CONFERENCE OF THE PARTIES SERVING AS THE MEETING OF THE PARTIES TO THE KYOTO PROTOCOL, *Procedures and Mechanisms Relating to Compliance Under the Kyoto Protocol*, Dec. 27/CMP.1, U.N. Doc. FCCC/KP/CMP/2005/8/Add.3 (Mar. 30, 2006).

B. Transparency and Accountability Deficiencies

Monitoring, reporting and verification have improved considerably under the enhanced transparency framework of Article 13 and the modalities, procedures and guidelines adopted to give it effect.¹³ Gaps nonetheless persist, particularly where reporting depends on national technical capacity. Inadequate oversight can produce inaccurate accounting, unreliable verification and, in time, the loss of public confidence in carbon credits.

C. Double Counting and Accounting Challenges

The risk that more than one party will claim the same emission reduction remains a serious problem. Article 6.2 addresses it by requiring corresponding adjustments, supported by technical review and reporting, so that the transferring Party adds the quantity of mitigation outcomes it has authorised and first transferred to its emissions balance, while the acquiring Party subtracts the quantity it uses, and the reduction is therefore counted once only.¹⁴ Implementation is nevertheless complex, depends on national capability, and is not yet fully secure. The further guidance adopted at Baku in 2024 tightened the reporting and review arrangements, but did not remove the underlying dependence on self-reporting.¹⁵

D. Environmental Integrity Concerns

Doubts about additionality, that is, whether reductions go beyond what would have happened in any event, together with over-crediting, leakage and low-quality credits, have damaged the credibility of the system.¹⁶ The CDM has attracted the sharpest criticism in this respect, and the empirical evidence is unflattering.¹⁷ Article 6.4 introduces stronger rules and procedures, including the baseline and additionality requirements set out in the rules, modalities and procedures adopted at Glasgow,¹⁸ but the transition of older CDM activities into the new mechanism and continuing methodological disputes keep the concern alive.

¹³ Dec. 18/CMA.1, *supra* note 6.

¹⁴ CMA, *Guidance on Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement*, Dec. 2/CMA.3, U.N. Doc. FCCC/PA/CMA/2021/10/Add.1 (Nov. 13, 2021), annex ¶¶ 6-8.

¹⁵ CMA, *Matters Relating to Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement*, Dec. 4/CMA.6, U.N. Doc. FCCC/PA/CMA/2024/17/Add.1 (Nov. 24, 2024).

¹⁶ MARTIN CAMES ET AL., HOW ADDITIONAL IS THE CLEAN DEVELOPMENT MECHANISM? ANALYSIS OF THE APPLICATION OF CURRENT TOOLS AND PROPOSED ALTERNATIVES 11 (Öko-Inst., Study Prepared for DG CLIMA, Rep. No. CLIMA.B.3/SERI/2013/0026, 2016), https://climate.ec.europa.eu/system/files/2017-04/clean_dev_mechanism_en.pdf.

¹⁷ Cames et al., *supra* note 16, at 11.

¹⁸ CONFERENCE OF THE PARTIES SERVING AS THE MEETING OF THE PARTIES TO THE PARIS AGREEMENT [CMA], *Rules, Modalities and Procedures for the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, Dec. 3/CMA.3, U.N. Doc. FCCC/PA/CMA/2021/10/Add.1 (Nov. 13, 2021), annex ¶¶ 32-38.

E. Incomplete National Implementation

International frameworks set out broad concepts; their application is carried out through diverse national legal systems. Differences in regulation, institutional capability, political priorities and resources, especially in low-income countries, produce a fragmented picture that limits cross-border trade and reduces legal certainty.¹⁹ The problem is structural rather than incidental, since the Paris Agreement is built on nationally determined contributions and therefore on national discretion.²⁰

F. The Operational Complexity of Article 6

The Article 6 rulebook now contains reasonably robust integrity and accounting rules, but full operationalisation is still in progress. The difficulties include high administrative cost, questions of equity for developing countries, the development of registries and the maintenance of high-quality procedures. Progress has been steady. The rules of the Article 6.4 mechanism were adopted at Glasgow in 2021,²¹ the standards for methodologies and for removals were approved at Baku in 2024,²² and further guidance followed in 2025.²³ Building a genuinely integrated market, however, takes time.

