To Reject or to Reimagine: Carbon Credits at a Crossroad

Hayley Johnson, *Columbia University*
Daniela Schulman, *Harvard Kennedy School*
Henry Lee, *Harvard Kennedy School*
Monica Medina, *Columbia University School of International and Public Affairs*

NOVEMBER 2026

HARVARD Kennedy School
BELFER CENTER
for Science and International Affairs

Acknowledgements

The authors and the Environment and Natural Resources Program at Harvard Kennedy School's Belfer Center for Science and International Affairs are grateful to representatives from the following organizations for lending their time and expert input to the development of this brief: American Forest Foundation, Beyond Alliance, Blue Green Future LLC, BlueSeeds, Carbon Growth Partners, Chris Dragisic, Climate Action Reserve, ClimateSeed SAS, Mallesons, The Nature Conservancy, Voluntary Carbon Markets Integrity Initiative (VCMI), West Africa Blue, World Resources Institute, Restorae AS, and WWF Singapore. The named mention of these organizations does not represent an endorsement of the views or recommendations below, which belong solely to the co-authors.

I. Introduction

Carbon credits are at a crossroads. Meeting global climate goals requires increasing annual climate finance from $2 trillion in 2024 to $9 trillion in the 2030s, necessitating a dramatic increase in private investment (Abraham et al. 2026). Carbon credits remain one of the few mechanisms available for channeling debt-free finance to carbon reduction and removal projects in developing economies with limited access to low-cost capital. Failing to finance and develop these projects risks higher warming scenarios that put billions of lives at risk of severe climate impacts.

The potential of credits is great, but voluntary and compliance markets have been hard to design and slow to mature. Voluntary market retirements have been flat at roughly 180 $MtCO_2e$ per year since 2022, a volume too small to deliver meaningful climate impact (Turner et al. 2025). Major compliance markets have not consistently allowed businesses to use international credits to reduce liability. Moreover, credits have faced a barrage of criticisms in the last decade, following documentation of greenwashing and fraud (West et al. 2023; Probst et al. 2024; Romm et al. 2025).

While the debate over the proper role of credits in carbon markets has raged on, credits have not been trapped in amber. Ahead of the United Nations climate conference COP31, new coalitions, such as the Open Coalition for Compliance Markets and the Coalition to Grow Carbon Markets, are working to align market infrastructure, standards, and credit use rules across jurisdictions. The Turkish government recently announced plans to elevate the use of carbon credits at COP31, recognizing them as an "underused" tool to "mobilize private capital at the speed and scale required" to mitigate climate change (Kurum 2026).

This policy brief takes stock of efforts in the last five years to correct carbon credit market failures and to improve their integrity and functionality. Section I of the brief is a landscape analysis of credit markets that highlights three core conditions necessary for their success:

- **Addressing integrity** issues to ensure projects deliver real emissions reductions
- **Incentivizing investment** by establishing a meaningful, regulated role for credits
- **Increasing interoperability** to enable simple, legal transfer of credits between voluntary and compliance markets and across jurisdictions

Based on an in-depth review of the literature and a series of expert interviews, Section II finds that a market correction is well underway to refocus carbon credits around integrity, the first core condition. Several nonprofit initiatives and government coalitions have issued aligned integrity principles. New technologies,

legal frameworks, and quality signals point in the right direction. The need at this stage is to accelerate implementation of existing integrity solutions and ensure the remaining core conditions are met to enable high-integrity credit markets to grow.

Finally, Section III highlights near-term priorities for policymakers to keep carbon credit markets moving toward integrity and maturity. Chief among these recommendations is for governments to establish a meaningful but narrow role for high-integrity credit use to reduce liability for residual emissions, complementing but not substituting for direct decarbonization by polluters. Integrity standards should retain enough flexibility to account for country-specific context, continued innovation and improvement, and diverse portfolios of engineered and nature-based reductions and removals. These policy actions will determine whether carbon credits become a credible asset class capable of mobilizing billions in private capital for climate.

II. The Current Landscape and Continued Role of Credits

Defining Carbon Credits and Credibility

From Ecuador to Senegal, mangroves storing four to five times the amount of carbon as terrestrial forests are facing threats from coastal development and aquaculture conversion (Tang et al. 2018; Song et al. 2023; Das et al. 2026). In Southeast Asia, fast-growing countries grappling with the global energy crisis spurred by conflict in the Middle East are doubling down on coal (Varadhan et al. 2026; Fazeli et al. 2025). While these challenges and contexts are vastly different in nature, both present a need for scaling private investment that keeps carbon in the ground and removes it from the atmosphere. Carbon credits are one strategy that, if properly regulated and incentivized, could help address both.

Carbon credits are tradable financial instruments, each representing one metric ton of emissions reduced or removed from Earth's atmosphere. Businesses can purchase credits and either "retire" them, using the emissions reductions represented by the credit to offset their ongoing emissions, or invest them in projects that contribute to climate mitigation beyond their value chain without claiming a reduction in their emissions inventory (Sylvera 2025; VCMI 2025).

At scale, credits could narrow the global climate finance gap, serving as a mature asset class that provides an ongoing revenue stream for project developers. While climate finance is growing each year, the rate of growth is far too slow and investment levels remain far too low to limit global temperature rise and avoid the worst impacts of climate change this century (Abraham et al. 2026). Public and philanthropic funding cannot fill the gap alone, particularly in emerging markets facing high debt burdens. Many carbon reduction and removal projects also cannot deliver the returns on investment necessary to access mainstream finance, which leaves a role for credits to help unlock private capital as a source of direct project funding.

Without carbon markets, companies can pollute for free while the public bears the cost. Carbon credits make companies pay for the emissions they cannot yet eliminate. While nearly 30 percent of global emissions are regulated by a carbon tax or emissions trading scheme (ETS), the rest remain unregulated and unpriced (World Bank 2026). Without sufficient regulation, emitters will continue to emit. Carbon credits are one of the few ways to direct money from polluting companies toward cutting the roughly 70 percent of global emissions that governments do not directly regulate.

