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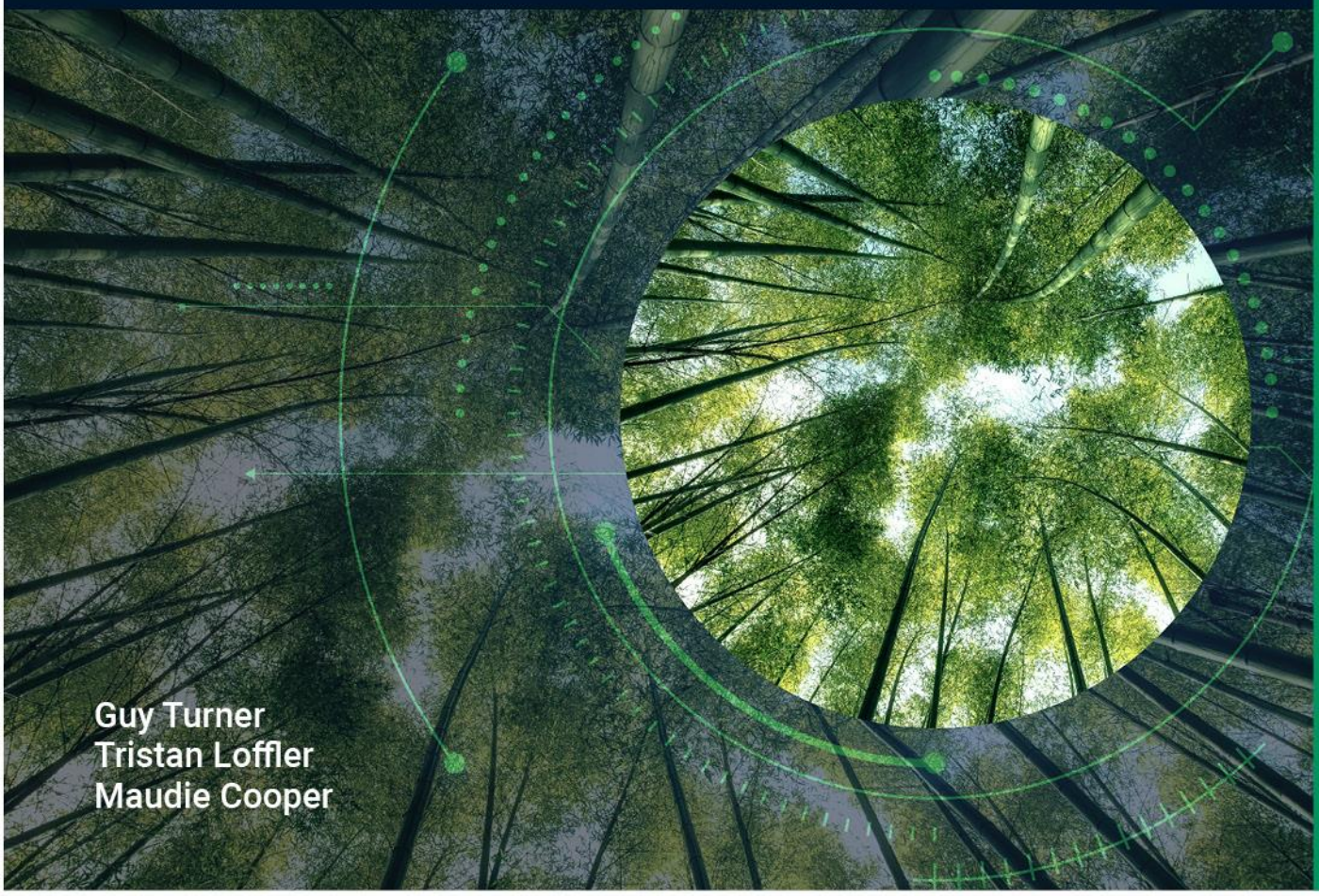
RESEARCH INSIGHT

State of Integrity in the Global Carbon-Credit Market

MSCI Carbon Markets

September 2024



Guy Turner
Tristan Loffler
Maudie Cooper

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Executive summary

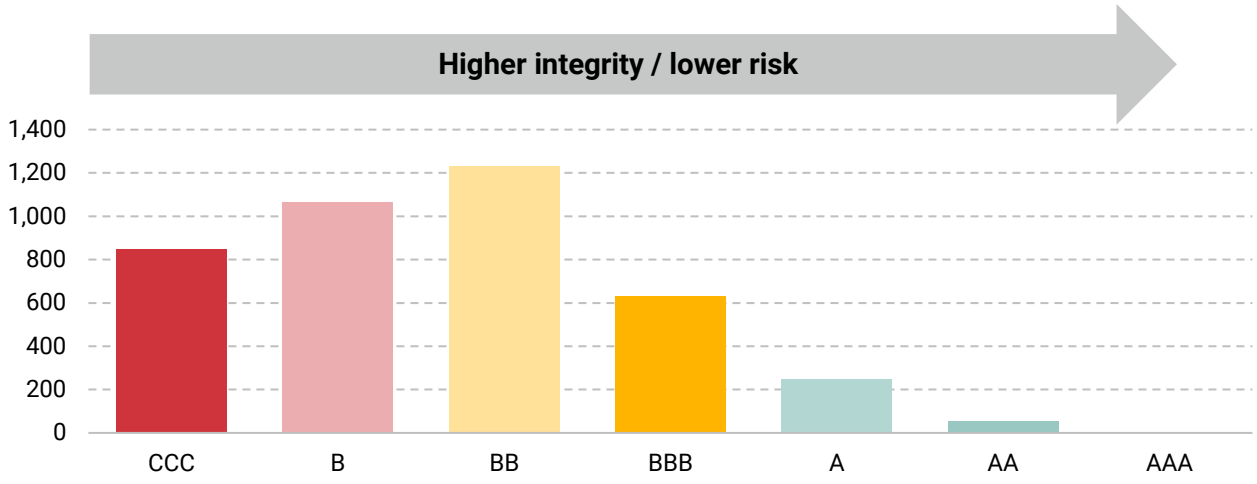
Integrity has long been a significant issue in the global carbon-credit market, though some high-quality projects do exist. For buyers and investors, identifying higher-integrity projects has always been challenging. However, multiple initiatives are now underway to improve integrity and bring transparency on the risks of projects.

This report describes the approach of MSCI Carbon Markets to rate the integrity of over 4,000 projects in the global carbon-credit market. Our process builds on key industry initiatives, such as the Integrity Council for Voluntary Carbon Markets' (ICVCM's) Core Carbon Principles (CCPs), to produce consistent and in-depth evaluations of individual projects using a rules-based, project-type-specific assessment framework. In aggregate, we analyzed over 10,000 documents and one million project data points through this work.

Each project's emissions impact and implementation approach are assessed against six criteria and over 50 sub-criteria. These criteria are combined and weighted to create a composite carbon-project rating that ranges from AAA to CCC.

Overall, no project currently receives an AAA rating, which reflects the inherent trade-offs that exist when both developing and evaluating carbon projects. Some 7% of the projects analyzed are rated in the AAA-A band (Exhibit 1). At the other end of the scale, 47% of projects are rated in the lowest two bands (B and CCC), demonstrating that many low-integrity projects do remain in the market.

Exhibit 1: Number of registered projects by MSCI Carbon Project Rating



Data as of September 2024. Source: MSCI Carbon Markets

There are, however, some early signs of a trend to increasing integrity. First, there has been a gradual shift in retired credits moving toward higher-integrity projects. Second, new projects being developed also appear to be, on average, of higher integrity. This is especially the case for projects, both engineered and nature-based, that remove carbon dioxide from the atmosphere.

Integrity considerations of a carbon project extend beyond its emissions impact. In particular, its co-benefits are increasingly being seen as core benefits for stakeholders. The contribution of a project to sustainable development varies by the nature of each project type, but also by how an individual project has been designed and implemented. Projects that have been assessed to deliver strong co-benefits, and operate with low legal and ethical risks, have commanded a premium price over the last two years.

More generally, over the same period, higher-integrity projects (AAA-A) have traded at a clear, and statistically significant, premium to lower-integrity credits. After controlling for other factors such as project type and location, a 1-point improvement in a project's overall integrity score (1-5) has been associated with an 8% increase in the spot price of a project's credits. There also appears to be an emerging trend toward higher-priced, higher-quality projects in the offtake market, particularly for nature-restoration projects.

While this relationship holds across the overall market, at the individual project level the relationship between integrity and price remains variable. This relationship may strengthen over time as tools to easily assess integrity across the whole market, such as the ICVCM's CCPs and MSCI Carbon Project Ratings, become more widely available.

1. Introduction

This report analyzes the state of integrity in the carbon-credit market using data and research from MSCI Carbon Market's in-depth rating of over 4,000 projects.

Ensuring carbon credits are of high quality is important. Buyers of credits need to know that the benefits to the climate and wider environment from the project they have helped fund are consistent with the claims being made. Without this assurance, firms voluntarily using carbon credits as part of their action to address climate change risk accusations of greenwashing, and credits used for compliance purposes risk undermining the integrity of their regulatory emissions targets.

In 2021, the Taskforce for Scaling the Voluntary Carbon Market (TSVCM) found that credit integrity was at the heart of buyers' hesitancy to engage with the market, with 45% of buyers identifying it as a key pain point.[1] More recently, some 55% of respondents in a survey run by the Science Based Targets initiative (SBTi) in April 2023 stated that the risk of greenwashing was discouraging them from buying more credits.[2]

This trend has continued due in part to recent media scrutiny regarding the quality of carbon credits. Recent academic papers and news articles have claimed significant integrity concerns exist with some types of carbon credits, adding to buyers' and investors' skepticism and hesitancy.

1.1 Defining carbon-credit integrity

Carbon credits have varying characteristics. These stem from fundamental differences in project types, but also from the methodologies that are used to quantify the credits, and how rigorously they are applied. Projects also differ in terms of their potential co-benefits and their legal and ethical characteristics.

This variation in quality was not intended. Standard-setting and governance bodies attempted to create a system in which all carbon credits had an equivalent climate benefit (representing a tonne of carbon dioxide equivalent [CO2e] removed or avoided), and could be used for voluntary or compliance purposes. These procedures date back to the Clean Development Mechanism (CDM) created under the 1997 Kyoto Protocol and have continued to evolve since, including through the expansion of the voluntary carbon market.

A key challenge lies in the quantification of the climate benefit of a project — i.e., whether the carbon credits calculated for a project are genuinely equivalent to mitigating or removing one tonne of CO2e from the atmosphere. This difficulty stems from the calculation method needed to determine what would have happened in the absence of a project, i.e., in the "baseline" scenario (sometimes referred to as the "counterfactual" scenario). Other aspects of a project's overall quality relate to the governance of the project and its broader sustainability impacts.

[1] "Taskforce on Scaling Voluntary Carbon Markets: Summary of the Public Consultation Report," ICVCM, June 3, 2021.

[2] "Beyond Value Chain Mitigation (BVCM) Research," SBTi press release, Sept. 1, 2023.

While there are many aspects to the quality of a carbon credit, there is a growing consensus on how to define and measure them. Typically, these relate to:

- The effectiveness of the project in reducing emissions beyond what would have happened in the absence of the project. This comprises assessment of issues such as the actual emissions from the project, the robustness of the baseline and risks of leakage and non-permanence.
- Environmental/social impacts — including environmental and social safeguards and general sustainable-development impacts.

The MSCI Carbon Project Ratings build on these factors to create a consistent approach to assessing carbon-credit integrity. The rest of this report describes current initiatives to improve carbon-credit integrity (Section 2), the approach used in the MSCI Carbon Project Ratings (Section 3) and key insights from the application of the ratings (Section 4).

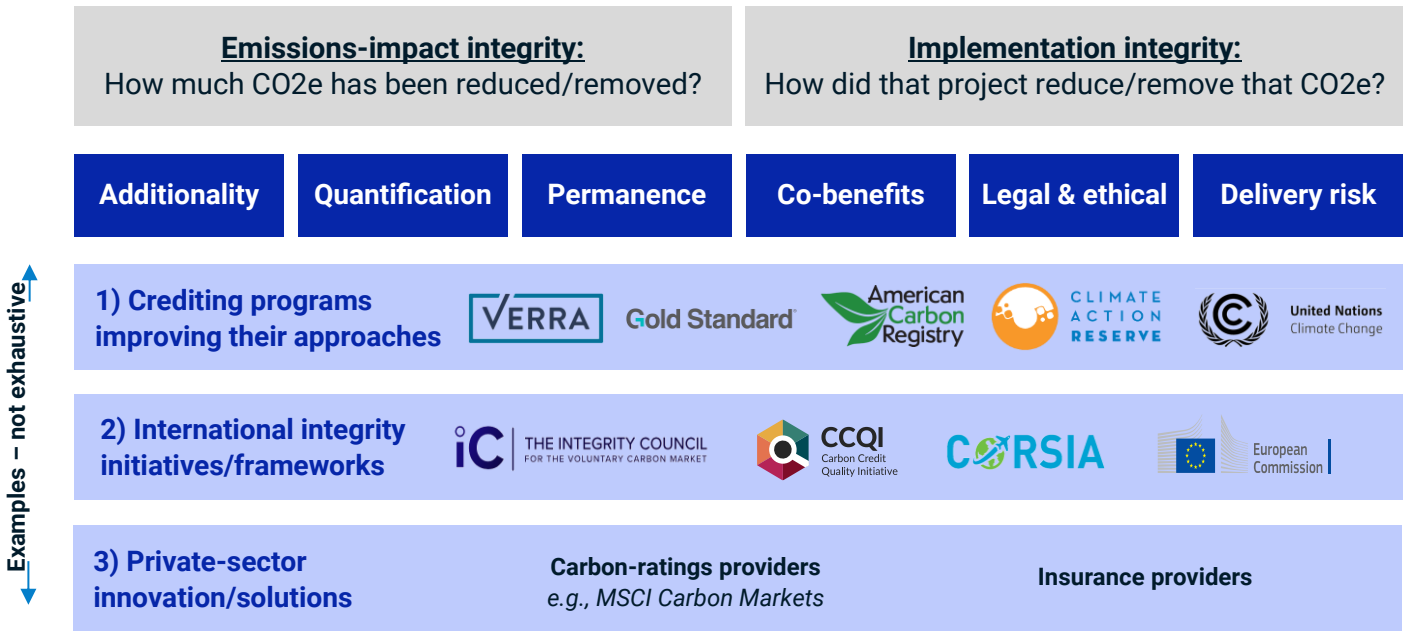
Within carbon markets, the terms “quality” and “integrity” tend to be used somewhat interchangeably. Through the rest of this document, we will use the word integrity.

