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Unlocking Climate Finance

Key Pillars for Robust Carbon Market Design in Amazonian Countries

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ABSTRACT*

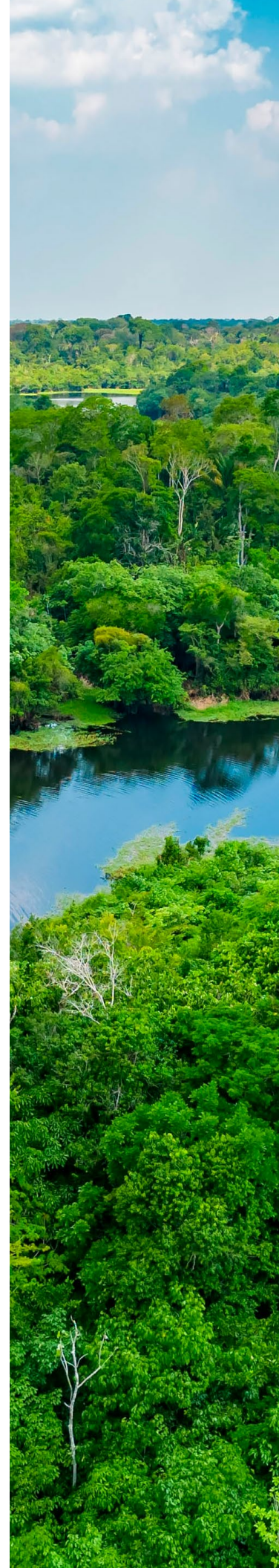
This technical note provides a comprehensive framework for developing effective carbon markets in the countries in the Amazon region, aiming to support greenhouse gas mitigation and mobilize climate finance. It highlights the Amazon's unique potential to supply high-quality nature-based carbon credits, which can attract investment and deliver broader benefits to local communities. The note identifies three essential pillars for robust carbon markets: (i) legal certainty in the definition and treatment of carbon credits, (ii) resilient market infrastructure—including registries, exchanges, and data security—and (iii) standardization of contractual arrangements to reduce complexity and transaction costs. It discusses both voluntary and compliance carbon markets, the role of the Paris Agreement's Article 6, and the importance of aligning domestic and international systems. Key challenges addressed include market fragmentation, inconsistent standards, technical capacity gaps, and the need for harmonized governance. The note does not advocate for a regional Amazon carbon market but offers options for policymakers to strengthen domestic frameworks and foster regional collaboration.

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ABBREVIATIONS

GHG greenhouse gas

VCM voluntary carbon market

CCM compliance credit market

ITMO internationally transferred mitigation outcomes

A6.4ER emission reduction under Article 6.4 of the Paris Agreement

ETS emissions trading system

EU ETS European Union Emissions Trading System

UNFCCC United Nations Framework Convention on Climate Change

NDC Nationally Determined Contribution

ISDA International Swaps and Derivatives Association

ICVCM Integrity Council for the Voluntary Carbon Market

MDB multilateral development bank



1 INTRODUCTION AND CONTEXT

This paper is a technical discussion guide intended to inform and support the development of well-functioning carbon markets as an effective tool for greenhouse gas mitigation with the potential to mobilize climate finance in the countries of the Amazon region (or Amazonia).¹ It provides a reference framework for policymakers, regulators, and other stakeholders that, by promoting consistency in solid design choices across the Amazon region, supports the development of robust and efficient systems that underpin credible mitigation outcomes and create the conditions to increase potential investment into Amazonia. This paper does not advocate for nor suggest the creation of a regional Amazon carbon market but rather indicates three pillars that countries in the Amazon region may consider in the design of carbon markets as part of their policy mix and to leverage climate finance. Amazon countries are especially relevant to this discussion, because they have the potential to be large suppliers of nature-based carbon credits and thus, potentially, to leverage climate finance to the region.

In Brazil alone, the Amazon rainforest is estimated to generate over US\$300 billion annually in economic value for local populations, while its global ecosystem services—driven by its role as a critical global carbon sink—are valued at over US\$200 billion per year (World Bank, 2024a). Given its potential to supply nature-based carbon credits that meet high environmental standards, Amazonia would benefit from establishing well-designed carbon markets—maximizing opportunities to transact high-quality, reliable carbon credits and scale climate finance, generating broader benefits for communities across the region.

Recognizing that Amazonia can have a critical role in climate change mitigation, this paper examines foundational elements needed for establishing and developing carbon markets that inspire confidence and deliver high-integrity outcomes across the region. Several key considerations influence the design and effectiveness of carbon markets—including institutional and regulatory frameworks, crediting methodologies, mechanisms for tracking the transfer of carbon units, and the alignment between domestic and international market systems—and will also define the quality of the carbon credits originated in that given market. For countries that have integrated carbon markets into their climate strategies, these design choices can directly affect their ability to meet their climate goals and shape how public and private stakeholders

¹ The term “Amazonia” follows the regional definition used by the Amazon Network of Georeferenced Socio-Environmental Information (RAISG), encompassing Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, and Venezuela. See RAISG, <https://www.raisg.org/en/>.

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engage in carbon market activities. Hence, three pillars—legal characterization of carbon credits, development of market infrastructure, and standardization of contractual arrangements—emerge as essential for establishing a robust carbon market. Each pillar presents distinct legal and practical challenges; together they, in particular, shape how carbon credits are defined, transacted, and trusted.

Effectively addressing these pillars is essential to fostering transparent, efficient, and credible carbon markets that would support Amazonia in achieving its climate mitigation objectives and channeling public and private finance into high-integrity mitigation activities. Therefore, rather than prescribing a single model, this paper highlights key considerations and options to support informed decision making and regional collaboration in advancing the implementation of carbon markets. It focuses its analysis on each of these pillars in depth.

Finally, this paper does not provide an in-depth assessment of issues related to distributive equity, land and carbon tenure conflicts, institutional asymmetries, or social and community safeguards. Nor does it focus on the requirements for the environmental assessment (and related questions) pertinent to high-integrity, high-quality carbon credit instruments. Though these considerations are critically important, they fall outside the scope of this paper and may be addressed in complementary Technical Notes.

1.1 Carbon Credits

Carbon credits are instruments which may represent the reduction, or removal² of greenhouse gases (GHG) from the atmosphere by natural or technological processes.³ In some regulatory schemes, carbon credits may also be issued in the form of allowances or permits to emit a specified quantity of GHGs, typically obtained from a government or regulatory entity. These tradable instruments allow market participants to claim reduced or removed GHG or otherwise emit them. By purchasing these credits, buyers can then, as applicable, retire or surrender the credits toward their climate change mitigation or other sustainability goals.

2 Reduction refers to actions that decrease the number of GHG emissions compared to previous practices, while avoidance refers to actions that prevent activities that would otherwise have led to the emission of GHGs. Removal relates to the extraction and sequestering of GHGs.

3 While emission avoidance is commonly used in the broader carbon markets context, it is not currently eligible under the rules adopted for Article 6 of the Paris Agreement (discussed in further detail herein). This may be subject to further consideration in the future (UNFCCC, 2024c).

1.2 Carbon Markets

Carbon markets constitute a complex and fragmented system where various types of carbon credits, created through different mechanisms, are traded across diverse markets. These markets can function at international, regional, national, or subnational levels, whether they are tied to the Paris Agreement Article 6 framework (discussed further in section 1.3). Carbon markets are generally categorized into two types: voluntary carbon markets (VCMs) and compliance carbon markets (CCMs), although these types are, in some jurisdictions, merging into single carbon markets, particularly with increased Article 6–related activity.

(a) Voluntary Carbon Markets

These markets allow participants to voluntarily offset their GHG emissions. They are decentralized, and participants may turn to them seeking to drive sustainable business practices or achieve other corporate social responsibility goals. In essence, they are a market-driven approach that is contributing to climate protection efforts through the creation, trading, and retirement of voluntary carbon credit instruments.

Voluntary carbon credits are generated or created through the verification and evaluation process of mitigation activities which can be individual projects or groups of projects framed under a program.⁴ Project developers, sitting upstream in the VCM, identify and initiate mitigation projects or activities focused on the reduction, avoidance, or removal of GHGs. These projects can range from large-scale carbon storage projects to projects focused on the natural environment. Once a mitigation project or activity has been identified, project developers produce a project plan, outlining and assessing baseline emissions as well as projected reductions, avoidances, or removals. Third-party verifiers then assess these projects, using appropriate methodologies published by standard setters, to confirm the required level of reduction, avoidance, or removal of GHG emissions. If the requirements of these standards are satisfied for a mitigation project or activity, voluntary carbon credits are created and recorded in the account of the project developer or sponsor at the applicable registry.

This process is not exclusive to voluntary carbon credits. It also tracks for the process of generating units under Article 6 of the Paris Agreement, as further outlined in Section 1.3. In addition to undergoing an authorization process, internationally transferred mitigation outcomes (ITMOs) under Article 6.2—including emissions reductions under Article 6.4 (A6.4ERs) where expressly authorized as such (discussed in further detail in Section 1.3)—are tied to an underlying mitigation project or activity, with project developers subject to monitoring, verification, and examination requirements in respect of that project or activity.

⁴ Throughout this paper, unless otherwise specified, references to “projects” should be understood to refer to mitigation activities implemented both as stand-alone projects and as groups of projects under a given program.

