Carbon Project Ratings - REDD+ Methodology

MSCI ESG Research

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1. Methodology overview

Objective

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.

A project with a higher rating has a greater likelihood of having a positive emissions impact and a reduced risk of overestimating its emissions impact. It is also more likely that such an emissions impact will have been implemented in a way that supports positive social and/or environmental outcomes and upholds legal and ethical standards. Consequently, a project with a higher rating has a lower likelihood of incurring reputational risks.

Document description

This document describes the detailed project type-specific methodology used to assess Carbon Project Ratings and Pipeline Carbon Project Ratings (but not Preliminary Carbon Project Ratings) for REDD+ projects.

This project type-specific methodology is applied in addition to, and partially in replacement of, the methodology that is described in the overall MSCI Carbon Project Ratings methodology document, “MSCI Carbon Project Ratings and Assessments Methodology.” Where an element of the overall methodology is replaced by this project type-specific methodology, it is detailed below. Every element of the overall MSCI Carbon Project Ratings methodology also applies to MSCI ESG Research’s assessment of Carbon Project Ratings and Pipeline Carbon Project Ratings for REDD+ projects unless explicitly excluded in this document.

Section 2 introduces the core concept of carbon credit integrity and why its assessment is important to the development of the global carbon credit market. Section 3 introduces and defines REDD+ projects. Sections 4-8 provide details on the project type-specific methodology, including data sources and assumptions, used in MSCI ESG Research’s Carbon Project Ratings and Pipeline Carbon Project Ratings assessments for REDD+ projects.

2. Introduction to carbon project integrity

What is carbon credit integrity?

Carbon credits have varying quality characteristics. These stem from fundamental differences in project types, but also from which methodologies have been used to define each project and create the credits (these methodologies are among the standards set by carbon crediting programs, and are hereafter called crediting program methodologies) and how rigorously they have been 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 [CO_2e] removed or avoided) which could be used for voluntary or compliance purposes. This effort dates back to the Clean Development Mechanism (CDM) created under the 1997 Kyoto Protocol and has continued with the evolution of the carbon credit 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 carbon dioxide from the atmosphere. This difficulty stems from the calculation method used 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).

Another difficulty is that projects differ hugely in age, size and technology. The science behind some crediting program methodologies has also evolved over time, as has the enforcement of standards and levels of governance.

Readers should note that, within the carbon markets, the words "quality" and "integrity" tend to be used somewhat interchangeably. Through the rest of this document, the word integrity is used when referring to carbon projects.

The importance of assessing carbon credit integrity

Corporate climate action is critical in the fight against climate change, and carbon credits represent an important mechanism for corporates to mitigate their carbon footprint. However, concerns over carbon credit integrity may have held back, and may continue to hold back, the global carbon credit market from reaching its potential. These concerns center around the perception that many carbon credits are of low integrity and are not delivering the benefits they claim to.

In 2021, the Taskforce for Scaling the Voluntary Carbon Market (TS-VCM) found that credit integrity was at the "heart of buyers' hesitancy,"[1] with 45% of buyers identifying it as a key pain point. Buyer concerns around credit integrity and the related risk of being accused of greenwashing due to the use of low-integrity credits have only grown since then. For example, some 55% of respondents to an April 2023 survey run by the Science-Based Targets Initiative (SBTi) stated that the risk of a greenwashing accusation was stopping them from buying more credits.[2]

Concerns over carbon credit integrity have been central to the creation of two major initiatives: the Integrity Council on the Voluntary Carbon Market (IC-VCM) and the Carbon Credit Quality Initiative (CCQI). The IC-VCM aims to create minimum standards of integrity with a set of Core Carbon

[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, September 1, 2023.

Principles (CCPs), and the CCQI has developed a comprehensive scoring system for certain project types. Both initiatives primarily assess integrity at the project-type level (primarily based on a project's methodology used) or at the project-registry level (a project registry is an organization that registers mitigation activities and issues carbon credits for the emission reductions or removals achieved by the mitigation activities). Neither initiative assesses integrity at the individual-project level.

MSCI ESG Research's assessment methodology draws on the IC-VCM's and CCQI's approach to assessing integrity, building on their principles to apply a more in-depth evaluation of integrity at the individual-project level.

The key components of carbon project integrity assessment

Market approaches to assessing carbon project integrity typically focus on three main issues:

A. **Emissions impact integrity:** How much CO_2e has been reduced/removed?

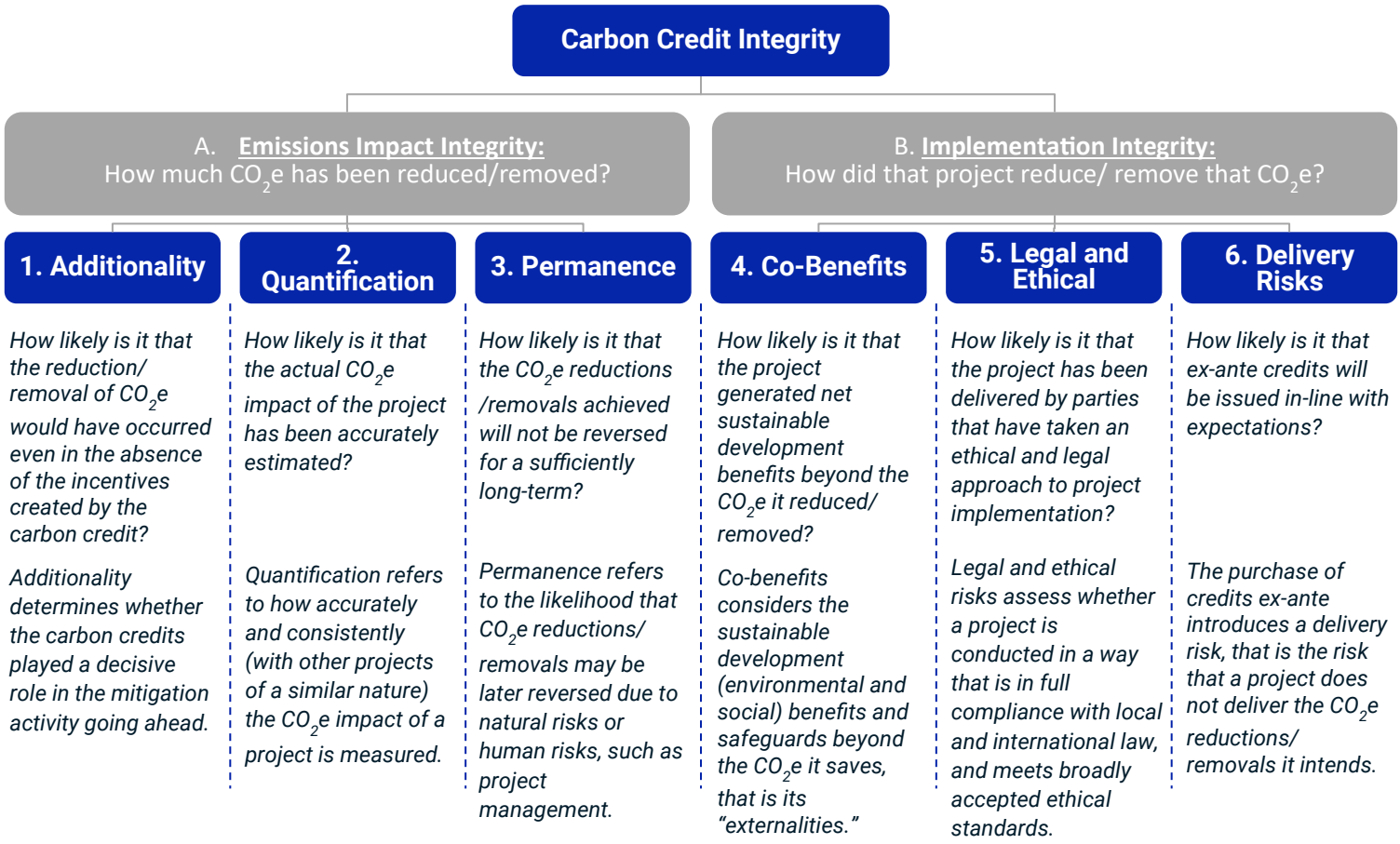
B. **Implementation integrity:** How did that project reduce/remove that CO_2e?

C. **Usage integrity:** How are the credits then reviewed and used?

Emissions impact integrity and implementation integrity can each be further broken down into three main areas of common concern. These are summarized in Figure 1, and outlined in detail below.

Emissions impact integrity, implementation integrity and usage integrity are each described in more detail in the overall methodology document "MSCI Carbon Project Ratings and Assessments Methodology."

Figure 1: Key components of carbon project integrity



3. Introduction to REDD+ projects

What are REDD+ projects?

Forests play a critical role in the global ecosystem by absorbing carbon dioxide (CO_2) and supporting biodiversity. Protecting them is essential.

Despite zero-deforestation pledges made by governments at COP26, in 2022 alone the tropics lost over 4 million hectares of primary rainforest — an area roughly the size of Switzerland — at a rate equivalent to 11 football fields per minute. This resulted in 2.7 gigatons (Gt) of CO_2 emissions, equivalent to the annual fossil fuel emissions of India.[3]

To incentivize forest protection, the United Nations Framework Convention on Climate Change Conference of the Parties established the concept of projects that aim to reduce emissions from deforestation and degradation due to human causes (REDD+ projects). By utilizing carbon finance, REDD+ projects can address the underlying drivers of deforestation and protect areas from any destruction that would lead to CO_2 being released and other negative environmental consequences (such as biodiversity loss). In this way, carbon revenues help to incentivize communities, companies and/or countries to protect forested areas.

REDD+ projects can be broadly split into two main subtypes that represent different drivers of deforestation:

- **Avoiding Unplanned Deforestation (AUD)** – These constitute about 80% of REDD+ projects: Reducing emissions by protecting forested areas from illegal deforestation, whether from local communities or illegal commercial deforestation.
- **Avoiding Planned Deforestation (APD)** – These constitute about 20% of REDD+ projects: Reducing emissions by preventing deforestation on forested lands where commercial agents have legally authorized plans to convert it to non-forest land. For example, where a local landowner is aiming to convert the land to an alternative use, such as a cattle ranch or timber plantation.

A third subtype of REDD+ project is jurisdictional REDD+. Unlike project-level REDD+ projects, jurisdictional REDD+ projects consider the entire forest in a national or subnational jurisdiction. This has important implications for how baselines are set, how leakage is accounted for and the impact of policy and regulation. Given these differences, jurisdictional REDD+ projects are evaluated through a separate methodological approach and not included in this methodology document, which only describes MSCI ESG Research's assessment of project-level REDD+ projects.

REDD+ projects should address their areas' specific drivers of deforestation, typically through a combination of two main types of activities. First, through protection measures, such as patrols or guards, that monitor and stop deforestation activities. Second, through community-building initiatives that provide financial support to communities, creating an attractive alternative livelihood compared to deforestation-related activities.

[3] World Resources Institute (2022). "How much forest was lost in 2022?", https://research.wri.org/gfr/global-tree-cover-loss-data-2022

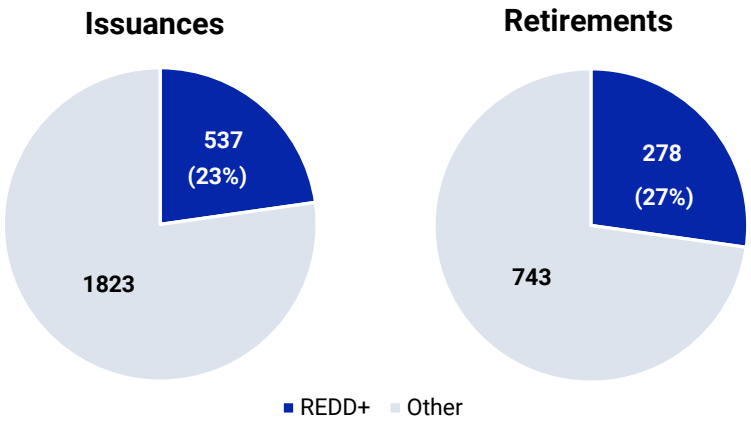
Market Overview

REDD+ projects have historically been one of the most important project types within the voluntary carbon market. As of the start of 2024, credits for nearly 550 megatons (Mt) of CO_2e have been issued by REDD+ projects, representing about 25% of total issued credits in the overall voluntary carbon market. This is illustrated in Figure 4.

REDD+ projects are typically much larger than other types of projects in the voluntary market. Indeed, the high total REDD+ issuance volume comes from fewer than 150 registered REDD+ projects. On average, REDD+ projects span 190,000 hectares and generate close to 1 Mt CO2e of credits annually.

The majority of REDD+ projects are located in tropical regions, with South America hosting by far the largest proportion of REDD+ projects (113 registered projects as of August 2023).

Figure 2: Cumulative REDD+ and total VCM issuances and retirements 2002-2023 (Mt CO_2e)



Key Integrity Considerations

The integrity of REDD+ projects has come under significant scrutiny for a number of years, including with renewed vigor in early 2023.[4] Assessing the integrity of REDD+ projects requires an holistic analysis of each project's activities and assumptions, with risks primarily found in five main areas:

- **Baseline Deforestation:** The emissions impact of a REDD+ project is calculated by comparing the actual amount of deforestation that occurs to the amount of deforestation that was expected to have occurred had there been no carbon credit revenue (i.e., the "baseline"). Estimating the deforestation rate in this counterfactual scenario is therefore a critical input, which, by definition, is impossible to measure with complete certainty.
- **Carbon Stock:** To convert an area of protected deforestation into a volume of emissions impact, projects must accurately estimate the amount of carbon stored in a forest.

[4] Patrick Greenfield, "Revealed: More than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows," *The Guardian*, January 18, 2023.

Measuring the carbon within a single tree is complex. Measuring the carbon within an entire forest becomes even more challenging.

- **Leakage:** It is of limited value to protect one area of forest if this protection just leads the same agent of deforestation to deforest another neighboring area. If this occurs, then the net impact of the project remains (close to) zero. Projects must counter this risk of "leakage" by appropriately mitigating and compensating for the risk that deforestation simply moves outside the project area.
- **Permanence:** Nature-based projects carry inherent risk of reversal from both human and natural causes (e.g., from fire), as any protected forest area could be subject to later deforestation or destruction. As they do for leakage, in their design and operation, REDD+ projects must mitigate and compensate for this risk (e.g., by putting in place fire breaks).
- **Alternative Livelihoods:** REDD+ projects revolve around incentivizing communities towards protection, rather than deforestation. However, many local communities rely on deforestation-linked activities as part of their living. Therefore, communities must be sufficiently compensated and supported in alternative livelihoods to ensure they are not made materially worse-off by the project.

MSCI ESG Research assesses each of these five areas in detail when evaluating the integrity of a REDD+ project.

4. Approach to assessing the integrity of REDD+ projects

MSCI ESG Research's assessment of REDD+ projects builds on the overall MSCI Carbon Project Ratings methodology to provide more in-depth analysis of REDD+ projects. This project type-specific assessment includes sub-criteria that are additional to, and partially in replacement of, the sub-criteria of assessment used in the overall MSCI Carbon Project Ratings methodology, as detailed below. These project type-specific sub-criteria evaluate a deeper set of questions, which are focused on the most important, specific drivers of integrity for REDD+ projects.

These project type-specific assessments are conducted at the individual project level, including a review of each individual project's data and assumptions. In this way, these assessments represent a more granular, project-level review of REDD+ projects than what would be possible using the overall MSCI Carbon Project Ratings methodology alone.

In total, MSCI ESG Research assesses 11 sub-criteria and 20 metrics (see Figure 4) under this project type-specific methodology that are either not assessed or are assessed differently in the overall MSCI Carbon Project Ratings methodology, as illustrated in Figure 3. These sub-criteria are focused on addressing the key drivers of integrity for REDD+ projects. Each of these sub-criteria align with and replace corresponding sub-criteria scores in the overall MSCI Carbon Project Ratings methodology.

Figure 3: MSCI ESG Research Overall Carbon Project integrity assessment

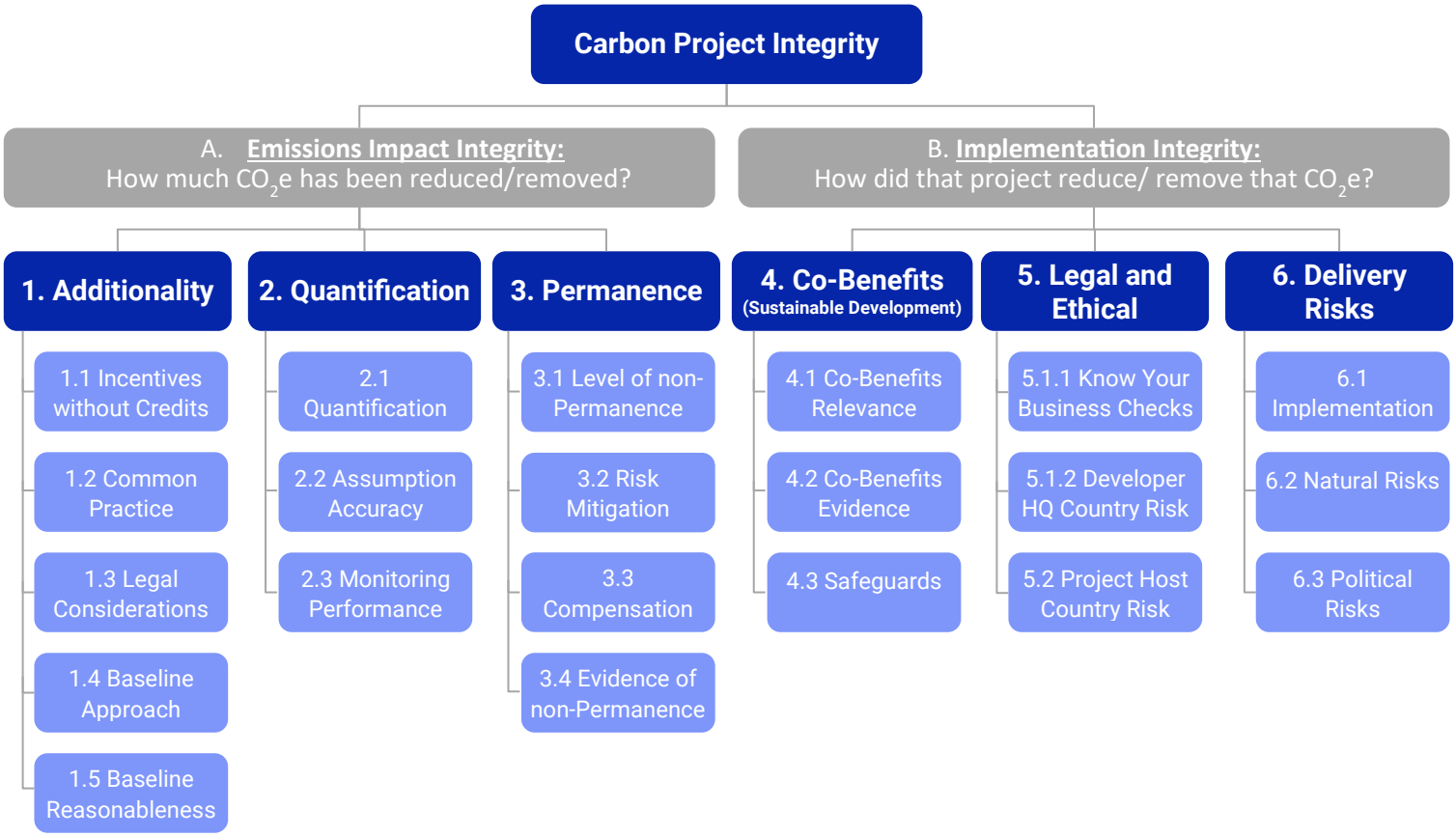
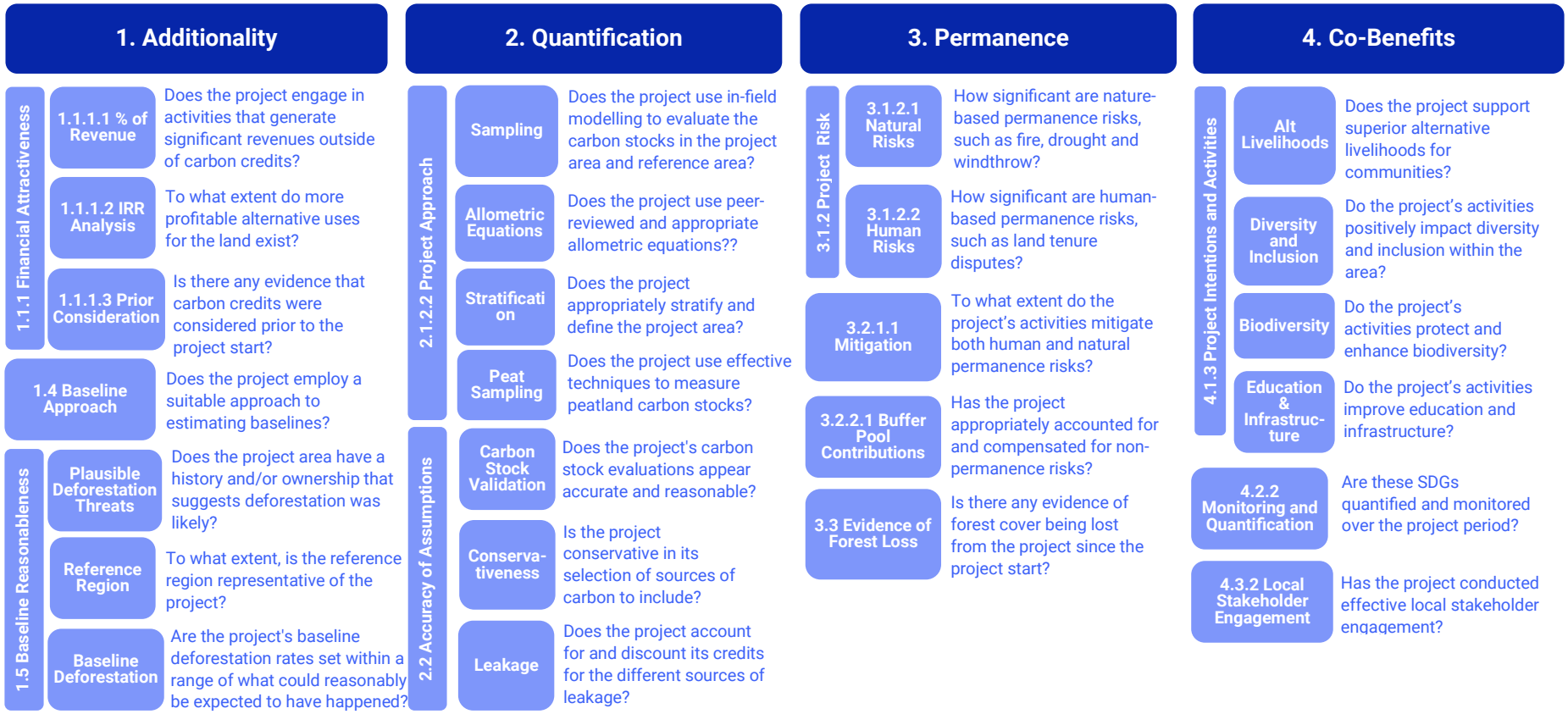