2. Initiatives to improve carbon-credit integrity

2.1 Overview

Over the past few years, several initiatives have been created to address concerns over carbon-project integrity (Exhibit 2). While these initiatives all share a common objective in improving integrity standards and transparency, they work at different levels. Some initiatives focus on an overall program governance or project-type methodology level, while others target individual project integrity.

Exhibit 2: Initiatives to improve carbon-credit integrity



Source: MSCI Carbon Markets

2.2 Crediting-program initiatives

Standards and registries produce methodologies that set out how carbon-crediting projects should be run, and how their carbon reductions and removals should be calculated. These organizations also maintain registry infrastructures that track carbon credits as they are issued and retired.

Currently, there are over 50 carbon-credit registries active around the world. Most of these are relatively small, often operating at a national level. Some, however, such as Verra and Gold Standard, cover hundreds of project types globally. Newer standards have also been created to focus on specific technologies and project features. For example, Puro Earth is a standard focused on engineered carbon removals and ART TREES is a standard focused on jurisdictional-scale REDD+ projects.

Registries have been actively improving their governance processes and methodologies for creating carbon credits. Some of these changes were initiated by the registries themselves, and

others came in response to the requirements of industry bodies or initiatives such as the International Carbon Offsetting and Reduction Alliance (ICROA) or the ICVCM. For example, several registries have improved their grievance processes, their oversight of third-party validation and verification bodies (VVBs) and their transparency around the nature of credit retirees or benefit-sharing arrangements. These changes are starting to have an effect. For example, in the summer of 2024, the world's largest standard setter, Verra, for the first time, sanctioned VVBs and project proponents overseeing rice-cultivation projects.[3]

As well as updates to governance procedures, the registries have made a series of enhancements to a number of their methodologies. For example, in 2023, Verra published new methodologies for some of its most important project types, specifically:

- **Reducing emissions from unplanned deforestation** (Verra methodology number VM0048). Historically, this type of project has had problems in accurately defining baseline levels of deforestation. This new methodology introduces jurisdictionally-aligned baselines from a more centralized database based on geospatial data.[4] It also requires projects to update their baseline every six years, versus 10 years in prior methodologies. New projects must transition to this new methodology within a certain period of time. In a relatively unusual move, this new methodology will, to an extent, also apply retroactively to credits that have been issued under one of Verra's previous methodologies (VM009).
- **Afforestation and reforestation.** Verra's new methodology for calculating credits from growing new forests (VM0047) introduces a more dynamic approach to baselining. This important change aims to address additionality concerns by measuring biomass changes in surrounding areas to create more accurate estimates of carbon savings.
- **Clean cooking.** A new version of the Verra cookstove methodology (M0174) was opened for public consultation in late 2023, with the aim of clarifying quantification ambiguities and improving standardization across clean-cooking projects. The focus was on reducing the factors for estimating the carbon savings from the wood used in the stoves, resulting in fewer credits being issued per clean-cooking device distributed. This will eventually replace its most recent methodology, VMR0006 v1.2.

Importantly, apart from the one application of the VM0048 methodology referenced above, these new methodological changes will not apply retroactively. Therefore, while the new methodologies should promote increased integrity for new or updated projects, they are unlikely to help address the issue of legacy low-integrity credits.[5] In addition, critics allege that many of the crediting methodologies still give project developers a degree of latitude in how they quantify their credit issuances, potentially enabling some projects to over-credit.

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[3] "Verra Rejects China Rice Cultivation Projects, Sanctions Auditing Firms and Project Proponents," Verra, Aug. 28, 2024.

[4] Released in November 2023 — for specifics about this particular methodology, please refer to MSCI's blog post, "Verra's New Methodology for Unplanned Deforestation Aims to Silence the Critics."

[5] Although projects will be able to voluntarily transition their issued credits to newer, higher-integrity methodologies.

2.3 International integrity initiatives/frameworks

The ICVCM and its CCPs

The ICVCM is an industry-wide initiative that was set up in 2021 to raise the minimum bar for integrity in the market. It launched its CCP in 2023. These are a set of 10 principles that define what is required for a carbon credit to be of high integrity, with a focus on its governance, emissions impact and sustainable-development impact. The CCPs operate at a level above individual projects, assessing the registry and methodology used for issuing credits. These principles are summarized in Exhibit 3.

Exhibit 3: Summary of ICVCM's CCPs

ICVCM's CCP		ICVCM's assessment framework		
		Program level	Category level	Project level
Governance	1) Effective governance	✓	×	×
	2) Tracking	✓	×	×
	3) Transparency	✓	×	×
	4) Third-party validation/verification	✓	×	×
Emissions impact	5) Additionality	×	✓	×
	6) Permanence	×	✓	×
	7) Quantification	✓	✓	×
	8) No double counting	✓	×	×
Sustainable development	9) Benefits and safeguards	✓	✓	×
	10) Contribution to net-zero transition	×	✓	×

Source: ICVCM

During 2024, the ICVCM announced the first programs and categories eligible under its CCPs. As of August 2024, eligible registries included American Carbon Registry (ACR), Climate Action Reserve (CAR), Gold Standard, Verra and Architecture for REDD+ Transactions (ART), and eligible methodologies include eight methodologies across landfill-gas and ozone-depleting substances project types. The ICVCM has also announced that all legacy renewable-energy methodologies that had applied for CCP approval would fail its integrity benchmark as they are "insufficiently rigorous" in their additionality.

With these announcements, the total number of surplus credits[6] in the market that were approved to use the CCP label were estimated to be 29.5 megatonnes (Mt) of CO2e (2.5% of the market) from a total of 106 projects, while 267 Mt of surplus credits have now been rejected, representing 23% of the market. In addition, a further 287 Mt of surplus credits have been issued under methodologies that have declined to apply for CCP review, including all legacy REDD+ methodologies.[7] As a result, it is already clear that at least 48% of surplus credits will not be approved under ICVCM's CCPs, unless they are retroactively transitioned to a newer, CCP-approved, methodology.

The ICVCM's recent decision to rule out all renewable-energy credits from CCP eligibility signals a commitment to establishing a significantly higher threshold for integrity going forward, but it is a somewhat blunt approach. Many renewable-energy projects score poorly on MSCI Carbon Markets ratings, but not all. The ICVCM's strict line on all renewable-energy projects comes at the expense of rejecting a smaller number of better-performing projects.

The ICVCM intends to release new approved categories over the coming months and to have completed its CCP assessments for the majority of credits on the market by the end of 2024. MSCI Carbon Markets anticipates that some 15% to 20% of issued credits will eventually achieve CCP labels (see our previous blog post on this, "Potential Impact of the Core Carbon Principles on the Global Carbon Credit Market").

Carbon Credit Quality Initiative

Founded by Environmental Defense Fund, Öko-Institut and World Wildlife Fund, the Carbon Credit Quality Initiative (CCQI) is a joint initiative created to provide transparent information on the quality of carbon credits. The CCQI provides confidence scores for the likelihood of seven quality objectives being achieved based on five parameters: (i) the project type; (ii) the carbon-crediting program; (iii) the quantification methodology; (iv) the host country; (v) authorization for use under Article 6. Like the ICVCM, the CCQI does not assess individual projects, but instead focuses on methodology-level assessments.

Carbon Offsetting and Reduction Scheme for International Aviation

The International Civil Aviation Organization (ICAO), a UN agency that helps align air regulations worldwide, has developed the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), a quasi-compliance scheme designed to offset any emissions from international aviation that are above 85% of their 2019 levels. Airlines that fly routes between countries participating in CORSIA will now have to start buying eligible carbon credits to cover emissions that exceed the agreed-upon baseline.[8]

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[6] The cumulative total of issued credits that have not been either retired or cancelled.

[7] REDD+ is a type of carbon project, standing for Reduced Emissions from Deforestation and forest Degradation. The "+" signifies the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

[8] Here, and elsewhere in this analysis, the information is provided "as is" and does not constitute legal advice or any binding interpretation. Any approach to comply with legal, regulatory or policy initiatives should be discussed with your own legal counsel and/or the relevant competent authority, as needed.

CORSIA has developed a specific set of rules for credit eligibility, aiming to ensure that only high-integrity credits are used within the scheme. These rules differ by each phase of the scheme, but typically include specifications around the registry, methodology and vintage of credits. A number of other bodies and non-airlines have used CORSIA's credit-eligibility rules as a guide to identifying higher-integrity credits.[9]

2.4 Carbon credit insurers

Some aspects of credit integrity are now, in part, starting to be addressed by the insurance sector. Insurance products primarily focus on insuring against two types of risks: delivery and reversal risks. Delivery-risk insurance is intended to protect buyers of credits that will be delivered in the future from the risk that the credits are not fully delivered, whether due to insolvency or natural catastrophe. Insurance for reversal risks aims to protect buyers from the risk that buffer pools are depleted, or that political risks reduce or eliminate a project's impact. Such products are still at a relatively early stage and remain untested.

2.5 Independent carbon ratings

Private-sector firms are also increasingly offering solutions designed to help raise and/or assess the integrity of carbon credits. Such companies, for example, use satellite imagery, location-specific data and remote sensing to independently monitor rates of deforestation within (and quantify the carbon sequestration of) forests protected or replanted.

Most prominently, several carbon-ratings providers, including MSCI Carbon Markets, have created solutions that assess or rate the integrity of carbon credits. Through conducting in-depth evaluations of individual projects, carbon-ratings providers offer an independent assessment of the integrity of projects, providing transparency and reassurance to buyers and investors.

[9] For example, the Voluntary Carbon Market Integrity Initiative (VCMI) suggested companies use CORSIA's eligibility rules as a guide to ensuring credits are high quality, during the period that the ICVCM's CCPs were being developed.

3. MSCI Carbon Project Ratings

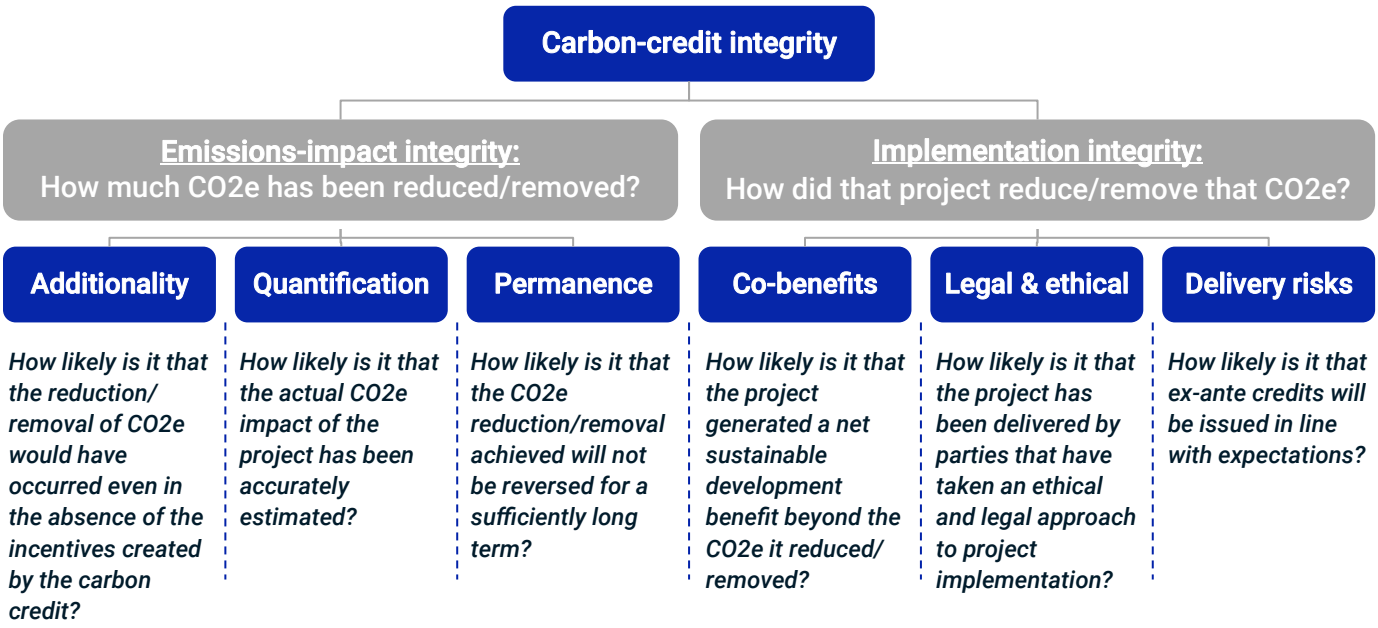
3.1 Overview

MSCI Carbon Project Ratings are composite ratings that independently assess the integrity and risks of carbon-credit projects across multiple criteria, including their impacts on the climate, environment and society.