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The relevance of VCMs to the development of Article 6 markets should not be overlooked. VCMs act as use cases for investment demand in climate financing and carbon products more broadly. The demand that has grown within VCMs over the past decade (McKinsey, 2021) acts as an indicator of the motivation in the investor base that now exists, particularly at a corporate level, to further drive demand into Article 6 markets and to direct climate finance toward strategic sectors.

(b) Compliance Carbon Markets

CCMs are established in response to international, regional, national, or subnational policies or regulatory mandates. CCMs are formed through mechanisms that share three key characteristics: (i) oversight by government or regulatory bodies, (ii) restrictions on GHG emissions for in-scope entities, and (iii) the use of carbon credits, permits, or allowances to meet these restrictions. Government-regulated CCMs operate under legally binding rules to enforce emission reductions. These markets mainly take two forms:

- ▶ **Cap-and-trade systems:** Governments set a total cap on permissible GHG emissions and issue or otherwise make available tradable permits or allowances. Entities must hold one permit for each tonne of GHG emitted and can trade permits to stay within the cap.⁵ The price of carbon is influenced by the demand and supply of permits. Examples include the EU Emissions Trading System (EU ETS) and Brazil's Greenhouse Gas Emissions Trading System (SBCE), the latter of which has been established by law and is in the process of being implemented.
- ▶ **Baseline-and-credit systems:** Entities reduce emissions below a set baseline to earn credits, which can be traded with entities that need them to offset their own excess emissions. An example is Canada's "output-based pricing system" at both provincial and federal levels, under which market participants are required to adhere to an annual emissions limit that is based on their emissions and determines their baseline.

⁵ The emissions cap is often adjusted over time, typically declining in accordance with climate targets. This trajectory is intended to steadily reduce total emissions and foster ongoing mitigation efforts.

1.3 The Paris Agreement, Nationally Determined Contributions, and Article 6 Mechanisms

The 2015 Paris Agreement, an international climate accord adopted in December 2015 by nations within the United Nations Framework Convention on Climate Change (UNFCCC), is a multilateral agreement aimed at limiting global temperature rise below 2 degrees Celsius above pre-Industrial levels, with efforts directed toward capping it at 1.5 degrees Celsius. The Paris Agreement sets out provisions for cooperation among nations on mitigating climate change.

Nationally Determined Contributions (NDCs) are commitments by signatories to the Paris Agreement to reduce national GHG emissions and to initiate their own adaptation efforts to climate change. These commitments are expected to be progressively strengthened over time and are central to the long-term goals of the Paris Agreement. Signatories are expected to use both non-market and market-based commitments to achieve their NDC goals, which include establishing and engaging in carbon markets as a potential tool for meeting their NDC commitments.

A framework for international market-based cooperation has been established under Article 6 of the Paris Agreement, introducing mechanisms for international collaboration to achieve climate goals through both markets (under Articles 6.2 and 6.4) and non-market approaches. This cooperation allows units issued under Article 6 to be traded or exported from one signatory nation to another to fulfil that importing signatory's NDC targets. Under this structure, carbon credits may be earned through the reduction or removal of emissions, and countries are enabled to transfer carbon credits.

Article 6.2 of the Paris Agreement enables countries to achieve their NDCs through bilateral or plurilateral cooperation agreements for trading ITMOs (White & Case LLP, 2024). These agreements facilitate direct trading of emission reductions or removals, allowing host countries to sell units representing emission reductions or removals in exchange for investments, capacity-building assistance, and access to advanced technology. The buyer countries use these ITMOs to meet their climate targets more cost-effectively. Implementation has led to the creation of a Centralized Accounting and Reporting Platform for transparency and accurate tracking, with an aim to preventing double counting.⁶ Standardized measurement, reporting, and verification procedures enhance market efficiency, ensuring environmental integrity and contributing to sustainable development goals. Many cooperative approaches under Article 6.2 involve ITMOs through bilateral or plurilateral arrangements known as “cooperative approaches.” These approaches are intended to facilitate the transfer of one country's GHG emissions reductions or removals to other countries seeking to use those reductions or removals. Additionally, linking emissions trading systems (ETs) between countries is another form of cooperation. For example, the existing link between the EU ETS and Switzerland's ETS will use Article 6 to manage the flow of allowances between the systems (White & Case LLP, 2023). Importantly, ITMOs are not limited to NDC compliance use.

⁶ See *Centralized Accounting and Reporting Platform (CARP)*, UNFCCC, <https://unfccc.int/process-and-meetings/the-paris-agreement/cooperative-implementation/carp>.

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Under Article 6, parties may authorize ITMOs for other international mitigation purposes, such as under the Carbon Offsetting and Reduction Scheme for International Aviation or for VCM transactions (UNFCCC, 2024b).

Article 6.4 establishes a UNFCCC centralized international carbon crediting mechanism known as the Paris Agreement Crediting Mechanism (otherwise known as the Article 6.4 Mechanism), where countries can generate carbon credits from emission reduction and removal projects under supervision. This mechanism offers a more structured approach than Article 6.2, ensuring that A6.4ERs are validated, verified, and issued according to the established framework. These A6.4ERs can be transferred to fulfill NDCs, with the host country's authorization.⁷

1.4 In-Scope Carbon Markets

In the evolving landscape of carbon markets in Amazonia, carbon market frameworks require assessment both at a domestic level and on a cross-border basis, including in the context of their alignment with Article 6 of the Paris Agreement. Article 6 may serve as a policy tool to support Amazonia in achieving individual NDCs as well as maximizing the potential of the region's domestic resources for carbon market development. Leveraging Article 6 units, such as A6.4ERs, may also build trust in the reliability and integrity of carbon markets as well as their interoperability. Equally, lessons learned from global market-based trading schemes, such as the Carbon Offsetting and Reduction Scheme for International Aviation, for example, which relies on implementation and enforcement at a national level, highlight the importance of international and domestic carbon market alignment. These principles will inform part of the discussion of the following sections of this paper.

1.5 Key Challenges in Market Development and Design Frameworks

There are many factors for policymakers, regulators, and stakeholders to consider when designing and implementing the infrastructure to support a well-functioning carbon market. Our review of these considerations is organized into three interrelated pillars: the legal characterization of carbon credits, the development of market infrastructure, and the standardization of contractual arrangements.

⁷ Once a host country authorizes the use of A6.4ERs for Nationally Determined Contribution or other international mitigation purposes, adjustments are triggered to the host country's emissions balance to reflect a transfer and to prevent double counting. By contrast, without authorization, the carbon credits remain with the originating country, are referred to as Mitigation Contribution Units, and benefit the originating country. These carbon credits do not require corresponding adjustments. A host country may authorize a Mitigation Contribution Unit at a later stage, converting it into an A6.4ER. See UNFCCC (2024a), *Further Guidance on the Mechanism Established by Article 6, Paragraph 4, of the Paris Agreement*, UN Doc. DT.DD.CMA6.i15b.2 (Nov. 18, 2024), <https://unfccc.int/documents/643925>.

(a) Pillar 1. Legal Nature of Carbon Credits

The legal characterization or “legal nature” of the different types of carbon credits refers to the ways in which such credits are defined, classified, and treated under domestic legal systems. These definitions remain unclear in many jurisdictions, resulting in a lack of legal certainty surrounding the treatment of carbon credits. At a foundational level, there is a need to clarify whether carbon credits should, for example, constitute intangible property, a bundle of contractual rights, tradable licenses or permits, or a distinct category altogether. This legal characterization has far-reaching implications for ownership, transferability, granting and taking security, and insolvency treatment, among others. In the absence of legal certainty, carbon markets risk being ineffective, underused, and counterproductive in supporting climate objectives. Establishing a clear and coherent legal framework for carbon credits—anchored in the well-defined legal nature of each relevant type of carbon credit—is important to supporting the development of scalable, well-regulated, and funded carbon markets and to ensuring their integrity.

(b) Pillar 2. Carbon Market Infrastructure

The effective operation of carbon markets also depends on the development of a robust market infrastructure: the institutional, technical, and procedural systems that enable the issuance, tracking, transfer, and, as applicable, surrender or retirement of carbon credits, as well as the oversight of underlying mitigation activities.

Ensuring environmental integrity in carbon markets is essential. Ambiguous methodology and validation protocols, uncertainty around rights relating to carbon benefits, and insufficient transparency and weak quality controls surrounding carbon credits invite disputes and fraud, compromise credibility, and deter investment.

Core operational components such as registries, custodial arrangements, exchanges, and trading platforms are critical for proper accounting and memorialization of transactions. However, these components may be affected by inconsistent systems and structures, lack of oversight, and insufficient security measures. At the same time, there may be opportunities to leverage existing infrastructure, including local, regional, and global exchanges.

Market fragmentation remains a significant challenge. The proliferation of registries, standards, and verification methodologies, and decentralized governance models may create market inefficiencies by complicating credit quality assessment and generating inconsistent terminology and stakeholder roles, respectively. Disparities in technical capacity and institutional readiness can widen market gaps. Financial constraints compound these challenges, because restricted access to early-stage funding limits participation in carbon markets in developing countries.

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Critical policy and design choices must be made to ensure that these systems are both responsive to market needs and appropriate to a jurisdiction's unique capacities. At the domestic level, policymakers face the challenge of designing and/or regulating market systems that balance responding to domestic needs and capabilities with international considerations; otherwise, fragmentation in market designs can occur. The absence of cohesive, internationally compatible legislative frameworks can result in legal uncertainty and limits the potential of domestic markets.

These challenges are amplified at the international level, where limited cross-border credit recognition and misalignment between domestic legal frameworks and global standards can undermine market integration and hinder interoperability.