Credit integrity is evaluated according to several criteria (UNFCCC 2025). The Integrity Council for the Voluntary Carbon Market (ICVCM) has emerged as a leading independent, nonprofit governance body focused on building market confidence. Using its Core Carbon Principles framework, ICVCM assesses and approves credit programs and methodologies against ten criteria (ICVCM 2026).

Historically, the core of what makes a credit real and valuable is **additionality**. One way to measure additionality is whether a project delivers a net decrease in carbon emissions relative to a counterfactual baseline scenario without any project activity. Another measure is whether a project would have been financed without the support of credit purchases. Closely related to the concept of additionality is **permanence** or durability, indicating the length of time over which the project will lower additional emissions, which can range from decades to centuries.

Additional components of integrity include the just **distribution** of benefits to the local community, environmental and social **safeguards**, and **co-benefits** beyond emissions reductions that project activities can deliver. For example, a mangrove forest not only sequesters carbon but also protects coastal communities from storm surge and provides crucial nursery habitat for marine species (Choudary et al. 2024).

To ensure these components of quality, methodology matters. High-integrity credits must be **conservatively quantified** and supported by independent and ongoing **measurement, reporting, and verification** (MRV). Credit integrity also requires standardized, **transparent data** sharing, which enables independent agencies to rate project quality, buyers to distinguish between low- and high-integrity projects, and governments to approve the transfer of credits across registries and jurisdictions.

Recently, the Frontier Coalition's $915 million advance market commitment betting on 10-15 carbon removal projects shows that major buyers are prioritizing durability and project activities with existing policy support (Frontier 2026).

While the terms are sometimes used interchangeably, carbon credits are an asset, and offsets are one potential way to use those assets, by retiring the credit and accounting for the emissions reductions in a company's emissions inventory. When using high-integrity carbon credits, best practice points toward a mitigation hierarchy: first avoid creating additional emissions, then reduce ongoing emissions as much as possible, and finally use credits as a last resort to fund carbon removal for hard-to-abate emissions (Arendt 2024). In response to the market failures discussed below, some actors are conflating integrity with carbon removal, as opposed to reduction, and prioritizing credits that sequester carbon from the atmosphere over those that keep emissions from rising (Boyd et al. 2023). Other scholars disagree, and independent ratings agencies suggest that both reductions and removals are essential. Both present a range of quality and scalability this decade, requiring an investment approach focused on the integrity criteria discussed in this brief (Mitchard et al. 2024, Rattenbury 2022).

Historical Carbon Credit Market Failures

The carbon credit market has been hard to design and slow to mature. Early concerns arose in the first phase of the European Union ETS, when over-issuance of allowances caused the carbon price to collapse to zero in 2007 (European Commission, 2025). In subsequent years, studies documented failures of the Kyoto Protocol's Clean Development Mechanism (CDM), finding that investments in carbon reduction projects in developing countries had low environmental integrity. Many projects would have proceeded without carbon credit revenue and did not represent additional emissions reductions (Cames et al., 2016).

Criticism moved to the voluntary market in 2023 when an investigation by *The Guardian*, *Die Zeit*, and *SourceMaterial* found that more than 90 percent of sampled Verra rainforest credits did not represent real emissions reductions because deforestation baselines were substantially overstated (Greenfield 2023). Subsequent analysis by *The Guardian* found that 39 of the 50 most heavily traded offset projects had flaws undermining their promised impact (Greenfield 2023). A 2025 review of carbon offsets literature claims that two decades of research point to "persistent" and "endemic" lack of quality across voluntary and compliance markets and across several project types such as forestry, energy, and cookstoves (Romm et al. 2025).[1]

These findings have contributed to widespread distrust in carbon credit markets. The role of credits in compliance markets remains limited; the voluntary market remains a tiny fraction (< 0.1 percent) of global climate finance and does not show signs of scaling at the rate necessary to meaningfully reduce emissions (Naran et al. 2025). Following a steep drop in demand, credit retirements have remained flat since 2022 at around 180 MtCO2e per year (Turner et al. 2025). In a survey of 137 corporate respondents, over 50 percent of respondents cited market imperfections, quality concerns, and a lack of transparency as deterrents to investment (World Economic Forum 2023).

Current Market Outlook

Urgency is increasing to scale private climate finance flows and lower emissions. Today's carbon credit markets are characterized by a heightened focus on integrity, data standardization, jurisdiction interoperability, and standard setting.

Recent advances in digital monitoring, reporting, and verification (MRV), aided by artificial intelligence, allow for more accurate baselining and evaluation to limit additionality risk (Gizachew 2026). New legal and financial frameworks can support a diversity of nature-based and engineered project activities while limiting durability risks (Healy et al. 2026; Kaplan et al. 2023). High-integrity principles from nonprofit institutions like the Integrity Council for the Voluntary Carbon Market (ICVCM) and rigorous evaluation from new ratings agencies like Calyx, BeZero, and Sylvera are providing quality signals for firms and governments alike (Faecks & Dufrasne 2025; ICVCM 2026; NEA 2025). Combined, these efforts should increase accountability and transparency while enabling markets to self-correct and align around quality.

Beyond integrity, governments are clarifying how carbon credits can be used in voluntary and compliance schemes, which in turn shapes their value to buyers. Article 6.4 of the Paris Agreement established the Paris Agreement Crediting Mechanism (PACM), the successor to the Clean Development Mechanism, through which countries and companies can trade UN-backed, high-quality credits (UNFCCC 2026). At the domestic and subnational levels, rules vary widely on how much of a firm's compliance obligation can be met with credits, and which methodologies qualify for use (Jain et al. 2026). Recently launched data initiatives such as the Climate Action Data Trust (CAD Trust) and Carbon Data Open Protocol (CDOP) hold promise to address this fragmentation and improve transparency, trust, and interoperability between markets (CAD Trust 2023; CDOP 2025).