The ratings are built on the detailed carbon-credit integrity assessment system developed since 2021 by Trove Research, which was acquired by MSCI in November 2023. This system builds on key industry integrity initiatives, such as the ICVCM's CCPs, and applies in-depth evaluations of individual projects using rules-based, project-type-specific frameworks on a consistent basis. In aggregate, we analyzed over 10,000 documents and one million project data points through this work.

Each project's emissions impact and implementation approach are assessed against six criteria and over 50 sub-criteria (Exhibit 4). Emissions integrity assesses how much carbon the project has reduced or removed from the atmosphere, and covers the criteria of additionality, quantification and permanence. Implementation integrity refers to how the project reduces or removes emissions, including the criteria of its co-benefits, legal and ethical risks and delivery risks.

Exhibit 4: MSCI Carbon Project integrity framework



Source: MSCI Carbon Markets

Within this framework, individual criteria and sub-criteria are assessed on a scale of 1 to 5, where 1 indicates the integrity is likely to be low and 5 indicates it is likely to be high. These criteria are combined and weighted to build an overall integrity score.

The overall score is calculated using an inverse weighting formula, where additionality is weighted 35%, quantification 20%, permanence 15%, co-benefits 20% and legal and ethical risks 10%. The sixth criterion, delivery risk, is assessed and scored but does not factor in the calculation of the overall integrity score for ex-post credits.[10] The inverse weighting mechanism places an even higher weighting on a criterion with a particularly low score. This ensures that, for example, a very low score in additionality cannot be offset by high scores elsewhere. The composite carbon-project rating is then translated into a letter rating, a type more familiar in financial markets (Exhibit 5).

Given different preferences exist among stakeholders, users of the MSCI Carbon Markets platform may calculate their own personal versions by customizing these weightings, including assigning a weight to delivery risk if they are looking at credits on an ex-ante basis.

Exhibit 5: Carbon Project Ratings and pipeline Carbon Project Ratings scale

Letter rating	Integrity score	Definition
AAA	4.50-5.00	Projects rated AAA have the highest Carbon Project Rating. There is a **very high** likelihood that these projects will deliver and support both at least a 1 tonne CO2e emissions-impact per credit, and a range of positive social and/or environmental outcomes while upholding legal and ethical standards.
AA	4.10-4.49	There is a **high** likelihood that projects rated AA will deliver and support both a 1 tonne CO2e emissions-impact per credit, and a range of positive social and/or environmental outcomes while upholding legal and ethical standards.
A	3.70-4.09	There is a **moderate** to **high** likelihood that projects rated A will deliver and support both a 1 tonne CO2e emissions-impact per credit or a range of positive social/and or environmental outcomes while upholding legal and ethical standards.
BBB	3.30-3.69	There is a **moderate** likelihood that projects rated BBB will deliver and support both a majority of a 1 tonne CO2e emissions-impact per credit or a range of material positive social/and or environmental outcomes while upholding legal and ethical standards.
BB	2.90-3.29	There is a **low** likelihood that projects rated BB will deliver and support either a majority of a 1 tonne CO2e emissions-impact per credit or material positive social and/or environmental outcomes while upholding legal and ethical standards.
B	2.50-2.89	There is a **very low** likelihood that projects rated B will deliver and support either a 1 tonne CO2e emissions-impact per credit or material positive social and/or environmental outcomes while upholding legal and ethical standards.
CCC	1.00-2.49	Projects rated CCC have the lowest Carbon Project Rating. These projects have **significant risks** regarding either delivering a 1 tonne CO2e emissions-impact per credit or supporting material positive social and/or environmental outcomes while upholding legal and ethical standards.

Integrity score calculated using the balanced weighting option. Source: MSCI Carbon Markets

[10] Ex-post means the credit has already been delivered and hence there is no delivery risk. Delivery risk exists when credits are considered on an ex-ante basis (that is, those yet to be issued by a project).

The rest of this section describes the methodology for assessing the key criteria for evaluating the integrity of a carbon-credit project. A more detailed methodology document for the MSCI Carbon Project Ratings can be found here. The analysis of the MSCI Carbon Project Ratings is based on an in-depth assessment of over 4,000 registered projects.

3.2 Additionality

Additionality defines the extent to which the development of a carbon project was stimulated by the finance provided by the sale of the carbon credit. If a mitigation activity is not additional, i.e., it would have been developed without the revenue from the sale of carbon credits, then purchasing carbon credits would not lead to any additional reduction or removal of emissions. This matters if the carbon credit is being used to claim an offset against emissions.

Two key factors need to be considered when assessing additionality: (i) Is it likely a project would have occurred without the incentive of a credit? and (ii) How reasonable are a project's assumptions around the amount of the CO2e that would have been reduced/removed in the absence of carbon credits (that is, its baseline scenario)?

The first of these revolves around whether the ability to sell credits has incentivized actors to implement mitigation activities that they would not normally pursue. This may be because the mitigation activity is not financially attractive without carbon-credit revenues, or that it would face other barriers that carbon credits can help to alleviate. These incentives can be assessed directly, for example, by evaluating the internal rate of return (IRR) of a project with and without carbon credits to determine whether carbon credits played the decisive role in making the project financially attractive. It can also be assessed indirectly by evaluating whether an activity is already common practice (without carbon credits) in that region.

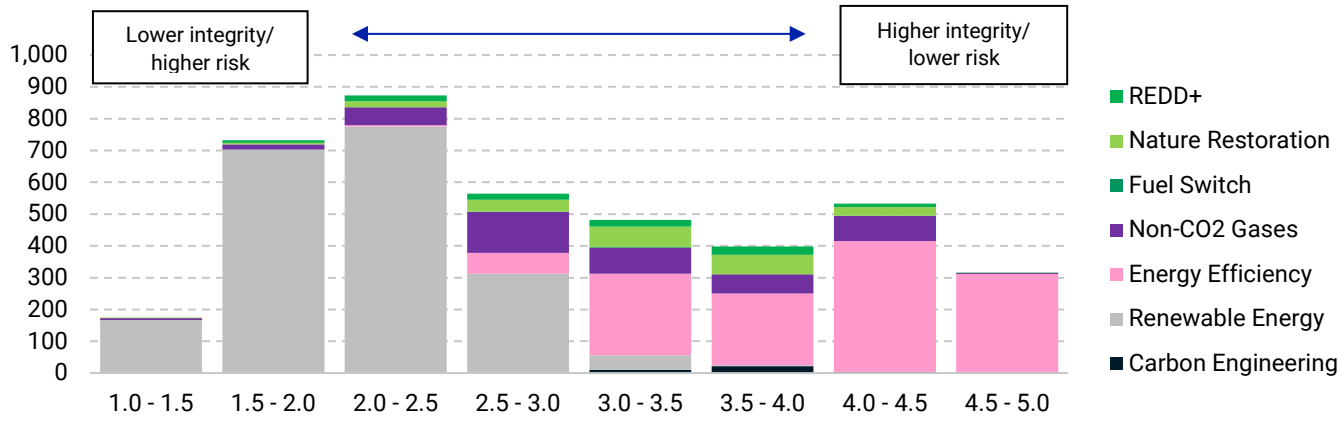
The second factor relates to the fact that credits may also be non-additional due to an "inflated" baseline scenario that overestimates what level of emissions reduction or removal would have occurred in the absence of a project. It is not possible to know with certainty what would have happened in this counterfactual scenario. But by analyzing a range of scenarios or control points, one can build up a picture of the likely scenarios that would have occurred.

Exhibit 6 shows the distribution of additionality scores by project type across more than 4,000 projects assessed by MSCI Carbon Markets. Our analysis shows that there is a wide range in additionality scores across and within project types.

Grid-connected renewable-energy projects typically have the highest additionality risk, as often the original investment decisions appear unlikely to have depended on the possibility of future carbon-credit revenues. The cost of renewable technologies has fallen for many years, making it comparable with fossil-fuel projects in many countries. Where renewables have been more expensive than conventional power sources, the sheer size of capital investment required for these projects — often running into hundreds of millions of US dollars — means that secure revenues are likely to have been needed before an investment decision could be made. Governments or corporates have often been available to provide this security in advance, through subsidies or power-purchase agreements, rather than the uncertain revenue from selling carbon credits at some point in the future.

Distributed renewable-energy projects, such as rooftop solar in developing countries, or those in politically unstable countries, have somewhat different characteristics, as secure financing is less available and the development risks are higher. The potential revenue from credits could, hence, have played a more meaningful role in the original investment decision, reducing the additionality risks.

Exhibit 6: Number of projects by additionality score, by project type



Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=4,074). Source: MSCI Carbon Markets

In contrast, projects which distribute more-efficient clean-cooking appliances to households typically score better on additionality. These projects form the majority of those in the energy-efficiency category. They use carbon credits to provide clean-cooking appliances for free or at subsidized prices to low-income households that would otherwise be unable to afford them. There have been issues with the quantity of carbon credits being claimed by some of the clean-cooking projects (see Section 3.3), but from an additionality perspective these projects score relatively highly.

Other project types have different additionality profiles. Projects that reduce emissions of non-CO2 gases, such as methane from landfills and agricultural waste, or industrial gases, tend to have reasonable additionality scores as carbon credits provide a key part of their financing. In some (typically developed) countries, however, these gases are controlled by regulation, so projects should only be eligible to generate credits where they fall outside of regulatory criteria. This could be due to their small size or by operating prior to a regulatory phase-out deadline.

Projects that remove carbon from the atmosphere tend, on average, to have good additionality scores, typically because of the absence of other sources of revenue, although there are variations by project type. These projects may use engineered solutions, such as direct air capture, bio-energy with carbon capture and storage (BECCS) or forests that harness the power of plants to capture carbon through photosynthesis — referred to as “nature restoration.”

Non-carbon revenues do, however, exist for some removal types, which can affect their additionality and require examination on a project-by-project basis. This is prevalent in the

biochar sector for example, where the char can be sold as a fertilizer to improve soil quality. Larger engineered projects may also have alternative means of financing, for example through government subsidies.

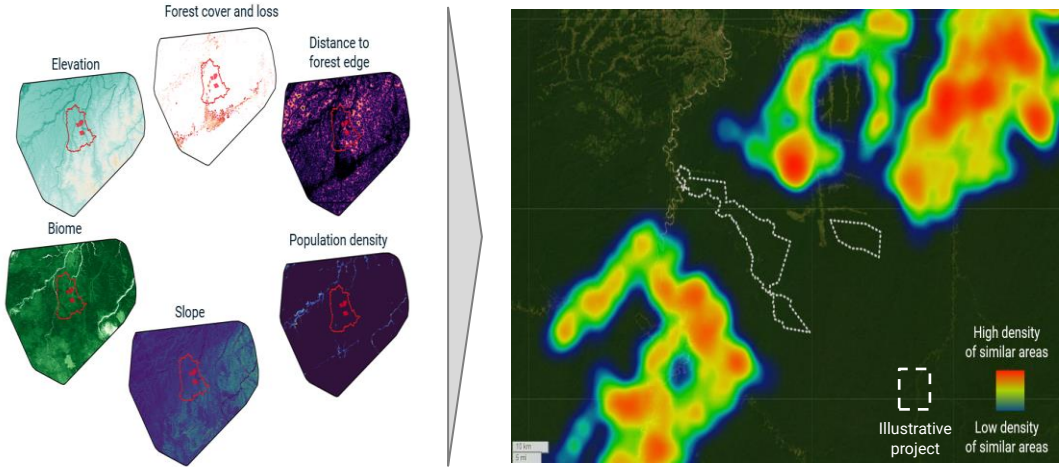
Additionality deep dive: Estimating REDD+ baselines

The world is still losing primary forests at an alarming rate, and often this loss is in regions of high biodiversity.[11] While few argue against the need to protect primary forests, the challenge for carbon projects has been quantifying the underlying threat of deforestation that would have occurred without the project.

To determine this baseline, REDD+ projects choose reference regions that best represent the project site characteristics, then evaluate historical rates of deforestation in these reference regions and extrapolate those rates into the future. Historically, REDD+ projects have done this by finding a single reference region that shares high-level characteristics with the project and conducting a backward-looking assessment of deforestation rates within that reference region. The risk with this is that the project's choice of reference area(s) may be biased, with only areas that have had high deforestation in the past chosen. The time period for calculation of historical deforestation rates might also have selection bias, with periods of low deforestation omitted.