(c) **Pillar 3. Contract Standardization**

A final challenge to the development of well-functioning carbon markets addressed in this paper is the lack of contract standardization. The preceding pillars highlight the fragmented nature of carbon markets. This fragmentation is, in turn, mirrored in the contractual landscape, where agreements governing carbon credit transactions, both in compliance and in voluntary markets, lack uniformity in form and content. Spanning the carbon credit lifecycle, these agreements cover activities from initial carbon credit issuance or sale in the primary market to subsequent trading in the secondary market. Limited contract standardization introduces various challenges—such as complex deal structures, increased transaction costs, and legal and commercial risks. These challenges can deter market entry, reduce participant confidence, and constrain the growth of carbon markets—factors that can hinder the flow of climate finance into Amazonia.

While the standardization of contracts depends in part on foundational elements such as legal certainty, governance, and infrastructure, progress is being made. Market governance bodies and standard-setting bodies are developing standardized documentation to enhance market efficiency, facilitate liquidity, enable scale, and support the broader expansion of carbon market activity. Governments, regulators, policymakers and other stakeholders also have a role to play in advancing contract harmonization and building a more robust carbon market ecosystem.

The remainder of this paper examines each of these three pillars in greater depth, with a focus on identifying specific legal and practical challenges, common implementation issues, and considerations for approaching these issues. The analysis draws on existing industry guidance, emerging best practices, and comparative insights from jurisdictions that have taken concrete steps to address these challenges in the design and operation of their carbon markets. This pillar-based approach offers a structured framework for policymakers and market participants seeking to build robust, credible, and scalable carbon markets, with a view to enhancing market confidence and enabling greater access to climate finance in Amazonia.



2 THREE PILLARS OF A WELL-FUNCTIONING CARBON MARKET

As jurisdictions seek to develop and operate nascent carbon markets, the need for a strong foundation is vital. Effective carbon markets not only mobilize private capital toward climate mitigation goals; they promote transparency, accountability, and investor confidence. To support the development of well-functioning carbon markets, this paper provides a high-level outline of three essential pillars: (i) legal certainty, (ii) robust infrastructure, and (iii) contract standardization.



2.1 Pillar 1 – Legal Certainty

(a) What is Legal Nature?

The first pillar required to develop a well-functioning carbon market is certainty regarding the legal characterization of a particular carbon credit; that is, how a carbon credit is defined and treated under the law—for example, whether it is considered a form of intangible property, a bundle of contractual rights, or a regulatory permit. This characterization informs what rights attach to the credit and how those rights may be enforced, transferred, or extinguished. Carbon credits are generally traded in two market categories: voluntary markets, where credits are purchased on a discretionary basis, and compliance markets, where credits are used to meet regulatory obligations. Regardless of market category, however, each credit must still be characterized under domestic law, and its legal treatment may vary by jurisdiction. Certainty surrounding the legal characterization of a carbon credit means that the legal nature of the carbon credit is clear and unambiguous, and that its legal implications are foreseeable.⁸

⁸ As a further clarification, the discussion in this paper focuses on the legal characterization of carbon credits rather than their regulatory classification for oversight purposes. For example, labeling carbon credits as a commodity or financial asset may determine which regulatory body may oversee them, but does not affect their underlying legal nature, which still must fall within one of the recognized legal categories, such as intangible property or contractual rights.

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(b) Why is Legal Certainty Important?

Legal certainty around the characterization of carbon credits is important because it determines how carbon credits can be created, bought, sold, transferred, and ultimately surrendered or retired. It also affects the regulatory, tax, and accounting treatment of carbon credits for key stakeholders and market participants, including project developers, investors, and regulators. The legal certainty of carbon credits is vital to the development and implementation of a well-functioning carbon market because it aids in establishing liquidity within these markets, attracting market participants and reducing transaction costs.

(c) Risks in Connection with Legal Uncertainty

In contrast, legal uncertainty creates risks that can undermine market participation and functionality. One of the most important factors guiding investment decisions is the level of risk involved, and the unpredictable treatment of carbon credits due to uncertainty of their legal characterization only heightens that risk. This, in turn, can hinder investment in carbon credits that generate sustainable projects and dampen efforts to comply with NDCs. Without a settled legal characterization, questions may also arise as to whether credits are transferable across borders or between registries and as to how disputes would be resolved. Moreover, the way credits are characterized in law can directly affect the value of the underlying ecological and social benefits that flow to stakeholders and communities. The greater the level of legal uncertainty, the more fragile those benefits become, as credits risk being viewed as unreliable, less transferable, or less enforceable.

(d) Global Status of Legal Certainty

Globally, the legal characterization of carbon credits remains unclear in many jurisdictions, leading to inconsistency across different carbon markets. In regulated compliance markets, such as the EU ETS, carbon allowances are typically defined by statute as regulatory instruments, although in some jurisdictions they may also carry features of property. By contrast, in the voluntary market, there is no universally accepted legal classification, and carbon credits are often treated as contractual rights derived from private standards, though some jurisdictions are beginning to define them as intangible property. For example, in some jurisdictions, such as Australia, voluntary carbon credits may be characterized as a form of intangible property.⁹ In others, they are treated as a bundle of contractual rights derived from underlying agreements between market participants. Other types of carbon credits may be classified as tradable licenses or permits issued under governmental frameworks; or they may simply not have a clear

⁹ Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth) §150 (Austl.), <https://www.legislation.gov.au/Details/C2015C00260>.

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characterization.¹⁰ There is currently no classification for units issued under Article 6 of the Paris Agreement. To add to the complexity, different types of carbon credits may be treated differently.¹¹ Without a clear definition, carbon credits are subject to inconsistent treatment across jurisdictions, which increases legal uncertainty and may deter investment and participation in carbon markets. Clarifying the legal characterization of carbon credits is essential to fostering carbon market integrity, transparency, and consistency.

At this stage, the objective is not to harmonize the legal nature of carbon credits across all jurisdictions or credit types, but to ensure that each jurisdiction provides a clear and transparent legal characterization within its own legal framework in relation to each type of carbon credit. It should also be considered whether jurisdictions that operate both compliance and voluntary carbon markets should align the legal treatment of credits across both systems. However, this question of legal harmonization is secondary to the more immediate need for clarity: that each type of carbon credit, regardless of its market context, is clearly defined in law to reduce uncertainty and support market confidence.

(e) Carbon Credits as Intangible Property

Defining carbon credits as intangible property means recognizing them as legally enforceable assets that confer fundamental legal benefits. Specifically, this treatment establishes clear ownership, enables transferability without the need for consent from counterparties, permits use as collateral, and ensures enforceability against third parties. As intangible property, a carbon credit may be recognized as an asset upon issuance, transferred from one holder to another through sale or other means without altering its legal identity, and ultimately surrendered or retired to satisfy a compliance obligation or voluntary commitment. Each stage of the credit's life cycle, from creation to retirement, is governed by a coherent body of property law, providing predictability and legal protection to market participants.¹²

10 For example, unlike many other jurisdictions with an emissions trading system, California defined the legal nature of carbon credits at the outset by stating that an emissions allowance does not constitute property or have associated property rights. Therefore, regulatory and enforcement actions targeted at these carbon credits do not give rise to a constitutional takings claim. In other words, regulators have broad discretion to terminate, revoke, or limit allowances without the constraints that typically restrict the government's ability to confiscate private property (i.e., under those constraints, California would have to compensate the owner if it ever revoked a carbon credit) (Abrell, Betz, and Koch, 2020). On the other hand, the legal status of carbon credits in Australia has been explicitly defined under federal legislation as personal property. "An Australian carbon credit unit is personal property and...is transmissible by assignment, by will and by devolution by operation of law." Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth) s 150 (Austl.), <https://www.legislation.gov.au/Details/C2015C00260>. Australian carbon credit units are recognized as investment instruments for the purposes of the Personal Property Securities Act and can be used as collateral for financing arrangements (Ben McQuhae & Co., 2023).

11 Carbon credits generated under a compliance scheme, such as the EU emissions trading system, may be treated differently from voluntary carbon credits issued under independent standards such as Verra or Gold Standard.

12 Under English law, however, contractual rights are a form of intangible property but only confer certain rights.

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Unlike contractual rights, which are typically only binding between the contracting parties, property rights are enforceable against all and survive insolvency and repudiation. This legal classification places carbon credits within a recognizable framework of property law, like intellectual property or financial instruments. This contrasts with jurisdictions that classify carbon credits as purely contractual rights or, alternatively, as tradeable licenses or permits, which extend less favorable legal treatment. A holder of intangible property may freely transfer the property, whether by sale, license, or as part of a collateral arrangement. This is generally more favorable than the rights arising under contract, which are only enforceable between the parties to an individual agreement. The transfer of contractual rights to a third party often requires assignment or consent and may not survive or may be materially altered by the parties' insolvency or repudiation. Another benefit of defining carbon credits as intangible property is that creditors may perfect a security interest in intangible property under Uniform Commercial Code Article 9 in the United States or its equivalent in regimes elsewhere, meaning that carbon credits can be pledged as collateral and will have priority in bankruptcy. This may contrast with collateral arrangements available in respect of contractual rights.

Although defining carbon credits as intangible property offers significant legal and commercial advantages, this approach is not without drawbacks. One concern is that property-based regimes may require formal legislative or regulatory recognition, which can be difficult to obtain in jurisdictions with underdeveloped legal infrastructure or fragmented market oversight. The designation of carbon credits as property may also trigger unintended regulatory or tax consequences, such as capital gains treatment or property tax liability, depending on local law.¹³ Finally, a property-based approach may reduce contractual flexibility, because standardized characterization could limit the ability of registries or project developers to tailor terms to evolving market or project-specific needs.