Since 2022, substantial progress has been made to correct market failures – now those efforts must be redoubled. Across voluntary, compliance, and Article 6 mechanisms, more alignment is needed around a

1 Voluntary carbon markets let companies, governments, and individuals purchase credits to meet self-determined climate targets. Compliance markets, created by law or regulation, require covered entities to surrender credits to meet binding emissions limits (CRS 2024). The two are increasingly interdependent, as some governments permit compliance use of voluntary credits and both draw on shared registries and standards (Ecosystem Marketplace 2025).

shared set of approved, high-integrity methodologies. Data are not yet standardized and shared transparently at the project and transaction levels. As such, it is challenging for buyers to discern quality, and for regulators to transfer credits between markets and trace credits through their life cycle to verify corporate claims. While the volume and share of credit retirements used in compliance as opposed to voluntary markets increased between 2023-2025, the legal status and role of credits vary substantially across jurisdictions (World Bank 2026; Jain et al. 2026).[2] In the voluntary market, the average traded price of credits ($5.69/ton) is far below estimated social costs of carbon and carbon prices in major compliance markets (Sylvera 2026).[3] Credit prices also range widely, from older avoidance credits that cost just a few dollars per ton on the spot market to emerging removal technologies that cost hundreds of dollars per ton in forward markets (Sylvera 2026). In sum, carbon credit markets today remain fragmented and, in many jurisdictions, lack the enabling policy frameworks for safe and scalable private investment, requiring further near-term action.

Ahead of COP31, new coalitions, such as the Open Coalition for Compliance Markets and the Coalition to Grow Carbon Markets, are working to align market infrastructure, standards, and credit use rules across jurisdictions (European Commission 2026; VCMI 2026). Türkiye, host of this year's UN climate summit, has vowed to pressure states to boost credit demand (Kurum 2026). This presents a window of opportunity to address concerns around carbon credits and converge on high integrity.

Modernizing Carbon Credit Markets

Instead of disallowing international credit use in compliance markets, tossing out one of the few mechanisms available for carbon finance globally, regulators should align around the standards and infrastructure that will let the market modernize and mature (Meyers et al. 2026). This has the potential to direct tens of billions of dollars toward carbon removal. Failure to realize this potential will have severe planetary consequences. Limiting global warming overshoot past 1.5 degrees Celsius will require a four-fold increase in carbon removal to 8-10 Gt of CO2 annually by mid-century (Dunne et al. 2026; UNEP 2026; National Academies 2019). This necessitates an all-inclusive approach to reductions and removals, nature-based and engineered, to protect existing carbon sinks and expand global sequestration capacity. With the right conditions in place, enabled by coordinated government action, carbon credits can become a trustworthy and investible market that benefits developers and buyers alike.

Buyers and investors need quality assurance and demand incentives. Developers need adequate revenue and clearer pathways for approval. Markets need transparent data and infrastructure to track and transfer heterogeneous credits as fungible assets. The role of credits must change from a cheap, voluntary way to claim carbon neutrality to a regulated backstop for addressing ongoing emissions while prioritizing direct decarbonization. **To succeed going forward, carbon credits must meet three core conditions**:

- **Address Integrity Issues:** A great deal of progress has been made since 2022 to distinguish between low- and high-quality credits and manage the risk of reversals. Policymakers now must issue guidance and regulations that strengthen integrity standards for voluntary and compliance purchases, coordinating with other states to align on existing principles and best practices while honoring country-specific contexts. To minimize global emissions this decade and remove atmospheric carbon

2 The retirement spike in 2024 is due to California's compliance cycle for its cap-and-invest program. Retirements in 2025 occurred primarily across Colombia, Australia, Alberta, and South Africa.

3 This refers to average spot market transaction prices in the voluntary carbon market in Q1 2026. This median obscures a wide range of values from less than $0.01 to over $100. The quality of credit that ratings agencies consider investment-grade (BBB+) trades for an average price of $20.10 per ton. Meanwhile, California's cap-and-invest prices in 2026 were $29.05, and the EU ETS $80.89.

at gigaton scale this century, policy frameworks must be pathway-neutral, allowing reduction and removal projects to employ both nature-based and engineered solutions to meet high-integrity criteria.

- **Incentivize Investment:** Resolving integrity issues may solve supply-side challenges but does not guarantee increased demand. Ideally, carbon credits should be low-risk assets that serve a concrete purpose for buyers. Resolving legal uncertainty around carbon rights and claims while establishing protection from lawsuits for buyers who meet high-integrity purchasing standards would significantly de-risk investment. Further, many compliance markets do not allow for the use of international credits, which inhibits demand and creates project funding gaps. To bolster corporate demand, policymakers should establish a limited yet meaningful role for high-integrity credit use to reduce emissions liability in compliance markets.
- **Increase Interoperability:** Carbon credit markets are fragmented, with dozens of siloed public and private registries that have inconsistent data schemes and opaque ledgers. This makes it challenging to track, validate, transfer, and report credit use across voluntary and compliance markets, as well as to prevent double counting. Governments can improve interoperability by adopting common data standards, connecting national registries to a shared metadata platform, coordinating on credit eligibility standards and mutual recognition, and requiring credits to carry labels with eligible policy uses. Governments can also engage in knowledge transfer and support, helping lower-capacity countries develop or modernize registries designed for interoperability. Increasing interoperability will allow multinational companies to purchase credits across jurisdictions and retire them where their compliance obligations arise, without double counting or compromising credit quality. This flexibility will increase the utility of carbon credits globally.

III. Recent Progress Toward Reimagining Credits

Carbon credits have undergone a major reset in the last five years in an effort to reestablish trust and strengthen integrity. Scientific and technological advances have enabled more advanced baselining and monitoring techniques. Legal and financial frameworks are emerging to handle the heterogeneity of project activities and timeframes. In the voluntary carbon market, new oversight bodies and ratings agencies are reviewing registries, methodologies, and projects based on more stringent integrity standards. Governments are actively developing regulations to determine the role of high-integrity carbon credits in compliance schemes.[4] The section below synthesizes recent milestones in these areas.