Through detailed geospatial modeling, MSCI Carbon Markets analyzes deforestation in a range of reference areas (selected based on six shared characteristics — see Exhibit 7) both prior to a project's start and after (known as dynamic baselining), to estimate multiple potential deforestation scenarios that could have occurred in the absence of credits. This approach avoids being overly reliant on a single (potentially unrepresentative) area.[12]

Exhibit 7: Reference region selection characteristics



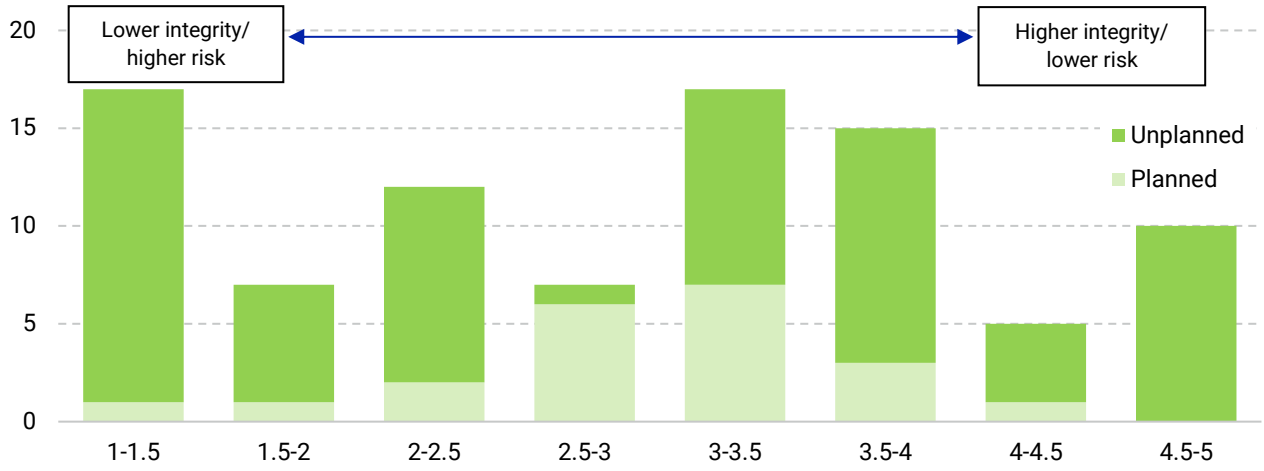
Source: MSCI Carbon Markets

[11] Mikaela Weisse, Elizabeth Goldman, Sarah Carter, "Forest Pulse: The Latest on the World's Forests," World Resources Institute and University of Maryland, April 4, 2024

[12] Webinar: "REDD+: Reduced Emissions or Distorted Deductions?" MSCI Carbon Markets, March 21, 2024.

Exhibit 8 shows the distribution of REDD+ projects by their score on the "strength of baseline" sub-criterion. The output of this analysis shows that the real picture is often more nuanced than many critics and proponents of REDD+ claim. In reality, there is a wide distribution of integrity on this specific sub-criterion, with projects located at both ends of the spectrum.

Exhibit 8: Number of registered REDD+ projects, by strength of baseline score



Data as of September 2024. Analysis covers all registered REDD+ projects which have an MSCI Carbon Project Rating (n=90). Source: MSCI Carbon Markets

3.3 Quantification

Quantification refers to the likelihood that the emissions impact of a project has been accurately estimated, assuming its baseline scenario is correct.

For some project types, there can be considerable uncertainty involved in carbon quantification, as assumptions cannot always be supported by measurable or reliable data. Best practice is for carbon estimates to be conservative to minimize the risks of over-crediting. This has not always been done, however, and a number of projects have overestimated their actual carbon reductions.

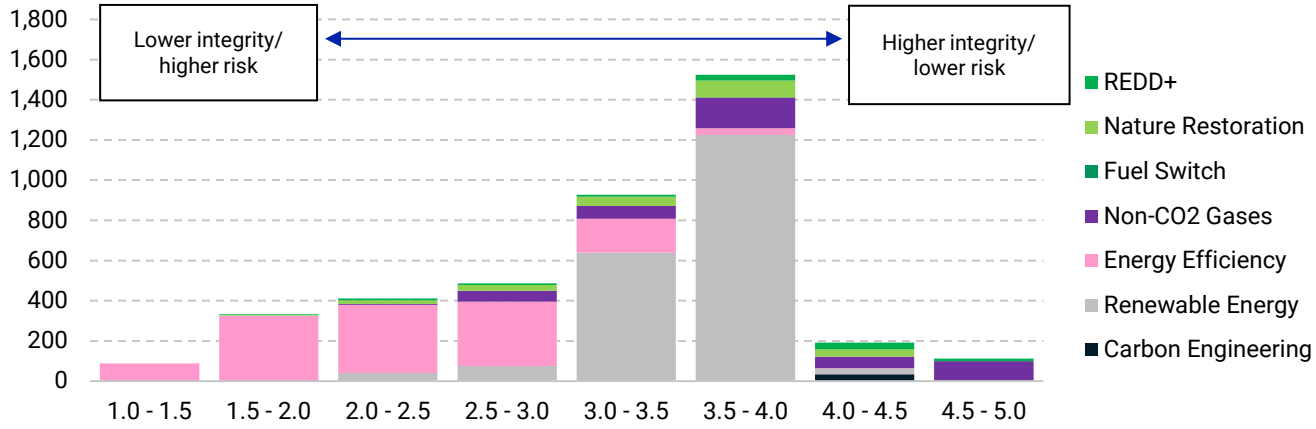
Given the uncertainties that often exist, our assessment aims to use multiple benchmarks and approaches to evaluate the accuracy of a project's quantification, including an assessment of both the robustness of the quantification approach applied and the accuracy of the assumptions themselves.

The challenges in quantification are well illustrated when considering nature-based projects. As natural living ecosystems often spread over very large and sometimes inaccessible areas of land, measurement of a nature-based project's carbon stock inevitably involves a degree of estimation and inaccuracy. Historically, carbon stock was measured by teams on the ground taking occasional samples of the area's biomass, although, increasingly, geospatial datasets and analysis are being used to complement this manual sampling.

The overall rating of quantification scores is summarized in Exhibit 9. In general, project types that rely on more measured and monitored inputs or use conservative adjustments score higher. For example, many "flaring and electricity" landfill-gas projects (within the non-CO2 gases sub-type) conservatively exclude the emissions impacts from their energy generation even though these sources could represent over 30% of their total emissions impacts.

In contrast, project types that rely on a number of hard to measure inputs, such as clean cooking, have the highest quantification risks. Nature-based projects demonstrate that, despite their inherent quantification risks, some projects use conservative methods and assumptions to still achieve very high quantification scores.

Exhibit 9: Number of projects by quantification score, by project type



Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=4,074). Source: MSCI Carbon Markets

Quantification deep dive: Leakage in nature-based projects

Leakage refers to the shifting of emissions to outside the project boundary as a result of the project's activities. For example, conservation of forests under REDD+ or improved forestry-management (IFM) projects may result in increased deforestation or timber harvesting elsewhere.

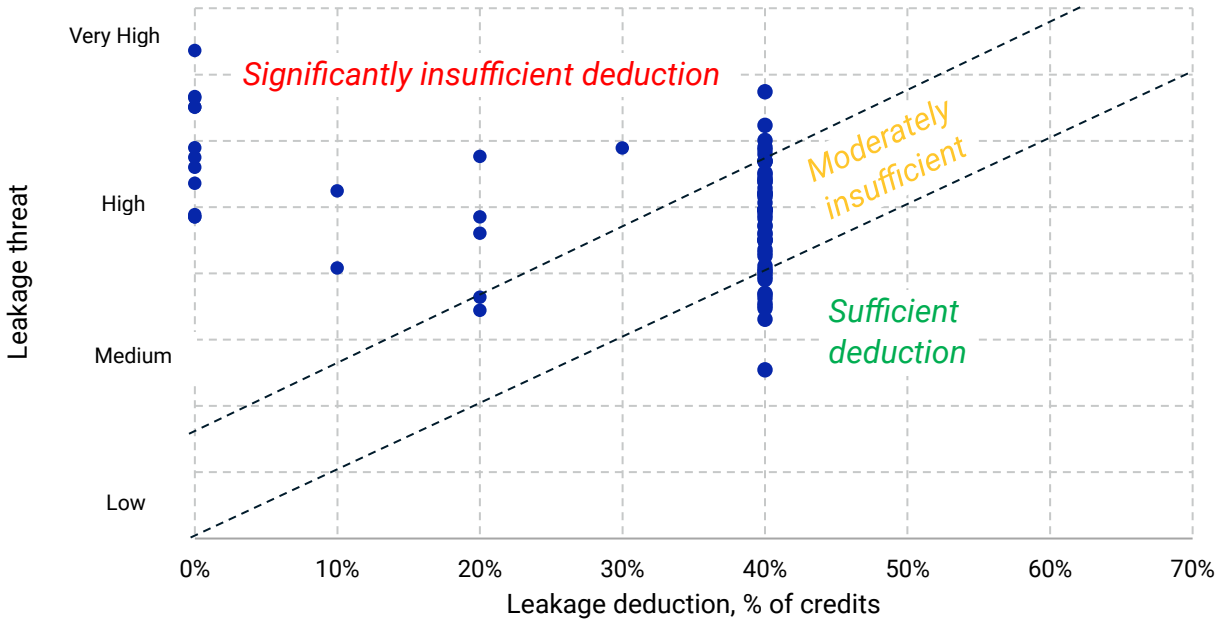
In IFM projects, leakage risk includes project, regional, national and global levels to cover all bases of potential timber harvest displacement. Risk factors include the baseline productivity of the project, landowner type (for example, an NGO or timber company), proximity to nearby protected areas and sawmills, and the country's (and tree species') integration into the global timber market.

Leakage risks are hard to completely eliminate, but projects can compensate for the resulting emissions impact through leakage deductions. For example, under ACR's IFM methodology, projects must typically apply a 40% leakage deduction. REDD+ projects under Verra can apply their own leakage deduction, with an average deduction being around 5% for the 135 registered projects assessed by MSCI Carbon Markets that accounted for any leakage deduction.

The overall leakage assessment must take into account both the size of the risk and the deduction. A leakage threat score is then compared with the leakage deduction to ascribe an overall leakage score. If a project has high leakage risk and a low deduction, it will therefore score much lower than a project with a similar leakage risk and higher deduction.

This comparison of the leakage threat to leakage deduction is shown in Exhibit 10 for IFM projects. This shows that most IFM projects do have significant leakage risk, as their deductions do not compensate adequately for the risk.

Exhibit 10: Estimated leakage threat level of 33 registered IFM projects versus their actual leakage deduction



Data as of September 2024. Analysis covers all registered IFM projects which have an MSCI Carbon Project Rating (n=33). Source: MSCI Carbon Markets

Quantification deep dive: Quantifying clean-cooking credits

Clean-cooking projects in particular have often suffered from overestimation. These projects distribute clean-cooking stoves to low-income households. The stoves burn wood more efficiently than traditional open fires. Again, there is widespread appreciation of the benefits these projects provide to rural households and the surrounding environment, but accurately measuring that benefit has proved difficult. This is due to the uncertainty in measuring the carbon savings from burning wood in the devices and the extent to which the devices are actually used.

Given the large number of stoves distributed (a typical project may distribute hundreds of thousands of stoves across a wide area), the usage rate of the devices is often estimated through a sampling of households. But a risk with this approach is that sample sizes can be too

small or even involve biased selection. Some newer projects, however, are using remote thermal sensors to monitor exactly how often they are used.

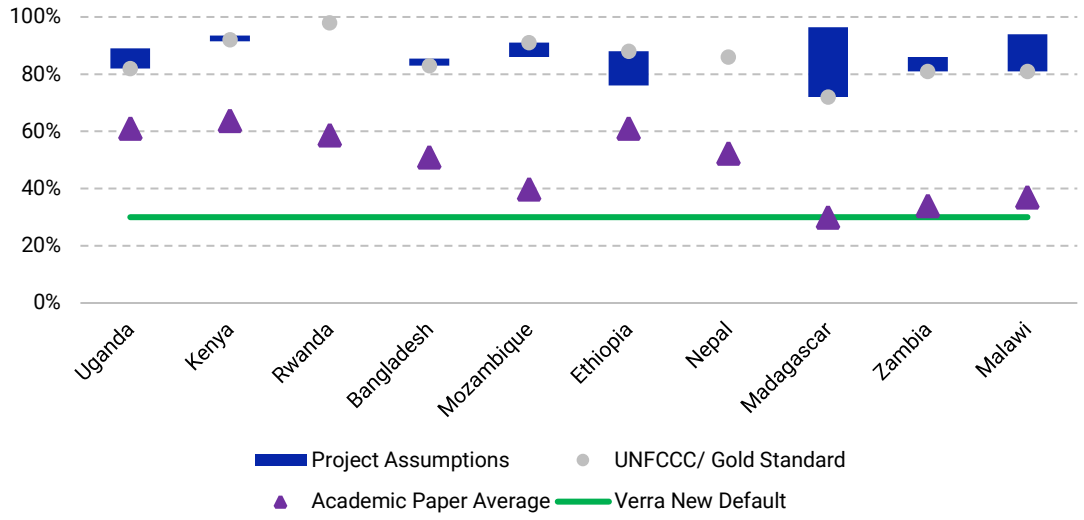
The carbon benefit of more efficient stoves is related to the source of the fuel used. A more efficient stove means fewer trees need to be harvested. If wood harvesting is sustainable, however, that is if trees are regrown to replace the wood used, then there is little climate benefit derived from more efficient stoves. Sometimes the wood used for cooking is not from sustainable sources, in which case any reduction in wood used reduces carbon emissions from deforestation. A key factor in quantifying estimation is therefore the fraction of non-renewable biomass (fNRB) assumed for the fuel used.

The fNRB composition of biomass fuel used in rural communities is difficult to estimate due to differences in the site of collection and type of biomass used and regional variations in forest growth. MSCI Carbon Markets has collected the fNRB assumptions of over 800 clean-cooking projects and assessed them against a range of third-party and academic benchmarks.

Our analysis shows that, on average, project fNRB values are considerably higher than those estimated in academic literature and often close to outdated values provided by the United Nations Framework Convention on Climate Change (UNFCCC) in the CDM. Compared to recent academic benchmarks, the use of old, inflated fNRB assumptions alone can contribute to a project's emissions impact being overestimated by over 100%.