(f) Carbon Credits as Contractual Rights

When carbon credits are defined as a bundle of contractual rights, a carbon credit's legal status and enforceability derive from the terms of privately negotiated contracts rather than from statutory or property law. Because of this factor, the relevant carbon credits would not be treated as property and would not have legal standing outside of the specific contracts governing creation, issuance, and use. Furthermore, the rights connected to the carbon credits may depend on performance by third parties, such as a registry or a project operator, and may be subject to revocation or cancellation under contract terms (ISDA, 2021a, p. 10). This classification is more commonly applicable in

¹³ See Australian Taxation Office, *Taxation of Australian Carbon Credit Units for Primary Producers* (last updated July 4, 2023), <https://www.ato.gov.au/businesses-and-organisations/income-deductions-and-concessions/primary-producers/livestock-and-other-assets/water-and-carbon-sequestration-rights/taxation-of-australian-carbon-credit-units-for-primary-producers>.

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voluntary carbon markets, where credits are issued and transacted through a series of private agreements and not through any statutory scheme.

Defining carbon credits as a bundle of contractual rights offers certain practical advantages, particularly in voluntary carbon markets. This approach allows for innovation, giving market participants the flexibility to tailor contractual terms to meet their specific project requirements or buyer preferences. Moreover, because these credits are typically created and transacted between project developers, registries, and credit purchasers, the contractual rights model aligns closely with the commercial realities of how voluntary carbon markets currently function.

However, as alluded to in section 2.1(e), the contractual rights approach may be a suboptimal solution when compared with a classification as property, because defining the legal nature of carbon credits as a bundle of contractual rights leads to increased variability, transferability, and standardization challenges. Contractual rights associated with carbon credits are governed by local contracts and domestic private law; consequently, their legal characterization depends entirely on the specific terms of the contract, the jurisdiction whose law governs that contract, and the forum in which disputes are resolved—which will likely lead to a patchwork of legal interpretations.¹⁴ This jurisdictional variation complicates efforts toward standardization and may lead to a higher risk of fragmentation across the general market (ISDA, 2021a).

Another risk associated with treating carbon credits as contractual rights is the added legal complexities compared to classifying them as intangible property. For example, if carbon credits are considered a bundle of contractual rights, the transfer of carbon credits becomes more uncertain and difficult, and their transferability is determined solely by the terms of the underlying contracts. Furthermore, there is a lack of clarity surrounding ownership and title when carbon credits are defined as a bundle of contractual rights. Contractual rights do not grant ownership in the traditional legal sense. Rather, they merely grant performance rights between the contracting parties. A transferee may not acquire full legal title to the credit, especially if they were not an original party to the contract that created and governs the credit.

(g) Carbon Credits as Tradable Licenses and Permits

Another alternative is to classify carbon credits as tradable licenses or permits. In this framework, carbon credits are considered regulatory instruments granted by

¹⁴ It is important to note that inconsistencies will exist across jurisdictions even if carbon credits are treated as property, because legal systems across the world have different property law regimes; however, treating carbon credits as property still typically provides a more coherent and reliable legal foundation than defining them purely as contractual rights. Although property laws do vary across jurisdictions, they tend to share core legal concepts and structures that are widely understood and reconcilable in cross-border contexts. For example, ownership, transfer, security interests, and priority are fundamental concepts present in most legal systems. In contrast, contractual rights are governed by local contract law, which is far less predictable and harder to reconcile across jurisdictions.

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governmental bodies that allow the holder to emit a specified amount of GHGs. This approach is typically used in compliance markets, such as those issued under cap-and-trade systems.

Defining carbon credits as tradable licenses or permits offers certain advantages, particularly within the context of regulated compliance markets. This classification aligns with established administrative and environmental regulatory frameworks, enabling greater government oversight and enforcement of emissions limits. It also often facilitates the integration of carbon credits into national climate policy tools, ensuring that credit issuance and use remain aligned with emissions caps. Regulatory authorities may also prefer this legal classification, because it gives them the flexibility to modify, suspend, or revoke allowances in response to shifting climate targets or market conditions.

However, classifying carbon credits as tradable permits or licenses introduces significant legal and practical limitations. Although this flexibility may be appealing to regulators, the ability of issuing authorities to unilaterally modify, suspend, or revoke licenses creates uncertainty for market participants, which can lead to unpredictability in carbon markets, disincentivizing market participation. In the voluntary market context, similar uncertainty can arise if private standard setters or registries reserve the right to alter methodologies, void issued credits, or revise eligibility rules, which would affect the validity of credits that buyers have already acquired. Moreover, there may be restrictions on the transferability of carbon credits, depending on the underlying statutory scheme. This constraint would impede the freely exchangeable nature of carbon credits, reducing their utility as tradable assets in financial or commercial transactions. As in the case with treating carbon credits as a bundle of contractual rights, treating carbon credits as tradable licenses or permits can lead to limited ownership rights, regulatory risk, and transfer constraints.

(h) Clarifying the Legal Nature of Carbon Credits

As discussed, there are many merits to expressly defining the legal characterization of the relevant carbon credits, especially during the creation of a carbon market. The legal characterization of carbon credits can be clarified through several mechanisms. Governments or regulatory bodies can issue authoritative legal statements, such as official guidance or interpretive opinions, that define carbon credits in a specific way, whether as property, a contractual right, or license or permit. Alternatively, governments can enact legislation to expressly classify carbon credits, as jurisdictions like Australia and

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New Zealand have done.¹⁵ Additionally, judicial decisions in relevant disputes can help establish legal precedent, while international organizations, such as the International Institute for the Unification of Private Law and the International Swaps and Derivatives Association (ISDA), can establish principles that can guide the development of carbon markets and encourage the harmonized legal treatment of carbon credits across jurisdictions. These approaches can all help ensure that carbon credits have a defined and stable legal foundation, enabling their secure use, transfer, and enforcement in carbon markets.



2.2 Pillar 2 – Robust Infrastructure

The second key pillar essential for developing a well-functioning carbon market is a robust infrastructure. Optimal functionality with safe, efficient, and interoperable systems attracts climate finance investment. Appropriate policy and design choices must be made to establish an infrastructure framework that allows for easy access to and participation in carbon markets, which, in tandem with legal certainty, increases their attractiveness to investors.

The key components of a robust infrastructure, which should be taken to also include legal certainty, are environmental integrity; carbon benefits rights; systems and structures; market harmonization; technical capacity; suitable domestic markets; and international coordination and integration. However, the reality surrounding the infrastructure of extant carbon markets reveals various challenges. The following sections assess each component and its associated risks.

(a) Environmental Integrity

Risks surrounding environmental integrity are pervasive and persist throughout the lifecycle of carbon credits. Key drivers of these risks may be ambiguous methodology and validation protocols, as well as insufficient transparency and the weak quality controls surrounding their application.

(i) Methodology and Validation Protocols

When methodologies are not well defined, it becomes challenging to ascertain whether a mitigation project or activity's emissions reductions or removals are genuine, additional, and verifiable. Such ambiguity could lead to the issuance of

¹⁵ Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth) s 150 (Austl.), <https://www.legislation.gov.au/Details/C2015C00260>. The legal status of carbon credits, or the New Zealand Units (NZUs) is defined under the Climate Change Response Act 2002 (the "Act"). Though the Act does not explicitly label NZUs as "property," it provides mechanisms for their transfer, ownership, and use within the New Zealand emissions trading system. For example, NZUs can be held in the New Zealand Emissions Trading Register and transferred between parties. These are features commonly associated with property rights (ICAP, 2025b).

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carbon credits that do not represent the actual emissions reductions or removals of the mitigation project or activity, increasing the risk of delivery failure, and thereby eroding the environmental integrity of that carbon market. Equally, the protocols used to review and approve new or changed methodologies must also be clear and objective, because market participants rely on the verifications of the underlying mitigation project or activity to substantiate what is claimed. This clarity and objectivity provide the transparency that market participants need.

In considering this challenge, governments and other stakeholders could look to the ongoing work of bodies such as the Integrity Council for the Voluntary Carbon Market and UNFCCC.¹⁶ These organizations work to promote or develop methodologies that are in line with globally recognized integrity principles, by endorsing specific supply-side methodology and validation standards.¹⁷

(ii) Transparency and Quality Controls

Transparency and proper quality controls in the application of methodologies and validation protocols are also essential for credible carbon markets to deliver high levels of environmental integrity. Investors need assurance not only that objectively validated methodologies have been relied on, but also that these methodologies have been properly applied at project level and that these projects have been appropriately assessed. Ambiguity and poor documentation of assessment criteria, as well as weak incentive structures that lack robust safeguards, could see the issuance of carbon credits that have not had sufficient scrutiny (World Bank, 2024b, p. 18).

In addressing these issues, governments could consider adopting consistent disclosure requirements, encouraging validators to publicly disclose assessment

¹⁶ The Integrity Council for the Voluntary Carbon Market (ICVCM) Core Carbon Principles may act as a further yardstick for best practice. In fact, ICVCM is continuing its assessment of carbon-crediting programs for adherence to its Core Carbon Principles. See ICVCM, *Assessment Status: Program and Category of Carbon Credit Assessments*, <https://icvcm.org/assessment-status/#program-status>; IOSCO, *Voluntary Carbon Markets* (Nov. 2024), p. 36.