Figure 4: REDD+ assessment framework



Assessment of all other criteria and sub-criteria, for example, Criterion 5, Legal and Ethical Risks, and Sub-criterion 1.2, Common Practice, within the REDD+ analysis use the same metrics and methodology as in the overall MSCI Carbon Project Ratings methodology framework. The granularity of the overarching framework for those sub-criteria, and the fact that their assessment is consistent across all project types (i.e., with no REDD+-specific characteristics), means that no further enhancement is required.

5. Criterion 1 – Additionality

If a mitigation activity is not additional, then purchasing carbon credits has not led to any additional reduction or removal of emissions. Additionality is therefore a crucial component of the integrity of carbon credits. A non-additional carbon credit has no direct net positive environmental impact given that the emission reductions/removals would have occurred anyway. However, it is worth noting that funding a non-additional credit may still indirectly help stimulate further investment in the same activity by raising its return.

The additionality of a project is not necessarily binary. Projects may be partly additional, where only a portion of emission reductions/removals are additional. For example, if, in the baseline scenario, some emission reductions would have been achieved anyway, but not as much as was achieved by the project, then only this difference in emission reductions is additional. If credits are issued for the total emission reductions rather than only the reductions that wouldn't have otherwise been achieved, then the credits are only partly additional.

There are two main components to assessing additionality: (i) is it likely a project's activities would have occurred without the incentive of a credit, and (ii) how accurately does a project's baseline scenario represent the amount of the CO_2e reduced/removed in the baseline scenario?

MSCI ESG Research's assessment of the additionality of REDD+ projects focuses on evaluating seven key topics. Figure 5 illustrates the sub-criteria and metrics through which the additionality of REDD+ projects is assessed, and the overall MSCI Carbon Project Ratings methodology sub-criteria that they refer to. The detailed sub-criteria are described in Figure 6.

Given the probabilistic nature of additionality, MSCI ESG Research scores projects based on the *likelihood* that their emission reductions or removals are additional. To achieve a high additionality score, a project's activities must be 'additional' (Sub-criteria 1.1, 1.2 and 1.3) and its baseline scenario reasonable (Sub-criteria 1.4 and 1.5).

An inverse weighting formula is used to determine a project's overall additionality score, where the combined scores of Sub-criteria 1.1, 1.2 and 1.3 are inversely weighted with the combined scores of Sub-criteria 1.4 and 1.5. As a result, a good score in any one criterion cannot offset a low score in another.

For example, a REDD+ project's conservation activities might be very additional given there would be few incentives for implementing patrolling and protection measures without carbon credits. However, if a project area is at no risk from deforestation, its baseline scenario should have been zero deforestation, and hence any emission reductions claimed by such a project are likely not additional.

Figure 5: REDD+ additionality assessment approach

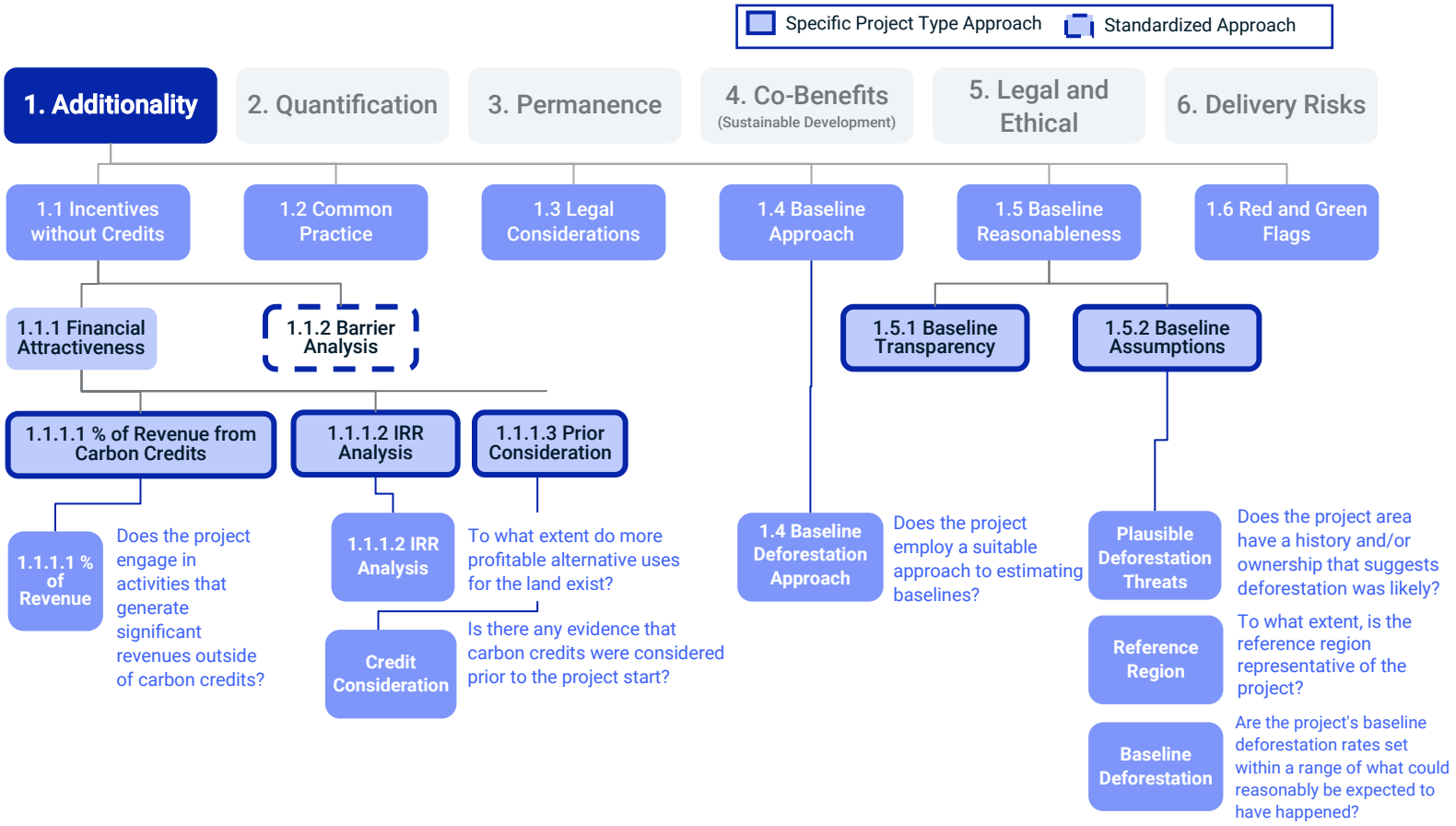


Figure 6: MSCI ESG Research Additionality integrity assessment framework

Sub-criteria		Metrics	Rationale	REDD+	Renewables	ARR	Cookstoves	Biochar	Landfill Gas	Safe Water	IFM	Waste Mgmt.	Blue Carbon
1.1 Incentives without Carbon Credits	1.1.1 Financial Attractiveness	1.1.1.1 % of Revenue from Carbon Credits	The higher the proportion of a project's revenue that comes from carbon credits, the greater the importance of credits to its financial attractiveness.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		1.1.1.2 IRR Analysis	Credits should play a decisive role in making a project financially attractive that would otherwise have not been.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		1.1.1.3 Prior Consideration	Carbon credits should have been clearly considered at the time the decision to go ahead with a project was taken.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	1.1.2 Barrier Analysis	Strength of Barriers	Projects that face high barriers to implementation would be less likely to go ahead without the added incentives of carbon credits.	✗	✓	✗	✓	✓	✗	✓	✗	✓	✓
1.2 Common Practice		Market Penetration	If a practice is already common within a market, it indicates that these types of projects will go ahead without the introduction of carbon credits.	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.3 Legal Considerations		Legal Requirements	Projects that are legally required or incentivized are unlikely to be additional. However, if laws are not enforced, then may still be additional.	✗	✗	✗	✗	✗	✓	✗	✓	✓	✓
1.4 Baseline Approach		Baseline Approach	Each project methodology is scored on the extent to which it mitigates the key risks associated with establishing a baseline scenario.	✓	✗	✗	✗	✗	✗	✗	✓	✗	✓
1.5 Baseline Reasonableness		Baseline Transparency	Transparent detail on a project's assumptions is required to make an objective assessment of a project's performance and additionality.	✓	✗	✓	✗	✗	✗	✗	✓	✗	✓
		Baseline Assumptions	MSCI ESG Research assesses the key baseline scenario assumptions for each project type — for example, for REDD+ projects a project's baseline deforestation rates are validated.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.6 Red and Green Flags		News scanning	Review of academic papers, industry sources and the news for Red or Green Flags to project's additionality.	✓ *Standardized approach*									

✓ *Assessed* ✗ *Not Assessed*

1.1.1.1 % of Revenue from Carbon Credits

% of Revenue refers to the proportion of a project's total revenue that comes from the sale of carbon credits.

Rationale	The higher the proportion of a project's revenue that comes from carbon credits, the greater the likely importance of carbon credits to the financial attractiveness of the project. If credits only represent a fraction of the financial return for the project, but the project can still claim credits representing 100% of the emission reductions or removals achieved, additionality is more uncertain.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					

Scoring Definition

Each project is scored on a 1-5 scale, where 1 indicates that a very low proportion of revenue comes from carbon credits and 5 indicates that carbon credits are likely the only source of revenue for the project.

Scoring Approach

MSCI ESG Research conducts a detailed review of project documentation to identify the sources of revenue for a project. Where financial data on the size of these revenue sources is presented, the proportion of total revenue that is estimated to come from carbon credits is calculated based on their estimated annual emissions reductions and the average realized carbon credit price since the project started for REDD+ projects. Where financial data is not present, the rough proportion of revenue from each revenue source is estimated given the project's activities and the developer's organization type, such as NGO, government, or private company.

Projects then receive a score from 1 to 5 based on the proportion of revenue that carbon credits are estimated to represent in the following way:

- 5 = 100% of revenue comes from carbon credits
- 4.5 = A very high (95%+) proportion of revenue is estimated to come from carbon credits
- 4 = A high (80-95%) proportion of revenue is estimated to come from carbon credits
- 3 = A medium (50-80%) proportion of revenue is estimated to come from carbon credits
- 2 = A low (10-50%) proportion of revenue is estimated to come from carbon credits
- 1 = A very low (<10%) proportion of revenue is estimated to come from carbon credits

1.1.2 IRR[5] Analysis

It is important for REDD+ projects to demonstrate that without carbon credits there would have been more profitable alternative uses of that land that would have likely resulted in it being deforested or degraded. Projects can evidence this by transparently estimating the profitability of alternative land uses. Projects that conduct this analysis and illustrate a high degree of difference between the project scenario and the most profitable alternative land use support their additionality claims.

There are three metrics that are used to evaluate this sub-criterion:

- **1.1.2.1 Financial Tests:** Whether the project uses a detailed and transparent approach to their financial analysis.
- **1.1.2.2 Financial Differences:** Whether there is a significant difference in profitability between the most profitable alternative land use and the project's activities.
- **1.1.2.3 Financial Evidence:** Whether the project's financial analysis is supported by a range of high-quality evidence.

The overall score for this sub-criterion is reached by weighting each of these factors 25%, 50% and 25% respectively.

1.1.2.1 Financial Tests

Financial tests refer to whether the project uses a detailed and transparent approach to their financial analysis.

Rationale	A project that conducts a more comprehensive financial analysis, in which key information is transparently given, provides more support and credibility to the outcome of this analysis.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that the project has not conducted any financial analysis and 5 indicates that the project conducted a full Internal Rate of Return (IRR) or Net Present Value (NPV[6]) analysis.					
Scoring Approach	MSCI ESG Research reviews the approach that a project took regarding its financial analysis and the types of tests performed.					

[5] The Internal Rate of Return (IRR) is a financial method used to calculate an investment's rate of return and profitability. The IRR is the percentage return on each unit of investment across its lifecycle.

[6] Net Present Value (NPV) is a profitability metric that measures how much an investment is worth throughout its lifetime, discounted to today's value.

1.1.2.2 Financial Differences

Financial differences relate to the magnitude of the difference between the expected profitability of the most profitable alternative use of the land, and the profitability of the project's activities without carbon credits.

Rationale	If the project area could have been used for a much more financially attractive land use other than the project's activities, then it indicates that the project activities would not have gone ahead in the absence of carbon credits. Alternatively, if no other more financially attractive land use existed for the project, then the project may have gone ahead even without carbon credits.
Key Sources	Project Documentation: ☑ Geospatial: Project Methodology Documentation: Academic Literature: Third-party Data: MSCI Carbon Markets:
Scoring Definition	Each project is scored on a 3-5 scale, where 3 indicates that the project's activities are thought to be equal to the most profitable land use and 5 indicates that the most profitable land use is more than 10x the profitability of the project's activities (without carbon credits).
Scoring Approach	MSCI ESG Research identifies the expected profitability of the different alternative land uses that the project presented. The profitability of the most profitable land use is then compared to the profitability of the project scenario without carbon credits. Projects are then scored on a 3 to 5 scale based on this difference, with projects receiving a higher score the greater the difference in profitability.

1.1.2.3 Financial Evidence

Financial evidence relates to the range of evidence used by a project to estimate and justify its financial analysis.

Rationale	It is possible to place more confidence in a project's financial analysis if its key assumptions are supported by a range of high-quality evidence.
Key Sources	Project Documentation: ☑ Geospatial: Project Methodology Documentation: Academic Literature: Third-party Data: MSCI Carbon Markets:
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that the project does not transparently use any sources to evidence its financial analysis and 5 indicates that the project's financial analysis is supported by four or more sources.
Scoring Approach	MSCI ESG Research identifies the specific sources used by the project as part of its financial analysis. The total number of sources used for each project is then aggregated and converted into a 1 to 5 scale based on the number of sources provided.

1.1.3 Prior Consideration

Projects that can clearly demonstrate that carbon credits were considered prior to their decision to start, provide more evidence that credits acted as an important incentive in starting mitigation activities.

Two key sub-criteria are used to evaluate this:

- **1.1.3.1 Evidence of Consideration:** Whether any evidence exists that credits were considered prior to the project start.
- **1.1.3.2 Registration Gap:** Whether a significant gap exists between the start of the project's activities and the initial registration and issuance date.

The overall score for 1.1.3 Prior Consideration is determined by an equal weighting of these sub-criteria.

1.1.3.1 Evidence of Consideration

Evidence of consideration refers to whether the project has specific evidence that demonstrates that the use of carbon credits was considered prior to the project start date.

Rationale	Evidence that carbon credits were considered prior to the project start date indicates that credits played an important role in this decision process. On the other hand, if no evidence of prior consideration exists, there is a higher chance that the decision to go ahead with the project occurred without any expectation of carbon credits.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a 3-5 scale, where 3 indicates that no evidence has been made available, and 5 indicates that good quality evidence of prior consideration exists.					
Scoring Approach	MSCI ESG Research identifies whether any evidence exists that carbon credits were considered prior to the project start date. This evidence may include a letter or notification of intent sent to a registry (such as CDM or Verra), the employment of a carbon credit consultant, or board meeting minutes indicating that carbon credits were analyzed. The date of any evidence of carbon credit consideration is then compared to the project start date to determine whether credits were considered prior to the start date or not.					

1.1.3.2 Registration Gap

Registration gap evaluates the gap between the start date of the project activity and the project being registered with a crediting standard and able to issue credits.

Rationale	A longer gap between the start of project activity and the project's registration suggests the project was able to maintain, at least to an extent, activities, and

	investment even in the absence of carbon credits. If credits were very important and decisive in the project going ahead, then one would typically expect a project to work hard to minimize this time taken in the registration process.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					☑

Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates a very significant gap between the initial decision date and the registration date and 5 indicates a short or inconsequential gap.
Scoring Approach	MSCI ESG Research analyzes project documentation to determine the project's start date and compared this to the date of registration and date of first issuance of the project using the MSCI Carbon Markets platform. The project stated start date is compared to the registration/issuance date and then categorized the gap between these dates into a 1 to 5 scale: - 5 = 2 years or fewer - 4 = 3-4 years - 3 = 5 to 6 years - 2 = 7-9 years - 1 = 10 years or higher

1.4 Baseline Approach

REDD+ methodologies usually allow multiple different approaches for a project to estimate its baseline deforestation rate. Projects that employ a baseline approach that is rigorous and suitable for the project's characteristics reduce the risk of using an unreasonable baseline.

There are two metrics that are used to evaluate this sub-criterion:

- **1.4.1 Recency of Data:** Whether the project uses recent, up-to-date data to estimate its baseline deforestation rate.
- **1.4.2 Type of Baseline Approach:** Whether the project employs a scientific best-practice approach which is suitable for that project.

The overall score for this sub-criterion is calculated by weighting these factors by 40% and 60% respectively.

1.4.1 Recency of Data

Recency of data refers to whether the project evaluates historic deforestation using recent and up-to-date data that accounts for any recent trends.

Rationale	Deforestation rates are subject to annual variability. Projects that assess historic deforestation for a significant period including the most recent years before the project start date will maximize the probability of recent deforestation trends being incorporated and accounted for.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑				☑	
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that a project's most recent deforestation analysis was conducted 10 years or more before the project start date, and 5 indicates that very recent historic deforestation analysis was included.					
Scoring Approach	MSCI ESG Research reviews in detail a project's deforestation analysis within its documentation to identify the time frame through which the project evaluated its historic deforestation trends. This time frame is then compared to the most recent year in which historic deforestation analysis was performed to the project's start date. The difference in years between these dates is then converted into a 1 to 5 scale, with a higher score given where more recent analysis is incorporated.					

1.4.2 Type of Baseline Approach

Type of baseline approach refers to whether the project performed rigorous and best-practice techniques to estimate its baseline deforestation rates.