New research and updated methodologies are currently under development to improve the accuracy of the fNRB values used by projects, which, if used, would reduce this overestimation risk in future clean-cooking projects.[13]

Exhibit 11: Comparison of project and third-party fNRB estimates by country



Data as of September 2024. Data based on 457 registered projects across the 10 countries shown. Project assumptions bar represents the inter-quartile range of project estimates. Source: MSCI Carbon Markets

[13] Webinar: "Clean cooking: How to assess project integrity?" MSCI Carbon Markets, May 16, 2023.

3.4 Permanence

Permanence refers to the degree to which a carbon credit is equivalent to a permanent removal or reduction in emissions. This is relevant to all projects where carbon is removed from the air or prevented from being released through storage in some form. Storage could be nature-based, for example in vegetation for REDD+ (reduction) or afforestation (removal) projects, or in geological structures or, less commonly, in engineered products, as seen, for example, in cement-carbonization projects.

Projects that reduce carbon emissions without any need for storage, such as renewable energy, have no permanence risks, as it is assumed a tonne of CO2e not emitted is permanently avoided. The relevance of permanence risks by project type is summarized in Exhibit 12.

Exhibit 12: Relevance of permanence risks by project type

Project type	Significance of non-permanence risk			
	Storage time	Natural risks	Human risks	Overall permanence risk
• Renewable Energy • Non-CO2 Gases • Fuel Switch • Cement Carbonization	n/a	✗	✗	**No risk**
• Clean Cooking	<100 Years	(✓) Indirect	✗	**Limited**
• Biochar	100-1,000 years	✓	✗	
• Afforestation & Reforestation • Improved Forest Management • REDD+ • Agricultural Land Management	<100 Years	✓	✓	**Material**

Source: MSCI Carbon Markets

For carbon stored in vegetation, emissions could be released through fire, other forms of damage or even harvesting, both legal and illegal. For geological storage solutions, risks tend to be lower and relate primarily to potential leakage from storage reservoirs.

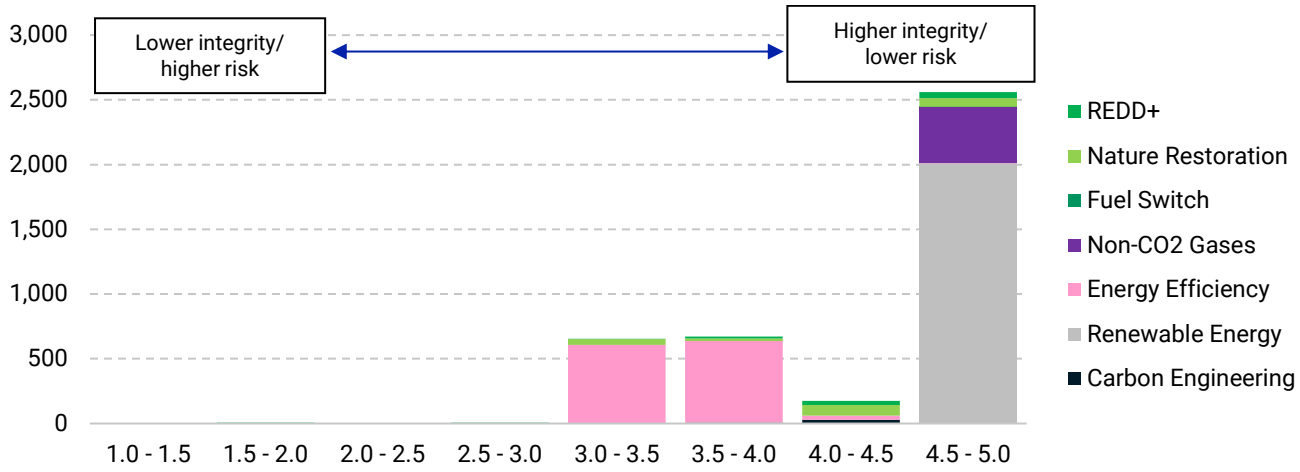
Risks can be managed and mitigated by project developers, either voluntarily or as mandated by their methodology. For nature-based projects, “buffer pools” are typically used to set aside some of the emissions savings to cover any potential loss of carbon due to vegetation damage. A project with high permanence risk could still achieve a high permanence score if its buffer pool contributions or mitigation measures sufficiently mitigate and/or compensate for the risk.

Engineered solutions do not typically maintain buffer pools but manage potential reversal risks through their design. Clean-cooking projects have not historically maintained buffer pools, but do still carry indirect permanence risks, because while the reduced fuel usage from using efficient stoves reduces the amount of trees that would have been deforested, these trees may still be destroyed through fire or other natural risks.

The overall rating of permanence scores is summarized in Exhibit 13. Clean-cooking projects have the lowest permanence scores overall, reflecting the fact that their indirect risks are rarely compensated for by projects. In contrast, nature-based projects have more significant permanence risks on average, but buffer-pool contributions for many of these do appear to be sufficient to compensate for the threats they face. There is, however, wide variability in the scores for nature-based projects, with permanence scores ranging from 1.0 to 4.9.

Carbon-engineering projects, such as biochar, score highly on permanence. There is some variability in risks for projects where biochar is stored in soil, as the leakage risks will be impacted by soil and temperature conditions, but these risks are limited over the 100-year period our assessments are focused on.

Exhibit 13: Number of projects by permanence score, by project type



Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=4,074). Source: MSCI Carbon Markets

Permanence deep dive: Analysis of buffer pools for nature-based projects

Each of the main carbon-credit registries has different buffer-pool requirements, and buffer-pool sizes vary substantially between project types and between registries with the same project type. Among the major registries, ACR has the largest buffer-pool contribution relative to its issued credit volume (25%), followed by Gold Standard (20%), CAR (18%) and Verra (15%). As of the end of 2023, CAR had utilized 27% of its buffer pool with 25 (out of 169) projects having requested drawdowns. Verra had utilized 10% of its buffer pool with 45 (out of 230) projects having requested drawdowns.[14]

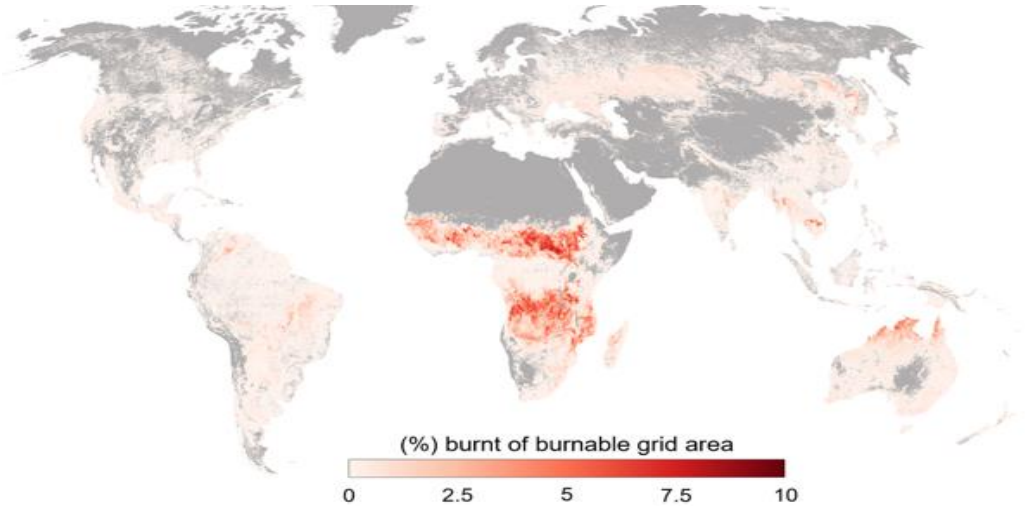
Human-based risks are, on average, the largest contributors to buffer pools for most nature-based projects, reflecting that such risks are typically considered to be the greatest threat to nature-based projects over a long timeframe.

[14] Only registered projects with detailed buffer pool compartment data were assessed in this MSCI Carbon Markets analysis.

For natural risks such as fire, the impact of climate change is expected to increase the frequency and/or intensity of these events in future. As shown by Exhibit 14, there has been considerable regional variation in the threat of fires historically. We geospatially forecast the future effects of fire, drought and other natural risks under different temperature scenarios to assess the current and likely future sufficiency of projects' buffer pools against these risks.

At a project level, we estimate that, based on the part of their buffer that is calculated to protect against fire risk, nearly 60% of all assessed Verra projects underestimate fire risk. This, however, appears to be offset by projects having sufficient buffer-pool provisions in other natural-risk compartments. At a market level, therefore, enough credits do appear to have been set aside in buffer pools to account for permanence risks, including climate-change impacts.

Exhibit 14: Global map of annual average burnt area, 1982-2018



Data as of 2019. Source: MSCI Carbon Markets

3.5 Co-benefits

Carbon projects have the potential to not only reduce/remove CO2e, but to deliver broader societal and environmental impacts. These can be in the form of health, economic development and improved habitats and biodiversity, and be both positive (e.g., enhanced biodiversity, or provision of local employment) and negative (e.g., displacement of local or indigenous communities).

The approach to co-benefit assessment builds on the UN's Sustainable Development Goals (SDGs) framework. MSCI Carbon Markets assesses the net impact of projects at a thematic level (such as biodiversity) and an SDG level, and then aggregates this impact to reach an overall co-benefits score.

Historically, projects have not been required to identify, quantify or monitor the co-benefits (or co-negatives) that they generate, and these impacts have not been validated by independent agencies. Evidence of co-benefit impacts being achieved is therefore variable. A lack of quantified evidence does not, however, mean that these benefits are not relevant to a project.

Hence, as well as assessing the evidence of impacts, it is also important to assess their relevance given the project's design and implementation. For example, a clean-cooking project might not provide evidence that it improves air pollution or gender outcomes, but through employing local women to distribute more efficient stoves that will reduce indoor fuel consumption, these outcomes will likely still be achieved.

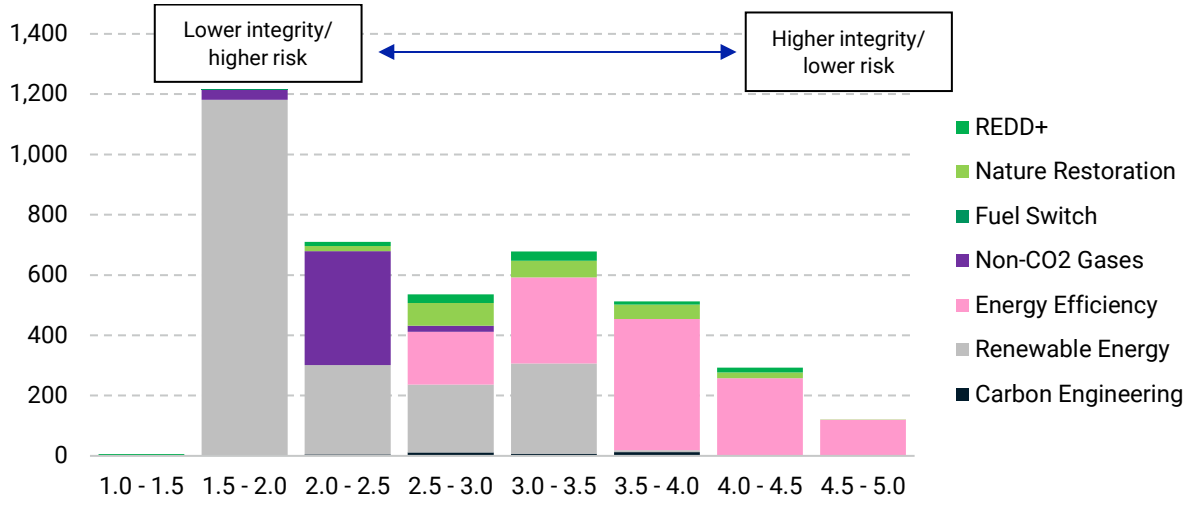
Finally, given that co-benefit impacts can be negative, we also consider whether a project has implemented effective safeguards to minimize any potential negative impact.

The distribution in co-benefit integrity scores is shown in Exhibit 15. While co-benefits are more likely with some project types, scores can still vary significantly project by project within the same type. For example, clean-cooking projects generally have significant benefits for health, employment and gender equality. There is significant variation, however, in the strength of different clean-cooking projects' co-benefits, as some may specifically employ women to distribute stoves or train users on how to use them, while others may manufacture stoves locally, which will support local employment.

The co-benefits of REDD+ and nature-restoration projects also differ significantly across both social and environmental impacts. Most nature-based projects either conserve or promote biodiversity, though the significance of this varies a lot. Variation is even greater with societal impacts. It tends to be strongest for those nature-based projects that involve a change in land use, as they must promote alternative livelihoods to locals that go beyond what they would have earned in the baseline scenario.

Renewable-energy projects tend to have fewer social and environmental impacts and score lower on this criterion, on average. Wind, solar and hydroelectric plants employ local labor during their construction, but tend to have relatively little ongoing benefit for their local communities or surrounding environments. Many non-CO2 gas projects are similarly limited in their co-benefits.