¹⁷ See World Bank (2025a), *CMI Working Group Technical Guidance Note Ecosystem Governance for Carbon Markets Infrastructure: Assessment and Recommendations*, p. 17 (<https://openknowledge.worldbank.org/server/api/core/bitstreams/d4fc9b83-21c3-4650-8fed-841ff988196e/content#:~:text=The%20Technical%20Guidance%20Note%20on,align%20with%20evolving%20market%20requirements>). See also the Article 6.4 Supervisory Body and its Methodological Expert Panel, who develop and oversee the Paris Agreement Crediting Mechanism under article 6.4 of the Paris Climate Agreement - UNFCCC, *Article 6.4 Supervisory Body*, <https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body>

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procedures, and mandating greater levels of accessibility to project-level documentation through centralized registries.¹⁸

Article 6 of the Paris Agreement recommends the adoption of uniform reporting guidelines, which include clearly defined reporting periods, standardized data formats, and specific criteria for data collection and presentation.¹⁹ The Enhanced Transparency Framework under Article 13 of the Paris Agreement builds on existing systems for tracking and reporting GHG emissions; but its success depends on adequate financial resources and a well-trained pool of reviewers.²⁰ Ultimately, transparency and rigorous quality controls in applying methodologies and validation protocols are essential for credible carbon markets, ensuring high levels of environmental integrity and investor confidence.

(iii) Governance and Stakeholder Engagement²¹

Building a resilient carbon market requires effective and fair governance as well as stakeholder engagement. These standards promote trust in decision-making processes, equitable access, increased transparency, and balance among differing viewpoints, ultimately ensuring not only the overall environmental integrity of carbon markets but also their social integrity.

Transparency in governance processes is crucial to ensuring fairness in allocating carbon benefits and making rules, methodologies, and decision-making processes open and accessible. Clear accountability mechanisms, potentially applied by independent bodies that oversee carbon market activities and ensure compliance with established rules, could further ensure that carbon benefits are distributed equitably based on agreed and measurable criteria, ultimately driving confidence in the market's integrity.

Stakeholder engagement is equally important, focusing on inclusive participation of local communities and nongovernmental organizations. Engaging these

18 Standardization of reporting protocols for developers of mitigation projects and activities could also facilitate greater transparency and quality control; consistent and limited time gaps in reports could reduce difficulties for auditors verifying the accuracy of data; and could mitigate risks around the oversight of proper project implementation (World Bank, 2021a, p. 81–82). Developers can also facilitate transparency by using the UNFCCC Sustainable Development Co-Benefits Tool, used by developers to self-report on the sustainability aspects of their project. The responses received via this tool are then used to produce a detailed report on the UNFCCC website, showcasing the value of sustainable project development to prospective developers and the wider public. See UNFCCC, *Sustainable Development Co-Benefits Tool*, <https://www4.unfccc.int/sites/sdcmicrosite/Pages/SD-Tool.aspx>.

19 Article 6 also advocates for periodic verification processes conducted by accredited third-party auditors to ensure data integrity and compliance with established standards.

20 See UNFCCC, [Preparing for the Enhanced Transparency Framework | UNFCCC](#). The secretariat has established training programs for expert reviewers and developed necessary reporting tools.

21 The discussion under this section on governance and stakeholder engagement as it relates to environmental and social integrity has been included for completeness and serves only to provide a high-level introduction to the topic. A further in-depth discussion is outside the scope of this paper.

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groups in the decision-making process, both at a governance level and in the implementation and management of mitigation projects and activities, through community consultations, participatory workshops, and inclusive policy-making processes, can ensure that their needs and concerns are addressed. Capacity building through education and training programs enhances stakeholders' understanding of carbon markets, governance structures, and their roles within the market. Offering technical assistance to countries and local communities could help them participate more effectively in carbon markets. Establishing regular stakeholder forums for discussing issues, sharing experiences, and providing feedback, along with clear and accessible grievance redressal mechanisms, could increase effective communication and dispute resolution.

(b) Carbon Benefit Rights

Carbon rights define the entitlements to benefits from reducing or removing carbon emissions, such as sales of carbon credits or government-sponsored Payment for Ecosystem Services programs.²² Similarly to the lack of a global legal definition for carbon credits themselves, there is no internationally accepted definition of carbon rights, and very few countries have adopted definitions in their national legal systems. The concept of carbon benefit rights has been generally understood to consist of two key components: (i) property rights associated with the sequestration and storage of carbon within land, trees, soil, and other natural repositories; and (ii) the entitlement to the benefits derived from the transfer of these property rights, such as through emissions trading schemes.²³

Uncertainty surrounding such carbon benefit rights stems from ambiguous or underdeveloped legal frameworks that fail to clearly define ownership and entitlement to carbon benefits. The lack of this clarity makes it difficult to ascertain who has the right to generate, own, and trade carbon credits, which can also increase due diligence costs and results in incomplete outcomes when any of these items cannot be clearly determined.

Investors require a stable and predictable legal and regulatory environment to commit capital to mitigation projects or activities. When rights to carbon benefits are unclear, potential investors may perceive the landscape as too uncertain, or they may be concerned about future competing claims over related carbon credit ownership. Moreover, projects that operate under uncertain or disputed carbon benefit rights may face challenges in securing validation and verification, because third-party auditors

²² See UNREDD Programme, *Carbon Rights*, <https://www.un-redd.org/glossary/carbon-rights>. Carbon rights should be distinguished from the legal nature of carbon credits discussed under Pillar 1, which looks at how carbon credits are characterized under law (i.e., do they represent property rights or contractual rights, etc.?).

²³ See UNREDD Programme (2022), *Carbon rights and the importance of benefit sharing*, <https://www.un-redd.org/post/carbon-rights-and-importance-benefit-sharing>.

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require clear evidence of rightful ownership and control over carbon assets. This can result in delays or rejections in the issuance of carbon credits, reducing the overall supply of credible carbon credits in the market.

To mitigate this uncertainty, a clear policy and legislative and regulatory regime should be standardized to give comfort as to the ownership of carbon benefits rights as well as long term safeguards to protect investors. In developing this framework, it could be helpful to have an internationally accepted definition of carbon benefit rights, that is integrated into domestic property ownership frameworks through collaborative government engagement. Clear legal parameters as to ownership, transfer, and entitlement, as well as appropriate recourse mechanisms, could also help.

(c) Systems and Structures

Establishing resilient carbon market infrastructure requires continuous investment in both human and technical resources by countries and supervisory bodies. This includes adequate funding for IT systems, capacity-building programs, and stakeholder engagement initiatives. Effective implementation necessitates participation in industry and governmental initiatives, supported by appropriate funding, meticulous planning, and sufficient resources.²⁴ Establishing resilient systems and structures in carbon markets enables countries engaging within this space to leverage climate finance. The following are certain components for scalable and interoperable systems that market stakeholders have identified as crucial for attracting climate finance to emerging markets:

(i) Registries

Registries function as the backbone of carbon markets: they record the issuance, transfer, and surrender or retirement of carbon credits. They may also develop standardized protocols for project registrations, ensuring that all transactions are properly accounted for and preventing double counting. These functions are crucial for maintaining the integrity of the carbon market and ensuring that there are no competing claims to emissions reductions or removals from surrendered or retired carbon: registries' comprehensive databases link credits to

²⁴ Certain countries within Amazonia have well-developed carbon trading infrastructure in place and are active in leveraging their vast natural resources for carbon credit generation. Brazil recently implemented Law No. 15,042/2024, which establishes the Brazilian Greenhouse Gas Emissions Trading System (Sistema Brasileiro de Comércio de Emissões de Gases de Efeito Estufa), and which looks to support the implementation of the law on the Brazilian National Climate Change Policy. We note that Ecuador is developing its carbon markets, with active support for mitigation projects and activities such as the Socio Bosco Program and UNFCCC Reducing Emissions from Deforestation and Forest Degradation framework (REDD+), and discussions around developing crediting mechanisms (ICAP, 2025a, p. 157); (UN-Redd Programme, 2020); and World Bank Group, *State and Trends of Carbon Pricing Dashboard*, <https://carbonpricingdashboard.worldbank.org/credits/instrument-detail>.

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relevant projects, certification protocols, and other pertinent information, thereby facilitating system oversight and transparency.

Many countries are in various stages of implementing carbon markets, particularly focusing on Article 6 of the Paris Agreement. Countries have developed diverse carbon systems, and the lack of standardization has led to higher due diligence costs for buyers. The establishment of a centralized global registry like the Article 6.4 Mechanism Registry to track all emissions under Article 6.4 helps to address this challenge. Centralization and standardization efforts under the Article 6.4 Mechanism are further enhanced by the Supervisory Body of the Article 6.4 Mechanism which oversees methodology development, activity registration, and third-party verification accreditation of the Registry.²⁵

Although the Registry has provided an international platform for the registration of carbon activities, national and third-party registries remain alternative options. The variation in registry types and their differing methodologies has led to inconsistencies and an increased risk of mismanagement. VCMs have also evolved significantly with the establishment of private registry systems, such as those operated by Verra and Gold Standard. Private registries have diversified through various platforms, creating different standards and procedural rules, reflecting market needs and stakeholder preferences. There are also private meta registries that act as ledgers for tracking carbon credits across different types of registries.²⁶ However, it is crucial to manage this market fragmentation to avoid the development of incompatible registries and to ensure regulatory and industry oversight. This could be mitigated through the standardization of registry protocols by adopting robust systems and establishing regulatory oversight.²⁷ International coordination could also help facilitate global interoperability, enhance market robustness, and increase transparency between registries.²⁸

(ii) Data Security

For the successful operation of carbon markets, robust technology is essential. However, IT security measures may be inadequate, leaving these systems vulnerable to fraud and cyber threats. Robust data security is fundamental to

25 UNFCCC, Registry, <https://unfccc.int/process-and-meetings/the-paris-agreement/article-6/article-64-pacm/registry>.

26 The S&P Global Commodity Insights Meta Registry is one such registry (S&P Global, *Meta Registry*®, <https://www.spglobal.com/commodity-insights/en/products-solutions/carbon-scenarios/meta-registry>).