Rationale	Scientific best-practice approaches provide greater likelihood that baseline scenarios are appropriately and reasonably estimated. Approaches that are considered scientific best practice have a lower risk of manipulation and/or overestimation.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑			☑		
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that a project uses an inappropriate and aggressive approach and 5 indicates that a project uses an appropriate, conservative approach that is highly suitable to the project's characteristics.					
Scoring Approach	MSCI ESG Research reviews in detail a project's deforestation analysis within its documentation to identify the type of modelling approach used to measure its baseline deforestation rate. For example, whether a project used a historic average, linear or logistic approach. It is also considered whether the project's deforestation analysis is incorporated within a national Forest Reference Emission Level (FREL).[7] Through an analysis of academic literature on the relative appropriateness of different modelling approaches, approaches are then scored on a 1 to 5 scale. Projects that are aligned to their national FREL and incorporate spatial allocation and covariate analysis into their approaches on average received higher scores.					

[7] Forest Reference Emission Level (FREL) is a national benchmark of baseline deforestation at the country-level that can be used by projects to assess performance against a country-level standard.

		Use of Spatial Allocation and Covariates			
		Neither	Spatial Allocation	Covariates Only	Both
Modelling Approach	Not Defined	1	2	2	3
	Historic Avg	1.5	2.5	2.5	3.5
	Non-linear	2	3	3	4
	Linear	3	4	4	5
	FREL	4	5	5	5

Furthermore, MSCI ESG Research also analyzes the forest cover definition used by a project. The percentage forest cover threshold selected can materially influence the estimated baseline deforestation and emission reductions. Scientific studies and international best practices typically suggest that a minimum canopy cover threshold of around 30% most accurately reflects forest conditions, particularly in tropical and subtropical regions.[8] Consequently, projects that employ a minimum forest cover threshold close to 30% are considered to have made a more conservative and reasonable assumption. Projects that adopt significantly lower or higher thresholds may introduce risks of over- or underestimation of baseline deforestation rates and associated carbon stocks. The appropriateness of the forest cover threshold is therefore considered as part of the overall evaluation of the project's baseline approach.

1.5 Baseline Reasonableness

Estimating the baseline rate of deforestation that would have occurred if the project did not happen is the most important, but hardest-to-measure, assumption for REDD+ projects. As it is not possible to know for certain what would have happened in this counterfactual scenario, assessing the reasonableness of a project's baseline scenario assumptions must be done in a probabilistic way.

Further, given the uncertainties that exist, it is important that any estimates of baseline deforestation rates do not overly rely on one single approach. MSCI ESG Research therefore assesses the reasonableness of a REDD+ project's baseline scenario through a number of considerations that avoid placing an over-reliance on a single approach and build a rich picture of that project's individual context. Six sub-components are considered to evaluate a project's baseline reasonableness:

- **1.5.1 Plausible Deforestation Threats:** Whether the history and ownership of the project and surrounding area suggests that deforestation was a threat.
- **1.5.2 Reference Region Similarity:** Whether the project uses a reference region that shares similar key characteristics including topology (such as slope and elevation) and economic characteristics (such as population density and distance to roads).

[8] GOFC-GOLD. 2016. A sourcebook of methods and procedures for monitoring and reporting on REDD+ activities (GOFC-GOLD Report version COP22-1). Wageningen University, Wageningen, Netherlands; and Food and Agriculture Organization of the United Nations (FAO). 2012. *Global Forest Resources Assessment 2010: Terms and Definitions.* FAO Forestry Paper 163. Rome, Italy.

- **1.5.3 Ex-Ante Baseline Reasonableness:** Whether the project's baseline deforestation rate assumptions appear reasonable given the deforestation that occurred around the project area prior to the project start.
- **1.5.4 Ex-Post Baseline Reasonableness:** Whether the project's baseline deforestation rate assumptions appear reasonable given the deforestation that occurred in the region after the project start.
- **1.5.5 Deforestation Risk Map:** Whether the project's baseline deforestation rate assumptions appear reasonable against spatial deforestation risk models.
- **1.5.6 Planned Deforestation Baseline Reasonableness:** Whether a planned deforestation project's baseline deforestation rate assumptions appear reasonable given both the likelihood and rate of deforestation predicted.

Each of these criteria is assessed independently on a scale of 1 to 5.

Unplanned deforestation projects

For unplanned deforestation projects, only the first five criteria are considered. If the project start date is fewer than five years ago, criteria 1.5.4 Ex-Post Baseline Reasonableness is not evaluated due to insufficient time series data to make reliable conclusions.

For the assessment of unplanned baseline reasonableness, each sub-criterion results in two outputs:

- A **percentage reasonableness** score, representing the ratio of the project's baseline deforestation rate to an independently modelled rate. A percentage reasonableness of 100% indicates a perfect match between the project's baseline and the comparative model; values above or below this indicate under- or overestimation, respectively.
- A **1–5 score**, which reflects the level of alignment between the project assumption and modelled rates, with consideration of data uncertainty and confidence.

To avoid overreliance on any single model or benchmark, MSCI ESG Research calculates an aggregate percentage reasonableness score by multiplying the percentage reasonableness scores produced by multiple scenario analyses (see Section 1.5.3 below for further details).

This approach has two advantages. Firstly, it ensures that the aggregate score reflects consistent alignment across multiple sub-criteria, rather than being dominated by a single high or low value. Secondly, it recognises where a project's baseline assumption appears conservative — that is, where the percentage reasonableness exceeds 100% — rather than capping values at a maximum score.

A final 1 to 5 score is then derived to ensure consistency with the broader scoring framework. As the 1 to 5 scale reflects both an assessment of the proportion of baseline emissions that appear reasonable, and the level of uncertainty in this assessment, the 1 to 5 score is based on two inputs:

- (i) Weighted average percentage reasonableness: A weighted average of the individual sub-criterion's percentage reasonableness values.
- (ii) Proportion of sub-criteria with acceptable reasonableness: The proportion of sub-criteria in which the sub-criterion scores at least 3.5

This two-part approach ensures that the final 1-5 score reflects both the central estimate of reasonableness and the confidence level in that estimate, based on the consistency of evidence across sub-criteria.

Planned deforestation projects

For planned deforestation projects, the baseline reasonableness score is calculated as the weighted average of the 1-5 scores for 1.5.1 Plausible Deforestation Threats (25%) and 1.5.6 Planned Deforestation Baseline Reasonableness (75%).

1.5.1 Plausible Deforestation Threats

For REDD+ projects to be additional, it is important that the threat of deforestation is real, otherwise these areas are likely to have been protected anyway. For example, many NGOs and conservation agencies have preexisting commitments to protect forested areas, even before they consider carbon credits. The history and ownership structure of a project area act as an important input in determining the extent to which deforestation of the area was likely in the absence of carbon credits.

Three main factors are considered as part of this assessment:

- **1.5.1.1 Plausible Ownership Structure:** Whether deforestation is plausible given the ownership structure of the project area.
- **1.5.1.2 Deforestation History:** Whether deforestation is plausible given the historic levels of deforestation occurring in the surrounding regions.
- **1.5.1.3 Suitability of Project Activities to Deforestation Drivers:** Whether the stated drivers of deforestation appear plausible given the suitability and relevance of the project's activities to addressing them.

Each of these sub-criteria is assessed on a scale from 1 to 5. The overall score for 1.5.1 History and Ownership is determined by weighting these three factors by 25%, 25% and 50% respectively.

1.5.1.1 Plausible Ownership Structure

Plausible Ownership Structure relates to the extent that deforestation of the project area was considered likely given the ownership structure of the project area.

Rationale	Some project areas may be owned by individuals or organizations that are unlikely to have allowed deforestation to take place, even without carbon credits. In this case, the sale of credits does not protect any additional area versus what would have otherwise occurred.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates very low plausibility of deforestation and 5 indicates very high plausibility of deforestation.					
Scoring Approach	MSCI ESG Research conducts a detailed review of project documentation to identify both the current landowner(s) and the previous landowner(s). The plausibility of deforestation is then assessed given these relevant owners and score projects on a 1 to 5 scale based on this plausibility.					

For example, projects that have a long history of being owned by conservation agencies before the project started have low plausibility of deforesting the land and score a 1. Projects that are community-owned or owned by a timber company have high plausibility and score a 5.

1.5.1.2 Deforestation History

Deforestation History relates to the extent deforestation of the project area was considered likely given the historic levels of deforestation occurring in the surrounding region.

Rationale	Projects that take place far away from any recent deforestation events are less likely to have been facing a near-term threat of deforestation.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					

Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that there has been no previous deforestation within 50km of the project area in the prior 10 years, and 5 indicates that there is clear evidence of recent deforestation within the past 10 years in the surrounding region.
Scoring Approach	For each project, geospatial analysis is conducted to estimate the historic deforestation rates of its surrounding area (within 10km and 50km buffer of the project boundary). Please refer to Section 9 of this document for more detail on MSCI's geospatial analysis. Each project is then scored from 1-5 based on the rate of deforestation surrounding the project area in the past 10 years as follows: - 5 = At least 0.3% deforestation rate within either a 10km or 50km radius of project - 4 = 0.2-0.3% deforestation rate within either a 10km or 50km radius of project - 3 = 0.1-0.2% deforestation rate within either a 10km or 50km radius of project - 2 = 0.05-0.1% deforestation rate within either a 10km or 50km radius of project - 1 = Less than 0.05% deforestation rate within either a 10km or 50km radius of project

1.5.1.3 Suitability of Project Activities to Deforestation Drivers

Suitability of Project Activities to Deforestation Drivers refers to whether the stated drivers of deforestation appear plausible given the suitability and relevance of the project's activities to addressing them.

Rationale	If the project undertakes activities that are not suitably addressing and mitigating the stated drivers of deforestation, then it indicates that the activities of the project were not required or that the threat from the stated drivers of deforestation are somewhat limited.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets

	☑
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that the project activities do not appear to be that relevant for the stated drivers of deforestation and 5 indicates that the project activities appear highly appropriate to tackling the stated drivers of deforestation.
Scoring Approach	MSCI ESG Research identifies the stated drivers of deforestation and the project activities undertaken from project documentation. A suitability mapping is then created of project activities to deforestation drivers based on how effectively each activity addresses each deforestation driver. For example, building a new education or health center has low suitability if the driver of deforestation is commercial logging by a timber company that owns the land. In contrast, community investments are very suitable activities where the agents of deforestation are the local communities. Projects are then scored on a 1 to 5 scale based on the overall suitability of their project activities to the stated drivers.

1.5.2 Reference Region Similarity

Reference Region Similarity relates to the extent to which the project has based its baseline deforestation rate modelling on a reference region that shares similar key characteristics to the project area.

Rationale	Projects use reference regions to help estimate what deforestation rate would likely have occurred in the project area. In simple terms, the deforestation rate that occurs in a similar nearby region is assumed to represent the deforestation rate that would have occurred in the project area in the absence of carbon credits. However, if a project uses a reference region that does not appear to share similar characteristics to its own area, then the project risks using an unrepresentative deforestation rate. For example, if the reference region faces higher deforestation threats due to a higher population density or greater proximity to roads, then the reference region deforestation rate may be higher than what would have occurred in the project area (without credits), resulting in a higher baseline and risk of over-crediting.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that the project uses a reference region that appears significantly unrepresentative, and 5 indicates that the reference region appears to share high similarity with the project area across five key characteristics.					
Scoring Approach	MSCI ESG Research conducts a geospatial assessment of both the project area and reference region on six key characteristics: (i) elevation, (ii) slope, (iii) distance to forest edges, (iv) population density, (v) distance to protected areas, and (vi) forest cover and loss.					

For each characteristic, the project area is compared to the reference region to produce a similarity score.

MSCI ESG Research also incorporates Red or Green Flags identified in academic literature, where reputable external studies have either strongly supported or refuted the similarity of a project's reference region to the project area.

Projects are then scored on a 1 to 5 score based on this similarity. Projects that have high similarity on all six variables will receive a score of 5. Projects that have low similarity on at least three of these variables will receive a score of 1.
More information on this geospatial approach can be found in Section 9.

1.5.3 Ex-Ante Deforestation Reasonableness (Unplanned Deforestation Only)

Ex-Ante Deforestation Reasonableness relates to whether the project's baseline deforestation rate appears reasonable given the deforestation that occurred around and within the project area prior to the project start date.

Rationale	Typically, the baseline deforestation rate used by a project should not be dissimilar to the deforestation rate that the project area, and other representative surrounding areas, have experienced historically (i.e., prior to the project and/or crediting period start date). There is an increased risk of over-crediting if the project baseline deforestation rate is higher than that projected by historic trends.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				

Scoring Definition	Each project is scored on a 1-5 scale based on ex-ante analysis, where 1 indicates that a project's baseline deforestation rate appears to be significantly overestimated and 5 indicates that a project's baseline appears to be conservative.
Scoring Approach	Given it is a counterfactual scenario, it is not possible to say with 100% certainty what would have happened in the project area in the absence of carbon credits. There are a multitude of different ways to try to estimate what would have happened in the counterfactual, each of which may produce a different baseline deforestation rate. A project baseline can be considered reasonable if it sits within the middle of the range of baseline rates that different approaches produce. However, if multiple different methodologies/approaches all produce a lower baseline deforestation rate than that used by the project, it would suggest that the project has overestimated its baseline. In the assessment, a project's baseline is compared to ten alternative baseline scenarios, each based on a different ex-ante analysis. The ten scenarios take historical deforestation rates from one of five different areas, and two different projection methodologies. ***Historic Deforestation Analysis:*** The historic rate of deforestation that has occurred in five different areas is evaluated: - **1) Project Reference Region:** The reference region used by the project.

- **2) MSCI Average, 3) MSCI Min and 4) MSCI Max Areas:** A range of MSCI-defined areas created through an in-house geospatial "pixel-based approach." The geospatial methodology used to construct these reference areas is described in more detail in Section 9 of this document.
- **5) 50km Surrounding Area:** The 50km area surrounding the project boundary.

In summary, several biogeographic and socioeconomic geospatial datasets are combined that include information considered to be relevant drivers of deforestation or highly correlated to forest loss, including topography, biome, distance to forest edge and population density in the year of project creation. Point samples (or "pixels") from a search area around the project site that best match the geospatial characteristics of the project area are algorithmically selected, and their historic deforestation rate then calculated.

Projections: Historic rates of deforestation in each of these five geographic areas are then projected forward to estimate what would have been reasonably expected to have occurred in the project area in the absence of carbon credits. Two different projection methods are used: (i) a "historic average," and (ii) a "linear" approach. These two projection methods, combined with five geographic areas, result in ten projected deforestation rates.

Comparison and Scoring: Each of the ten projected deforestation rates are evaluated based on two historic time periods: (i) observed deforestation rates in the five years prior to the project start; (ii) observed deforestation rates in the 10 years prior to the project start. This dual-period analysis allows an evaluation of the consistency of deforestation risk over time and identification of any short-term or long-term trends that could influence the reasonableness of the project's baseline assumptions.

For each scenario, the project's baseline deforestation assumption is compared to the level of deforestation observed to produce an estimate of the percentage difference, where 100% indicates the project's assumption matches the observed or modelled rate, 50% indicates the project's assumption is double the observed or modelled rate, or 200% indicates the project's assumption is half the observed or modelled rate.

These percentages are also converted into a 1 to 5 scale, where 5 indicates that the project's baseline assumption appears highly reasonable based on the observed or modelled rate. For example, if a project's baseline deforestation rate is ≥100% higher (i.e., more than double) than the comparative baseline, then it will score a 3. The scoring naturally considers the inherent uncertainty in the geospatial dataset and machine learning-based pixel matching model by giving a score of 5 if a project's baseline is within 10% of a comparative baseline.

A project's overall percentage difference and 1 to 5 score is then based on a weighted average of the ten individual comparative baseline scores. The weighting of these factors depends on the similarity assessment of the project's reference region to the project area. If the project's reference region is highly similar, then the project reference region receives a high weighting under the historic average

and linear approach. Otherwise, the linear projection method and MSCI average/max/min areas are given a higher weighting.

1.5.4 Ex-Post Deforestation Reasonableness (Unplanned Deforestation Only)

Ex-Post Baseline Reasonableness refers to whether the project's baseline deforestation rate appears reasonable given the observed deforestation that has occurred in surrounding and/or similar regions since the project started.

Rationale	Typically, the baseline deforestation rate used by a project should not be dissimilar to the deforestation rate that other representative surrounding areas (that don't have carbon credit projects) experience during the project's crediting period. There is an increased risk of over-crediting if the project baseline deforestation rate is (significantly) higher than the rates of deforestation observed in similar surrounding areas during the project's operation.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				

Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that a project's baseline assumptions appear significantly overestimated (based on ex-post analysis) and 5 indicates that a project's baseline appears to be conservative (based on ex-ante analysis).
Scoring Approach	The general process and steps of the ex-post baseline analysis is similar to that of the ex-ante analysis (described above under sub-criterion 1.5.3). MSCI ESG Research assesses multiple areas to avoid over-relying on a single approach and account for uncertainty in the scoring. In the assessment, a project's baseline is compared to observed deforestation in the same five geographic areas used in 1.5.3 Ex-Ante Deforestation Reasonableness. The observed deforestation rates in these five areas are compared to the project's baseline rate. For each scenario, the project's baseline deforestation assumption is compared to the level of deforestation observed to produce an estimate of the percentage difference, where 100% indicates the project's assumption matches the observed rate, 50% indicates the project's assumption is double the observed rate, or 200% indicates the project's assumption is half the observed rate. These percentages are also converted into a 1 to 5 scale, where 5 indicates that the project's baseline assumption appears highly reasonable based on the observed rate. Each of these comparisons are scored on a 1 to 5 scale based on the level of difference observed. For example, if a project's baseline deforestation rate is ≥100% higher (i.e., more than double) than what was observed in a comparative area, then it will score a 1. The scoring naturally considers the inherent uncertainty in the geospatial dataset and machine learning-based pixel matching model by giving a score of 5 if a project's baseline is within 10% the observed rate within a comparative area.

A project's overall percentage difference and 1 to 5 score is then based on a weighted average of the five individual comparative baseline scores, with the MSCI Average Reference Area weighted 40%, the MSCI Min and Max Reference Areas weighted 15% each, the Project Reference Region weighted 20% and the 50km surrounding zone weighted 10%. If the project's reference region appears highly representative of the project area as determined by 1.5.2 Reference Region Similarity, then this receives a higher weighting.

1.5.5 Deforestation Risk Maps (Unplanned Deforestation Only)

Deforestation Risk Maps are used to assess whether the project's baseline deforestation rate appears reasonable given modelled spatial deforestation risk projections for the project area.

Rationale	Modelled deforestation risk maps provide a forward-looking estimate of where and to what extent forest loss is most likely to occur, based on historic deforestation patterns and key spatial drivers such as proximity to roads, rivers, urban areas, prior forest loss, and topography. Evaluating a project's baseline deforestation assumptions against these models helps to test whether the projected baseline aligns with broader jurisdictional or national-level expectations of future forest loss. Projects whose baseline assumptions are consistent with these modelled risk patterns demonstrate a higher degree of reasonableness and conservativeness. Conversely, significant divergence from modelled risk — either in the magnitude of assumed deforestation or the spatial distribution of projected loss — may indicate a risk of baseline inflation and over-crediting.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				

Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that a project's baseline assumptions appear significantly overestimated (based on deforestation risk maps) and 5 indicates that a project's baseline appears to be conservative (based on deforestation risk maps).
Scoring Approach	The deforestation risk maps are generated using the forestatrisk Python package, which integrates spatial modeling techniques with empirical deforestation patterns. This approach leverages the forest transition hypothesis, applying curve-fitting methods to simulate both deforestation and potential regrowth over time. Key drivers incorporated into the model include historical forest loss data, proximity to roads and rivers, terrain characteristics, urbanization levels, and population density. These variables are used to estimate the probability of deforestation spatially. The model then produces forecasts at 5-year intervals from 2020 to 2050, under different Shared Socioeconomic Pathways (SSP2 and SSP3) , to account for varying development pressures. The outputs are spatially explicit maps indicating areas of high deforestation risk. The project's baseline deforestation rate assumption is compared to the deforestation rate forecasts modelled under these SSP2 and SSP3 scenarios. Specifically, the

project's assumption is compared to the 10-year forward-looking average deforestation rate forecasts (SSP2 and SSP3) from the project start date. This comparison yields a percentage difference, where 100% indicates the project's assumption matches the forecasted rate, 50% means it is twice the forecasted rate, and 200% means it is half. These percentages are then translated into a 1 to 5 scoring scale, where a score of 5 reflects high alignment between the project's assumption and the forecasted deforestation rates.