Exhibit 15: Number of projects by co-benefits score, by project type

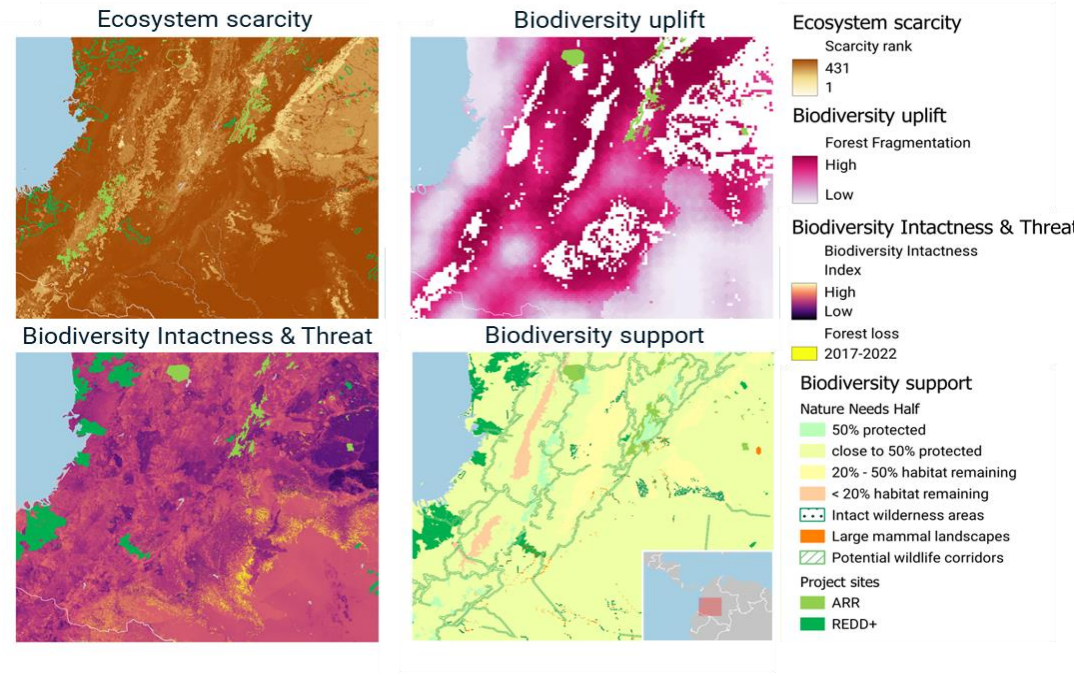


Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=4,074). Source: MSCI Carbon Markets.

Co-benefits deep dive: Assessing biodiversity benefits of nature-restoration projects

Biodiversity impacts are complex and a function of a number of factors associated with the geography of the project area. We break these down into: (i) ecosystem scarcity, (ii) biodiversity uplift, (iii) biodiversity intactness and threat and (iv) biodiversity support. These are illustrated in Exhibit 16. For nature-restoration projects, these factors are assessed not only for the project in its current state, but also modeled into the future, taking account of the biodiversity value of the fully-planted forest and its likely impact on reducing local forest fragmentation.

Exhibit 16: Co-benefits assessment considers eight biodiversity-related geospatial datasets



Source: MSCI Carbon Markets

Over the more than 200 afforestation, reforestation and revegetation (ARR) projects analyzed by our geospatial biodiversity assessment tool, there is significant variation in biodiversity scores.

A key driver of an ARR project's biodiversity benefit depends on the suitability of the tree species to the project's area. Monoculture plantations of non-native species, for example, may actually cause more biodiversity harm than good. Exhibit 17 shows the mix of tree species for the 142 afforestation and reforestation projects that provided detailed species data. Some 13% of them plant a single non-native tree species, heightening the risks of limited or even negative biodiversity impacts.

Exhibit 17: Proportion of ARR projects by tree-species mix

# of species	Type of species: Non-native	Partial	Native
1	13%	0%	9%
2-3	10%	9%	12%
4-5	7%	6%	10%
6-10	3%	9%	4%
10+	1%	7%	1%

Higher biodiversity benefits

Data as of September 2024. Data is based on 142 registered ARR projects from Gold Standard and Verra. Source: MSCI Carbon Markets

3.6 Legal and ethical risks

Positive climate and social impacts must not be made at the expense of legal or ethical standards. In addition to their direct negative impact, the use of illegal or unethical practices to generate carbon credits would threaten the reputation of the buyers of those credits and also the trust in the carbon-credit market more broadly.

The risks of illegal and/or unethical practices being associated with a project depend to some extent on the identity of a project's developer(s). As part of MSCI Carbon Project Ratings' assessments, project developers are screened against business registration databases and sanctions, politically-exposed-persons and adverse media databases to identify and assess the risk that they might have been engaged in illegal or unethical behavior.

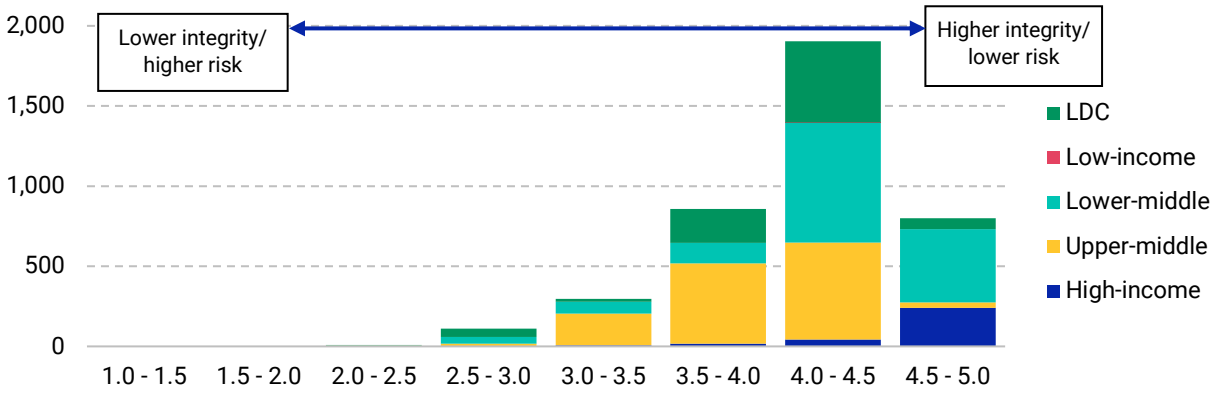
Legal and ethical risks are also assessed at the country level. For example, all other factors equal, there is a greater risk of illegal or unethical behavior occurring on a project that operates in a country with endemic corruption than one with negligible corruption.[15]

Exhibit 18 shows the distribution in legal and ethical scores by country type. Primarily due to country-level risk factors, projects located in some Least Developed Countries (LDCs)[16] and lower-income countries have higher legal and ethical risk on average. It is important to note, however, that many LDC and lower-income countries do not have high corruption risks. At the project-developer level, higher business registration risk also exists for developers located in these types of countries. Financial crime and adverse media risks are, however, generally more idiosyncratic to individual project developers. Indeed, the six projects with the highest legal and ethical risk are all based in upper-middle-income countries.

[15] To evaluate corruption risk, MSCI ESG Research uses multiple indices from the Worldwide Governance Indicators and the Corruption Perception Index (CPI)

[16] A LDC is a country that exhibits the lowest indicators of socioeconomic development, as defined by the United Nations. There were 33 LDCs as of August 2024.

Exhibit 18: Legal and ethical risk score distribution by country type



Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=4,019). Source: MSCI Carbon Markets

Legal and ethical deep dive: Assessing adverse media severity

Building a detailed picture of the legal and ethical risks at the developer level requires an in-depth evaluation of a range of information and data sources. Through an extensive review of global news sources and adverse media checks on third-party news platforms, we identify relevant news articles associated with developers. A dedicated team of analytical staff within MSCI Carbon Markets assesses the severity of controversy cases' impact on society or the environment as minor, moderate, severe or very severe.

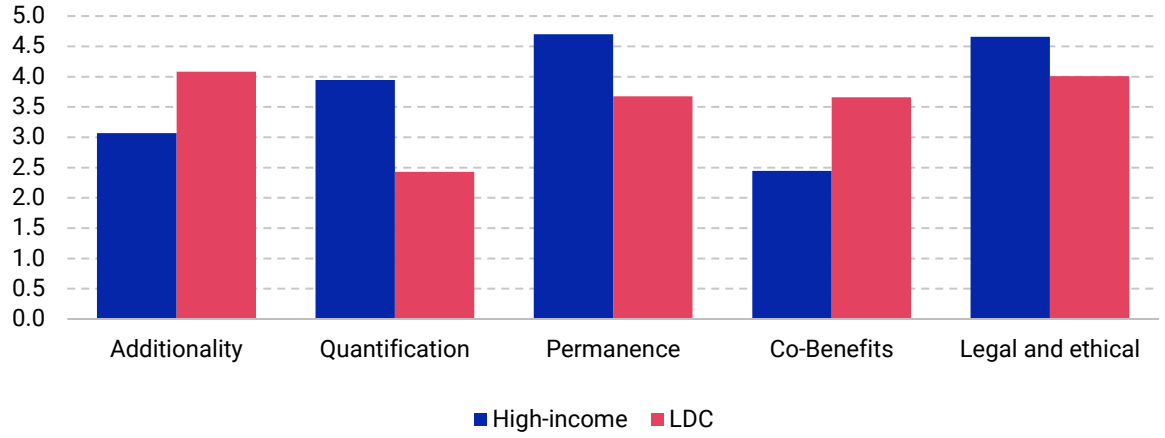
Across the over 2,000 developers analyzed, more than 350 have adverse media articles identified, with more than 50 of those being classified as very severe. For example, an Australian hydropower developer was fined for releasing polluted water, while human-rights abuses have been alleged in a particular nature-based project in Kenya. While it is difficult to prove the extent of any wrongdoing, adverse media coverage has the potential to affect the reputation of the project and that of the buyers of its credits.

Legal and ethical deep dive: Assessing country risks and opportunities

The country where a project is based also has a significant effect on the project's integrity profile. Carbon-credit projects exist in both developing and developed countries. Projects located in LDCs tend to have higher additionality and co-benefits than those based in high-income countries. Projects in higher-income countries, however, tend to have better quantification, permanence and legal and ethical scores.

Similar to other emerging-market investments, a detailed assessment of the country policy and political context is important for understanding and mitigating any legal and ethical risks. Exhibit 19 shows the average integrity scores for each of the five criteria that contribute to our overall project ratings, contrasting projects based in high-income countries with those based in LDCs.

Exhibit 19: Average integrity scores by country types



Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=1,165). Source: MSCI Carbon Markets

3.7 Delivery risks

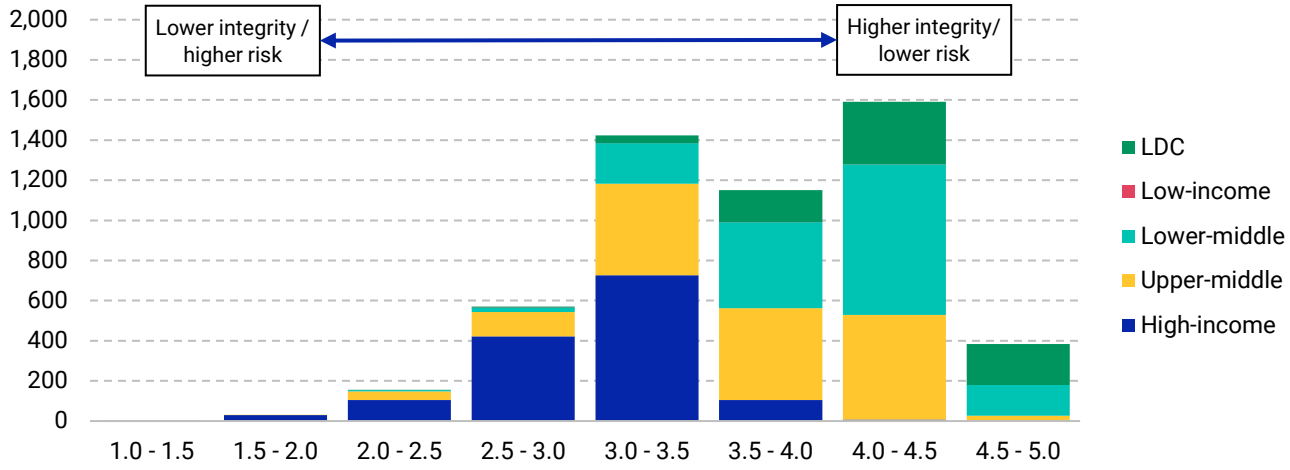
There is a growing trend in the market toward credits being purchased ex-ante — i.e., before CO2e has been reduced/removed and the resulting credits have been issued. Such a purchase introduces a delivery risk — that the CO2e reductions/removals are not delivered as intended.

A project may not deliver credits as expected due to either factors internal to that project, or events or factors that are external to it. Internal risks can vary from the financial risk that a project lacks sufficient funding to operate effectively (or at all) to poor project implementation (e.g., too few rangers recruited for a nature-based project). External factors that generate delivery risks include natural hazards such as fires and political events at the country or state level, such as land appropriation or restrictions on carbon trading.

MSCI Carbon Markets' assessment of delivery risk includes a detailed analysis of three components of internal implementation risk: financial risks, execution risks and registration risks. This internal implementation risk is then weighted with an analysis of natural risks and political risks to reach an overall determination of a project's delivery risk.

Delivery risk scores vary significantly based on the specific developer context, project type and country. Though lower-income countries tend to face higher political risks, as illustrated in Exhibit 20, this relationship does not extend as strongly to overall delivery risk once project-developer and project-type risk factors are taken into account. On average, carbon-engineering and nature-based projects have the highest delivery risks.