27 For instance, the EU's Union Registry centralized all EU ETS operations into a single registry operated by the European Commission in 2012.

28 Another promising development is the creation of the Carbon Data Open Protocol, which aims to connect various credit registries on a single platform using an open-source metadata system. The goal is to enable easy access to registry data for benchmarking, compliance reporting, and avoiding the double counting of carbon credits. This increased ease of access to key data will provide governments and regulators with a comprehensive overview of the registry space, facilitating better oversight and management.

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building trust, ensuring reliability, and establishing credibility in carbon markets. As the number of participants in these markets increases, so does the risk of fraud and information breaches. Consequently, it is important to safeguard data associated with carbon credits and transactions from unauthorized access, manipulation, or breaches. One recommendation proposed by the Carbon Markets Infrastructure Working Group is to implement internationally recognized cybersecurity policies and standards consistently across the board to avoid data vulnerabilities, whilst ensuring that these are continually advanced and developed (World Bank, 2024b).

Anti-fraud and anticorruption mechanisms could also be adopted in carbon markets, enabling stakeholders to verify the legitimacy of market participants through regulatory standard checks. Data security in carbon markets requires a multilayered approach, using advanced cryptographic protocols, machine learning systems, and behavioral analytics to detect malicious behavior. Clearly defined roles and accountability are essential for safeguarding data and ensuring secure transactions, thereby upholding market integrity and participant confidence. They also ensure a safe and reliable pathway to scale climate finance whilst ensuring greater transparency and market confidence.

(iii) Custodians

Custodians are responsible for the safekeeping, management, and administration of carbon credits on behalf of market participants. They streamline the processes of buying, selling, and transferring carbon credits, ensuring efficient and compliant transactions that lower barriers to entry for new participants and promote more active trading. By providing existing accounts on registries and managing the transfer of carbon credits, custodians reduce the administrative burden of setting up registry accounts and managing corporate end users' entry into the market. However, inconsistent or inadequate custodial structures in carbon credit markets could lead to significant market barriers, risk misallocation, fraud, and loss of credits. Discrepancies in custodial arrangements can undermine the roles of custodians, creating vulnerabilities that can be exploited by fraudulent activities. The carbon credit market can reduce risks associated with misallocation, fraud, and loss of credits through the standardization of custodial services and practices. This transparency helps build trust in the market and allows for better oversight and risk management.

(iv) Exchanges and Trading Platforms

Exchanges and trading platforms are digital marketplaces where carbon credits are bought and sold, ensuring efficient resource allocation, liquidity, transparency,

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and risk management in carbon markets.²⁹ These platforms provide a structured environment for transactions and attract investment by offering stability (SSE, 2023). The primary aim of these platforms is to maintain an orderly, transparent, and liquid market, which is crucial for the development of carbon markets and for facilitating broader access to these markets for a variety of participants.

With many countries expressing interest in participating in carbon markets under Article 6,³⁰ there has been growing investment in the development and implementation of digital infrastructure to enable countries to participate in international carbon markets.³¹ Policymakers increasingly anticipate that capital market entities, including securities and derivatives exchanges, will assume a significant role in developing carbon trading frameworks and improving carbon pricing within a structured market. Exchanges are well equipped to support effective scaling and reliable trading of carbon credits. By collaborating with regulators, they can play a crucial role in harnessing the potential of carbon markets to aid in the climate transition. Through promoting alignment and ensuring market integrity and credibility, exchanges can help fully realize the opportunities offered.³²

(d) Market Harmonization

Carbon markets have a multitude of regimes, registries, standards, and verification methods, which have caused market fragmentation and complicated the evaluation of credit quality. For instance, various regions and countries are at different stages of the development and implementation of their own ETSs. In Amazonia, this diversity is evident. Brazil has laid the legal groundwork for a federal ETS and is in the initial phase of implementation, focusing on regulatory development. Peru is setting sectoral emissions limits and preparing a pilot ETS for its forestry sector. Colombia has launched a public consultation on ETS regulations, marking its progress towards phased implementation, while other countries in Latin America, such as Mexico, are transitioning pilot ETSs to full implementation (World Bank, 2021b). Economies within Europe are also advancing their

²⁹ Examples include the EU ETS, California Cap-and-Trade, and Carbon Trade Exchange.

³⁰ As of October 2025. This has been evident in countries' Nationally Determined Contribution 3.0 submissions. See UNFCCC, NDC 3.0, <https://unfccc.int/ndc-3.0>.

³¹ In 2023, there were about 31 exchanges across 24 countries at various stages of engagement with carbon markets, highlighting the need to start aligning the exchanges to prevent further market fragmentation. See Sustainable Stock Exchanges (2023), *How exchanges can maximise the opportunities of carbon markets – An action framework to guide exchanges*, <https://sseinitiative.org/sites/sseinitiative/files/publications-files/how-exchanges-can-maximize-the-opportunities-of-carbon-markets-an-action-framework-to-guidance-exchanges-.pdf>.

³² For example, the Regional Voluntary Carbon Market Company (RVCMC) introduced a voluntary carbon market exchange platform in November 2024 to facilitate carbon market trading and the growth of the carbon credit market RVCMC, (2024) *RVCMC launches voluntary carbon market exchange platform to channel finance to high quality climate projects* (Nov. 12, 2024), <https://vcm.sa/en/media-detail/rvcmc-launches-voluntary-carbon-market-exchange-platform-to-channel-finance-to-high-quality-climate-projects/>. See also the Climate Impact X Singapore Carbon Exchange – Climate Impact X, Carbon Credits, <https://www.climateimpactx.com>.

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ETSs;³³ for instance, the European Union and United Kingdom recently announced their intentions to link the carbon markets of the UK ETS and the EU ETS.³⁴

A decentralized ecosystem with inconsistent terminologies and stakeholder roles creates tracking difficulties and market inefficiencies. The market also faces potential fragmentation due to diverse bilateral agreements for carbon trading under Article 6.2, various new carbon pricing instruments with differing credit provisions, and differing government policies respecting carbon markets. Governments' approaches to carbon credit markets vary, because these markets complement other climate policies adapted to their national circumstances. The governments of Singapore, Kenya, and the United Kingdom launched the "Coalition to Grow Carbon Markets" to enhance voluntary demand for carbon credits (S&P Global, 2025). This coalition aims to offer clearer guidance on using high-integrity credits and establishing principles that increase business confidence in the voluntary market.

Furthermore, there is a critical need to develop a standardized framework defining market components and provide a comprehensive mapping of key terms to enhance clarity, credit fungibility, and seamless cross-market transactions.³⁵ The Carbon Markets Infrastructure Working Group is carrying out work within ecosystem governance mapping. They have created a preliminary ecosystem map, working on establishing clear consistent terminologies and frameworks, as well as identifying the roles and responsibilities across the various stages of the market.³⁶ Efforts such as these may help harmonize the market, to create a more unified and efficient carbon credit market.

(e) Technical Capacity and Institutional Readiness

Disparities in technical and institutional support create significant market gaps that hinder the equitable growth and effectiveness of carbon markets. To address these, it is essential to invest in targeted capacity-building initiatives, technical training, and institutional support. Establishing minimum common elements and standardized frameworks can streamline capacity-building efforts so that development occurs more uniformly across regions. For example, the implementation of comprehensive training

³³ The European Union has recently completed extensive reforms to its ETS and plans to introduce a separate system for buildings, road transport, and additional sectors from 2027, potentially doubling the share of covered emissions.

³⁴ There are multiple ways to link the registries: bilaterally, where both systems' credits can be used, or unilaterally, where only one system's credit can be used in the other system. See European Commission (2025), *A renewed agenda for European Union – United Kingdom cooperation Common Understanding* (May 19, 2025) https://ec.europa.eu/commission/presscorner/detail/en/statement_25_1267.

³⁵ See Sylvera and other similar organizations which seek to rate credits on the voluntary carbon market to facilitate standardization and trading – Sylvera (2025), *Sylvera's Carbon Credit Framework: How We Rate Carbon Credits on the VCM (Updated)* (Sep. 11, 2025), <https://www.sylvera.com/blog/carbon-credit-ratings-frameworks-and-processes-white-paper>.

³⁶ See World Bank, *Preliminary Ecosystem Mapping: Functionality and Entities across the Carbon Market Infrastructure Ecosystem* (draft; Nov. 7, 2024), https://ik.imagekit.io/mtozw1qojis/world-bank/Preliminary_Ecosystem_Mapping_7_Nov2024_CMIWG_Website_1b75a71558_RT0jw6eeX.pdf.