1.5.6 Planned Deforestation Baseline Reasonableness (Planned Deforestation Only)

Assessing planned deforestation baseline reasonableness is highly context- and project-specific. The baseline rate depends on both the likelihood that the planned deforestation would have gone ahead and the rate of deforestation that was planned. Five sub-criteria covering both the likelihood and rate of deforestation are therefore assessed:

- **1.5.6.1 Deforestation Likelihood Given Stage:** The likelihood of the planned deforestation occurring given the stage the agents of deforestation had reached in their deforestation plans.
- **1.5.6.2 Deforestation Likelihood Given Evidence:** The likelihood of the planned deforestation occurring given the evidence provided.
- **1.5.6.3 Deforestation Likelihood Given Distance to Roads:** The likelihood of the planned deforestation occurring given the project's distance to road infrastructure at the start of the project activity.
- **1.5.6.4 Deforestation Rate Benchmarking:** The similarity of the baseline rate of planned deforestation to the rate of deforestation observed in similar surrounding areas.
- **1.5.6.5 Deforestation Rate Evidence:** The strength of evidence provided to support the planned deforestation rate.

Each of these is scored on a 1-5 scale and then weighted to reach an overall score. 1.5.6.1 Deforestation Likelihood Given Stage and 1.5.6.2 Deforestation Likelihood Given Evidence are weighted 25% and 35% respectively, and 1.5.6.4 Deforestation Rate Benchmarking and 1.5.6.5 Deforestation Rate Evidence are weighted 20% each. 1.5.6.3 Deforestation Likelihood Given Distance to Roads is used as a deduction from the baseline reasonableness score, not as a weighted input. The deduction ranges from 0 to a maximum of 1.5.

1.5.6.1 Deforestation Likelihood Given Stage

Deforestation Likelihood Given Stage relates to the extent to which the planned deforestation was likely given the stage the agents of deforestation had reached in their deforestation plans.

Rationale	If the agents of deforestation already had ownership of the land and permission to deforest it, then the likelihood of the deforestation happening in the baseline scenario is higher.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that there appears to have been little likelihood of imminent deforestation, and 5 indicates imminent deforestation					

was extremely likely had the carbon project not started based on the stage of that deforestation planning.

Scoring Approach

MSCI ESG Research assesses the relation of the agent of deforestation to the project area at the start of the project and whether legal permissions were already secure to deforest the land.

Projects are then scored on a 1 to 5 scale based on how likely deforestation was to occur. For example, likelihood is assessed for the following scenarios as follows:

		Agent of Deforestation			
		Previous Owner	Prospective Owner (that did not bid for land)	Prospective Owner (that bid for land)	Current Owner
Permission to Deforest Secure	Yes	3	3	4	5
	No	1	2	3	4

1.5.6.2 Deforestation Likelihood Given Evidence

Deforestation Likelihood Given Evidence relates to the extent to which the planned deforestation was likely given the strength the evidence provided.

Rationale

High-quality evidence indicating that the planned deforestation was likely can help to support and confirm the threat of deforestation.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					

Scoring Definition

Each project is scored on a 1-5 scale, where 1 indicates no evidence is provided by the project and 5 indicates that multiple, well-regarded pieces of evidence have been provided.

Scoring Approach

MSCI ESG Research identifies the different evidence sources provided by the project. The main types of evidence considered are: attestations, legal documentation, management plans, evidence of history of deforestation and expert opinions.

Projects are then scored on a 1 to 5 scale based on the variety and reliability of this evidence. Projects that provide at least four pieces of evidence including either legal documentation and/or evidence of previous deforestation receive a score of 5.

1.5.6.3 Deforestation Likelihood Given Distance to Roads

Deforestation Likelihood Given Distance to Roads relates to the extent to which the planned deforestation was likely given the distance of the project area from road infrastructure.

Rationale

Proximity to road infrastructure is a strong leading indicator of future deforestation, with areas located closer to existing roads facing significantly higher risks of land conversion. Roads facilitate access for agricultural expansion, logging, and other land uses that drive deforestation. Projects located far from road networks are less exposed

	to immediate deforestation pressures, and therefore a baseline assumption of rapid or near-term forest loss in such areas may be less reasonable. Assessing a project's distance to major roads helps to validate whether the projected rate and timing of baseline deforestation are credible given the area's accessibility at the project start date.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				

Scoring Definition	Each project receives a score from 0 to 1.5, where 0 indicates project area is adjacent to a road, 0.5 if road infrastructure is over 2 km away, and 1.5 if road infrastructure is over 10 km away.
Scoring Approach	To assess the proximity of project boundaries to existing road infrastructure, MSCI ESG Research calculates the minimum Euclidean distance between each project and the nearest road segment. This analysis utilizes the Global Roads Inventory Project (GRIP) Version 4 dataset, which covers 222 countries and territories, and categorizes roads into five types: highways, primary, secondary, tertiary, and local roads. The underlying road data primarily reflects conditions up to 2018 and may not capture developments post-2018. The output of the above analysis is the calculated distance (in kilometers) from the project area to the nearest road infrastructure. This distance is used to assign a deduction score ranging from 0 to 1.5: 0 if the project borders a road, 0.5 if the road is over 2 km away, and 1.5 if it is over 10 km away.

1.5.6.4 Deforestation Rate Benchmarking

Deforestation Rate Benchmarking relates to the extent to which the rate of planned deforestation appears reasonable given the rate of deforestation observed in similar areas.

Rationale	The time taken to fully deforest similar areas of land should be roughly the same. Projects that assume a rapid pace of deforestation relative to other similar areas will likely overestimate their near-term baseline deforestation rate, increasing the risk of over-crediting.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				

Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that a project assumes an aggressive clear-cutting schedule relative to other similar surrounding areas, and 5 indicates that a project's rate of baseline deforestation appears conservative relative to those areas.
Scoring Approach	Each project's baseline rate of planned deforestation is extracted from its project documents. Two metrics are reviewed: (i) the baseline deforestation rate assumed in

each year, and (ii) the number of years after which the area would have been fully deforested.

Projects are then scored on a 1 to 5 scale based on how reasonable the time-period until 100% deforestation appears, compared to other registered Planned Deforestation projects.

Given the specific nature of each Planned Deforestation project, an average across all registered Planned Deforestation projects is used to minimize the impact of anomalous projects. The average registered Planned Deforestation project assumes that 100% of the land will be deforested within 10 years. For example, projects that assume 100% deforestation will occur in their first year will score a 1 if the average length of time until 100% deforestation for similar projects is closer to ten years.

1.5.6.5 Deforestation Rate Evidence

Deforestation Rate Evidence relates to the extent to which the rate of planned deforestation appears reasonable given the strength of evidence provided.

Rationale	Projects that combine a rigorous approach with strong supporting evidence provide more confidence in the reasonableness of their baseline deforestation rate assumptions.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					

Scoring Definition	Each project is scored on a 1-5 scale, where 1 indicates that a project does not provide any evidence for its baseline rate of deforestation and 5 indicates that a project provides multiple pieces of well-regarded evidence to support its baseline assumptions.
Scoring Approach	MSCI ESG Research identifies the key evidence that a project uses to estimate its baseline rate of deforestation. In general, planned deforestation projects use two approaches to evidencing their baseline: either (i) using a management plan to evidence what would have happened in the absence of carbon credits, or (ii) analyzing actual deforestation in proxy areas that share similarities to the project area. Planned deforestation projects are then scored on a 1 to 5 scale based on the type and strength of evidence provided. Projects that use both approaches, including the use of a good sample of highly similar proxy areas, offer more evidence supporting their rate of deforestation and hence receive a score of 5.

6. Criterion 2 – Quantification

Quantification refers to the likelihood that the emission reduction or removals claimed by a project are accurate, assuming the baseline scenario is correct. It includes both emission reductions or removals within a project area and emissions released or generated outside the project area, known as leakage.

Along with the strength of baseline assessment, quantification is a key determinant of the risks of over-crediting: whether the number of credits issued by the project is equal to the CO_2e actually reduced/removed. In theory, all carbon credits are worth the equivalent of 1 tonne of CO_2e reduced or removed. A low carbon quantification score means that the emission reductions or removals delivered by the credit is likely to be less than 1 tonne. In this case, buyers should be cautious in using one credit to offset 1 tonne of their own emissions as they are unlikely to be equivalent.

Quantifying a REDD+ project's emission reductions, even assuming the baseline scenario has been accurately estimated, requires a complex estimation of two primary components: first, the project's carbon stock and, second, any project leakage. Both of these components are difficult to measure with a high degree of accuracy.

As natural living ecosystems spread over what is often a very large and sometimes inaccessible area of land, measurement of a REDD+ 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 geospatial datasets and analysis are increasingly being used to complement this manual sampling.

Accurately measuring leakage is even more difficult as evaluating factors such as what size leakage area to monitor and what proportion of any increase in (local) deforestation is attributable to the project inevitably involve a degree of subjectivity.

Figure 7 illustrates the sub-criteria through which MSCI ESG Research assesses the quantification of REDD+ projects, and the Integrity Assessment framework sub-criteria to which they refer. The detailed sub-criteria are described in Figure 8.

Figure 7: REDD+ Quantification assessment approach

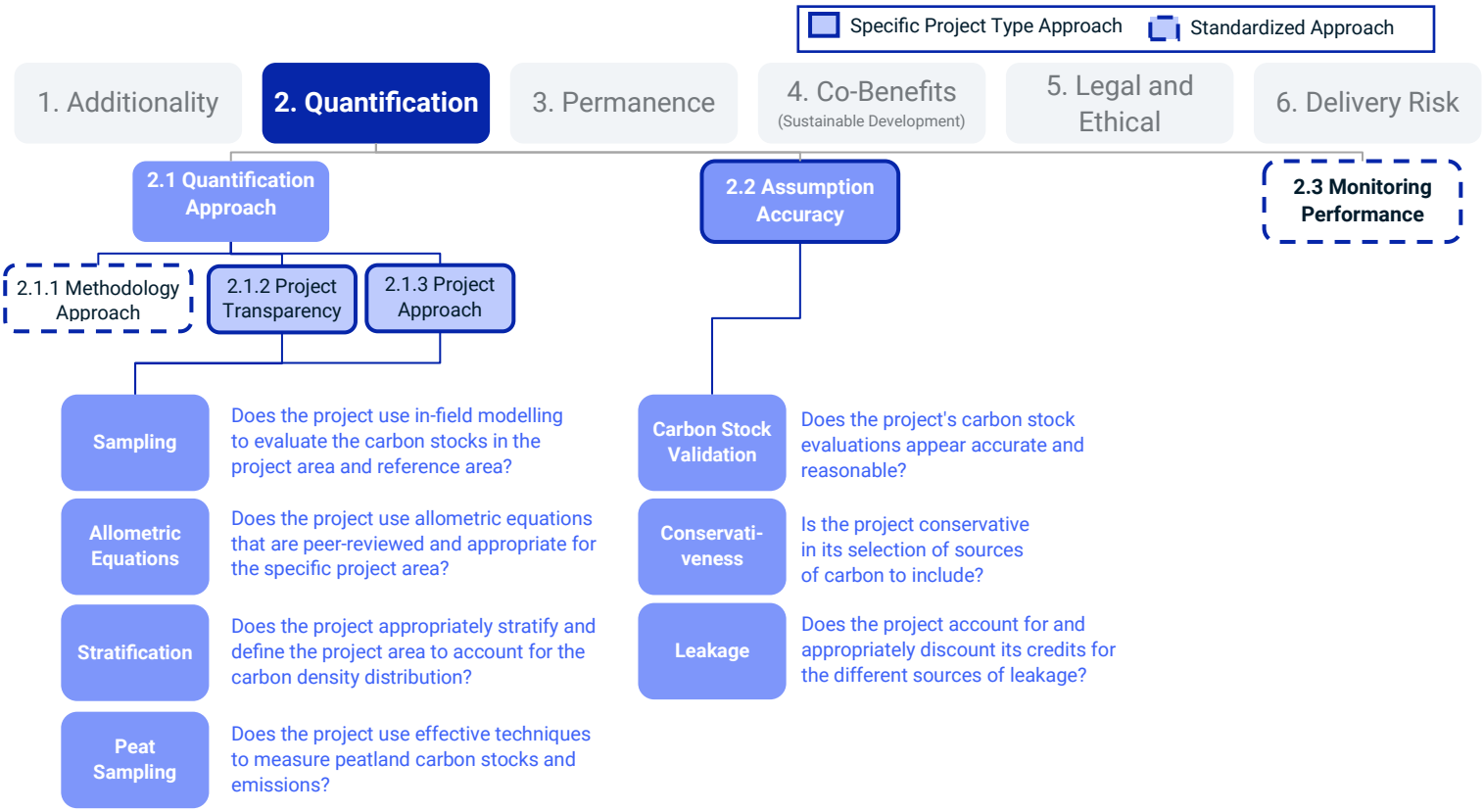


Figure 8: MSCI ESG Research Quantification integrity assessment framework

Sub-criteria	Metrics	Rationale	REDD+	Renewables	ARR	Cookstoves	Biochar	Landfill Gas	Safe Water	IFM	Waste Mgmt.	Blue Carbon
2.1 Quantification Approach	2.1.1 Methodology Approach	Through setting the assumptions that projects must make, and the sources that can be used to estimate them, crediting program methodologies can play an important role in reducing or even increasing the level of quantification risk.	✓ *Standardized approach*									
	2.1.2 Project Transparency	Transparent documentation and detail on a project's assumptions are required to make an objective assessment of its approach to carbon quantification.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	2.1.3 Project Approach	Two projects with the same methodology may carry different quantification risks depending on the approaches that each uses.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.2 Assumption Accuracy	Quantification Accuracy	Each project type has a set of key assumptions that determine the accuracy of their carbon quantification. Evaluating the reliability and accuracy of these key assumptions shows whether a project has over- or understated their emission reductions or removals.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.3 Monitoring Performance	2.3.1 Monitoring Plan	Projects that have effective processes in place to regularly monitor and measure key quantification inputs and assumptions are more likely to accurately estimate and update their emissions impact.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	2.3.2 VVB Analysis	Projects that use a diverse mix of well-regarded verification and validation bodies (VVBs) will improve the likelihood that key quantification details are accurately checked and validated.	✓ *Standardized approach*									
2.4 Red and Green Flags	News scanning	Review of academic papers, industry sources and the news for Red or Green Flags relating to project's quantification.	✓ *Standardized approach*									

2.1.2 Project Quantification Approach

Projects that use scientifically best-practice techniques to estimate key components of their quantification increase the probability that CO_2e impact will be accurately measured.

There are four metrics that are used to evaluate this sub-criterion:

- **2.1.2.1 Sampling:** Whether the project uses suitable and representative sampling approaches to estimate its carbon stock.
- **2.1.2.2 Allometric Equations:** Whether the project employs a peer-reviewed and suitable allometric equation as part of its carbon stock calculations.
- **2.1.2.3 Stratification:** Whether the project appropriately stratifies the project area to account for differences in carbon density.
- **2.1.2.4 Peat Sampling:** Whether the project uses effective sampling approaches to estimate carbon stocks and emissions within peatlands.

The overall score for this sub-criterion is reached by weighting 2.1.2.1 Sampling, 2.1.2.2 Allometric Equations and 2.1.2.3 Stratification by 40%, 40% and 20%, respectively. If the project area includes peatlands, then 2.1.2.4 is weighted based on the proportion of total net emission reductions that are accounted for by the peatland components of the project, with the weightings assigned to the other three sub-criteria decreasing proportionately.

2.1.2.1 Sampling

Sampling relates to whether the project uses suitable and representative sampling to measure the carbon stock within the project area.

Rationale	To estimate the carbon stock within their project area, projects must use tree measurements from a sample of the project area as an input in their calculations. Given that these measurements are then extrapolated over the entire project area, the accuracy of the estimate is dependent on how representative the sampled area is to the entire project area. Projects that use more representative sampling techniques over a larger area increase the chances that this sampled area will be representative of the entire project area.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑				☑	

Scoring Definition	Each project is scored on a 5-point scale from 1 to 5, where 1 indicates a relatively low sampling representativeness and 5 indicates a relatively high sampling representativeness.
Scoring Approach	MSCI ESG Research conducts a detailed review of each project's documents to understand its approach to carbon stock estimation and its sampling procedures during both its design and monitoring phases. For each project, two key factors are considered. First, if the project combined in-field sampling with any remote sensing. Second, the number and size of plots sampled to understand what proportion of the total project area had been sampled.

Projects that sample over 0.1% of their area and support this with remote sensing receive the highest score of 5. Projects that sample less than 0.01% of their project area or do not provide any transparent information on their sampling receive the lowest score of 1.

2.1.2.2 Allometric Equations

Allometric Equations relates to whether the project uses peer-reviewed allometric equations that are appropriate for the region, forest type and biome type.

Rationale	Allometric equations are used to convert tree measurements into the amount of carbon they contain. The accuracy of this calculation is therefore dependent on the appropriateness of the allometric equation used. The most scientifically appropriate equations will be peer-reviewed and specifically chosen by a project based on their relevance to the project's key characteristics.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑				☑	

Scoring Definition	Each project is scored on a 5-point scale from 1 to 5, where 1 indicates that a non-peer reviewed allometric equation was used that does not appear to be appropriate for the region or species, and 5 indicates that a species/region/forest-type relevant equation from a peer-reviewed study was used.
Scoring Approach	MSCI ESG Research identifies the specific allometric equation(s) a project uses in its carbon stock calculations. This specific study for the allometric equation is then researched to determine whether it was peer-reviewed and its relevance for the project's key characteristics. This analysis is done by comparing the project's allometric equations with an in-house database, built from academic literature and third-party sources, to assess their relevance and applicability. Projects that use a peer-reviewed equation receive 2 points. Projects receive an additional point if their equation is relevant to each of the country, region, tree species or forest type.

2.1.2.3 Stratification

Stratification relates to whether the project appears to employ an appropriate stratification of the project area.

Rationale	Stratification relates to the layers of different vegetation within a forest. Appropriately stratifying the project's land into areas of distinct vegetation is an important part of accurately estimating and recording the carbon stock within a project area. Projects that do not appropriately stratify their land may use samples from one vegetation layer to make estimates for another vegetation layer, which may have very different characteristics.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑			☑	

Scoring Definition	Each project is scored on a 5-point scale from 1 to 5, where 1 indicates that a project does not appear to appropriately stratify the project area or use an appropriate forest definition, and 5 indicates that the stratification appears appropriate for the forest characteristics.
Scoring Approach	MSCI ESG Research uses two factors to assess the appropriateness of the stratification: (i) definition of forest cover; and (ii) number of strata used. **Definition of Forest Cover:** A project's definition of forest cover typically refers to the minimum threshold of canopy cover, tree height, and area that must be met for a parcel of land to be classified as "forest." This definition directly affects how forest loss — and thus baseline deforestation and emissions reductions — is calculated. The percentage forest cover threshold selected can materially influence the estimated baseline deforestation and emission reductions estimated. Scientific studies and international best practices typically suggest that a minimum canopy cover threshold of around 30% most accurately reflects forest conditions, particularly in tropical and subtropical regions.[9] Consequently, projects that employ a minimum forest cover threshold close to 30% are considered to have made a more conservative and reasonable assumption. Projects that adopt significantly lower or higher thresholds may introduce risks of over- or underestimation of baseline deforestation rates and associated carbon stocks. The appropriateness of the forest cover threshold is therefore considered as part of the overall evaluation of the project's baseline approach and carbon stocks. Projects that use a 30% forest cover will receive a score of 5, otherwise the project receives a score from 1 to 5 based on the level of difference between the number of hectares of forest using a 10% and 30% definition. **Number of Strata Used:** The number of strata used by the project is identified through a review of project documentation. The suitability of this number is evaluated based on the number of biomes within the project area and the distribution of carbon stock density within the project area. Each of these factors is assessed on a 1 to 5 scale. The overall score for this sub-criterion is a simple average of these two scores.

2.1.2.4 Peatland Sampling

Peatland Sampling relates to whether the project appears to employ effective procedures to measure the carbon stock and emissions from peatlands within the project area.