Science, Technology, and a Spectrum Approach toward Additionality

Additionality is a core measure of credit quality subject to increasing scrutiny at the project and methodology level. Traditionally, additionality tests occur before a project starts, comparing projected emissions outcomes over the crediting period under a "business-as-usual" scenario to those estimated from the project development. The counterfactual baseline scenario is calculated by the project developer in accordance with a method approved by standards bodies, and is independently verified by verification organizations. A myriad of additionality tests measure whether a project would have occurred absent carbon credits:

4 The EU and California represent the two most consequential open windows for shaping the role of credits in major compliance markets in 2026. Additional countries such as Brazil are in earlier stages of establishing carbon markets.

- Regulatory surplus tests whether the project goes above and beyond existing legal requirements.
- Investment analysis tests whether the project would be profitable in the absence of credits.
- Barrier analysis tests whether the project faces significant obstacles, such as technical, financial or market barriers that would prevent the project from being developed without the credit incentive.
- Common practice analysis requires that the project, or technology or practice it relies upon, is not common practice.
- Performance-based approaches assume that projects which achieve high environmental impact are likely to rely on the production of carbon credits; this approach equates high performance with proof of additionality.

The Paris Agreement Article 6.4 standard relies on a stacked approach to additionality, requiring projects to pass regulatory surplus, investment analysis, barrier analysis, performance-based approaches, and a common practice analysis test (UNFCCC 2026). In the voluntary market, ICVCM also requires its approved methodologies to meet several stacked tests and aviation industry standards.

Beyond stacking tests, ICVCM's Core Carbon Principles address an additionality concern by excluding ex-ante credits from eligibility. Historically, credits could be issued before a project had actually reduced or removed any emissions based on a projection of what the project was expected to achieve over its lifetime. Under those conditions, a buyer had no guarantee that the emissions outcomes they were paying for would materialize. The Core Carbon Principles close that gap by barring all forward-issued credits, requiring that credits only be issued after the emissions reduction or removal has been independently verified (ICVCM 2024). This distinction shifts additionality from a forecast problem to a verification problem. For buyers, it reduces the risk of purchasing credits that never corresponded to real mitigation.

Additionality concerns also vary by project type, and the market has increasingly responded to those differences. Engineered removal projects such as direct air capture, biochar, and enhanced rock weathering are structurally additional in a way that other projects are not, relying heavily on carbon finance revenue to succeed. That structural clarity partially explains why engineered removals alone attracted $8 billion investment in 2025, an estimated 67 percent of the value of offtake agreements signed that year, despite representing a fraction of current credit issuance (World Bank 2026). Avoidance credits, such as REDD+ forestry projects, present an additionality challenge, requiring proof that forest conservation would not occur without financial incentive, while nature-based removal credits fall somewhere in between.[5]

Due to the diversity of carbon reduction and removal pathways, market actors are increasingly recognizing additionality as a spectrum, rather than a binary. Stacked additionality tests reduce, but cannot eliminate, the uncertainty of measuring progress against a counterfactual. No project can truly ensure additionality with 100 percent confidence (White 2026). Like any government spending program, from unemployment insurance to tax credits, some money inevitably will flow to non-additional projects; the key is to manage and minimize the problem (Salzman & Weisbach 2024). As such, independent ratings agencies grade additionality on a spectrum to help buyers assess quality (White 2026, Downey 2025).

Minimizing uncertainty and risk around additionality requires scientifically sound measurement and monitoring, particularly for nature-based credit projects. Historically, developers and verifiers of forest-based

5 REDD+ stands for "countries' efforts to reduce emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks" (Forest Carbon Partnership Facility 2026).

credits have relied on survey teams measuring trees in-situ to establish and monitor a static emissions baseline. This process is hard to scale and drives up project costs significantly without delivering value to local communities (RMI 2022). Newer high-integrity methodologies for nature-based projects mitigate additionality risk by combining stacked tests before credit issuance with dynamic baseline measurement, which uses remote sensing to deliver more precise and accurate carbon accounting.

Dynamic baselining compares a carbon credit project to matched control areas and re-verifies the project throughout the crediting period to reflect real-world changes (Nolan et al. 2024). For example, the Family Forest Carbon Program, an initiative developed by the American Forest Foundation and the Nature Conservancy, uses a dynamic baseline approach by matching a sample of the land in the project with equivalent plots in the U.S. Forest Service's Inventory and Analysis database, which are not in the project scope. The project sequestration outcomes are measured periodically against the baseline provided by the out-of-scope plots to ascertain additionality over time (TNC). Critics of older forestry methodologies often point to traditional baseline selection and evaluation as vulnerable to manipulation and overcrediting due to its reliance on a counterfactual (West et al. 2020). Dynamic baseline measurement turns additionality from an educated guess about a project developer's motivation to a quantifiable observation of comparative outcomes. Since 2025, ICVCM has granted CCP approval for high-integrity forest management and mangrove restoration methodologies using dynamic baseline measurement across major registries (Verra 2025; ACR 2026; Isometric 2026).

Of course, new technology is not a silver bullet solution and should not be used in the absence of quality data or as a total substitute for fieldwork. Remote sensing and artificial intelligence (AI) require access to high-speed internet, electricity, software, hardware, computing infrastructure, and human capital. The accuracy of AI models also depends on the availability of training and validation data. Communities, governments, and institutions around the world have varying access to these resources, posing equity and cost risks for less developed nations that could decrease project profitability and, thus, the likelihood of financing (Gizachew 2026). Even if implemented successfully, dynamic baseline measurement can only minimize, not eliminate, uncertainty around additionality. High-integrity projects should not only integrate AI-enabled digital measurement where such methods are cost-effective and well-calibrated but also use conservative accounting to make sure emissions claims are valid and additional (Calyx 2024).

Legal and Financial Innovations in Credit Durability

Permanence, or durability, is subject to fierce debate because carbon removal pathways operate on different timescales with varying levels of reversal risk. For example, novel engineering technology has the potential to store carbon indefinitely but is not ready to deploy at scale, while nature-based solutions are available today but may only remove carbon for a matter of decades. Like additionality, this brief argues that durability is a spectrum that carbon credit markets have been treating as a binary. Sophisticated buyers are already approaching the durability spectrum issue by investing in portfolios of credits with diverse activities and timescales, and by forming coalitions to aggregate demand and finance the development of high-integrity projects with shorter- and longer-term durations (ClimateSeed 2025; Symbiosis 2026; Frontier 2026).