Exhibit 20: Delivery risk scores by country type



Data as of September 2024. Based on an assessment of 5,307 pipeline projects. A pipeline project is one that is currently applying to a crediting program to become registered. Source: MSCI Carbon Markets

4. Key insights

The application of MSCI Carbon Project Ratings for the over 4,000 projects in this analysis reveals a number of important insights for the global carbon-credit market. Three of these are highlighted in the rest of this section:

- Low-integrity projects remain prevalent, but integrity is slowly improving.
- Co-benefits and risks differ significantly both within and across project types.
- Integrity is one of the many drivers of carbon-credit prices.

4.1 Low-integrity projects are prevalent, but integrity is slowly improving

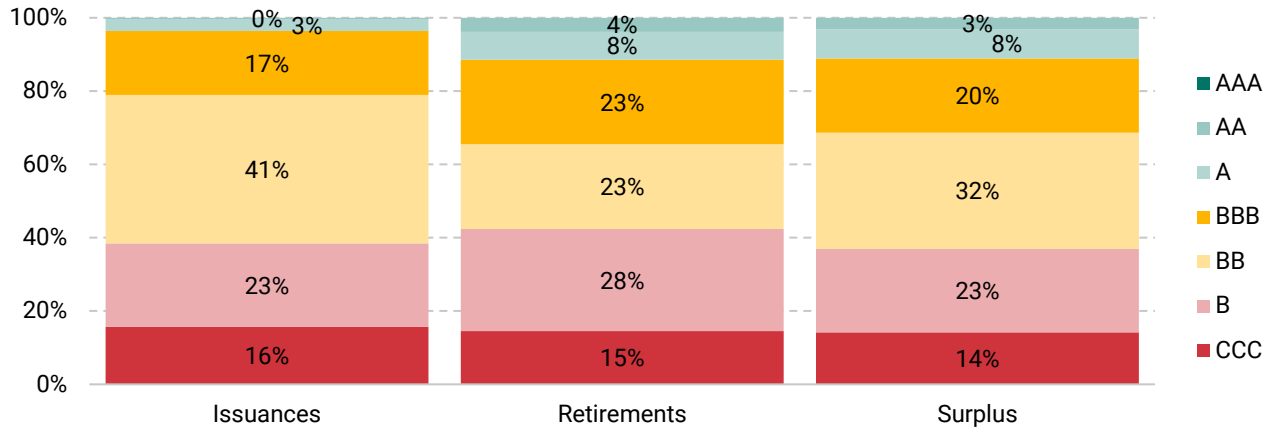
Low integrity has been a challenge in the market

Exhibit 21 shows the composite integrity rating of carbon-credit issuances and retirements in the first half of 2024 and the overall market surplus as of June 30, 2024.[17] Low-integrity projects (rated B or lower) remain a significant proportion of the market, representing some 39% of credits retired in the first half of 2024.

The prevalence of low-integrity credits has been even higher in the past. To date, nearly 55% of carbon-credit issuances and 59% of retirements have come from low-integrity projects.

The extent of low-integrity credits is driven in part by the mix of project types in the market. For example, nearly 30% of retirements to date are from renewable-energy projects, which have the lowest average ratings. In contrast, high-integrity credits are currently in relatively short supply. The proportion of A-AAA rated credits was less than 12% of issued, retired and surplus credits in the first half of 2024.

Exhibit 21: Proportion of issuances, retirements and surplus by rating category (1H 2024)



Data as of June 30, 2024. Issuance and retirement data covers the first six months of 2024. Analysis covers all transactions from projects which have an MSCI Carbon Project Rating (n=4,074). Source: MSCI Carbon Markets

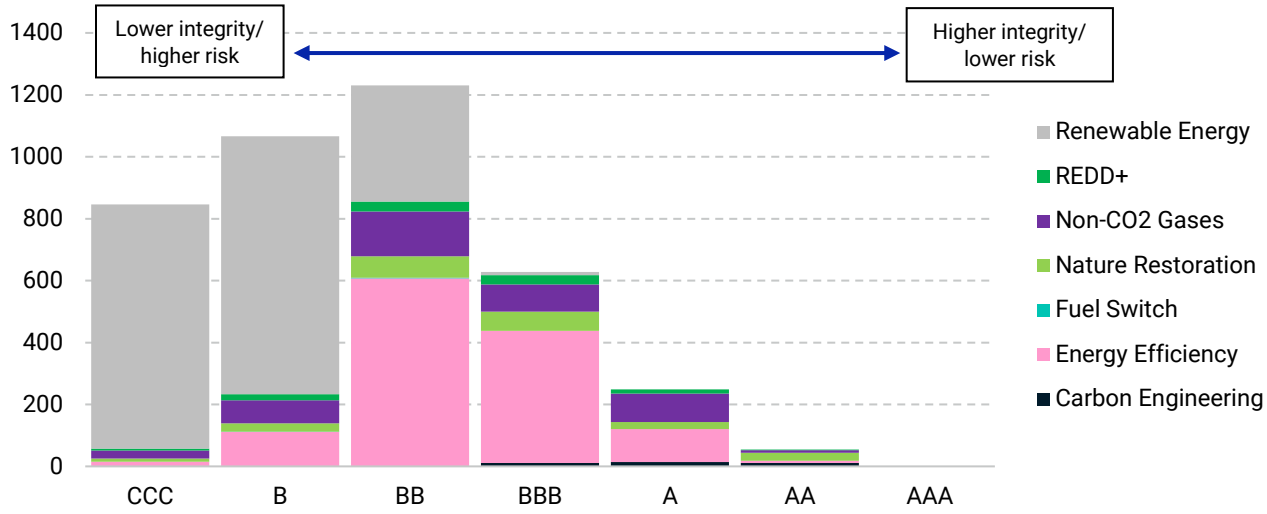
[17] Only includes transactions where project has an MSCI Carbon Project Rating. These projects represented over 100 Mt CO2e of issuances in H1 2024 (over 75% of total market issuances).

There is considerable variation in integrity within and between project types

Exhibit 22 shows the distribution of ratings by project type, highlighting the wide distribution of overall integrity ratings across project types. Many projects achieve high emissions integrity but score lower on other implementation criteria, while others deliver strong positive social and environmental impacts but suffer from lower scores on additionality, quantification and/or permanence.

Currently, no project receives the highest AAA rating at the overall level, reflecting the challenges and trade-offs inherent in developing a carbon project that is of maximum integrity in every dimension.

Exhibit 22: Number of registered projects by MSCI Carbon Project Rating across project type



Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=4,074). Source: MSCI Carbon Markets

Market demand is moving toward higher-integrity projects

Exhibit 23 shows the distribution of overall ratings of retired credits in the first half of 2024 compared to the first half of 2022. There is a gradual shift in retired credits moving toward higher-integrity projects. Over this period, the proportion of retired credits of the lowest rating, CCC, decreased by over 10%, while the use of the highest integrity credits, A-AAA, increased by over 5%. This trend is consistent within project types as well, with the average integrity rating of retired credits increasing within nearly all project types.

Exhibit 23: Proportion of retired credits by integrity rating, H1 2022-H1 2024

Project type	Percentage of retired credits by integrity rating		
	H1 2022	H1 2024	% change
AAA	0.0%	0.0%	-
AA	2.1%	3.8%	+1.8%
A	3.8%	7.6%	+3.9%
BBB	12.9%	23.0%	+10.1%
BB	20.7%	23.2%	+2.5%
B	31.9%	27.8%	-4.1%
CCC	28.7%	14.5%	-14.2%
TOTAL	100.0%	100.0%	-

Data as of September 2024. Analysis covers all registered projects which have an MSCI Carbon Project Rating (n=4,074). Source: MSCI Carbon Markets

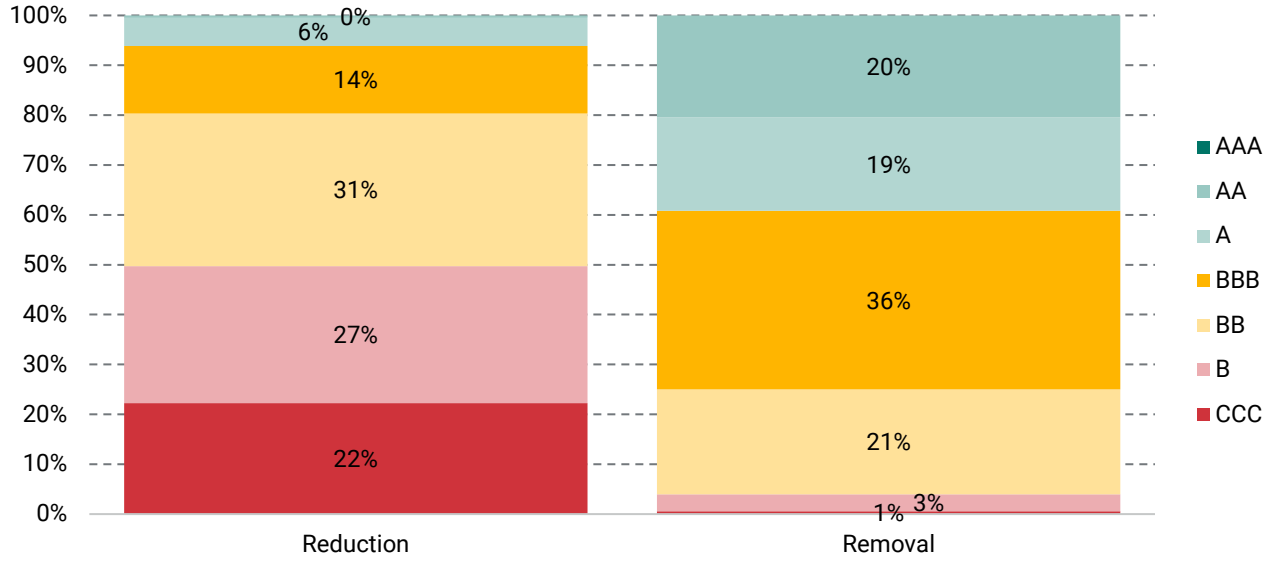
New projects coming on stream tend to be higher-integrity

The above assesses the integrity of credits that have already been issued by registered projects. MSCI Carbon Markets has also assessed the integrity of over 400 pipeline projects (that is, those currently applying to a registry to become registered). The same in-depth individual project assessment framework used to produce full carbon-project ratings is used to produce pipeline carbon-project ratings. These ratings have more uncertainty due to such projects' early-stage nature and greater variability in data transparency, but may still be good indicators of the likely integrity of projects once they become registered.

On average, pipeline projects are rated more highly than registered projects. This higher average integrity reflects the increased tendency for pipeline projects to utilize best-practice improvements and techniques in their methodologies, assumptions and implementation design.

Higher average integrity among pipeline projects also reflects a change in project-type mix toward removals, such as ARR or biochar. On average, removal credits have higher integrity ratings than reduction credits. Almost 40% of removal projects have received A-AAA ratings, compared to only around 5% of reduction credits as of September 2024. This is primarily driven by higher additionality and co-benefit scores for removal projects.

Exhibit 24: Distribution of carbon-project ratings by credit type (based on 3,713 registered reduction projects and 176 registered removal projects)



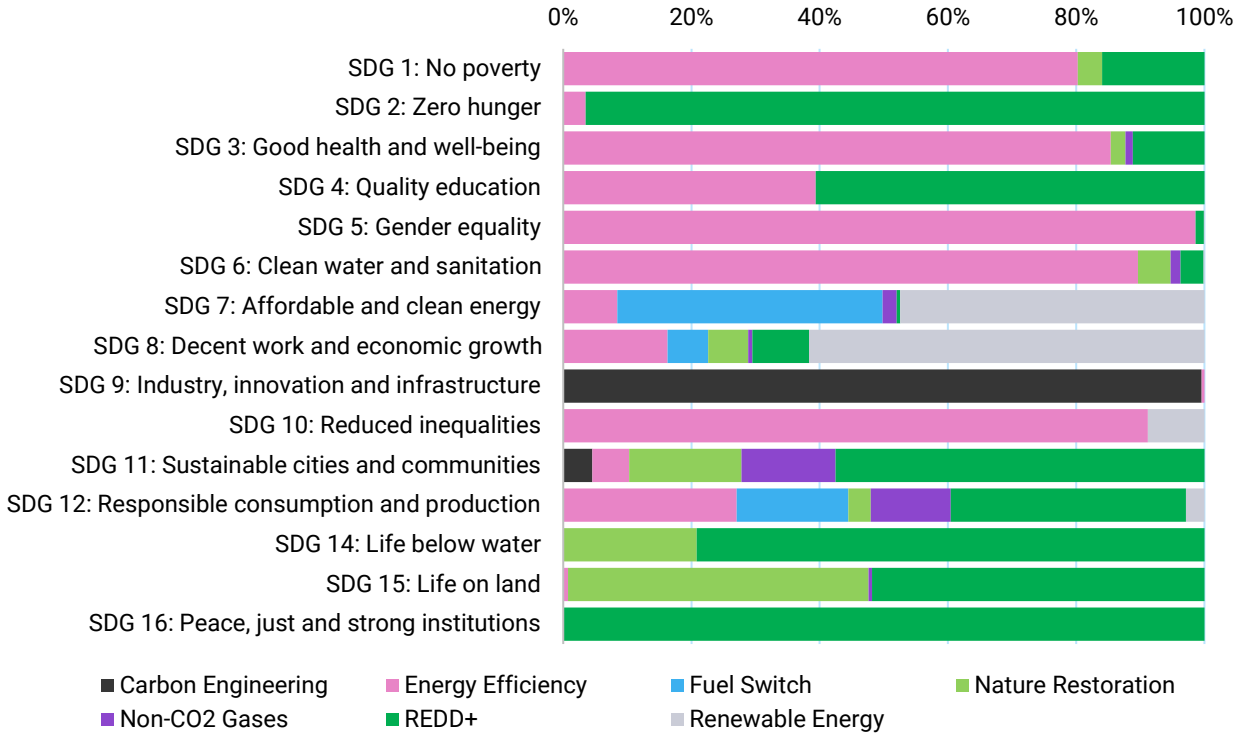
Data as of September 2024. Analysis covers all reduction and removal registered projects which have an MSCI Carbon Project Rating (n=3,889). Excludes "mixed" credits from projects that both avoid emissions and remove carbon. Source: MSCI Carbon Markets

4.2 Co-benefits and risks differ significantly both within and between project types

The relevance of sustainable-development impacts is often driven by project type

Some SDGs are inherently more relevant to certain project types. As shown in Exhibit 25, often one or two project types represent the majority of contributions to each SDG across all registered carbon-credit projects. For example, all renewable-energy projects are likely to contribute to achieving SDG 7 (affordable and clean energy). Likewise, given their relatively nascent technological development, most carbon-engineering projects will drive innovation, which is a subcomponent of SDG 9 (industry, innovation and infrastructure).