Rationale	Peatlands represent a critical carbon pool within many REDD+ project areas, containing disproportionately high levels of belowground carbon relative to mineral soils. Accurate

[9] GOFC-GOLD. 2016. A sourcebook of methods and procedures for monitoring and reporting on REDD+ activities (GOFC-GOLD Report version COP22-1). Wageningen University, Wageningen, Netherlands; and Food and Agriculture Organization of the United Nations (FAO). 2012. *Global Forest Resources Assessment 2010: Terms and Definitions.* FAO Forestry Paper 163. Rome, Italy.

	measurement of peat carbon stocks and peatland emissions is essential to ensure the reliability of a project's total emission reduction estimates. High-integrity projects will apply best-practice peat sampling methodologies, including sufficient spatial sampling density, periodic re-sampling to monitor changes, appropriate stratification by water table height or peat depth, and detailed depth-wise sampling.[10] The use of direct laboratory testing methods, such as loss-on-ignition (LOI) tests, is also preferred over reliance on default carbon fraction values.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑			☑	

Scoring Definition	Each project is scored on a 5-point scale from 1 to 5, where 1 indicates that a project does not appear to effectively measure peat carbon stocks or emissions, and 5 indicates that the measurement appears to employ effective methods.
Scoring Approach	Each project with identified peatland areas is assessed against five core factors: (i) the number of peat core samples taken relative to the total peatland area; (ii) whether core sampling is re-conducted at regular intervals of at least every 2 to 5 years; (iii) whether the project accounts for variation in water table height by strata or depth; (iv) the granularity of sampling depth increments; and (v) whether loss-on-ignition (LOI) tests were conducted or a default carbon fraction was used. Each factor is scored independently on a 1-5 scale. For instance, more than five peat core samples per 1,000 ha of peatland area scores a 5, while one or fewer scores a 1. Regular sampling and adjustments for water table height score a 5; absence of these scores a a 2. The final Peatland Sampling score is based on a weighted average across these five factors, with greater weight placed on sampling representativeness and depth, reflecting their greater influence on peatland carbon stock accuracy.

[10] IPCC. 2014. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. Intergovernmental Panel on Climate Change (IPCC), Geneva, Switzerland; and Page, S. E., Rieley, J. O., & Banks, C. J. (2011). "Global and regional importance of the tropical peatland carbon pool." *Global Change Biology*, 17(2), 798–818. https://doi.org/10.1111/j.1365-2486.2010.02279.x

2.2 Accuracy of Assumptions

The accuracy of key project quantification assumptions is evaluated against a combination of internal and third-party estimates to determine whether they appear reasonable.

There are three components that are used to evaluate this sub-criterion:

- **2.2.1 Carbon Stock Validation:** Whether the project's carbon stock assumptions appear accurate and reasonable over the project lifetime.
- **2.2.2 Conservativeness:** Whether the project has conservatively excluded certain sources of carbon pools from its calculations.
- **2.2.3 Leakage:** Whether the project appropriately accounts for and compensates for the threat of leakage.

Each of these criteria are evaluated on two dimensions:

- **A percentage accuracy,** reflecting how closely the project's assumptions align with independent data. Values above 100% indicate conservative assumptions (i.e., underestimation of impact).
- **A 1 to 5 score**, reflecting the level of alignment and uncertainty.

The overall score is reached through a weighted multiplicative approach based on the percentage accuracy of each sub-criterion. A **multiplicative approach** is applied to the percentage accuracy values to calculate an overall accuracy score. This method reflects consistent alignment across sub-criteria and preserves credit for conservative assumptions where applicable. **2.2.1 Carbon Stock Validation** and **2.2.3 Leakage** are weighted 40% each, while **2.2.2 Conservativeness** is weighted 20%.

2.2.1 Carbon Stock Validation

Alongside the area deforested in the baseline scenario, the estimation of the amount of carbon stored within a project area is a fundamental component of how a REDD+ project estimates their emissions reduction compared to the baseline scenario. Measurement of a REDD+ project's carbon stock inevitably involves a degree of estimation and inaccuracy.

There are two components that are used to evaluate this sub-criterion:

- **2.2.1.1 Conservativeness:** Whether the project has conservatively excluded certain sources of carbon pools from its calculations.
- **2.2.1.2 Carbon Stock Accuracy:** Whether the project's carbon stock per hectare assumptions appear accurate and reasonable.
- **2.2.1.3 Regrowth Analysis:** Whether the project's carbon stock assumptions account for any regrowth in biomass within previously deforested parts of the project area.
- **2.2.1.4 Unaccounted Emission Removals:** Whether the project removed carbon during its lifetime through biomass growth above those included in their emissions calculations.

Each sub-criterion is evaluated on a percentage basis, where scores greater than a 100% indicate that the project's carbon stock is conservative and underestimated. These sub-criteria are then multiplied together, with the overall score for 2.2.1 Carbon Stock Validation then converted into a 1-5 scale, where any scores greater than 5 indicate project underestimation.

2.2.1.1 Conservativeness

Conservativeness relates to whether the project has conservatively excluded certain sources of carbon pools from its calculations.

Rationale	The carbon stock of a forested area comprises not only the trees that are visible aboveground, but also the belowground biomass, such as soil organic carbon and other dead wood. Deforestation and degradation can impact the carbon stored in each of these carbon pools but is not always accounted for by projects. Projects that do not estimate the carbon stock within certain pools, such as soil organic carbon, will estimate their emissions impact more conservatively than if they include all these pools in their calculations.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑		☑		

Scoring Definition	Each project is scored on a scale of 2.5 to 5, where 2.5 indicates no optional carbon pools were excluded from a project's calculations and 5 indicates that carbon pools potentially representing 30% of carbon are excluded from a project's carbon stock calculations.
Scoring Approach	MSCI ESG Research conducts a detailed review of each individual project's documents to identify which carbon sources were included in its carbon stock calculation. The carbon sources reviewed are: aboveground biomass; belowground biomass; dead wood; wood products; soil organic carbon and litter. Given that each of these pools has different significance to the overall carbon stock, the proportion of the total carbon stock that any excluded pools likely represent are estimated based on analyzing a sample of similar projects. For example, soil organic carbon is, on average, four times more important as a carbon source than dead wood or litter, so its exclusion is more conservative than the exclusion of dead wood or litter. All projects receive a score of at least 3.25 for including mandatory aboveground and belowground biomass sources. Projects then receive an additional 1 point if they conservatively exclude soil organic carbon, and 0.25 points if they conservatively exclude each of dead wood, litter and wood products.

2.2.1.2 Carbon Stock Accuracy

Carbon Stock Accuracy refers to whether the project's carbon stock per hectare assumptions appear reasonable.

Rationale	Carbon stock per hectare assumptions are subject to calculation uncertainty. Projects that overestimate their carbon stock will overestimate their emission reduction impact.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
		☑				

Scoring Definition	Each project is scored on a continuous % scale, where 100% indicates that the estimates (once accounting for uncertainty intervals) match the project's estimate, 50% indicates that the project's carbon stock per hectare is only half of the project's assumption and 200% indicates that the project's carbon stock per hectare may be over double the project's assumption.
Scoring Approach	MSCI ESG Research evaluates carbon stock per hectare assumptions using aboveground biomass estimates when reported in project documentation. For projects that only provide total carbon stock estimates (i.e., estimates potentially including carbon sources other than aboveground biomass), the reported mix of carbon sources or regionally specific default values is used to estimate the aboveground biomass component of a project's carbon stock. This carbon stock per hectare assumption is then compared to a range of geospatial estimates. The primary third-party geospatial estimate used is through MSCI ESG Research's partnership with Chloris Geospatial, who estimate the aboveground biomass within project areas and on a per-forested hectare basis using the latest geospatial techniques. Further, to avoid overreliance on a single dataset, aboveground biomass estimates from Global Ecosystem Dynamics Investigation (GEDI),[11] NASA,[12] and UN Environment Programme World Conservation Monitoring Centre (UNEC-WCMC) are used.[13] A percentage score is then derived from the ratio difference between the geospatial estimate (using the lower-bound uncertainty interval) and the project assumption.

2.2.1.3 Regrowth Analysis

Regrowth analysis refers to whether the project's carbon stock assumptions account for any regrowth in biomass within previously deforested parts of the project area.

Rationale	REDD+ projects claim emission reductions by preventing certain forest areas from being fully deforested. However, these areas may naturally regenerate, potentially affecting the biomass stock density assumed by the project for carbon quantification. If the natural regrowth rate is high, it suggests that some biomass would have returned regardless, indicating a possible overestimation of the initial carbon stock density.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
		☑				

[11] Dubayah, R.O., Armston, J., Kellner, et al. (2022). *GEDI L4A Footprint Level Aboveground Biomass Density, Version 2.1*. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2056

[12] Spawn, S.A., & Gibbs, H.K. (2020). *Global Aboveground and Belowground Biomass Carbon Density Maps for the Year 2010*. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1763

[13] Soto-Navarro, C., Ravilious, C., Arnell, A., et al. (2020). "Mapping co-benefits for carbon storage and biodiversity to inform conservation policy and action." *Philosophical Transactions of the Royal Society B*, 375(1794), 20190128. https://doi.org/10.1098/rstb.2019.0128

Scoring Definition	Each project is scored on a continuous percentage scale, where 100% indicates no significant biomass regrowth has occurred in deforested patches. A score of 90% indicates that natural biomass regrowth accounts for 10% of the assumed carbon stock density, suggesting a slight overestimation.
Scoring Approach	MSCI ESG Research uses geospatial estimates of the carbon stock within a project area through a partnership with Chloris Geospatial to estimate how the aboveground biomass within the deforested patches of the project area evolved since the project start date. For deforested patches, the cumulative growth of biomass density is calculated from the project start date. This observed biomass density is then compared to the project's assumed biomass density in the start year to determine a percentage value. If there is no growth or negative growth in the deforested patches, this value is set to 0%. This percentage is then subtracted from 100% to derive a percentage score reflecting the degree to which the project's carbon stock density may be overestimated. A score of 100% indicates biomass stock density is conservative, while a lower percentage score suggests the project's assumptions are slightly overestimated.

2.2.1.4 Unaccounted Emission Removals

Unaccounted Emission Removals refer to whether the project removed carbon during its lifetime through biomass growth above those included in their emissions calculations.

Rationale	Though the primary objective of REDD+ projects is to avoid emissions by protecting existing forests, the forests that they protect may experience growth and therefore remove additional carbon from the atmosphere. Project areas that sequester carbon may not account for this emissions impact, and therefore may underestimate their total emissions impact.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
		☑				

Scoring Definition	Each project is scored on a continuous percentage scale, where 100% indicates that there is no unaccounted for forest growth and 150% indicates that the carbon stock has grown 50% within the project area but none of this growth has been accounted for through claimed emission removals.
Scoring Approach	MSCI ESG Research uses geospatial estimates of the carbon stock within a project area through a partnership with Chloris Earth to estimate how the aboveground biomass within the project area evolved since the project start date. For projects that have experienced significant increases or reductions in carbon stock, MSCI ESG Research then evaluates whether these project removals or emissions have been accounted for. The difference between this carbon stock growth and the project removals is then used to derive the percentage score based on this ratio difference.

2.2.2 Leakage

When reducing deforestation in a project area, there is a risk that the agents of deforestation simply deforest a surrounding area instead, resulting in little net climatic benefit. This concept of leakage must be appropriately accounted, monitored, and compensated for by projects.

To evaluate the appropriateness of a project's leakage deductions, both the threat of leakage and the extent to which it is appropriately accounted for is considered:

- **2.2.2.1 Leakage Threat:** The extent to which leakage represents a significant threat given the project's location and its drivers of deforestation.
- **2.2.2.2 Leakage Deduction Suitability:** Whether the project's accounting and compensation for leakage is appropriate given this threat.

These criteria are each assessed on a scale of 1 to 5, with the overall score based on weighting the leakage threat 35% and the leakage deduction suitability 65%.

2.2.2.1 Leakage Threat

The threat of leakage is determined by the specific circumstances of a project. Four factors are considered:

- **2.2.2.1.1 Leakage Driver Threat:** The extent to which a project's activities and drivers of deforestation impact its leakage threat.
- **2.2.2.1.2 Project Area Leakage Threat:** Whether the geographic characteristics of a project impact the threat of leakage.
- **2.2.2.1.3 Surrounding Area Forest Dynamics:** Whether the geographic characteristics of the surrounding area impact the threat of leakage.
- **2.2.2.1.4 Leakage Area Deforestation:** Whether any significant change in deforestation has occurred in a project's surrounding area since it started.

2.2.2.1.1 Leakage driver threat

Leakage Driver Threat relates to the extent to which a project's activities and drivers of deforestation impact its leakage threat.

Rationale	Different underlying drivers of deforestation carry different leakage threats. Furthermore, project activities can also impact this leakage threat through how comprehensively they mitigate and address these drivers of deforestation.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates very high leakage threat and 5 indicates very low threat of leakage given the project's activities and drivers of deforestation.					
Scoring Approach	MSCI ESG Research conducts a detailed review of each individual project's documents to understand its underlying drivers of deforestation and the activities it is undertaking to prevent deforestation. Both "activity" and "market" leakage are considered.					

"Activity" leakage relates to the displacement of deforestation agents or activities to areas outside the project area, resulting in increased deforestation in another location. For example, where small-scale pastoral farming is the deforestation driver, and these activities are displaced, there is a high risk of leakage from these agents shifting their pastoral farming to a neighboring area.

"Market" leakage occurs when a project's activities lead to changes in market conditions, resulting in increased supply elsewhere in response to this market change. For example, where large-scale commercial logging is a deforestation driver, and these activities are displaced, risk of leakage is high because large-scale commercial logging will be more integrated into global markets and therefore be more likely to result in a response in market supply elsewhere.

A leakage threat table is then used to assess the threat of different sources of leakage given each driver of deforestation, as shown below:

		Example Deforestation Driver					
		Commercial Logging	Small-scale Logging	Large-scale Agriculture	Small-scale Pastoral	Small-scale Arable	Mineral Extraction
Leakage Sources	Activity	Very Low	Medium	Very Low	Very High	High	Very Low
	Market	High	Very Low	High	Very Low	Very Low	Very Low

For each project, the overall leakage threat is calculated based on the relevance of each driver of deforestation to the project and the associated leakage threat of these drivers. A score is then assigned to the project via a mapping of its activities to its drivers of deforestation.

A score of 1 indicates that the underlying drivers of deforestation have a high leakage threat and have not been mitigated by the projects' activities. A score of 5 indicates that the leakage threat is low given the activities and drivers of deforestation of the project.

2.2.2.1.2 Project area leakage threat

Project Area Leakage Threat refers to whether the geographic characteristics of a project area impact the threat of leakage.

Rationale	Project areas with more forested borders have a larger leakage threat given there are more surrounding areas for the agents of deforestation to move to, and for the project to monitor.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates a relatively high leakage threat and 5 indicates a relatively low leakage threat given a project's geographic characteristics.					
Scoring Approach	MSCI ESG research conducts a geospatial circularity test of a project's area to estimate the proportion of its perimeter that is surrounded by forested land relative to the size of the project area. Projects with a ratio of forested perimeter to project area of >4x					

receive a score of 1. Projects with a ratio of forested perimeter to non-forested perimeter area of <0.5 receive a score of 5.

2.2.2.1.3 Surrounding Area Forest Dynamics

Surrounding Area Forest Dynamics refers to whether the geographic characteristics of the surrounding area impact the threat of leakage.

Rationale	The amount of contiguous forest surrounding a project area is a key determinant of its leakage threat. Projects embedded within large expanses of forest have a higher risk of activity-shifting leakage, as displaced deforestation agents have greater opportunity to move into neighboring unprotected forests. Conversely, projects located in more isolated or fragmented forest landscapes face lower leakage risks, given the more limited availability of adjacent forested land.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑				

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates a relatively high leakage threat given 100% of the surrounding area is forested and 5 indicates a relatively low leakage threat given 50% or less of the surrounding area is forested.
Scoring Approach	MSCI ESG Research analyzes geospatial forest cover data within 2 km and 5 km radii of the project boundary at the project start date. Projects are scored based on the proportion of land within each buffer that remains forested. Higher proportions of surrounding forest correspond to higher leakage threat scores. Specifically, projects with 100% forest cover within either buffer receive a lower score (indicating higher leakage threat), while projects with <50% surrounding forest cover receive a higher score (indicating lower leakage threat). The final score is determined by averaging the 2 km and 5 km buffer assessments.

2.2.2.1.4 Leakage Area Deforestation

Leakage Area Deforestation relates to whether any significant change in deforestation has occurred in a project's surrounding area since it started. If an increase in deforestation is observed in surrounding areas, it suggests there might be activity-shifting leakage occurring. This is generally perceived as a negative, although it does serve to indicate additionality.

Rationale	After a project starts, increasing deforestation rates in its surrounding areas may indicate the presence of activity-shifting leakage.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
		☑				

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that deforestation rates in surrounding areas have increased by over 200% since the project start date, and 5

	indicates that no increase in deforestation has been observed within the surrounding areas.
Scoring Approach	Annual deforestation rates within a 10 km and 50 km area (the "leakage belt") around each project area are analyzed through geospatial modelling. More information on the geospatial modelling approach can be found in Section 9 of this document. The average deforestation rate in each leakage belt is then compared to deforestation rates in the same areas during the 10 years before and after the project start date (or during the time since the start date if it started less than 10 years ago). Projects are then scored from 1 to 5 based on the change in leakage belt deforestation since the project started, as shown below: - 5 = No increase in deforestation in leakage belt - 4 = 0-50% increase in deforestation rates in leakage belt - 3 = 50-100% increase in deforestation rates in leakage belt - 2 = 100-200% increase in deforestation rates in leakage belt - 1 = 200%+ increase in deforestation rates in leakage belt

2.2.2.2 Leakage Deduction Suitability

Leakage Deduction Suitability refers to whether a project appropriately accounts (i.e., deducts) for leakage given its leakage threat.

Rationale	The size of a project's leakage deduction should reflect the specific leakage threat level it faces. Projects that deduct a low proportion of their credits due to leakage despite facing high leakage threats risk overestimating their total emissions reduction impact.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that a leakage deduction appears to be very low given the relatively high leakage threat that exists, and 5 indicates a relatively high leakage deduction has been made relative to the apparent low threat of leakage.					
Scoring Approach	MSCI ESG Research conducts a detailed review of key project documents, including monitoring reports and project design documents, to identify both a project's ex-ante and ex-post leakage deductions as a proportion of total baseline emissions. Ex-post leakage deductions are prioritized where it was available in monitoring reports, otherwise the ex-ante leakage deduction is used. The size of the leakage deduction is then compared to the total leakage threat level as determined by 2.2.3.1 Leakage Threat. Projects are then scored from 1 to 5 based on the size of their leakage deduction relative to their leakage threat level.					

7. Criterion 3 - Permanence

Permanence refers to the likelihood that the emission reductions or removals achieved by a project will be sufficiently long-term and not released back into the atmosphere. There is growing consensus that 100 years represents a good benchmark for projects to be classified as 'permanent'. The IC-VCM's Core Carbon Principles require a monitoring and compensation period of at least 40 years for nature-based projects.

A permanent reduction or removal can only be guaranteed where it is physically impossible for a reversal to occur. However, for most projects, a risk of reversal does, to some extent, exist. This risk may be due to natural risks, such as wildfires, or human risks, such as poor project management.

REDD+ projects involve both inherent human and natural permanence risks. For example, protected forests may be destroyed by wildfires or other natural disasters. The significance of this permanence risk depends on both the level of natural and human risks, and the extent to which these have been mitigated by the project's activities. This net risk must then be sufficiently compensated for in the project's crediting methodology.

Given the interplay of permanence risk, mitigation and compensation activities, the overall permanence assessment is conducted in three main steps:

1. **Significance of Risks:** Each relevant risk factor is assessed on a 1 to 5 scale that signifies the proportion of credits at risk of reversal and the likelihood of this occurring. These 1 to 5 scores are also converted into a percentage of carbon stock at risk, which represents a more quantitative measure of the percentage of carbon stocks that are expected to be at risk. These risks are then individually summed to reach an overall permanence risk, reflecting the percentage of all achieved emissions reductions that would be expected to be reversed without any mitigation or compensation activities.
2. **Net Permanence Risk:** The extent to which applied mitigation activities address the permanence risks defined in the significance of risk. This is to ensure that the relevant mitigation activities are used to reduce the relevant components of permanence risks for the project. Each mitigation activity is mapped to the specific permanence risk that it relates to, with assumptions made regarding the proportion of this risk that can be mitigated.
3. **Post-Compensation Risk:** Comparing the net permanence risk score to the buffer pool contribution to ensure any risks that are not mitigated are accounted for.[14] The net permanence risk, which is calculated as a percentage, is directly compared to the project's percentage buffer pool contribution as part of this step.