The Kyoto Protocol and the Paris Agreement have therefore laid the legal groundwork for international carbon markets, but their effectiveness is constrained by weak enforcement, gaps in transparency and accountability, and scattered implementation across national legal systems. These flaws threaten both the environmental integrity and the economic efficiency of carbon markets and reduce their capacity to deliver meaningful, cost-effective reductions. Strengthening compliance, harmonising domestic implementation and improving transparency are accordingly essential if international carbon market governance is to work as intended.

¹⁹ Bo Chen, Kang Yuan & Xuwu Wen, *The Legal Governance of the Carbon Market: Challenges and Application of Private Law in China*, 15 CARBON MGMT., no. 1, 2024, at 1, 3, <https://doi.org/10.1080/17583004.2023.2288591>.

²⁰ Paris Agreement, *supra* note 2, art. 4.2.

²¹ Dec. 3/CMA.3, *supra* note 18.

²² CMA, *Guidance on the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, Dec. 5/CMA.6, U.N. Doc. FCCC/PA/CMA/2024/17/Add.1 (Nov. 11, 2024); CMA, *Further Guidance on the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, Dec. 6/CMA.6, U.N. Doc. FCCC/PA/CMA/2024/17/Add.1 (Nov. 24, 2024).

²³ CMA, *Implementation of the Guidance on Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement*, Dec. 19/CMA.7 (2025); CMA, *Further Guidance for the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, Dec. 20/CMA.7 (2025).

III. BALANCING ECONOMIC EFFICIENCY WITH ENVIRONMENTAL PROTECTION

The legal framework governing carbon markets seeks to reconcile economic efficiency with environmental protection by using market mechanisms to achieve emission reductions at the lowest available cost, while embedding safeguards intended to ensure that those reductions are real, additional and verifiable. This hybrid approach is visible in the Kyoto Protocol and, more clearly still, in Article 6 of the Paris Agreement.²⁴

A. The Economic Efficiency Rationale

Countries and firms that can reduce emissions cheaply are able to reduce more and to sell the resulting credits to those facing higher abatement costs. Emissions trading systems, the Clean Development Mechanism and internationally transferred mitigation outcomes under Article 6.2 all make this possible.²⁵ The World Bank has estimated that cooperative implementation of this kind could substantially reduce the aggregate cost of meeting nationally determined contributions, or in the alternative allow greater mitigation for the same expenditure.²⁶

This flexibility lowers the overall economic burden of meeting climate targets, mobilises private investment in low-carbon technology, and encourages innovation and the efficient allocation of resources by attaching a financial value to emission reductions.²⁷ Empirical work on established carbon markets suggests that the price signal does influence energy conservation and emission reduction at the regional level, although the size of the effect varies with market design.²⁸ Carbon pricing instruments now cover a substantial share of global emissions and raise significant public revenue, which gives some indication of how far the model has been adopted.²⁹

B. Environmental Safeguards

Against this efficiency rationale the framework sets a series of legal and procedural safeguards. Corresponding adjustments are the first. Where a mitigation outcome is transferred internationally, the transferring country must adjust its emissions accounting so that the

²⁴ Paris Agreement, *supra* note 2, art. 6.

²⁵ Paris Agreement, *supra* note 2, art. 6.2 (providing for the use of internationally transferred mitigation outcomes towards nationally determined contributions).

²⁶ WORLD BANK, *supra* note 5, at 1.

²⁷ Jingbo Sun, *Legal Regulations and Economic Impacts in Carbon Emission Trading Systems*, 12 OPEN J. SOC. SCI. 215, 217 (2024), <https://doi.org/10.4236/jss.2024.1210017>.

²⁸ Guangtong Gu et al., *Does Carbon Financial Market as an Environmental Regulation Policy Tool Promote Regional Energy Conservation and Emission Reduction? Empirical Evidence from China*, 163 ENERGY POL'Y 112826 (2022), <https://doi.org/10.1016/j.enpol.2022.112826>.

²⁹ WORLD BANK, STATE AND TRENDS OF CARBON PRICING 2025 (2025).

reduction is counted only once.³⁰ This prevents double counting and ensures that a traded reduction is credited once only in the global total.