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programs tailored for government agencies, project developers, financial institutions, trading entities, and corporate buyers can significantly improve the competence of key market participants. These market participants, in turn, need to focus on establishing well-defined roles and frameworks, and they often lack training in relevant matters such as compliance, trading mechanisms, and monitoring, reporting, and verification, which complicates the task of establishing environmental and market integrity. Resulting inconsistent standards can undermine carbon market credibility (GSF Task Force, 2015). Multilateral development banks (MDBs) play an important role in enhancing the technical capacity and institutional readiness of participants in carbon markets; for example, regional MDBs in the Amazon region can offer technical assistance to support countries' engagement with carbon markets and ensure the establishment of resilient carbon market infrastructure. Certain countries' limited funding restricts their market participation, preventing investment in necessary technologies and projects, and they struggle to finance high-quality carbon offset projects. More support of technical assistance in the project preparation phase (e.g., by way of grants) is needed for MDBs to justify taking on the risk of such projects. Additionally, countries with more advanced carbon markets could consider sharing expertise and supporting emerging systems through robust frameworks and policies.³⁷ Initiatives that successfully build technical capacity and institutional readiness, leverage advanced technologies, effectively foster collaboration, and deploy training are essential to developing a comprehensive approach to environmental integrity and sustainability. Technical capacity may be enhanced by improving monitoring and reporting systems for emissions, for instance, using satellite technology and geographic information systems or advanced remote sensing technologies and data analysis tools,³⁸ and by focusing on supporting local communities and government officials in relation to sustainable land management and conservation techniques. Institutional readiness may be bolstered through interagency coordination mechanisms; strengthening the capacity of regional environmental authorities to implement and enforce environmental policies; and providing resources for developing policies and governance structures. At an international level, such initiatives can aim, for example, to support institutional arrangements and capacity building for credit authorization and the reporting necessary for Article 6 implementation through international cooperation.³⁹

In summary, targeted capacity-building initiatives, technical training, and institutional support are essential for addressing disparities, improving competence, and ensuring more uniform development across carbon markets.

³⁷ Initiatives such as the London Stock Exchange Group's Voluntary Carbon Designation and the efforts of market intelligence companies like BeZero and Sylvera exemplify innovative financial products and services that can drive the green transition and foster economic growth.

³⁸ See for instance ND-GAIN, *ND-GAIN Adaptation Brief*, https://gain.nd.edu/assets/565158/nd_gain_adaptation_brief_colombia.pdf; and Amazon Fund, <https://www.amazonfund.gov.br/en/home/>.

³⁹ See Paris Article 6 Implementation Partnership, <https://a6partnership.org/>.

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(f) Suitable Domestic Markets

In defining suitable domestic markets, governments and other stakeholders need to consider consistency of design choices to align domestic markets with international carbon market standards, while also balancing domestic concerns and priorities.

(i) Inconsistent Domestic Market Designs

Issues with varying types of schemes and regulatory approaches adopted by individual countries' domestic carbon markets as well as differences in the scope of entities and sectors covered by each domestic carbon market have led to market fragmentation, making it more difficult to establish a cohesive regional carbon market that is compatible with the global carbon trading system. Similarly, inaccurate and inconsistent emissions limits and baselines, along with a lack of robust reporting standards and reliance on recognized methodologies, may lead to issues with the comparability of carbon credits from different jurisdictions, contributing to further fragmentation and uncertainty.

Harmonized legal and regulatory frameworks that align global best practices with local needs are, therefore, required to achieve consistency in domestic market design. This could involve aligning domestic market rules with international standards in respect of the design and implementation of their respective carbon trading systems and linking these to the rules under Article 6 or the World Bank's Partnership for Market Readiness.⁴⁰ Domestic governance structures could also look to incorporate suitable regulatory frameworks, drawing, where appropriate, from those established by the UNFCCC. For example, Brazil has aligned its National Policy on Climate Change with UNFCCC guidelines to implement its own national ETSS.⁴¹

Appropriate transparency on a national level is equally essential in the design of domestic carbon markets and in addressing issues of interoperability between domestic carbon markets of different countries. For example, issues with transparency and integrity around access to information about the verification process of carbon credits and with the monitoring and allocation of resources obtained from such projects, remain one of the biggest risk factors for REDD+ projects in the Colombian Amazon (Global Financial Integrity, 2025). Therefore, although the task of maintaining integrity in the entire project development

⁴⁰ For instance, the Partnership for Market Readiness sets specific objectives of making available a repository of information on market instruments that may be adopted and tailored for specific domestic application as well as creating a platform for market participants to collaborate and consult on market readiness. See NDC Partnership, *Partnership for Market Readiness (PMR)*, <https://ndcpartnership.org/knowledge-portal/climate-funds-explorer/partnership-market-readiness-pmr>.

⁴¹ UNFCCC, *Brazil, Second Nationally Determined Contribution (NDC)*, https://unfccc.int/sites/default/files/2024-11/Brazil_Second%20Nationally%20Determined%20Contribution%20%28NDC%29_November2024.pdf.

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and carbon credit verification process is challenging, a holistic yet proportionate approach to public disclosure of market activities, including critical data on emissions reductions and compliance status is, nevertheless, essential to establish the transparency needed to stimulate both domestic and cross-border investment.

(ii) Absence of Established Domestic Frameworks

The absence of established domestic frameworks hampers the development of the supportive infrastructure and institutions necessary for effective domestic carbon markets. Key components such as carbon registries, compliance mechanisms, and dispute resolution processes are essential to the proper functioning of carbon markets. Without these elements, carbon markets lack the necessary transparency, accountability, and legal recourse to address issues such as double counting of carbon credits, fraud, or disputes over ownership. For example, in a domestic carbon market, if a country lacks a centralized registry or appropriate crediting infrastructure to track carbon credits, there is a heightened risk of credits being issued, used, or claimed more than once, further compromising the market's integrity (World Bank, 2021a, p. 40–41).

To address these risks, the development of robust domestic governance structures that provide clear legal and regulatory guidance for carbon markets should be considered. These include appropriate legislation or guidance that defines the roles and responsibilities of various stakeholders, establishes clear rules for carbon credit creation and trading, and ensures rigorous monitoring, reporting, and verification standards domestically. This also necessitates expanding discussions around governance structures to ensure accountability through regulatory or industry bodies and third-party verifiers, as well as actively consulting with all stakeholders, including nongovernmental organizations and local populations and communities, to develop market policies and procedures that reflect domestic requirements and practicalities, particularly around carbon credit generation (World Bank, 2025b, p. 126–127). The need for capacity building could also be considered in this context: strengthening institutional capabilities, leveraging technology for transparency, and fostering peer-to-peer learning. The role of MDBs could be of relevance in supporting and expanding capacity-building efforts through knowledge sharing and investment initiatives.

(g) International Coordination and Integration

As more countries work toward NDCs and look to Article 6 and UNFCCC guidance on implementing carbon trading policies, adopting a standardized approach to carbon credit recognition and market alignment is critical to the interoperability of international trading systems.

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(i) Limited Cross-border Credit Recognition

When different calculation methodologies are adopted by different verification bodies (e.g., Designated Operational Entities accredited by the Supervisory Body of the Article 6.4 Mechanism, Verra and Gold Standard), they inevitably produce different outcomes for the carbon credits valued, including key metrics such as leakage, double counting, over-counting etc. For example, the UNFCCC adopts a results-based approach to subtract current emissions from historical emissions, while Verra and Gold Standard use a “business-as usual” approach, subtracting projected emissions from a given baseline. This diversity in carbon credit verification standards and project validation processes invariably affects the perception of the integrity of carbon credits across different jurisdictions (Yang and Park, 2025).

This uncertainty demonstrates the need for standardization of the methodologies adopted by verification bodies and for a unified approach to other base metrics in assessing the quality of carbon credits, including establishing project sites in legal jurisdictions and calculating carbon pools in emissions consistent with host country data (Yang and Park, 2025). A globalized focus on standardization would create a baseline metric for carbon credits and therefore provide the necessary quality guarantees and assurances required by investors to transact on a cross-border basis.

(ii) Domestic–International Misalignment

A divergence between domestic legal frameworks governing carbon markets and international standards, such as Article 6 of the Paris Agreement and UNFCCC guidance, leads to gaps in tracking and validation of carbon credits and in the interoperability of carbon markets more broadly.

To mitigate these challenges, there could be a more clearly defined intersection between domestic regulations and global standards that should ideally be harmonized to the extent appropriate. Fostering regional cooperation by collaborating on shared standards, practices, and experiences would also allow for more integrated and transparent carbon markets, enhancing Amazonia’s collective position as a center for carbon credit creation and trading.

Additionally, disparities in infrastructure, the deployment of technology, financial constraints, and logistical challenges contribute to domestic-international misalignment of carbon markets. These factors affect processes such as carbon credit verification and crediting, the volume of credits flowing into and through carbon markets, and transaction costs. Fostering regional cooperation by collaborating on shared standards, practices, and experiences could assist with overcoming these challenges and allow for more integrated and transparent carbon markets.

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2.3 Pillar 3 - Standardization of Contracts

Contract standardization can play a critical role in enhancing the efficiency and integrity of carbon markets. As outlined in the preceding pillars, carbon markets are characterized by significant legal and operational fragmentation, stemming from uncertainty around the legal characterization of carbon credits (Pillar 1) and divergent infrastructure designs across jurisdictions (Pillar 2). This fragmentation is reflected in the contractual landscape, where agreements underpinning carbon credit transactions—whether in voluntary or compliance markets—vary in form and content. These contracts span the full lifecycle of carbon market activity, from project certification through to credit sale. By reducing complexity, lowering transaction costs, and providing a more stable foundation for transaction execution, standardization can increase investor confidence and help unlock greater flows of climate finance into Amazonia.