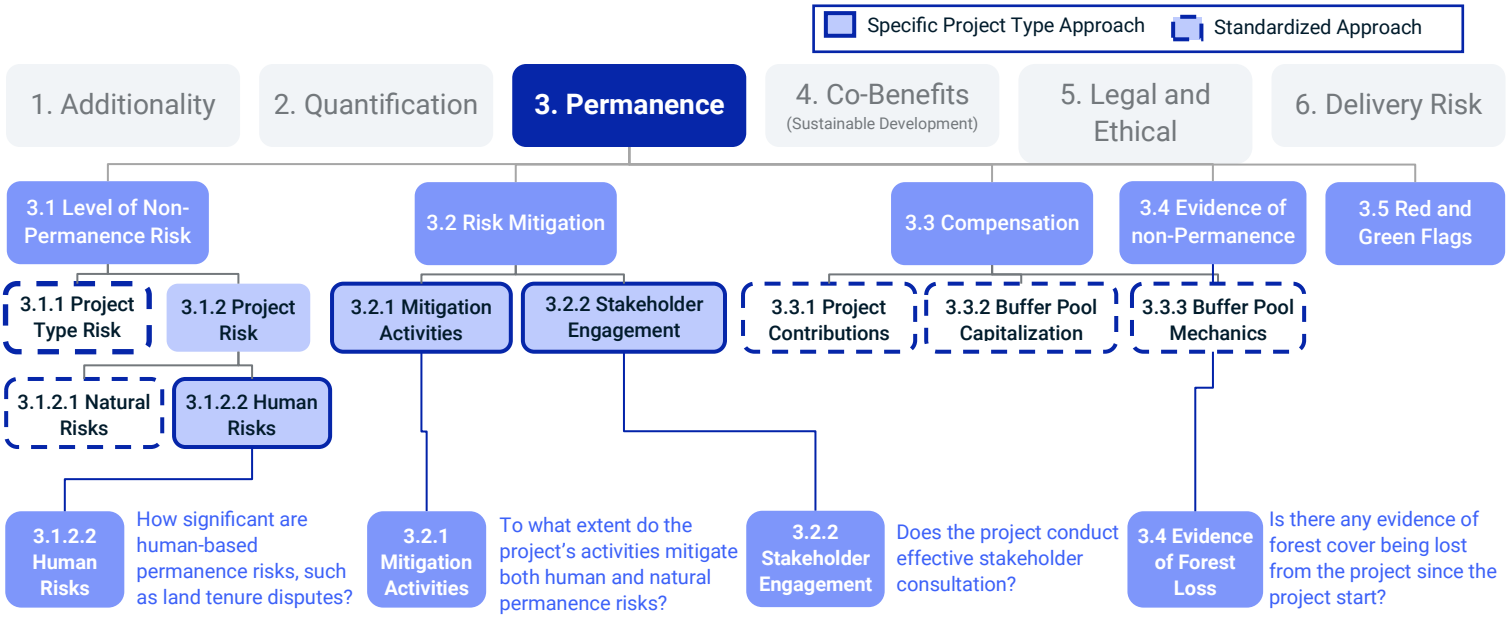
The remaining percentage of credits therefore represents the percentage of credits for which the project either under- or overcompensated. A negative post-compensation risk score indicates that the buffer pool appears over-sufficient given the net permanence risk of the program. A positive post-compensation risk score indicates that the buffer pool appears insufficient given the net permanence risk of the program.

[14] A buffer pool is a form of insurance mechanism used in many carbon crediting programs. Projects contribute a portion of their credits to a shared reserve (the buffer pool), which is used to compensate for unforeseen reversals (e.g., from wildfires, pests, or illegal logging). If a project fails to maintain its carbon stock over time, credits may be cancelled from the buffer pool to preserve the environmental integrity of the system as a whole.

Figure 9: Permanence integrity assessment approach illustrates the sub-criteria through which MSCI ESG Research assesses the permanence of the emissions reductions achieved by REDD+ projects, and the Integrity Assessment framework sub-criteria that they refer to. The detailed sub-criteria are described in

Figure 10.

Figure 9: Permanence integrity assessment approach[15]



[15] The approach to assess 3.2.2 Local Stakeholder Engagement is outlined in Section 4.3.2, Local Stakeholder Engagement.

Figure 10: MSCI ESG Research Permanence integrity assessment framework

Sub-criteria		Metrics	Rationale	REDD+	Renewables	ARR	Cookstoves	Biochar	Landfill Gas	Safe Water	IFM	Waste Mgmt.	Blue Carbon
3.1 Level of Non-Permanence Risk	3.1.1 Project Type Risk	Project Type Significance	Different project types have inherently different levels of non-permanence risk.	✓ *Standardized approach*									
	3.1.2 Project Risk	3.1.2.1 Natural Risks	The risk of fire, drought, landslide and other natural risks in that project area.	✓		✓					✓		✓
		3.1.2.2 Human Risks	Human-related permanence risks include the strength of land tenure rights or a project developer's experience.	✓		✓					✓		✓
3.2 Mitigation		3.2.1 Mitigation Activities	Projects can mitigate non-permanence risks through implementing activities that focus on addressing key risks.	✓		✓	✓	✓		✓	✓		✓
		3.2.2 Local Stakeholder Engagement	Successfully engaging with local stakeholders lowers the risk of human-based non-permanence.	✓		✓	✓	✓		✓	✓		✓
3.3 Compensation and Contributions		3.3.1 Project Contributions	A project's buffer pool contributions should appropriately account for the non-permanence risk.	✓		✓	✓	✓		✓	✓		✓
		3.3.2 Buffer Pool Capitalization	An under-capitalized buffer pool may have insufficient credits to cover future losses.	✓ *Standardized approach*									
		3.3.3 Buffer Pool Mechanics	A buffer pool should have mechanisms in place to ensure projects appropriately account for and estimate their buffer pool credits.	✓ *Standardized approach*									
3.4 Evidence of Non-Permanence		Non-Permanence Events	If significant reversals have occurred without being accounted for, then carbon stock reversals have already occurred.	✓		✓					✓		
3.5 Red and Green Flags		News scanning	Review of academic papers, industry sources and the news for Red or Green Flags relating to project's permanence.	✓ *Standardized approach*									

3.1.2.1 Natural Risks

Natural risks refer to the significance and likelihood that such risks within a project area might lead to a reversal in the emission reductions/removals achieved.

Rationale	Natural disturbances, such as drought, fire or landslides, can threaten the CO_2e stored in land-based carbon pools. These risks are most relevant for nature-based projects, where the CO_2e is stored in carbon pools that are susceptible to a range of natural

	risks. For example, wildfires may burn down trees within a REDD+ project, resulting in CO2 being released into the atmosphere.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑	☑			☑	

Scoring Definition	Each project is scored on a 5-point scale from 1 to 5 for each natural risk type, where 5 indicates no permanence risk and 1 indicates a very significant permanence risk.
Scoring Approach	MSCI ESG Research has considered five main types of natural risk in the assessment: (i) fire, (ii) drought, (iii) landslide; (iv) windthrow/tropical cyclone (or uprooting of trees by wind); (v) biotic. These risks are assessed independently using MSCI ESG Research's geospatial analysis. MSCI ESG Research only assesses natural risks where they are relevant to that project type. For many types, natural risks do not represent a permanence risk as the CO_2e is not stored in a carbon pool at risk of natural disturbances. Major natural risks are assessed for each individual project through geospatial analysis of its boundary, as shown in **Table 1**. For each risk, MSCI ESG Research looks at the historical trends and patterns of natural risk. Then, MSCI ESG Research forecasts these risks using in-house climate models that account for the projected change in likelihood as temperatures and climates change. This modelling results in a specific estimate of risk within that project boundary. More detail on MSCI ESG Research's geospatial permanence methodology can be found in separate methodology note: "MSCI Carbon Project Ratings - Geospatial Methods in Assessing Permanence"

Table 1: Analytical Approach for each natural risk

Wildfire	Forecast of the future frequency and severity of fires based on a geospatial analysis and internal modelling.
Drought	Forecast of the intensity and frequency of drought risk for each project.
Landslide	Assess the percentage of project areas that are currently susceptible to landslides based on the NASA landslide susceptibility map.[16]
Windthrow	Estimate the tropical cyclone return interval for each project area based on a 10,000-year synthetic dataset.
Biotic	Assess biotic outbreaks (% of area at risk/not at risk), based on the National Insect and Disease Risk Map (NIDRM) 2018.[17]

[16] Thomas Stanley and Dalia B. Kirschbaum, "A Heuristic Approach to Global Landslide Susceptibility Mapping," *Natural Hazards*, 87.1 (2017), 145–64, https://doi.org/10.1007/s11069-017-2757-y, 2017.

[17] US Forest Service, "National Insect and Disease Risk Map (2018 NIDRM)," 2018.

3.1.2.2 Human Risks

Protected forests are also subject to human-based risks of reversal, given that the areas may be deforested at a later date. If a REDD+ project successfully protects an area for 20 years, but the area is then deforested anyway, the project's emissions impact will only be transitory. While even a transitory reduction is helpful in providing the climate some short-term "relief," it is less valuable than a more permanent reduction/removal and cannot be said to be a "true" offset of a fossil fuel emission (which stays in the atmosphere for a very long time).

To assess human-based permanence risks, the different underlying drivers of human-based deforestation are considered. As part of this assessment, four primary components of human risk are analyzed:

- **3.1.2.2.1 Land Tenure:** Whether disputable or unsecure land tenure may impact the stability of the project area's governance and protection.
- **3.1.2.2.2 Crediting Period:** Whether plans are in place to protect the forest beyond the project lifetime to ensure ongoing protection of the area.
- **3.1.2.2.3 Activity-Driver Suitability:** Whether the project's activities suitably address and mitigate the underlying drivers of deforestation for that project area.
- **3.1.2.2.4 Opportunity Cost:** Whether a deforestation-linked alternative land use represents a high opportunity cost of the project activities and therefore may incentivize deforestation in the future.

3.1.2.2.1 Land Tenure

Land Tenure refers to whether any land tenure issues or uncertainties exist in the project area which impact the potential for deforestation in the future.

Rationale	Project areas that have secure land tenure are less prone to illegal settlements or the threat of communities being removed from their land. In this way, agents of deforestation from outside the project area are less likely to inhabit and control the project area.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑			☑	☑	

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates very high land tenure risks and 5 indicates very secure and stable land tenure with low risk of being seized by agents of deforestation.
Scoring Approach	MSCI ESG Research conducts a detailed review of each individual project's documents to identify the security and strength of land tenure rights and the existence of any current or historic land disputes. This analysis is combined with third-party data on the regional stability of property and land rights. First, the stability and security of land tenure is assessed through three components: (i) The security and stability of land tenure rights (20% weighting within the overall sub-criterion);

(ii) The type of land ownership and whether any disputes or claims to the land exist (50% weighting within the overall sub-criterion);

(iii) The level and type of documentation provided by the project to demonstrate land ownership (10% weighting within the overall sub-criterion).

Each component is evaluated and scored on a 1 to 5 scale.

Lastly, the security of property and land rights is assessed within the relevant region using third party data from the World Economic Forum and World Bank (20% weighting within the overall sub-criterion). For larger countries, such as Brazil, regional state-level data is used. Each area is scored on a 1 to 5 scale based on the stability of property rights and land rights recognition.

The overall project score is based on a weighted average of these components of land tenure.

3.1.2.2.2 Crediting Period Impact

Crediting Period Impact relates to whether plans are in place to protect the forest beyond the project lifetime to ensure ongoing protection of the area.

Rationale

A REDD+ project may have a lifetime of 30 years, beyond which the project proponents may not be obligated to protect the area. Therefore, the risk of abandonment of project activities are heightened after the end of this project lifetime. In contrast, projects that legally commit to preserving the area beyond the project's lifetime reduce this risk.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					☑

Scoring Definition

Each project is scored on a scale of 1 to 5, where 1 indicates very high risk of abandonment and 5 indicates very limited risk of abandonment within a 100-year period.

Scoring Approach

MSCI ESG Research identifies the project lifetime and whether any commitments exist beyond this to protect the area. The drivers of deforestation are also considered, as projects in which the agents of deforestation are also the project participants may have higher abandonment risk after the crediting period ends. For example, planned deforestation projects with 30-year crediting periods may simply deforest the area at the end of this period.

The total score is therefore determined through a consideration of both the length of legal commitment and project subtype.

		Length of Legal Commitment (# of Years)				
		0 to 19	20-29	30-39	40-99	100+
Project Type	Planned	1	2	3	4	5
	Unplanned	2	3	3.5	4	5

3.1.2.2.3 Activity-Driver Suitability

Activity-Driver Suitability relates to whether the project's activities are suitably targeted at addressing and countering the project's drivers of deforestation.

Rationale	Project activities must be specific and relevant to the underlying drivers of deforestation to be effective. If a project area's underlying drivers of deforestation are not suitably addressed by that project's activities, then these same drivers represent ongoing threats to the project area over the project lifetime (and beyond).
Key Sources	Project Documentation ☑ | Geospatial | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates very low suitability of the project's activities to the key drivers of deforestation in that project area, and 5 indicates the project activities are highly suited to the key drivers of deforestation in that project area.
Scoring Approach	MSCI ESG Research conducts a detailed review of each individual project's documents to understand both the underlying drivers of deforestation in the project area and the project's activities. Each project activity is mapped to relevant deforestation drivers. The aggregated mapping of deforestation drivers across all project activities is used to score the project's suitability.

3.1.2.2.4 Opportunity Cost

Opportunity Cost refers to whether a deforestation-linked activity represents a very attractive alternative land use compared to the project scenario.

Rationale	If a deforestation-linked activity represents a significantly more attractive activity for the local community compared to the project's activities, then agents of deforestation may still be incentivized to deforest the area rather than protect it.
Key Sources	Project Documentation ☑ | Geospatial | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates a very high apparent opportunity cost and 5 indicates that forest protection appears relatively attractive.
Scoring Approach	MSCI ESG Research conducts a detailed review of each individual project's documents, including its project design document and non-permanence risk reports, to understand the financial attractiveness of alternative land uses compared to the project scenario. The relative financial attractiveness of alternative land uses are compared to the project to assign a score on a 1 to 5 scale.

For example, if the most profitable land use would have been 100% or more financially attractive compared to the project scenario, then the project receives a score of 1.

3.2.1 Mitigation Activities

Mitigation Activities refers to the extent to which the project's activities address and mitigate permanence risks.

Rationale	Both human- and nature-based permanence risks can be addressed through the implementation of relevant project activities. For example, fire monitoring and protection plans can help to reduce the threat of wildfires. In this way, effective mitigation activities can reduce the significance of permanence risks.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that very limited and ineffective mitigation procedures appear to be in place and 5 indicates evidence of very effective mitigation plans.
Scoring Approach	MSCI ESG Research conducts a detailed review of each individual project's documentation to identify the mitigation activities that the project has put in place. Projects are then scored based on both the variety and strength of their mitigation activities. The variety of mitigation activities refers to the number of mitigation-related activities and the range of human and natural-based permanence risks that they address. The strength of mitigation activities refers to the effectiveness of each of these activities. The mitigation activities assessed include anti-poaching activities, fire mitigation techniques, alternative livelihood support, guards and patrols, the protection of native species and adaptive management plans. Projects that leverage a high variety of mitigation activities including the most effective mitigation techniques score a 5. Projects that implement limited mitigation techniques or only less effective techniques receive a score of 1.

3.4 Observed Risk

Observed Risk relates to whether any recent degradation, deforestation or regrowth within the project area represents higher or lower risk of non-permanence.

Rationale	Evidence that non-permanence events have occurred within a project area indicates that reversals have recently occurred. Though non-permanence events should, in theory, be accounted for in subsequent monitoring reports through the calculation of project emissions or buffer pool contributions, there is a risk that these events may not be sufficiently compensated for in future.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
		☑				

Scoring Definition

Each project is scored on a scale of 1 to 5, where 1 indicates very significant observed non-permanence risk and 5 indicates very limited observed non-permanence events.

Scoring Approach

MSCI ESG Research uses geospatial analysis to evaluate land use change within the project area over time through three approaches: (i) deforestation rate; (ii) degradation rate; and (iii) regrowth percentage. Each approach is assessed independently, with the overall score based on a weighted average of these three scores. Deforestation rate is weighted 70%, degradation rate is weighted 10% and regrowth percentage is weighted 20%.

(i) Deforestation Rate

Firstly, the average pre-project deforestation rate in the five years prior to the project start date is compared to the average deforestation rate between the project start year and the latest full year to calculate an absolute percentage difference. This percentage difference is then compared to the project's baseline deforestation rate in order to normalise the change in project area deforestation on a per-credit basis. This difference is scored on a 1 to 5 scale, where an increase of 10% or less receives a score of 5, and a 300% increase receives a score of 1.

Secondly, for each year since the project start date, analysis is conducted to identify any major deforestation spikes. A spike is defined as a year in which the project area's deforestation rate was more than twice the pre-project start date historical average. If more than three such spikes are observed, a score of -1 is assigned; one spike results in a score of -0.5.

These two sub-scores are then added together. In aggregate, projects that have experienced significant deforestation events or increases in deforestation within the project area will therefore receive a lower score.

(ii) **Degradation Rate**

Degradation is defined as a reduction in biomass density. It is monitored by measuring the extent of degradation, the proportion that results in deforestation, and the degree of recovery following degradation events. As degradation can act as a forward-looking indicator for deforestation, an analysis of changes in degradation can provide information regarding the risk of deforestation. Three different degradation trends are assessed:

a) The change in degradation;

b) The proportion of degraded forest that leads to deforestation; and

c) The degree of recovery.

These factors are assessed by comparing degradation over a five-year period before the project start date and degradation in the time period since the project start date. If the extent of degradation increases post-project, the project receives a score of 0. If it decreases by 0–1%, the score is 1, and if it decreases by more than 1%, the score is 2. For the proportion of degraded forest that leads to deforestation, an increase results in

a score of 0, while a decrease can yield a score of up to 2, depending on the percentage change. Lastly, if the degree of recovery improves post-project compared to the pre-project period, the project receives a score between 0 and 2, where 0 indicates worse recovery than before. These three component scores are then summed to produce an overall degradation score ranging from 1 to 5.

(iii) Regrowth

Forest regrowth is monitored in areas that were previously deforested or experienced substantial biomass loss. Biomass changes in these areas are tracked annually and incorporated into the evaluation of observed risks.

For deforested patches, the cumulative growth in biomass density is calculated from the project start date. This observed growth is then compared to the project's assumed biomass density in the start year to determine a percentage value. This percentage is converted to a score on a scale of 1 to 5, where a value of 10% or more receives a score of 5, and 0% or less receives a score of 1.

8. Criterion 4 – Co-benefits

Co-benefits reflect the sustainable development benefits (and safeguards) of a project beyond the CO2e it saves – i.e., its "externalities." These are typically positive but can, on occasion, be negative.

Carbon projects have the potential to reduce/remove CO2e and simultaneously have a broader positive societal impact via issues such as development, adaptation and biodiversity.

REDD+ projects have the potential to deliver significant social and environmental outcomes outside of their emissions impact. Through protecting forested areas, REDD+ projects naturally preserve the biodiversity that lies within those areas, which can regularly be composed of rich and diverse fauna and flora. Further, given the importance of community-building initiatives to REDD+ project design, these initiatives can help to support social development goals. Though, to have a net positive social impact, it is important that these initiatives provide support beyond that which the community would have achieved from any deforestation-linked activities in the baseline scenario.

The approach to co-benefit assessment builds on the UN's Sustainable Development Goals (SDG) framework. MSCI ESG Research focuses on understanding both the SDG significance of a project and the extent to which the project provides evidence of these outcomes being achieved through effective monitoring.

Figure 11 illustrates the sub-criteria through which MSCI ESG Research assesses the co-benefits of REDD+ projects, and the Integrity Assessment framework sub-criteria that they refer to. The detailed sub-criteria are described in **Figure 12**.