Durability requirements remain unsettled across independent and government registries. Methodologies may require monitoring for as few as five or as many as 1,000 years (ACR 2023; Puro.Earth 2026). ICVCM requires 40 years of monitoring and compensation from the start of crediting for CCP eligibility (ICVCM 2024). California, on the other hand, requires forest offset projects to monitor, verify, and report for 100 years following any credit issuance, and the U.K. ETS sets a 200-year minimum storage rule for greenhouse gas

removals (CARB 2014, UK 2025). **To enable convergence between high-integrity carbon credit markets, governing bodies will need to more closely align on durability thresholds that allow engineered and nature-based credit types a path to eligibility without undermining integrity.**

Although not yet established in practice, "contracted durability" is a novel legal and financial solution to ensure all high-integrity project types can participate in the market, regardless of the timeframe. Contracted durability assigns enforceable liability and provides compensation for reversals throughout the length of a durability threshold (Healy et al. 2026). Using a combination of tools (such as buffer pools, insurance, horizontal stacking, and permanence trusts), credits can shift from one carbon pool to another over time or in the case of a reversal event. Buffer pools and insurance are well-established tools for compensating reversal but insufficient on their own. For example, parametric insurance can provide communities with a payout just days after a natural disaster to cover business interruption and limit ecosystem damage, but solves only for reversals during a project's crediting and post-credit monitoring period (UNEP 2025). Contracted durability folds in additional, long-term risk management tools.

Horizontal stacking replaces credits when a project's monitoring period ends or a reversal occurs with the same amount of credits from a new project (Cabiyo 2022). In other words, a single contract for a certain amount of carbon removal can be satisfied by multiple physical projects over time, for example, first by a forestry credit and later by geological storage. Permanence trusts are the most novel tool proposed for contracted durability, an endowment of pooled funds paid into by buyers and developers at the time of credit issuance that assumes full liability for monitoring, preventing, and compensating for reversals (AFF 2026).

Challenges remain to implementing permanence trusts for contracted durability, including setting a defined threshold for negligible risk and guaranteeing that sufficient long-duration replacement credits would be available in the case of reversal. If successful, contracted durability could enable shorter-duration carbon removal pathways to meet regulatory requirements for 100-year permanence thresholds, preventing nature-based credits from becoming stranded assets. The key is assigning a well-endowed, long-term liable party, shifting burden off the project developer to an enduring institution that can compensate for reversals.

Carbon accounting offers an alternative approach to addressing the durability spectrum. Time-based discounts reduce a credit's value based on its durability, requiring a buyer to purchase multiple 30-year forestry credits to achieve the equivalent level of carbon removal from a single long-duration storage credit (Parisa et al. 2022). Risk-based discounts require assessing the probability of reversal for a given project and reducing credit value against the social cost of carbon (Groom & Venmans 2023). For example, credits from a landfill methane capture project carrying baseline quantification uncertainty would be discounted against the social cost of carbon relative to those of a geological storage project with sequestration that can be directly monitored. This would produce a market in which geological credits trade like investment-grade instruments while methane avoidance credits trade at a structural discount. Time- and risk-based accounting, or combinations of the two, would turn carbon credits from a fungible, commodity-like asset into something closer to Treasury bonds, with tiered asset classes based on durability and reversal risk (Lamarque et al. 2026).

Contracted durability depends on defining negligible risk and securing replacement credits. Discounting, by contrast, requires agreement on contested values such as the discount rate and social cost of carbon. Both approaches treat durability as a spectrum rather than a binary.

Voluntary Action to Define Integrity and Mitigation Hierarchy

In the absence of government action, nonprofits and private agencies have moved to define high-integrity credits and establish market rules for corporate buyers to follow.

The Core Carbon Principles established by ICVCM are providing buyers a clear integrity signal. As of October 2025, CCP-approved credits were commanding a 25 percent premium over non-CCP-approved credits (ICVCM 2026). This is driven in part by scarcity: ICVCM has approved only 41 methodologies to date, covering approximately 4 percent of existing credits in the market (ICVCM 2026). At a more granular level, independent carbon credit ratings agencies evaluate individual projects. Since 2022, rating agencies such as BeZero, Calyx, MSCI, and Sylvera have assigned grades (e.g., AAA to D) that signal project efficacy and risk, similar to the role Moody's & S&P Global play in debt markets. Project ratings address the reality that verification is imperfect. Developers can overstate impact, auditors can rubber stamp flawed baseline assumptions, and standards bodies that provide oversight and issue credits can fail to catch issues. Ratings agencies provide an added layer of accountability to the voluntary carbon market and increase project-level transparency. This enables buyers to distinguish low- from high-integrity projects and purchase credits with real emissions impact that are aligned with their corporate strategy.

Table 1. Project-level assessment criteria across four major carbon credit rating agencies

Criteria	BeZero	Calyx	MSCI	Sylvera
Additionality	x	x (caps entire project rating)	x	x
Carbon Accounting (*baselines, leakage, quantification*)	x	x	x	x
Permanence	x	x (100-year scale)	x	x (100-year scale)
Overlapping Claims	x (pre-rating assessment)	x		
Co-benefits			x	1-5 scale (separate assessment)
Legal and ethical risk	x (pre-rating assessment)		x	
Delivery risk (*for ex ante issuance*)	x		x	

Nonprofit initiatives are defining integrity on both the supply and demand side of carbon credit markets. The Voluntary Carbon Markets Integrity Initiative (VCMI) released its first Claims Code of Practice in June 2023, under which companies can make claims reflecting their purchase and retirement of carbon credits. Notably, those claims cannot be counted toward a company's stated emissions reduction targets. Instead of reducing responsibility to decarbonize, VCMI-approved claims must use credits to deliver additional mitigation – a

contribution to global climate action beyond a company's value chain. VCMI also permits companies to make a claim only if they first demonstrate progress toward near-term emissions reduction targets, publicly disclose how their policy advocacy activities are consistent with Paris Agreement goals, and purchase CCP-approved credits. **The Claims Code language also intentionally aligns with that of other voluntary governance bodies such as ICVCM and the Science Based Targets initiative (SBTi), breaking with the idea that credits can be counted as offsets for ongoing emissions (VCMI 2025).**[6] This contends with the widely shared concern that offsets permit continued pollution and distract from direct decarbonization by introducing a hierarchy of mitigation: decarbonize first, then use credits as an extra contribution.