(a) Challenges Arising from the Absence of Standardization

The absence of contract standardization gives rise to a range of challenges that echo the legal and structural issues identified in the first two pillars. Fragmentation, diversity, and complexity—across project methodologies and types, verification standards, and the regulatory frameworks of individual jurisdictions—have given rise to an array of contractual arrangements, often lacking standardized terminology, structure, or core provisions (TSVCM, 2021, p. 38). This heterogeneity complicates the legal structuring, financial planning, and operational execution of carbon market activities (World Bank and IOSCO, 2024, p. 7). It also contributes to increased transaction costs, because bespoke agreements typically require tailored negotiation and legal review, demanding significant time and resources to execute (World Bank and IOSCO, 2024, p. 7–8).

Even where parties successfully negotiate bespoke agreements, the absence of standardized documentation and common definitions leaves room for uncertainty. Without shared contractual language, parties may interpret key terms differently, introducing legal and commercial risks that can undermine trading relationships and complicate transaction execution. In ITMO transactions under Article 6.2, for example, both bilateral government agreements and the commercial contracts executed within their framework can be hindered by inconsistent terminology or legal interpretation, complicating the negotiation and implementation of cross-border transactions (White & Case, LLP, 2023). In May 2021, the Taskforce on Scaling Voluntary Carbon Markets—a private sector–led initiative established to promote the development of effective and efficient voluntary carbon markets—published a public consultation report identifying key issues in the development of legal principles and documentation. These challenges include a lack of clarity and certainty regarding the nature of carbon market products, increased legal complexity and associated costs, and the potential for opportunistic behavior by bad actors (TSVCM, 2021, p. 41). The Taskforce proposed that such challenges

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could be addressed using standardized general trading terms applicable across a range of carbon market transactions.

Broader market risks in carbon transactions often stem from uncertainties in the drafting and interpretation of fundamental contractual provisions. These provisions address critical legal and commercial elements, including project scope, and monitoring and reporting; the legal characterization and transferability of carbon credits and associated rights and obligations; and the selection and application of the relevant carbon credit standard and methodology.

These challenges not only make participation more difficult for existing market actors but also deter potential entrants by creating higher barriers to entry, particularly for smaller entities with limited legal or financial resources (World Bank and IOSCO, 2024, p. 7–8). From an investment perspective, lack of standardization creates uncertainty that deters engagement. The absence of consistent contracting practices thus constrains scalability, inhibits market growth, and dampens liquidity, discouraging investment in carbon market activities that are critical to achieving NDCs and broader climate and sustainable development objectives (World Bank and IOSCO, 2024, p 7–8).

(b) Risks Mitigated by Standardization

Beyond legal and technical clarity, contract standardization also plays a critical role in mitigating broader market-related risks. Standardized terms can help reduce counterparty risk by clarifying performance obligations and remedies, thereby enhancing trust between transacting parties. They can contribute to better market risk management, particularly through consistent pricing, delivery, and settlement provisions that support more reliable valuation and risk modeling. In addition, standardization helps mitigate basis risk—the unintended pricing or performance discrepancies that can arise between instruments that are otherwise economically similar but structured under differing contractual terms (ISDA, 2021a, p. 23). Clearly defined contractual frameworks reduce vulnerabilities to cybersecurity breaches and fraud, especially in systems where credit issuance, transfer, and retirement are digitally tracked. Standardized approaches can also help address reversal risk—the risk that credited emissions reductions are later reversed—by embedding clear liability and replacement provisions. Similarly, they can reduce operational risk by streamlining transaction processes and minimizing the potential for administrative errors or inconsistencies. Collectively, these measures foster more secure market conditions and enable participants to engage in transactions with greater assurance across the full spectrum of carbon market activities.

(c) The Carbon Market Landscape

Carbon markets are broadly divided into primary and secondary markets. Primary markets refer to the initial distribution of emission allowances or carbon credits. In

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compliance markets, the primary market includes allocation of allowances to covered entities under emissions trading schemes (ISDA, 2021b, p. 4). In both compliance and voluntary markets, this initial distribution can take the form of purchases of carbon credits directly from emissions reduction projects (ISDA, 2021b, p. 4), where offtake agreements underpin the initial transfer of carbon credits.⁴² These agreements typically involve a buyer committing to purchase a defined volume of credits from a project developer or credit-generating entity. Often concluded before project implementation and credit issuance, offtake agreements establish key commercial and technical terms (e.g., price/volume, crediting standard and methodology, remedies for breach/nonperformance). Commonly structured as forward contracts—which commit parties to transact at a future date, often at a fixed price—offtake agreements play a critical role in reducing project risk, facilitating access to finance, and ensuring long-term revenue certainty for project proponents. In some cases, offtake arrangements may also include partial or full prepayment by a buyer, which can serve as a vital source of upfront capital for project development, particularly in capital-constrained contexts.

Secondary markets involve all subsequent trading, where carbon credits are resold or exchanged among intermediaries, traders, or end-users not directly connected to the originating project (ISDA, 2021b, p. 4). Secondary trading enhances market liquidity, enables price discovery, and broadens access to carbon credits. Transactions in these markets range from spot transactions—entailing immediate purchase and delivery through registry transfer upon payment—to forward contracts, which help manage supply risks and price exposure.⁴³ Options contracts add flexibility by granting the right, but not the obligation, to buy or sell credits under agreed terms. In addition to more traditional mechanisms, some secondary market instruments are built around different financial structuring approaches. Structured products, for example, bundle carbon credits or related cash flows into tradable instruments, broadening investor access. Tokenization efforts leverage blockchain technology to issue digital representations of carbon credits, enabling their transfer on decentralized platforms while preserving the environmental integrity and traceability of the underlying assets.

Carbon market activity also spans another dimension: over-the-counter trades and exchange-based trading. These transactions, which form the main channel for primary market activity and remain prevalent in the secondary market, allow for tailored terms and bilateral negotiation. Exchange-based trading, by contrast, is concentrated in the

⁴² As an example, in 2023, the International Emissions Trading Association released a suite of standardized emission reduction purchase agreements. These include a primary emission reduction purchase agreement template designed to accommodate the requirements of two leading crediting standards, Verra and Gold Standard. The template addresses core contractual elements, including definitions, conditions precedent, representations and warranties, and remedies for nondelivery or nonperformance.

⁴³ To promote consistency in verified carbon credit trading, ISDA published the 2022 ISDA Verified Carbon Credit Transactions Definitions and accompanying template confirmations. These definitions apply to physically settled spot, forward, and option contracts, and provide standard language on key terms, including credit eligibility, delivery and retirement, failure to deliver or receive, and disruption events. When incorporated into trade confirmations, they offer a uniform contractual framework, aligning with ISDA's established role in other derivatives markets.

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secondary market and typically relies on centrally cleared contracts with predefined terms and eligibility criteria.⁴⁴

Although contractual arrangements in carbon markets are largely privately negotiated, governments, regulators, policymakers, and other stakeholders can play a pivotal role in shaping the environment within which such contracting occurs. For example, although contract standardization is a foundational pillar for the development of robust carbon markets, its effectiveness is closely linked to progress under the other pillars discussed in this paper—particularly, the legal characterization of carbon credits (Pillar 1). In certain respects, efforts to establish standardized contractual frameworks depend on achieving greater legal certainty regarding the characterization and treatment of carbon credits across jurisdictions. Legal clarity is essential not only for drafting standardized contracts, but also for the development of supporting legal opinions, particularly in the context of derivatives and other secondary market instruments (ISDA, n.d., p. 3; TSVCM, 2021a, p. 103); market participants must be able to assess the legal risks associated with carbon credit transactions in order to structure them appropriately (ISDA, n.d., p. 3). Without this clarity, standardized documentation cannot fully support scalable, high-integrity market activity. Policymakers, regulators, and legislators can advance this effort by establishing clear laws, rules, and regulations regarding the legal characterization of carbon credits and the enforceability of rights and contractual agreements. In addition, authorities can encourage standardization by endorsing or recognizing widely accepted standards, protocols, and practices. Such actions can provide market participants with greater confidence that their contracts will be enforced and interpreted consistently with their commercial expectations.

As these frameworks are developed, it is essential for domestic efforts to include consideration of cross-border compatibility. Alignment with international practices can help reduce fragmentation, facilitate market integration, and deepen markets. Though jurisdiction-specific approaches are likely to evolve organically in response to domestic legal and commercial considerations, widespread acceptance of harmonized terms, whether driven by national authorities or industry associations—domestic or international—can help avoid a patchwork of incompatible documentation between different regions and carbon markets. In this context, MDBs, for example—particularly those with strong regional presence—can play a valuable role in bridging jurisdictional gaps by convening stakeholders, supporting legal and technical alignment, and facilitating pilot transactions that apply standard terms in practice. Such measures would ensure confidence in the contractual framework, reduce transaction costs, and support market growth and liquidity, ultimately enabling greater flows of climate finance into Amazonia.

⁴⁴ Because exchanges operate independently and establish their own trading terms and protocols, exchange-based trading falls outside the scope of our discussion of contract harmonization and standardization in this paper.



3 CONCLUSIONS

The development of a well-functioning carbon market is based on three key pillars: (i) legal certainty, (ii) robust infrastructure, and (iii) contract standardization. As jurisdictions seek to design or refine their carbon market frameworks, a coordinated approach that strengthens each of these pillars will be key to unlocking private capital, fostering market integrity, and achieving long-term climate commitments.



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