Figure 11: Co-benefits integrity assessment approach

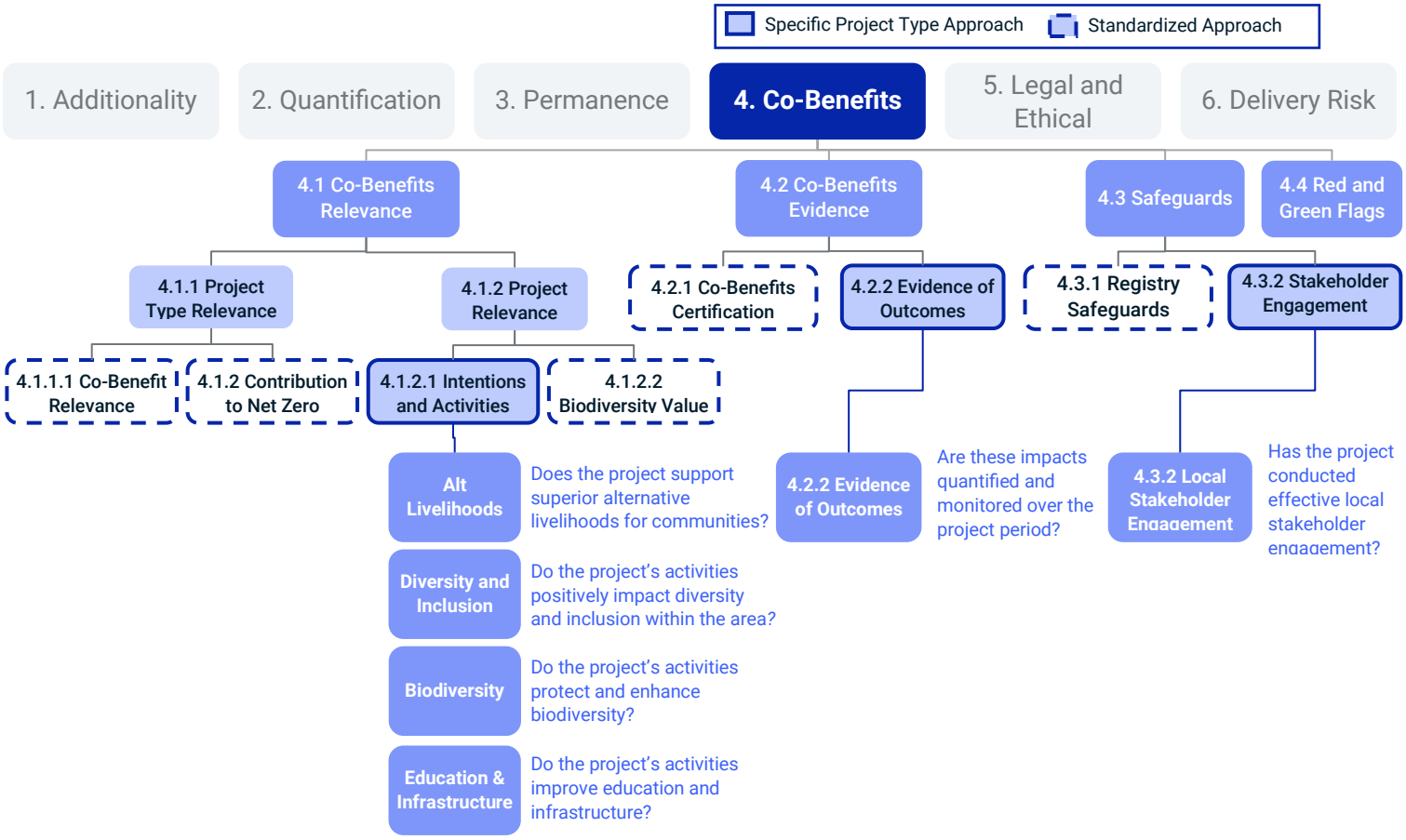


Figure 12: MSCI ESG Research Co-benefits integrity assessment framework

Sub-criteria		Metrics	Rationale	REDD+	Renewables	ARR	Cookstoves	Biochar	Landfill Gas	Safe Water	IFM	Waste Mgmt.	Blue Carbon
4.1 Co-benefits Relevance	4.1.1 Project Type Relevance	4.1.1.1 Relevance to Project Type	Different project types have an inherently different impact on each sustainable development impact.	✓ *Standardized approach*									
		4.1.1.2 Contribution to Net Zero	Some project types create 'carbon lock-ins' of technologies or practices that are not compatible with a net zero economy.	✓ *Standardized approach*									
	4.1.2 Project Relevance	4.1.2.1 Project Intentions to Activities	The specific design and implementation of a project's activities are critical drivers for whether a project generates positive sustainable development impact.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		4.1.2.2 Biodiversity Value	Nature-based projects that enhance or protect areas of rich biodiversity have greater environmental value.	✓		✓					✓		✓
4.2 Co-benefits Evidence		4.2.1 Certification	Achieving certification involves more stringent project verification. This improves the likelihood that a project's co-benefits have been realized.	✓ *Standardized approach*									
		4.2.2 Quantification of Outcomes	Projects can increase the confidence that co-benefits are attributed to their actions through measuring, monitoring, and quantifying the outcome.	✓		✓	✓	✓		✓	✓		✓
4.3 Safeguards		4.3.1 Registry Safeguards	More effective environmental and social safeguards required by registries reduce the likelihood of projects causing harm.	✓ *Standardized approach*									
		4.3.2 Local Stakeholder Engagement	Projects that successfully engage with local stakeholders reduce the likelihood of any negative impacts occurring.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4.4 Red and Green Flags		News scanning	Review of academic papers, industry sources and the news for Red or Green Flags relating to project's co-benefits.	✓ *Standardized approach*									

4.1.2.1 Project Intentions to Activities

While REDD+ projects can impact a range of social or environmental goals, the significance of these co-benefits is heavily determined by the project's design and implementation. A deep understanding of a project's activities and design is required to fully assess its co-benefit impact.

There are four categories of sustainable development impacts that are evaluated as part of this sub-criterion:

- **4.1.2.1.1 Alternative Livelihoods:** Whether the project provides a superior alternative livelihood to stakeholders beyond that which would have been achieved with the previous land use.
- **4.1.2.1.2 Diversity and Inclusion:** Whether the project promotes and drives increased diversity and inclusion within the project area, supporting the needs of any disadvantaged groups.
- **4.1.2.1.3 Education and Infrastructure:** Whether the project supports and invests in local education, health and infrastructure.
- **4.1.2.1.4 Biodiversity:** Whether the project protects an area of high biodiversity value, supporting continued ecosystem value and resilience.

Each project is scored on a scale of 1 to 5 based on the evaluation of these metrics.

4.1.2.1.1 Alternative Livelihoods

When REDD+ projects change the land use within a project area, they are also changing the source of income for the households within the project area. Many communities may have financially relied on deforestation-linked activities, and therefore REDD+ projects must aim to reduce their reliance on these activities by substituting them with alternative activities that provide equal or greater benefits to the communities. If project activities do not sufficiently compensate communities, then the households may suffer a reduction in their incomes compared to what would have otherwise happened.

An assessment of Alternative Livelihoods therefore requires both understanding the opportunity cost of a project and the project's support mechanisms aimed to substitute for this opportunity cost:

- **4.1.2.1.1.1 Alternative Livelihoods Risk:** The extent to which the baseline scenario would have created high financial outcomes for local communities.
- **4.1.2.1.1.2 Alternative Livelihoods Support:** Whether the project provides attractive and sustainable opportunities and support to local communities.

Both sub-criteria are assessed on a scale of 1 to 5, with the overall score based on an equal weighting of each.

4.1.2.1.1.1 Alternative Livelihoods Risk

To assess alternative livelihood risk, two factors are considered related to a project's opportunity cost:

- **4.1.2.1.1.1.1 Opportunity Cost:** Whether an alternative land use represents a financially attractive scenario for project participants.
- **4.1.2.1.1.1.2 Driver Relevance to Alternative Livelihood Risk:** Whether the underlying drivers of deforestation supported local community livelihoods through deforestation-linked activities.

These criteria are assessed on a scale of 1 to 5, where 1 represents high risk and 5 low risk. The overall score for 4.1.2.1.1.1 Alternative Livelihoods Risk is then reached by weighting these two factors 80% and 20% respectively.

4.1.3.1.1.1.1 Opportunity Cost

Opportunity Cost relates to whether the most profitable alternative land use is significantly more financially attractive than the project scenario.

Rationale	The extent to which projects' activities impact the financial opportunities and support for local communities is determined by how else the land could have been used. If this alternative land use would have delivered high financial benefits to local communities, then the risk that the project leads to lower community support and incomes is higher.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that there is a very high opportunity cost and 5 indicates that the opportunity cost risk is very low.
Scoring Approach	First, MSCI ESG Research assesses the financial attractiveness of alternative land uses for the project area. Based on the relative size of the most profitable land use compared to the project scenario, projects are categorized on a 1 to 5 scale. For example, if the most profitable land use would have been 100% or more financially attractive compared to the project scenario, then the project receives a score of 1. Secondly, the extent to which the project area includes or is close to significant local populations is assessed. If the project is a planned project that is not in close proximity to any local communities, the extent of alternative livelihood risks is lower, as local populations are less likely to rely on the land for economic opportunities within the baseline scenario. Based on the type of project and the population density, projects are scored on a scale from -1.5 to 0.5, where -1.5 indicates a relatively high population density and 0.5 indicates a relatively low population density. The scores for each of these components are summed to reach an overall 1 to 5 score on this sub-criterion, with a maximum score of 5 and minimum score of 1 allowed.

4.1.3.1.1.1.2 Driver Relevance to Alternative Livelihood Risk

Driver Relevance to Alternative Livelihood Risk relates to whether the underlying drivers of deforestation supported local community livelihoods through deforestation-linked activities.

Rationale	If the underlying driver of deforestation relates to a deforestation-linked activity that would have provided financial opportunities and support to local communities, then the financial opportunity cost of removing this activity is higher.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates very high alternative livelihood risk and 5 indicates very low alternative livelihood risk.
Scoring Approach	MSCI ESG Research conducts a detailed review of the underlying drivers of deforestation for the project and assesses the relevance of these drivers to alternative livelihood risk.

Each driver of deforestation is then scored based on the risk to local communities' alternative livelihoods. For example, if the underlying driver of deforestation is small-scale agriculture, then this represents a very high risk for alternative livelihoods. While commercial logging represents a lower risk.

The drivers of deforestation for each project are identified and combined with their relevance to alternative livelihoods risk to reach an overall score.

4.1.2.1.1.2 Alternative Livelihoods Support

To assess the extent to which a project supports its local community's financial opportunities, five factors are considered:

- **4.1.2.1.1.2.1 Target SDGs:** Whether a project targets specific Sustainable Development Goals related to the employment and financial opportunities for local communities.
- **4.1.2.1.1.2.2 Overall Support Initiatives:** The extent to which a project's activities involve support initiatives directly aimed at alternative livelihoods.
- **4.1.2.1.1.2.3 Benefit Sharing:** The extent to which a project shares the proceeds of its revenue from carbon credits directly with local communities.
- **4.1.2.1.1.2.4 Job Creation:** Whether a project creates quantified employment outcomes.
- **4.1.2.1.1.2.5 Secure Land Rights:** Whether a project secures or provides land rights to local communities to strengthen their ownership over the project area.

These criteria are assessed on a scale of 1 to 5. The overall score is based on a weighting of each of the first three sub-criteria and the maximum of the last two sub-criteria. The maximum of job creation and secure land rights is used as projects do not necessarily need to provide both to achieve a high score. A high score in one may be sufficient to providing this direct support.

4.1.2.1.1.2.1 Target SDGs

Whether the project targets specific Sustainable Development Goals that relate to alternative livelihood opportunities.

Rationale	Explicitly targeting certain development goals increases the chance that these goals and impacts will be emphasized and focused on by the project. That chance is further increased by the need to complete SDG goal verification process during a project's registration process.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no relevant Sustainable Development Goals have been targeted and 5 indicates that the three most relevant sustainable development goals to alternative livelihoods have been targeted.					
Scoring Approach	MSCI ESG Research assesses whether the project has targeted either directly or indirectly Sustainable Development Goal 1 (No Poverty), 2 (Zero Hunger) or 8 (Decent Work and Economic Growth).					

Projects are then scored based on the number of relevant targeted SDGs or sustainable development impacts:

- 1 = No relevant SDGs
- 3.5 = 1 relevant SDGs
- 4.5 = 2 relevant SDGs
- 5 = 3 relevant SDGs

4.1.2.1.1.2.2 Overall Support Initiatives

Whether alternative livelihood support represents a clear and central part of the project.

Rationale	The extent to which the project's design and activities involve and focus on supporting alternative livelihoods indicate how relevant and significant that support is likely to be.
Key Sources	Project Documentation ☑ | Geospatial | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that alternative livelihood activities seem to be limited to patrolling jobs, while 5 indicates that alternative livelihood activities appear to be a central part of the project.
Scoring Approach	MSCI ESG Research conducts a detailed review of project documents to develop a understanding of a project's activities, particularly those supporting alternative livelihoods. For each project, 13 specific activities, such as agricultural support, training, and others, are assessed across 26 broader activity groups. The project is then scored based on both the range (diversity of activities) and depth (level of detail and resource allocation) of these interventions to determine the extent of its support for alternative livelihoods.

4.1.2.1.1.2.3 Benefit Sharing

Whether the project transparently shares the proceeds of carbon credit revenues with local communities.

Rationale	The proceeds of carbon credit revenues can sometimes be directly shared with local communities to ensure that they financially benefit from the project.
Key Sources	Project Documentation ☑ | Geospatial | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no benefit sharing appears to be in place and 5 indicates evidence of transparent benefit-sharing agreements, pursuant to which a significant proportion of proceeds are delivered to local communities rather than to larger institutions (e.g., private companies or international charities) or governments.

Scoring Approach

The Benefit Sharing score is calculated as the weighted average of three components:

(i) The presence, type, and value of benefit sharing provided to local stakeholders (60%);

(ii) The suitability of the benefit sharing structure, based on the distribution mechanism used and the reliability and regularity of payments (10%); and

(iii) The governance and transparency of the benefit-sharing agreement, including whether governance structures are clearly defined and whether financial flows are transparently disclosed (30%).

The presence, type, and value of benefit sharing evaluation considers not only cash payments or revenue distribution but also alternative forms such as equity sharing or land lease payments.

Projects that demonstrate greater transparency in disclosing the amount or value of these benefits receive higher scores. A score of 1 indicates no disclosed information on benefit sharing, while a score of 5 reflects a contribution of more than 40% of project revenue to benefit-sharing initiatives.

4.1.2.1.1.2.4 Job Creation

Job creation relates to whether the project creates quantified employment for local communities.

Rationale

Project activities can directly provide employment opportunities to local communities and thereby contribute to sustainable alternative livelihoods.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					

Scoring Definition

Each project is scored on a scale of 1 to 5, where 1 indicates that no employment opportunities appear to have been created and 5 indicates that a high number of jobs are likely to have been created (relative to the volume of credits issued).

Scoring Approach

MSCI ESG Research conducts a detailed review of key project documents, including project design documents and monitoring reports, to identify the number of employment opportunities created by the project. This is then divided by the project's estimated annual emission reductions to assess the relative proportion of job creation.

This job creation is assessed through an analysis of project monitoring and verification reports, but where not available the assessment is made probabilistically based on the project design documents.

This ratio of job creation per credit is then categorized into a 1 to 5 score, where 5 indicated that over 5 jobs were created per 1,000 credits. This same scoring system for jobs created per ktCO2e is used across all project types to ensure consistency.

Points Scoring	# Jobs per $ktCO_2e$
1	0
2	0-1

3	1-2.5
4	2.5-5
5	5+

4.1.2.1.1.2.5 Secure Land Rights

Secure Land Rights refers to whether the project helps to secure or provide land rights and asset ownership to local communities.

Rationale	Project activities can directly support local communities' ownership of land through helping to secure land rights or transferring rights.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no employment opportunities appear to have been created and 5 indicates that a high number of jobs are likely to have been created (relative to the volume of credits issued).					
Scoring Approach	MSCI ESG Research assesses the extent to which projects had secured land rights for local communities or engaged in transfers of asset ownerships through a detailed review of project documentation. Projects that help to secure land rights and are transparent on the number of households that benefit from this receive the maximum score of 5.					

4.1.2.1.2 Diversity and Inclusion

REDD+ projects are regularly located in rural, less developed communities in which inequality may be high and certain parts of the population disadvantaged. For example, women may hold limited governance power and have low participation in community activities. REDD+ projects can help improve the diversity and inclusion within project areas by directly promoting positive outcomes for disadvantaged groups.

To assess a project's impact on diversity and inclusion, four sub-criteria are considered:

- **4.1.2.1.2.1 Target SDGs:** Whether a project targets specific Sustainable Development Goals related to diversity and inclusion.
- **4.1.2.1.2.2 Inequality Outcomes:** Whether a project explicitly improves equality within the region and local community through specific project activities.
- **4.1.2.1.2.3 Inclusion and Power:** Whether a project supports improved and more equal power dynamics within the region and local community.
- **4.1.2.1.2.4 Gender Outcomes:** Whether a project supports more equal gender outcomes through active and representative inclusion of women in project activities.

Each of these sub-criteria is assessed on a scale of 1 to 5, with the overall score based on a weighting of each. 4.1.2.1.2.2 Inequality Outcomes is weighted 35%, 4.1.2.1.2.3 Inclusion and Power and 4.1.2.1.2.4 Gender Outcomes are weighted 30% and 4.1.2.1.2.1 Target SDGs is weighted 5%.

4.1.2.1.2.1 Target SDGs

Target SDGs refers to whether the project explicitly targets Sustainable Development Goals related to diversity and inclusion.

Rationale	Explicitly targeting certain development goals increases the chance that these goals and impacts will be emphasized and focused on by the project. That chance is further increased by the need to complete SDG goal verification process during a project's registration process.
Key Sources	Project Documentation ☑ | Geospatial | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no relevant Sustainable Development Goals appear to have been targeted and 5 indicates that both the most relevant Sustainable Development Goals have been targeted.
Scoring Approach	MSCI ESG Research conducts a detailed review of project documentation to identify whether the project has targeted either Sustainable Development Goal 5 (Gender Equality) or 10 (Reduced Inequalities). Each project is then scored based on the number of relevant targeted SDGs or sustainable development impacts: - 1 = No relevant SDGs - 4 = 1 relevant SDGs - 5 = 2 relevant SDGs

4.1.2.1.2.2 Inequality Outcomes

Inequality Outcomes refers to whether the project supports equality in the region and local community through specific activities and reduces disputes.

Rationale	Projects can support lower income, marginalized or disadvantaged groups through explicit project activities that target the wellbeing and opportunities of these groups. By actively targeting such groups, the project may reduce overall disputes related to land or tenure rights.
Key Sources	Project Documentation ☑ | Geospatial | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that activities do not appear to support more equitable project outcomes and 5 indicates that project activities are likely to have a significant, positive impact on more equitable project outcomes for marginalized groups
Scoring Approach	MSCI ESG Research assesses the extent to which project activities improve economic inequality through a detailed assessment of key project documents. Common relevant

activities may include the extent to which projects provide financial incentives to local communities as part of their implementation, or the supporting of land rights. Project documentation is also assessed for evidence of land or rights disputes and any form of forced community expulsion, both of which negatively impact the score.

Projects that prioritize community-focused activities such as financial incentives, training, and livelihood support receive a score of 5, as these approaches can help reduce land rights-related tensions. In contrast, projects that emphasize restrictive measures like expulsion or strict patrolling are assigned a score of 1.

4.1.2.1.2.3 Inclusion and Power

Inclusion and Power refers to whether the project supports improved and more equal power dynamics within the region and local community.

Rationale	Projects can support more equal power dynamics in a local community by ensuring all groups are included in decision-making and have equal representation in governance structures.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that activities do not appear to improve power dynamics and 5 indicates that power dynamics are likely to be substantially improved through the project's activities.
Scoring Approach	A detailed assessment of project documentation and local media is conducted to assess whether all minority groups have been included in governance and the degree to which the project seems to give power to local governance. Projects are scored on a 1 to 5 scale based on both the inclusion of special groups and the extent of local governance power as below:

		Local Governance Power			
		None	Low	Medium	High
Inclusion of Special Groups	Yes	2	2.5	4	5
	No	1	1.5	3	4

4.1.2.1.2.4 Gender Outcomes

Gender Outcomes refers to whether the project supports more equal gender outcomes in the region and local community through the involvement and participation of women in the project activities.

Rationale	Projects can support more equal gender outcomes by involving women in key project activities and decisions.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that activities do not appear to support more equal gender outcomes and 5 indicates that project activities seem to significantly involve the participation of women.
Scoring Approach	A detailed review of key project documents is conducted to assess the participation of women in project activities. In particular, the proportion of people with employment, improved health and/or training that are women is identified. This assessment is primarily conducted through an analysis of project monitoring and verification reports, but where not available the assessment is made probabilistically based on the project design documents. Projects are then scored based on the proportion of the project's beneficiaries that are women in the following way: - 1 = No or low female participation or no transparent information is provided - 2 = 10-20% of project beneficiaries are women - 3 = 20-30% of project beneficiaries are women - 4 = 30-40% of project beneficiaries are women - 5 = 40%+ of project beneficiaries are women

4.1.2.1.3 Education and Infrastructure

As well as supporting direct, near-term social impacts, REDD+ projects can lay the foundations for future development by investing in local education, health, and infrastructure.

To assess a project's impact on education and infrastructure, four sub-criteria are considered:

- **4.1.2.1.3.1 Target SDGs:** Whether a project targets specific Sustainable Development Goals related to education and infrastructure.
- **4.1.2.1.3.2 Education Impact:** Whether a project explicitly improves educational outcomes through its activities.
- **4.1.2.1.3.3 Health Impact:** Whether a project explicitly improves health outcomes through its activities.
- **4.1.2.1.3.4 Infrastructure Impact:** Whether a project explicitly improves local infrastructure through its activities.