Additionality is the second. A project must demonstrate that its reductions go beyond what would have occurred under a business-as-usual scenario, so that the market incentive is the operative cause of the reduction rather than an incidental benefit.³¹

Monitoring, reporting and verification is the third. Robust systems provide transparency, track actual outcomes and verify compliance with the applicable standards.³²

Finally, Article 6 ties carbon trading to sustainable development, environmental integrity and increased ambition, and requires the mechanism established under Article 6.4 to deliver an overall mitigation in global emissions rather than a simple offset.³³ The Paris Agreement Crediting Mechanism established under that provision builds on the experience of the CDM through stricter oversight, tighter methodologies and a supervisory body.³⁴

C. Tensions and Ongoing Reform

Despite these safeguards, an inherent tension remains. Pressure to widen participation and to keep compliance costs low can result in weak project quality, over-crediting or insufficient oversight. The historical difficulties of the CDM, particularly on additionality, and more recent scrutiny of the voluntary market have shown that overly flexible rules can compromise environmental outcomes.³⁵

The response has been a steady tightening of the rules. The Article 6 rulebook agreed at Glasgow and refined at Baku and in the sessions that followed has strengthened accounting standards, transparency requirements, baseline conservatism and supervisory arrangements.³⁶ Implementation continues, with emphasis on national capacity building and on the quality of methodologies.³⁷

Whether the framework can hold economic efficiency and environmental protection together depends in the end on rigorous enforcement, continuous improvement of standards, transparent implementation at both levels of governance, and adaptive governance that prefers high-

³⁰ Dec. 2/CMA.3, *supra* note 14, annex ¶¶ 6-8.

³¹ Dec. 3/CMA.3, *supra* note 18, annex ¶¶ 32-38.

³² Dec. 18/CMA.1, *supra* note 6.

³³ Paris Agreement, *supra* note 2, arts. 6.1, 6.4(a)-(d).

³⁴ Dec. 3/CMA.3, *supra* note 18.

³⁵ Cames et al., *supra* note 16; Thales A. P. West et al., *Action Needed to Make Carbon Offsets from Forest Conservation Work for Climate Change Mitigation*, 381 SCIENCE 873 (2023), <https://doi.org/10.1126/science.ade3535>.

³⁶ Dec. 3/CMA.3, *supra* note 18; Dec. 5/CMA.6 & Dec. 6/CMA.6, *supra* note 22.

³⁷ Dec. 19/CMA.7 & Dec. 20/CMA.7, *supra* note 23.

integrity outcomes to high volumes. Where the design is sound, the framework can deliver economic benefit and real climate progress at once; where the safeguards weaken, it risks losing both trust and environmental effect.

IV. PHANTOM CREDITS, OVER-CREDITING AND THE LEGITIMACY OF CARBON MARKETS

Phantom credits, meaning credits issued for reductions that did not occur or that were not additional, and over-crediting, meaning the award of more credits than the reductions actually achieved, present a fundamental challenge to the legal legitimacy, environmental credibility and functional integrity of international carbon markets. Both arise chiefly from weaknesses in monitoring, verification, additionality testing and accounting within the frameworks established under the Kyoto Protocol, particularly the CDM, and under Article 6 of the Paris Agreement.³⁸

A. Undermining Environmental Integrity

The core legal purpose of a carbon market is to ensure that each credit represents a real, measurable and additional reduction in greenhouse gas emissions. Phantom credits and over-crediting defeat that purpose by creating units that deliver no genuine mitigation. Recent empirical work on forest conservation offsets illustrates the scale of the problem: an assessment published in *Science* found that most of the reductions claimed by the projects it examined were not borne out when measured against a properly constructed counterfactual.³⁹ Practices of this kind cut directly against the environmental integrity requirement that runs through Article 6, and allow global emissions to continue or even to rise while compliance appears to have been met on paper.

B. Distortion of Market Function

Carbon markets rest on the assumption that one credit equals one tonne of carbon dioxide reduced or removed. Phantom and over-credited units break that equivalence. They inflate the supply of credits, depress the carbon price artificially, and encourage reliance on cheap but low-quality units in place of genuine decarbonisation.⁴⁰ States and companies can then meet their obligations on paper without achieving real reductions, which defeats the cost-efficiency rationale on which the whole system is built.