In June 2026, SBTi released its Corporate Net-Zero Standard Version 2, which similarly establishes a role for credits to address "ongoing emissions responsibility" without letting those credits count toward corporate emissions reduction targets. Under this framework, SBTi provides recognition for companies that use credits as a complement, not a substitute, to lowering emissions on the path to net-zero, and shifts to a requirement post-2035. Industry response to this approach has been mixed, with some hailing its recognition as a "watershed moment" for high-integrity credit demand and others predicting "inactivity" because it strips credits of their value to companies absent a government mandate (Jones 2026; Tam & Rattenbury 2026).

While the impact of these new voluntary initiatives on future demand remains to be seen, the convergence between supply- and demand-side oversight bodies like ICVCM, VCMI, and SBTi is notable. Each of these nonprofits references each other's work, aligns on a clear set of high-integrity principles, and proposes a limited yet meaningful role for carbon credits not as offsets, but as complements to direct decarbonization. This level of integration is important for enabling carbon market growth, not only between voluntary actors, but also between voluntary and compliance schemes.

Compliance Market Reforms to Incentivize Demand

The role of carbon credits in government-regulated markets is growing but varies widely across jurisdictions. Four carbon market schemes allow for unlimited use of credits to meet carbon tax liability; 33 jurisdictions allow for a capped amount; and 40 jurisdictions do not allow for the use of credits at all (World Bank 2026). Of the national and subnational schemes that allow credit use, several have recently increased the stringency of their protocols in an effort to prevent the trading of low-integrity credits.[7] This is in part a reaction to the Kyoto Protocol's CDM, which flooded the EU ETS with cheap, non-additional credits in the 2010s (Wetterberg et al. 2025).

Compliance markets are also converging around shared data principles that should increase interoperability. According to a comparative analysis by Columbia University researchers, government registries are increasingly adopting standardized unit metadata and unique identifiers, interoperable machine-readable systems, and public transparency requirements. The report cites the United Kingdom's voluntary registry and Australia's and Japan's compliance registries as models that already incorporate all three of these principles (Jain et al. 2026).

---

6 According to version 3.0 of the Claims Code, updated in April 2025: "Carbon credits cannot be counted towards the achievement of within value chain emission reduction targets. Carbon Integrity Silver, Gold and Platinum Claims are made by companies that are taking action now to accelerate global net-zero, by going above and beyond science-aligned emissions cuts through additional use of high-quality carbon credits." (VCMI 2025)

7 For example, following an independent review in 2022, the Australian Carbon Credit Unit went through a period of reform to strengthen governance, transparency and integrity between 2023-2025 (DCCEEW 2026). California is setting up mechanisms for its CDR program (SB 905), updating credit protocols for its cap-and-trade program (SB 840), and reviewing CDR accounting methods in its Scoping Plan update (AB 32) to ensure meaningful climate impact (CARB 2026).

Governments are also shaping expectations for voluntary credit use with binding rules and non-binding guidance. The European Union adopted its first set of methodologies under the Carbon Removals and Carbon Farming Regulation (CRCF), a binding certification framework for voluntary credits with enforceable sanctions that can serve as a model for other jurisdictions (European Commission 2025). The United Kingdom and Singapore both released non-binding guidance in 2025 for voluntary corporate use of high-integrity credits that reference ICVCM's Core Carbon Principles (DESNZ 2025; MAS 2025). Singapore also hosts multiple credit exchange platforms, such as Climate Impact X, that integrate directly with registries like Verra and Gold Standard and enable voluntary trading that is more transparent, standardized, and liquid (CIX 2025).

While unilateral credit regulation may unlock demand, it also risks increased fragmentation and, as a consequence, cross-border transaction friction. For example, the legal classification of credits can change depending on the jurisdiction. Some countries recognize credits as intangible assets, others as tradable assets, securities, or nothing specific (Jain et al. 2026). Strong carbon credit market growth requires liquidity, and legal uncertainty limits it. To reduce fragmentation, carbon credit guidance should be based on shared standards agreed upon at the coalition level, and balance clarity and flexibility (Wolfram et al. 2026).

As of August 2026, several governments are actively developing regulations that will determine the role of carbon credits in their compliance markets and, as a consequence, shape domestic and international demand. Most significant as a global demand driver is the European Union, which agreed to allow international credit use beginning in 2036 to help meet its 2040 climate target, capped at 5 percent of 1990 net emissions levels (European Commission 2026). This decision alone could drive up credit demand by nearly 260 million tons, a volume close to the total annual volume of credits retired globally in 2025 (ICAP 2026; World Bank 2026). Beyond the EU, Japan's Emissions Trading Scheme, which allows for domestic credit use and Article 6.2 bilateral trading, is shifting from voluntary to mandatory.

Another major source of near-term, compliance credit demand is the International Civil Aviation Organization's (ICAO's) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Credit retirements for CORSIA's first compliance phase, expected to generate 100-150 MtCO2e of demand, are due in 2028. Eligible credits must meet ICAO's eight integrity criteria, be authorized by the host country, and receive a corresponding adjustment to avoid double counting (ICAO 2019). This creates an incentive for creating and issuing high-integrity credits but also constrains near-term supply.