Exhibit 25: Proportion of registered projects with high SDG score by project type



Data as of September 2024. Analysis covers all registered projects which have an SDG score (over 5,000). A high SDG score indicates that project received a score of at least 3 out of 5 for the relevant SDG. Source: MSCI Carbon Markets

The significance of the impacts is also driven by a project's design

The contribution to sustainable-development impacts also varies within a particular project type depending on how the project has been designed and implemented. For example, to enhance gender equality, some clean-cooking projects are designed to create specific roles for women such as in the distribution of and training on the stoves. Variability may also be due to the quantification and monitoring of these outcomes. Only 25% of cookstove projects, for example, provide data on women's employment, of which only 20% outline women's roles clearly.

A project's co-benefit impact is also driven, in part, by the flow and distribution of carbon-credit proceeds to local communities. This is particularly important for REDD+ projects where projects need to provide alternative economic opportunities to communities beyond what they would have earned from deforesting the area. Various academic studies have indicated this opportunity cost regularly exceeds USD 10/t CO2e,[18] which is above the current average price of a REDD+ credit in the spot market.[19]

[18] Romain Pirard, Katia Philippot and Claudia Romero, "Estimations of REDD+ opportunity costs: Aligning methods with objectives," *Environmental Science & Policy*, Vol. 145 p.188-199; Ari Rakatama et al., "The costs and benefits of REDD+: A review of the literature," *Forest Policy and Economics*, Vol. 75 p.103-111.

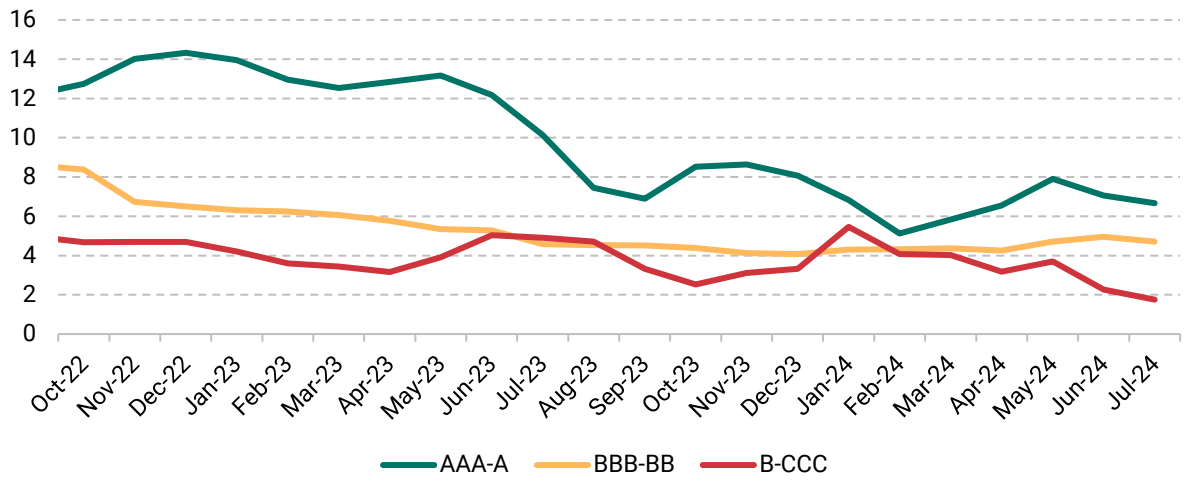
[19] Carbon-credit price data as of Sept. 1, 2024. Source: MSCI Carbon Markets.

Overall, more transparency is needed across REDD+ projects on the amount of revenue that they share with their local communities to determine whether these projects are having a net positive social impact. At current prices though, even if all the proceeds were shared, projects may not be able to provide sufficient economic opportunities to disincentivize their local communities from deforesting their land. This highlights the importance of material carbon-credit revenues for high-integrity carbon projects.

4.3 Integrity is one of many drivers of credit prices

On average, higher-integrity projects achieve higher credit prices in the spot market. Exhibit shows the three-month rolling average credit price for three integrity ranges, AAA-A, BB-B and B-CCC, over the last two years. During this period, the monthly average price of the higher-integrity projects has ranged from USD 6/t CO2e to USD 14/t CO2e, whereas the monthly average price of the lowest-rated projects has hovered around USD 4/t CO2e.

Exhibit 26: Three-month rolling average carbon-credit spot price, by integrity rating (USD/t CO2e)



Data as of September 2024. Based on over 40,000 carbon-credit spot prices, including both exchange and over-the-counter (OTC) trades and asks. Averages are weighted by volumes of asks and transactions, with asks given a lower weighting. Only includes transactions from projects with an MSCI Carbon Project Rating. Source: MSCI Carbon Markets

Other factors besides the integrity rating, such as a credit's type, location or vintage, also impact its price. Multivariate analysis on MSCI Carbon Markets' proprietary carbon-credit price database shows that, after controlling for project type, region and vintage, integrity has a statistically significant impact on price.[20] On average, a 1-point improvement in a credit's overall integrity score (1 to 5) is associated with an 8% increase in price.

[20] Database contains over 19,000 credit prices since 2021. Prices are a mix of asks and transactions, covering both exchange and OTC transactions, sourced from MSCI's confidential network of carbon-market participants. Price impact is based on a multivariate regression of prices as a function of the following independent variables: (i) the overall integrity score using a balanced weighting, (ii) project type, (iii) region and (iv) vintage bucket. The result for the overall integrity score was statistically significant with a P-Stat of 0.0005.

The different dimensions of integrity have different impacts on a credit price. Exhibit 27 shows the regression coefficients associated with each criterion. A 1-point improvement in the co-benefits and legal and ethical criteria is associated with a greater than USD 1.50/t CO2e increase in price. For additionality and quantification, however, there is little statistically significant impact, while permanence appears to have a negative relationship with price, because the main project types with no reversal risks (e.g., renewable energy) are not valued that highly.

Exhibit 27: Regression coefficients of integrity criteria on observed prices

Criteria	Regression coefficient	Statistical significance (P-test)
Additionality	0.35	0.40
Quantification	0.07	0.89
Permanence	-2.58	0.00
Co-benefits	1.68	0.00
Legal and ethical	1.83	0.00

Data as of September 2024. Based on over 19,000 credit-price transactions involving projects with an MSCI Carbon Project Rating and on a multivariate regression of prices as a function of the following independent variables: (i) additionality score; (ii) quantification score; (iii) permanence score; (iv) co-benefits score; and (v) legal and ethical score. Source: MSCI Carbon Markets

Some new projects are both more ambitious and more expensive

The above price correlations are for carbon credits traded ex-post on the spot market. Increasingly, buyers are committing to longer-term deals rather than buying credits on the spot market and, in some cases, are providing capital to help develop projects. This is particularly the case for nature-restoration projects, which often require significant up-front capital to acquire land and plant trees.

Currently registered nature-restoration projects vary considerably in type and location, and credits from these projects have typically traded between USD 10/t CO2e and USD 15/t CO2e during 2024, albeit with some trades outside these ranges. Average composite integrity ratings for these projects range between B and AA.

Offtakes for new nature-restoration projects, however, have often been observed in the range of USD 40/t CO2e to USD 50/t CO2e. Typically, the integrity of these new projects is also relatively high, due to an emphasis on conservation with mixed native species. An emerging trend within the nature-restoration sector therefore appears to be toward higher-integrity, higher-priced credits for new(er) projects.

5. Conclusion

Ensuring carbon projects are of high integrity is important for the proper functioning of the carbon credit market. Analysis of MSCI Carbon Project Ratings in the context of the how the market currently functions highlights the progress that still needs to be made. Specifically in three dimensions.

Low-integrity projects remain prevalent in the market, but integrity is slowly improving

Overall, no project currently receives an AAA rating, which reflects the inherent trade-offs that exist when both developing and evaluating carbon projects. Some 8% of the projects analyzed are rated in the AAA-A band (Exhibit 28). At the other end of the scale, 47% of projects are rated with the lowest two scores (B-CCC), demonstrating that many low-integrity projects do remain in the market.

Exhibit 28: Number of registered projects by MSCI Carbon Project Rating, with percentages

	AAA	AA	A	BBB	BB	B	CCC	Total
Renewable Energy	0	0	0	10	376	833	789	**2,008** *49%*
REDD+	0	2	14	30	32	20	6	**104** *3%*
Nature Restoration	0	26	22	62	70	27	10	**217** *5%*
Energy Efficiency	0	7	107	427	607	111	15	**1,274** *31%*
Non-CO2 Gases	0	8	93	88	144	74	26	**432** *11%*
Carbon Engineering	0	11	14	11	0	0	0	**36** *1%*
Total *% of all projects*	**0** *0%*	**54** *1%*	**249** *6%*	**628** *15%*	**1,231** *30%*	**1,066** *26%*	**846** *21%*	**4,074** *100%*

Data as of September 2024. Source: MSCI Carbon Markets

As a result, 47% of credits retired to date have come from projects rated B or lower, versus less than 10% coming from projects rated A-AAA. There are, however, some early positive signs of a trend to increasing integrity.

First, there has been a gradual shift in retired credits moving toward higher-integrity projects. Over the last two years (2Q 2022-2Q 2024) the proportion of retired credits of the lowest rating, CCC, has fallen by nearly 10%, while the use of the highest-integrity credits (A-AAA), has increased by up to 3%. This move to higher-integrity credits may seem modest, but the highest-integrity credits have, until recently, been hard to identify and tend to be more expensive, damping the shift in demand towards them.

Second, new projects being developed also appear to be, on average, of higher integrity. This is especially the case for projects, both engineered and nature-based, that remove carbon dioxide from the atmosphere. Other project types are also increasingly improving their accuracy of measuring emission savings. Some new cookstove projects, for example, are using remote thermal sensors to monitor how often each stove is used.

Co-benefits and risks depend on the type of project, and its design and implementation

Co-benefits of carbon projects are increasingly being seen as a core benefit for stakeholders. The contribution of a project to sustainable development varies by the nature of each project type, but also by how an individual project has been designed and implemented.

Historically, the carbon market has placed less emphasis on these aspects of integrity, meaning that transparency and monitoring of co-benefits is variable and regularly insufficient. For example, only 20% of REDD+ projects provide transparent details on benefit-sharing agreements with local communities, despite the criticality of these flows to determining the social impacts (and likely permanence) of these projects.

For project developers, better transparency and quantification of co-benefit outcomes is crucial to providing greater confidence in the social and environmental benefits of a project outside its emissions impact. Projects that have been successful in doing this have, over the last two years, been able to attract a premium price for their credits, equivalent to USD 1.50/t CO2e for each 1-point increase in their co-benefits criterion score.

Integrity is currently only one of many drivers of carbon credit prices

More generally, over the last two years, higher-integrity projects (AAA-A) have traded at a clear, and statistically significant, premium to lower-integrity credits. After controlling for other factors such as project type and location, a 1-point improvement in a credit's overall integrity score (1-5) has been associated with an 8% increase in its spot price. There also appears to be an emerging trend toward higher-priced, higher-integrity projects in the offtake market, particularly for nature-restoration projects.

While this relationship holds across the overall market, at the individual-project level the relationship between integrity and price remains variable. This relationship may strengthen over time as tools to easily assess integrity across the whole market, such as the ICVCM's CCPs and MSCI Carbon Project Ratings, become more widely available. A closer relationship between integrity and price in the future will likely support a better functioning carbon market, where incentives are more aligned toward supplying and choosing higher integrity credits.

Contact us

msci.com/contact-us

AMERICAS

United States	+ 1 888 588 4567 *
Canada	+ 1 416 687 6270
Brazil	+ 55 11 4040 7830
Mexico	+ 52 81 1253 4020

EUROPE, MIDDLE EAST & AFRICA

South Africa	+ 27 21 673 0103
Germany	+ 49 69 133 859 00
Switzerland	+ 41 22 817 9777
United Kingdom	+ 44 20 7618 2222
Italy	+ 39 02 5849 0415
France	+ 33 17 6769 810

ASIA PACIFIC

China	+ 86 21 61326611
Hong Kong	+ 852 2844 9333
India	+ 91 22 6784 9160
Malaysia	1800818185 *
South Korea	+ 82 70 4769 4231
Singapore	+ 65 67011177
Australia	+ 612 9033 9333
Taiwan	008 0112 7513 *
Thailand	0018 0015 6207 7181 *
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