³⁸ Cames et al., *supra* note 16.

³⁹ West et al., *supra* note 35.

⁴⁰ Ariadna Dumitrescu & Carmen Ansotegui, *Unlocking the Potential of Carbon Markets: Challenges and Opportunities*, ESADE DO BETTER (Nov. 8, 2024), <https://dobetter.esade.edu/en/carbon-markets>.

C. Legal Weaknesses in Verification and Additionality

These problems arise from structural limitations in international carbon governance rather than from isolated failures of administration. Additionality testing under the CDM was weak, and allowed credits to be issued to projects that were already economically viable.⁴¹ MRV systems have been applied inconsistently across jurisdictions.⁴² There is no strong centralised enforcement authority, and reliance falls instead on national implementation. Article 6 has introduced reforms, notably corresponding adjustments and stricter accounting rules,⁴³ but enforcement still depends heavily on domestic capacity, which leaves significant regulatory gaps.

D. Double Counting and Accounting Manipulation

Phantom credits frequently contribute to the risk of double counting, where the host country counts a reduction towards its own nationally determined contribution while the purchasing country also claims it.⁴⁴ The effect is inflated global climate progress on paper while atmospheric concentrations remain unchanged. The corresponding adjustment requirement is designed precisely to prevent this, but it operates only where the outcome has been authorised for international transfer, and its integrity depends on the accuracy of the underlying national inventories.⁴⁵

E. Erosion of Trust and Market Legitimacy

The most damaging long-term consequence is the loss of confidence among those on whom the market depends. When credits are perceived as unreliable, investor and corporate participation falls, states become reluctant to rely on international trading to meet their contributions, private engagement weakens, and the credibility of international climate agreements as a whole is called into question.⁴⁶ Civil society reporting and independent assessment have repeatedly raised concerns of this kind, including in relation to the first wave of credits issued under Article 6 arrangements.⁴⁷

⁴¹ Cames et al., *supra* note 16, at 11.

⁴² Dec. 18/CMA.1, *supra* note 6.

⁴³ Dec. 2/CMA.3, *supra* note 14.

⁴⁴ Paris Agreement, *supra* note 2, art. 6.2 (requiring robust accounting to ensure the avoidance of double counting); *see also id.* art. 4.2.

⁴⁵ Dec. 2/CMA.3, *supra* note 14, annex ¶¶ 6-8.

⁴⁶ Eric Usher, *Road to COP30: UN-Regulated Carbon Market, the Risks and Opportunities for Financial Institutions*, U.N. ENV'T PROGRAMME FIN. INITIATIVE (Nov. 12, 2025), <https://www.unepfi.org/themes/climate-change/road-to-cop30-un-regulated-carbon-market-the-risks-and-opportunities-for-financial-institutions/>.

⁴⁷ Isa Mulder, *First Wave of Article 6 Carbon Credits Misfire Spectacularly*, CARBON MKT. WATCH (Apr. 10, 2025), <https://carbonmarketwatch.org/2025/04/10/first-wave-of-article-6-carbon-credits-misfire-spectacularly/>.

F. Broader Legal and Governance Implications

Phantom credits and over-crediting expose deeper structural features of international environmental law: heavy dependence on self-reporting and voluntary compliance, fragmented governance between international rules and national enforcement, and the absence of a global regulatory authority with power to verify and to sanction.⁴⁸ Questions of registry design and of the legal characterisation of the credit itself, whether as a form of property or as a mere accounting entitlement, add a further layer of uncertainty.⁴⁹ Carbon markets consequently function less as fully enforceable legal regimes than as decentralised, hybrid regulatory systems. These difficulties expose the gap between the aspirational design of carbon markets and their practical operation. Strengthening additionality testing, improving MRV systems, developing centralised oversight and aligning international standards with national capacity are all necessary if legitimacy is to be restored and carbon markets are to contribute meaningfully to climate goals.