The voluntary carbon market has an oversupply of low-quality credits and an undersupply of high-integrity credits authorized for CORSIA use. As of 2025, the volume of credits eligible for phase one CORSIA compliance was less than 11 percent of expected demand (Brun et al. 2026). Host country authorization is a serious limiting factor, creating an opportunity for government action.[8] In June 2026, the International Air Transport Association launched the Supporting Alliance for CORSIA EEU Supply to pool technical assistance for moving credits between the Article 6 and CORSIA systems (IATA 2026). Until July 2026, the European Commission was also considering imposing tighter quality standards on airlines in member states that would have made nearly all existing CORSIA-ready credits ineligible (Stankova 2026). In short, the largest compliance market for carbon credits struggles to meet one of the essential conditions for markets to thrive: interoperability.

As a global standard setter, the EU's choices will impact carbon finance elsewhere. Near-term policy decisions, such as how to regulate European airlines or set the eligibility criteria for international credits used toward

8 Host country authorization refers to the formal approval a government grants through a Letter of Authorization permitting credits generated within its territory to be used toward CORSIA, rather than counted toward its own Nationally Determined Contribution. Authorization obliges the government to apply a corresponding adjustment under Article 6 of the Paris Agreement, which means every CORSIA-authorized credit raises the difficulty of meeting the country's climate target under Paris.

its 2040 climate goal, have the potential to cause further fragmentation, or to reimagine credits as verified, integrated, tradable assets with a limited yet meaningful role in compliance markets.

Coalitions to Make Markets Interoperable

In recent years, multiple coalitions and initiatives have emerged to help carbon markets mature and align. The Coalition to Grow Carbon Markets focuses on strengthening voluntary corporate demand for high-integrity credits through increased cross-border consistency (VCMI 2026). Türkiye, Ghana, and Luxembourg joined the coalition in 2026, bringing the number of participating countries to 14 and elevating carbon credit markets as a priority of COP31 (Kurum 2026). Separately, the Open Coalition for Compliance Markets, launched in 2025 by the EU, China, and Brazil, serves as a platform to enhance cooperation between domestic carbon markets and pricing policies. Building on the work of Article 6.4, the Open Coalition will prioritize the topic of potential high-integrity credit use (European Commission 2026).

New initiatives like the Climate Action Data Trust (CAD Trust), the Carbon Data Open Protocol (CDOP), and the Global Carbon Market Utility (GCMU) offer data platforms and schemes meant to standardize and connect registries to each other. The World Bank's CAD Trust uses blockchain-based digital infrastructure to create a decentralized, publicly accessible platform for carbon registry data, allowing credit information from various registries to be viewed and verified in one place (CAD Trust 2023). CDOP goes a step further by standardizing the underlying data schema itself. Their data fields can be used by registries, verifiers, buyers, and regulators to describe credits of all kinds with the aim of enhancing consistency, transparency, and interoperability across voluntary, compliance, and UN markets (CDOP 2025). While not yet finalized, the GCMU also plans to publish a neutral registry infrastructure establishing clear legal title and ownership tracking for carbon credits, with the aim of de-risking credits for institutional investors (GCMU 2025).

Shared data infrastructure of this kind, if adopted and supported by governing bodies of key national and subnational markets, should rebuild buyer confidence in credit quality and credibility. Another positive sign of market maturation is the recent addition of project-level credit ratings from three leading agencies to the Bloomberg Terminal (Stankova 2026). The ratings (on a standard scale from AAA to D) assess the integrity and risk of projects. Housing those credit integrity ratings alongside the financial information investors already use to evaluate equities and bonds, suggests credits are beginning to be treated as a real, trackable asset class.

These country coalitions and market actor data initiatives, while nascent, show initial progress toward more interoperable carbon credit markets. The remaining task is for standards bodies and regulators to align around, then adapt and adopt these largely nonprofit efforts and operationalize common infrastructure to enable cross-border implementation.

IV. The Road Ahead for High-Integrity Carbon Credits

Multiple near-term windows of opportunity exist to shape the future of carbon credits. The following sections highlight ways to move toward meeting the core conditions necessary to achieve high-integrity markets.

Addressing Integrity Issues

The last five years have been characterized by increasingly stringent integrity standards in voluntary and compliance markets. The next five years should focus on continuity and convergence around those standards, such as ICVCM's Core Carbon Principles. Two existing government coalitions are positioned to drive near-term convergence from different sides of the market. The Coalition to Grow Carbon Markets works to mobilize high-integrity voluntary credit demand among corporate buyers, and the Open Coalition on Compliance Carbon Markets brings the world's largest compliance regimes together around shared accounting and offset standards. Convergence should be an immediate priority, as multiple standards for credit use in carbon market systems are being designed in parallel, and will grow much more challenging after rules harden (Wolfram et al. 2026). Shared standards should retain enough flexibility to account for country-specific context, continued innovation and improvement, and diverse high-integrity credit portfolios of engineered and nature-based reductions and removals.

Additionality and durability are not binary or guaranteed. Some degree of risk and uncertainty is inherent to any government program. Practices such as conservative accounting, dynamic baseline measurements, and contracted durability should be more widely adopted to manage risk, reduce uncertainty, and deliver real decarbonization outcomes. Governments have a key role to play in setting voluntary purchasing guidelines and supporting pilots or public-private partnerships that create a path for validating these emerging risk management strategies. For dynamic baselines, this could look like funding the procurement of remote-sensing tools and supporting research and development to test the accuracy and precision of AI-enabled analysis of raw remote sensing data against in-situ fieldwork. For contracted durability, governments could fund permanence trust pilots for a select number of high-integrity projects within their borders, or in partnership with lower-capacity host countries. If pilots demonstrate that a trust can reliably assume liability for monitoring and compensating reversals, the next step is supporting the establishment and endowment of independent permanence trusts to serve as long-term liable entities.

In the immediate term, the Article 6.4 Supervisory Body's ongoing review of methodologies and projects illustrates both the potential and the risk of designing high-integrity carbon markets. So far, much of its attention has gone to re-evaluating legacy projects using tighter baselines and more conservative accounting. This exercise is not the same as reimagining a credible, high-integrity market for the 2030s. The Supervisory Body should move on from legacy projects and hold new ones to rigorous performance standards that are activity agnostic. Credits should be issued for projects based on demonstrated outcomes rather than prescriptive design requirements that categorically exclude certain activity types, preserving a role for high-integrity nature-based and engineered carbon removals. In parallel, other market actors should work to maximize alignment with the Article 6.4 system as it matures.