V. CONCLUSION

The international legal framework governing carbon markets is a sophisticated attempt to reconcile economic efficiency with environmental sustainability through flexible, market-based mechanisms. The Kyoto Protocol and the Paris Agreement, and Article 6 in particular, have established a global architecture for carbon trading that rewards cost-effective mitigation and encourages cooperation between states.⁵⁰

The effectiveness and legitimacy of that system continue, however, to be undermined by legal and institutional weaknesses. Weak enforcement, gaps in transparency and verification, and fragmented integration with national legal systems limit the capacity of the framework to deliver genuine environmental outcomes.⁵¹ Phantom credits, over-crediting, double counting and additionality failures erode trust further, because they allow apparent compliance without corresponding reductions in greenhouse gas emissions.⁵²

Carbon markets remain a valuable instrument of global climate governance, but their success depends on reform. Strengthening legal accountability, improving transparency and MRV,

⁴⁸ Paris Agreement, *supra* note 2, art. 15(2); Dec. 20/CMA.1, *supra* note 11.

⁴⁹ Juan Didier Pierre, Reeshabh Shayan Tupsee & Zakiyyah Bibi Azraa Mungroo, *Legal Implications of Control-Based Versus Ownership-Based Frameworks in Carbon Market Registries: A Case Study of the Article 6.4 Mechanism Under the Paris Agreement* (Apr. 7, 2025) (submission to the Article 6.4 Supervisory Body in response to its 2025 call for input on ownership of account holdings in the Article 6.4 mechanism registry), https://unfccc.int/sites/default/files/resource/20250407_Pierre_Tupsee_Mungroo.pdf.

⁵⁰ Paris Agreement, *supra* note 2, art. 6.

⁵¹ Asadnabizadeh & Moe, *supra* note 7.

⁵² Cames et al., *supra* note 16; West et al., *supra* note 35.

harmonising international standards with domestic implementation and securing robust environmental integrity safeguards are all necessary. Without them the balance between economic efficiency and environmental protection cannot be struck, and carbon markets will not contribute credibly to long-term climate goals.

VI. BIBLIOGRAPHY

Treaties

1. Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 162.
2. Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104, 3156 U.N.T.S. 79.
3. United Nations Framework Convention on Climate Change, May 9, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107.

Decisions of the Conference of the Parties

4. CMA, *Guidance on Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement*, Dec. 2/CMA.3, U.N. Doc. FCCC/PA/CMA/2021/10/Add.1 (Nov. 13, 2021).
5. CMA, *Rules, Modalities and Procedures for the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, Dec. 3/CMA.3, U.N. Doc. FCCC/PA/CMA/2021/10/Add.1 (Nov. 13, 2021).
6. CMA, *Modalities, Procedures and Guidelines for the Transparency Framework for Action and Support Referred to in Article 13 of the Paris Agreement*, Dec. 18/CMA.1, U.N. Doc. FCCC/PA/CMA/2018/3/Add.2 (Dec. 15, 2018).
7. CMA, *Modalities and Procedures for the Effective Operation of the Committee to Facilitate Implementation and Promote Compliance*, Dec. 20/CMA.1, U.N. Doc. FCCC/PA/CMA/2018/3/Add.2 (Dec. 15, 2018).
8. CMA, *Matters Relating to Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement*, Dec. 4/CMA.6, U.N. Doc. FCCC/PA/CMA/2024/17/Add.1 (Nov. 24, 2024).
9. CMA, *Guidance on the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, Dec. 5/CMA.6, U.N. Doc. FCCC/PA/CMA/2024/17/Add.1 (Nov. 11, 2024); CMA, *Further Guidance on the Mechanism Established by Article 6, Paragraph 4, of the*

- Paris Agreement*, Dec. 6/CMA.6, U.N. Doc. FCCC/PA/CMA/2024/17/Add.1 (Nov. 24, 2024).
10. CMA, *Implementation of the Guidance on Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement*, Dec. 19/CMA.7 (2025); CMA, *Further Guidance for the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, Dec. 20/CMA.7 (2025).
 11. CONFERENCE OF THE PARTIES SERVING AS THE MEETING OF THE PARTIES TO THE KYOTO PROTOCOL, *Procedures and Mechanisms Relating to Compliance Under the Kyoto Protocol*, Dec. 27/CMP.1, U.N. Doc. FCCC/KP/CMP/2005/8/Add.3 (Mar. 30, 2006).

Books and Reports

12. MARTIN CAMES ET AL., *HOW ADDITIONAL IS THE CLEAN DEVELOPMENT MECHANISM? ANALYSIS OF THE APPLICATION OF CURRENT TOOLS AND PROPOSED ALTERNATIVES* (Öko-Inst., Study Prepared for DG CLIMA, Rep. No. CLIMA.B.3/SERI/2013/0026, 2016), https://climate.ec.europa.eu/system/files/2017-04/clean_dev_mechanism_en.pdf.
13. WORLD BANK, *THE ECONOMIC POTENTIAL OF ARTICLE 6 OF THE PARIS AGREEMENT AND IMPLEMENTATION CHALLENGES* (2019), <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/215681585753172514/the-economic-potential-of-article-6-of-the-paris-agreement-and-implementation-challenges>.
14. WORLD BANK, *STATE AND TRENDS OF CARBON PRICING 2025* (2025).

Journal Articles

15. Majid Asadnabizadeh & Espen Moe, *A Review of Global Carbon Markets from Kyoto to Paris and Beyond: The Persistent Failure of Implementation*, 12 FRONTIERS ENV'T SCI. 1368105 (2024), <https://doi.org/10.3389/fenvs.2024.1368105>.
16. Bo Chen, Kang Yuan & Xuwu Wen, *The Legal Governance of the Carbon Market: Challenges and Application of Private Law in China*, 15 CARBON MGMT., no. 1, 2024, at 1, <https://doi.org/10.1080/17583004.2023.2288591>.
17. Guangtong Gu et al., *Does Carbon Financial Market as an Environmental Regulation Policy Tool Promote Regional Energy Conservation and Emission Reduction? Empirical Evidence from China*, 163 ENERGY POL'Y 112826 (2022), <https://doi.org/10.1016/j.enpol.2022.112826>.

18. Jingbo Sun, *Legal Regulations and Economic Impacts in Carbon Emission Trading Systems*, 12 OPEN J. SOC. SCI. 215 (2024), <https://doi.org/10.4236/jss.2024.1210017>.
19. Thales A. P. West et al., *Action Needed to Make Carbon Offsets from Forest Conservation Work for Climate Change Mitigation*, 381 SCIENCE 873 (2023), <https://doi.org/10.1126/science.ade3535>.

Other Sources

20. Article 6: Cooperative Approaches, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-paris-agreement/article-6> (last visited Sept. 9, 2026).
21. Clean Development Mechanism, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism> (last visited Sept. 9, 2026).
22. Ariadna Dumitrescu & Carmen Ansotegui, *Unlocking the Potential of Carbon Markets: Challenges and Opportunities*, ESADE DO BETTER (Nov. 8, 2024), <https://dobetter.esade.edu/en/carbon-markets>.
23. Isa Mulder, *First Wave of Article 6 Carbon Credits Misfire Spectacularly*, CARBON MKT. WATCH (Apr. 10, 2025), <https://carbonmarketwatch.org/2025/04/10/first-wave-of-article-6-carbon-credits-misfire-spectacularly/>.
24. Juan Didier Pierre, Reeshabh Shayan Tupsee & Zakiyyah Bibi Azraa Mungroo, *Legal Implications of Control-Based Versus Ownership-Based Frameworks in Carbon Market Registries: A Case Study of the Article 6.4 Mechanism Under the Paris Agreement* (Apr. 7, 2025) (submission to the Article 6.4 Supervisory Body in response to its 2025 call for input on ownership of account holdings in the Article 6.4 mechanism registry), https://unfccc.int/sites/default/files/resource/20250407_Pierre_Tupsee_Mungroo.pdf.
25. Eric Usher, *Road to COP30: UN-Regulated Carbon Market, the Risks and Opportunities for Financial Institutions*, U.N. ENV'T PROGRAMME FIN. INITIATIVE (Nov. 12, 2025), <https://www.unepfi.org/themes/climate-change/road-to-cop30-un-regulated-carbon-market-the-risks-and-opportunities-for-financial-institutions/>.