Incentivizing Investment

Buyers have little reason to purchase carbon credits on uncertain legal grounds. On the legal front, the Global Carbon Market Utility's proposed legal infrastructure could mature into a central securities depository of sorts for carbon credits, giving carbon credits the certainty investors already expect from other financial assets. Otherwise, domestic governments will need to individually clarify carbon rights in coordination with other states. Safe harbor legislation for verified, high-integrity credits such as AB 1911 proposed in California may also provide buyers with the clarity they need to invest in credits (Climate Trust 2026).

Beyond a select group of well-meaning voluntary actors, most firms will not purchase credits unless those credits allow them to make a meaningful emissions claim or meet regulatory obligations. The mitigation hierarchy framework, validated by SBTi's net-zero standard and VCMI's Claims Code of Practice, prevents greenwashing and supports direct decarbonization by forbidding companies to use credits as offsets. That leaves compliance as the major driver of credit use going forward.

Incentivizing investment requires creating and preserving limited yet meaningful roles for high-integrity credit use in compliance markets, enough to mobilize capital for international projects that could not otherwise access debt-free finance. Several governments with compliance markets in advanced stages can serve as models. Among the 20 major economies studied in a recent regulatory stocktake, four have already enacted binding caps allowing companies to reduce 5 to 10 percent of their liability with credits (Jain et al. 2026). Alternatively, the EU announced in 2025 that it would set up a government-vetted, centralized procurement facility for up to 260 million tons of high-quality international credits between 2036 and 2040 to meet up to 5 percent of its 2040 climate target (European Commission 2025). Although some governments are setting the limit at the firm level, and others at the country level, the convergence around a 5-to-10-percent threshold is notable because it echoes SBTi's 10 percent definition of residual emissions that can be met with carbon removals. The alignment between governments' caps on credit use and corporate standards suggests an emerging cross-sector consensus on what a limited but meaningful role for credits means in practice.

The EU and California represent the two most consequential open windows for shaping the role of credits in major compliance markets in 2026. Both governments have to balance upholding integrity and credibility while preserving a role for credits of all types. Overly prescriptive policies will lock out project activities that are not domestic, long-duration engineered removals, technologies that are not yet deployable at scale. The EU is still finalizing governance and eligibility criteria for international credit use, and California is reviewing the role of credits under its carbon dioxide removal (CDR) and cap-and-invest programs. Preserving a meaningful role in these markets for high-integrity international credits with diverse removal pathways matters beyond the timely achievement of each jurisdiction's emissions targets. Credits are one of the few mechanisms that channel debt-free carbon finance to decarbonization, conservation, and carbon removal projects in lower-income countries with inadequate access to low-cost capital.

Increasing Interoperability

Without shared infrastructure, credits will fail to deliver fungible, high-integrity markets. Standardized data schemes, clear transfer mechanisms, and unified ledgers are necessary precursors to building credibility and attracting institutional investors. They give buyers transparent information that allows for more accurate price discovery based on discernable credit quality, and create audit trails necessary for regulators to verify corporate claims and trace custody as credits transfer between registries.

A few governments are ahead of the curve on interoperability. In 2025, Australia migrated its credit schemes to a single digital platform spanning both voluntary and compliance credits, with a cradle-to-grave ledger (Clean Energy Regulator 2026). The new registry is a single digital home for project IDs and metadata, making transfer, retirement, and claims tracking far easier. The system positions Australia to connect more readily with international registries and third-party exchanges. Singapore offers an alternative model: its Climate Impact X (CIX) exchange integrates directly with independent registries like Verra and Gold Standard, enabling voluntary trading that is more transparent, standardized, and liquid than trading conducted bilaterally or over

the counter (CIX 2025).[9] Australia demonstrates what a unified national registry can look like, and Singapore what a cross-registry integrated marketplace can look like. Governments elsewhere can draw on both models to modernize their registry and trading infrastructure.

Emerging multi-sector initiatives such as CAD Trust, CDOP, and GCMU also aim to unlock investment through improved and connected market infrastructure. That said, uptake by compliance registries is voluntary and uneven. Going forward, such tools should become de facto requirements for registries and projects to use. Broad engagement with these global schemes and platforms will require shared trust in their underlying institutions and clarity on the status and eligible use of credits they issue and host (E+E Leader 2026). The near-term task is increasing adoption of shared data schemes across markets and supporting lower-capacity governments as they develop or modernize their registries to ensure a high degree of interoperability.

Conclusion

Based on the landscape analysis in this report, carbon credit markets have made significant progress addressing integrity concerns since 2022. New technologies, methodologies, legal frameworks, and quality criteria point toward higher integrity. What remains is to create a stable policy environment that incentivizes buyers, with consistent standards across jurisdictions, and the market infrastructure that lets credits move across registries and between voluntary and compliance schemes.

- **Address Integrity**: converge around shared standards before individual government rules harden, and support pilots or public-private partnerships that validate dynamic baselines and permanence trusts as tools for managing additionality and durability risk.
- **Incentivize Investment**: issue clear legal guidance on carbon rights and claims, and preserve a capped, meaningful role for international credit use in compliance markets.
- **Increase Interoperability**: adopt shared data schemes, connect registries to common metadata platforms, and update digital infrastructure, extending technical assistance support to help lower-capacity countries develop or modernize registries.

Instead of rejecting credits over their earlier failures, the more productive path is to align around high-integrity principles, methodologies, and projects. Governments can reimagine a meaningful role for carbon credits and take action now to unlock additional climate finance.

9 In August 2026, CIX announced plans to merge with the London-based platform Carbonplace. The combined company would pair CIX's trading and pricing capabilities with Carbonplace's connections to multiple registries and bank-backed payment and delivery systems, expanding cross-registry interoperability beyond Singapore (CIX 2026).