Each of these sub-criteria is assessed on a scale of 1 to 5, with the overall score based on a weighting of each. 4.1.2.1.3.2 Education Impact and 4.1.2.1.3.3 Health Impact are each weighted 35% respectively, while 4.1.2.1.3.4 Infrastructure Impact is weighted 15% and 4.1.2.1.3.1 Target SDGs is weighted 5%.

4.1.2.1.3.1 Target SDGs

Target SDGs refers to whether the project explicitly targets Sustainable Development Goals (SDGs) related to education and infrastructure.

Rationale	Explicitly targeting certain development goals increases the chance that these goals and impacts will be emphasized and focused on by the project. That chance is further increased by the need to complete SDG goal verification process during a project's registration process.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no relevant Sustainable Development Goals have been targeted and 5 indicates that five or more Sustainable Development Goals relevant to education and infrastructure have been targeted.					
Scoring Approach	MSCI ESG Research conducts a detailed review of key project documents to identify whether a project has targeted either SDG 3 (good health & wellbeing), 4 (quality education), 6 (clean water & sanitation), 7 (affordable & clean energy), 9 (industry, innovation & infrastructure), 11 (sustainable cities & communities), 12 (responsible consumption and production), 16 (peace, justice & strong institutions) or 17 (SDG partnerships). Projects are then scored based on the number of relevant targeted SDGs or sustainable development impacts: - 1 = no relevant SDGs - 3 = one relevant SDGs - 3.5 = two relevant SDGs - 4 = three relevant SDGs - 4.5 = four relevant SDGs - 5 = five or more relevant SDGs					

4.1.2.1.3.2 Education Impact

Education Impact refers to whether the project supports improved education outcomes through its activities.

Rationale	Projects can directly invest in and support local education in order to improve educational outcomes in the local community.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that the project does not appear to impact education and 5 indicates that a projects' activities seem to impact the education of a significant proportion of local households.					

Scoring Approach	MSCI ESG Research conducts a detailed review of project documents to develop a understanding of a project's activities, particularly those supporting improved educational outcomes. As part of this review, MSCI ESG Research assesses whether the project includes up to five specific types of education-related interventions, such as agricultural training, school infrastructure improvements, teacher training, fire prevention education, and others. The project is then scored based on both the range (diversity of activities) and depth (level of detail and resource allocation) of these interventions to determine the extent of its support for improved educational outcomes. Projects that have activities that are highly relevant to improved education and impact at least 0.5% of the local population achieve a score of 5. An example of the conversion of other percentages into scores is shown below: - 1 = 0% of population - 2 = 0.01% of population - 3 = 0.05% of population - 4 = 0.1% of population - 5 = 0.5% of population

4.1.2.1.3.3 Health Impact

Health Impact refers to whether the project's activities support improved health outcomes.

Rationale	Projects can directly invest in and support improved health outcomes in their local community.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that activities do not appear to positively impact local health and 5 indicates that projects' activities seem to positively impact the health of a significant proportion of local households.					
Scoring Approach	MSCI ESG Research conducts a detailed review of key project documents to develop a understanding of a project's activities, particularly those supporting improved health outcomes. As part of this review, MSCI ESG Research assesses whether the project includes up to four specific types of health-related interventions, such as support to local health through the training of local doctors and nurses or investments in hospitals or agricultural training. The project is then scored based on both the range (diversity of activities) and depth (level of detail and resource allocation) of these interventions to determine the extent of its support for improved health outcomes. Projects with activities that are highly relevant to improving health outcomes and can demonstrate that they impact at least 5% of the local population achieve a score of 5. An example of the conversion of other percentages into scores is shown below: - 1 = 0% of population					

- 2 = 0.2% of population
- 3 = 0.5% of population
- 4 = 1% of population
- 5 = 4% of population

4.1.2.1.3.4 Infrastructure Impact

Infrastructure Impact refers to whether the project supports the development and improvement of local infrastructure through its activities.

Rationale	Projects can directly invest in and support local infrastructure, such as roads and internet connectivity.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that activities do not appear to positively impact local infrastructure and 5 indicates that the project's activities are likely to have a significant positive impact local infrastructure.					
Scoring Approach	MSCI ESG Research conducts a detailed review of project documents to identify the activities that the project implements and their relevance to infrastructure (e.g., whether the project supports the construction of roads or internet connectivity). As part of this review, MSCI ESG Research assesses whether the project includes up to eight specific types of infrastructure-related interventions, such as investments in local digital infrastructure or road networks. The project is then scored based on both the range (diversity of activities) and depth (level of detail and resource allocation) of these interventions to determine the extent of its support for improved local infrastructure.					

4.1.2.1.4 Biodiversity

By protecting forested areas, REDD+ projects not only preserve the carbon captured by the forests but also the habitats and ecosystems within them. In this way, REDD+ projects have potential environmental benefits beyond their emissions impact. The significance of this impact depends on the biodiversity context (i.e., richness) of the specific project area and the activities undertaken by the project to protect, enhance and monitor that biodiversity.

To assess a project's impact on biodiversity, four sub-criteria are considered:

- **4.1.2.1.4.1 Target SDGs:** Whether a project targets specific Sustainable Development Goals related to biodiversity.
- **4.1.2.1.4.2 Geospatial Biodiversity Value:** Whether a project is located within an area of high biodiversity value.
- **4.1.2.1.4.3 Species Richness:** The extent to which high importance species live in a project area and are protected by the project.
- **4.1.2.1.4.4 Biodiversity Monitoring:** Whether a project monitors biodiversity within its project area and actively engages in activities to support and protect biodiversity.

Each of these sub-criteria are scored on a 1 to 5 scale and weighted to reach an overall score for 4.1.2.1.4 Biodiversity. 4.1.2.1.4.4 Biodiversity Monitoring is weighted 35%, 4.1.2.1.4.2 Biodiversity Ecoregion and 4.1.2.1.4.3 Species Richness are weighted 30% and 4.1.2.1.4.1 Target SDGs is weighted 5%.

4.1.2.1.4.1 Target SDGs

Target SDGs refers to whether the project explicitly targets Sustainable Development Goals (SDGs) related to biodiversity.

Rationale	Explicitly targeting certain development goals increases the chance that these goals and impacts will be emphasized and focused on by the project. That chance is further increased by the need to complete SDG goal verification process during a project's registration process.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no relevant sustainable development goals appear to have been targeted and 5 indicates that both land and water biodiversity sustainable development goals have been targeted.
Scoring Approach	MSCI ESG Research conducts a detailed review of key project documents to identify whether the project has targeted either Sustainable Development Goal 14 (life under water) and 15 (life on land). Projects are then scored based on the number of relevant targeted SDGs or sustainable development impacts: - 1 = No relevant SDGs - 4.5 = 1 relevant SDGs - 5 = 2 relevant SDGs

4.1.2.1.4.2 Geospatial Biodiversity Value

This criterion refers to whether the project conserves an area of high biodiversity value.

Rationale	The biodiversity impact and conservation value of a nature-based project is likely to be higher if it is located in an area of high biodiversity and species richness.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑				

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates the project has very limited biodiversity value, and 5 indicates the project supports and conserves an area of very high biodiversity value.

Scoring Approach	MSCI ESG Research conducts detailed geospatial analysis on the project area to assess four components: (i) ecosystem scarcity; (ii) biodiversity intactness; (iii) biodiversity threat; (iv) biodiversity support. More detail on the approach is found in the MSCI Carbon Project Ratings Overall Methodology Note.

4.1.2.1.4.3 Species Richness

Species Richness relates to the extent to which the project area hosts a range of high importance species within its ecosystem.

Rationale	Projects that preserve areas of high species richness will play a more pivotal role in protecting vital ecosystems.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no transparent information is provided on the animal species within the project area, and 5 indicates that the project activities are designed to support a wide range of threatened species.					
Scoring Approach	MSCI ESG Research conducts a detailed review of a project's documents to understand the range of fauna species within the project area. In particular, both the animal species within the area and the proportion of them that are endangered or on the IUCN Red List are identified. Projects with no transparent information receive a score of 1. Projects that support over 0.5 species per thousand hectares including at least 20 endangered species receive a 5.					

4.1.2.1.4.4 Biodiversity Monitoring

Biodiversity Monitoring refers to the extent to which the project engages in ongoing monitoring of the biodiversity within its area.

Rationale	Monitoring and training initiatives can help to not only track the biodiversity within a project area but also identify biodiversity opportunities and risks that a project can focus on.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates that no biodiversity monitoring or training activities are present and 5 indicates that the project monitors and tracks biodiversity outcomes related to at least 5 key indicators.					

Scoring Approach	MSCI ESG Research conducts a detailed review of a project's documents to understand whether it monitors and tracks biodiversity within its area. In particular, all the key metrics that a project monitors and tracks as part of its activities are identified. These metrics include the number of flora species, number of fauna species and the importance value index of the main species. Projects that do not monitor or track biodiversity receive a score of 1. Projects that monitor at least four key biodiversity metrics receive a score of 5.

4.2.2 Quantification of Outcomes

Quantification of outcomes relates to whether the project monitors and/or quantifies the impact of the project on targeted Sustainable Development Goals.

Rationale	Assessing the evidence of co-benefit impacts is crucial to evaluating the degree to which co-benefits are achieved and can be attributed to a project. Projects that measure, quantify, and monitor their co-benefit impacts provide greater evidence in support of the targeted social and environmental benefits being achieved.

Key Sources

Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
☑					

Scoring Definition	Each project is scored on a scale of 1 to 5, where 1 indicates there is no quantification or monitoring of SDGs and 5 indicates that benefits are quantified and monitored.
Scoring Approach	MSCI ESG Research assesses the level to which co-benefits have been quantified and/or monitored.

		Quantified	
		Yes	No
Monitored	Yes	5	1
	No	3	1

4.3.2 Local Stakeholder Engagement

The quality of engagement by REDD+ project organizers with local stakeholders plays a key role in ensuring communities benefit from their activities while helping to mitigate human-based permanence risk. Projects that put additional resources and time into consulting with local communities and modify project design/operations to suit locals are more likely to realize their social objectives.

This is evaluated through the following sub-criteria:

- **4.3.2.1 Effective Consultation:** Whether the project conducted an effective consultation process
- **4.3.2.2 Representation and Inclusivity:** Whether the project ensured proper and inclusive representation of stakeholders
- **4.3.2.3 Access to Information:** Whether the project relayed relevant information to stakeholders

- **4.3.2.4 Feedback and Grievances:** Whether the project displayed effective feedback and grievance redressal mechanisms
- **4.3.2.5 Level of Stakeholder Requirements:** The importance of local stakeholder consultation given the land type and population density of the project area

Each project is scored on a 1 to 5 scale for each of these sub-criteria. An overall score for criterion 4.3.2 is then reached by weighting both effective consultation, representation and inclusivity and access to information by 25%, both feedback and grievance by 15%, and level of stakeholder requirements by 10%.

4.3.2.1 Effective Consultation

Effective consultation relates to whether the project uses best-practice techniques to engage and consult with stakeholders.

Rationale	Projects that engage with stakeholders toward the start of a project's conception and use multiple methods of in-person consultation provide more open and effective channels to engage with stakeholders and receive any feedback.					
Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					
Scoring Definition	Each project is scored on a scale of 1 to 5, where 5 indicates that the project appeared to conduct effective in-person engagements prior to its start, and 1 indicates that very limited in-person stakeholder consultation seemed to have been performed prior to the start of the project or thereafter.					
Scoring Approach	Through a detailed review of key project documents, three main components of stakeholder consultation effectiveness are assessed. First, the first date of stakeholder consultation is compared to the project start date. Projects that conducted their initial consultation prior to their start date receive a score of 2. Second, the types and range of consultation conducted are considered. Projects that conducted multiple forms of engagement including an in-person consultation receive 2 points. Third, the frequency with which ongoing consultation is conducted is assessed. Projects that perform ongoing consultation receive 2 points. These component scores are summed up to a maximum possible score of 5.					

4.3.2.2 Representation and Inclusivity

Representation and Inclusivity relates to whether the project has ensured that it consults with a representative and inclusive range of stakeholders.

Rationale	Projects which consult a greater number of stakeholders tend to incorporate more representative feedback and ensure that they are designed with a representative set of stakeholder interests in mind.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					

Scoring Definition

Each project is scored on a scale of 1 to 5, where 5 indicates that a project transparently consults with a representative group of stakeholders, including women, while 1 indicates that no information is provided on the which stakeholders were consulted.

Scoring Approach

MSCI ESG Research assesses if the number of stakeholders in attendance has been provided. In particular, if the total number of stakeholders and the number of female attendees is disclosed. This is then scored as shown in the table below.

		No. Stakeholders Consulted		
		Unknown	**<50**	**50+**
Transparency of Disclosures	Total, including women	3	4	5
	Total	2	3	4
	None	1	n/a	n/a

4.3.2.3 Access to Information

Access to Information refers to whether the project provides transparent and comprehensive information to local stakeholders regarding its activities.

Rationale

By providing greater access to information, stakeholders will be better informed on a project's activities and more able to provide feedback to the project.

Key Sources	Project Documentation	Geospatial	Project Methodology Documentation	Academic Literature	Third-party Data	MSCI Carbon Markets
	☑					

Scoring Definition

Each project is scored on a scale of 1 to 5, where 5 indicates that a project provides very transparent access to information through both documentation and in-person meetings, and 1 indicates that limited access to information is provided to stakeholders.

Scoring Approach

MSCI ESG Research conducts a detailed review of relevant project documentation to understand whether in-person meetings were conducted to present project information to stakeholders and whether clear documentation was provided to stakeholders.

Projects receive a score of 2 if project organizers have conducted in-person meetings to present information to stakeholders. Projects receive a score of 3 if Project Design Documents (PDDs) or pamphlets were provided to stakeholders, or a score of 1 otherwise.

These component scores are summed up to a maximum possible score of 5.

4.3.2.4 Feedback and Grievance

Feedback and Grievance refers to whether the project has procedures in place to receive and act on feedback received from stakeholders.

Rationale	By providing local stakeholders with a clear feedback mechanism and committing to disclose and act on this feedback, then projects are more likely to satisfy the needs of stakeholders by both listening and responding to their feedback.
Key Sources	Project Documentation ☑ | Geospatial | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a scale of 1 to 5, where 5 indicates that a project provides very transparent access to information through both its documentation and in-person meetings and 1 indicates that stakeholders appear to have only limited access to information.
Scoring Approach	Three aspects of a project's feedback procedure are assessed: - **Feedback Mechanism:** Whether a project has a feedback and grievance procedure in place. - **Feedback Disclosure:** Whether a project transparently discloses any feedback received. - **Feedback Response:** Whether a project has clearly acted on any feedback received. Projects receive a score of 3 if they have a feedback mechanism in place, and 1 otherwise. For the other 2 factors, projects receive a score of 1 if they satisfy this factor. The overall scores are then based on adding each of these components to reach a score from 1 to 5.

4.3.2.5 Level of Stakeholder Requirements

Level of Stakeholder Requirements refers to how important local stakeholder consultation is for the project given the land type and population density of the project area.

Rationale	The importance of stakeholder consultation varies based on the characteristics of the project area and its surrounding landscape. In areas with high population density and community land use, the need for extensive, inclusive consultation is significantly greater to ensure that local populations are meaningfully engaged and not adversely affected. Conversely, in sparsely populated or remote areas with minimal direct human presence or use, the material risk to local communities is lower.
Key Sources	Project Documentation ☑ | Geospatial ☑ | Project Methodology Documentation | Academic Literature | Third-party Data | MSCI Carbon Markets
Scoring Definition	Each project is scored on a 1 to 5 scale based on the degree to which meaningful stakeholder consultation is necessary. A score of 1 indicates that the project is located in a densely populated area with high community reliance on the land, implying a very high requirement for stakeholder consultation. A score of 5 indicates that the project is

	located in an area with minimal human presence and limited land use, implying a low consultation requirement.
Scoring Approach	MSCI ESG Research assesses the level of stakeholder consultation requirement by evaluating (i) the population density within the project and surrounding areas, and (ii) the land type and usage classification of the project area. Population density is assessed geospatially through analysis of the population density in both the project and surrounding area. Projects are assessed based on land ownership clarity and population density within the project area and its surrounding 5 km buffer. Projects located on private land with clear ownership and very low population density (fewer than 1 person per km²) receive a score of 5, indicating a relatively low need for stakeholder consultation. Projects on government, indigenous or customary lands with unclear ownership but similarly low population density receive a score of 3, reflecting a moderate need for consultation. In contrast, projects on government, indigenous or customary lands with unclear ownership and high population density (more than 10 persons per km²) receive a score of 1, indicating a high importance for stakeholder consultation.

9. Appendix – Geospatial pixel-based approach

9.1 Introduction

Evaluating the success of a REDD+ conservation effort requires the establishment of an appropriate baseline deforestation rate — i.e., what deforestation would have occurred within a project area in the absence of the conservation effort. Lately, the reasonableness of REDD+ project baselines has been called into question in both academic studies and the press.

Remote sensing, field measurements, and modelling can help establish an appropriate baseline. But this is not straightforward, with challenges including accurately measuring forest cover and changes over time, determining what constitutes deforestation, and selecting relevant layers of information about factors that are deemed to be drivers of deforestation (e.g., elevation, distance to population, etc.).

MSCI ESG Research has leveraged the latest geospatial technologies and research to develop an in-house "pixel-based" baseline-setting tool. This tool combines geographic and demographic geospatial datasets (which contain data on relevant drivers of deforestation and/or that is highly correlated to forest loss) in order to identify similar "pixels" of land in the surrounding region that should fairly and reliably proxy the level of deforestation threat that the protected area faces.[18]

Pixel-level matching is a standardized evaluation approach used to assess the impact of conservation policies. It takes a different approach to that found in Verra's historical REDD+ methodologies, which use actual areas of land as a reference region. In contrast, a pixel-based approach utilizes a large sample of points spread out around the surrounding region, with either a regular or random pattern, instead of a single area. While not perfect (e.g., it does not entirely account for spatial correlation, and doesn't currently include factors such as land ownership), this pixel-level approach is effective in selecting control pixels that are exposed to similar levels of deforestation threats as the REDD+ project sites, in terms of geographical and socioeconomic covariates.[19]

9.2 Inputs

9.2.1 REDD+ project boundaries

MSCI ESG Research collects the boundaries of REDD+ project and reference areas either directly from a project's carbon crediting registry or by digitizing maps found in a project's documentation. As of April 2025, around 150 unplanned deforestation REDD+ project areas had been collected and analyzed.

9.2.2 Environmental and socioeconomic data

MSCI ESG Research has collected data on forest cover and forest cover loss together with various socioeconomic and geographic characteristics that have been commonly linked to deforestation

[18] Guizar-Coutiño, A. et al. (2022). "A global evaluation of the effectiveness of voluntary REDD+ projects at reducing deforestation and degradation in the moist tropics." *Conservation Biology*.

[19] Schleicher, J. et al. (2019). "Statistical matching for conservation science." *Conservation Biology*.

activities, including: country boundaries, biome type, elevation, slope, distance to forest edge (as proxy for distance to roads), and population density.[20]

The Global Forest Change (GFC) dataset is used to calculate deforestation rates.[21] This dataset provides information on global forest extent and yearly forest loss with annual temporal coverage from 2000 to 2023.

The 10 m resolution country boundaries accessed from Natural Earth Data are used to ensure that pixels are selected only when located within the same political context as a REDD+ project area.

Similar to the country boundaries, the WWF Ecoregions of the World dataset is used to delineate 16 biomes in the pixel sampling approach to ensure that pixels are selected only when located in the same climatic and environmental context as a REDD+ project area.[22]

Elevation and its derivative, slope, are obtained from WorldPop.[23] These are extracted from the Shuttle Radar Topography Mission (SRTM) data from the year 2000.[24]

Population density (people/km^2) data for the years 2000-2021 is collected from WorldPop. This layer estimates population density based on country-level Food and Agriculture Organization of the United Nations census data and ancillary data (e.g., land cover data) through Random Forest approach.[25] To match the population pressure at a location as closely as possible to the time when the project was implemented, the population layer of the year prior to a project's starting date is selected.

Distance to forest edge (DFE) is another explanatory variable, particularly relevant for frontier deforestation.[26] DFE is calculated annually based on GFW forest loss data in 100 m intervals for all projects. The DFE covariate is extracted for the year prior to a conservation effort's starting date, to recreate a DFE as similar as possible to the conditions of the forest when a REDD+ project was implemented. As up-to-date spatiotemporal road data is not commonly publicly available due to the high costs associated with continuous high-resolution (<2 m) remote sensing data, DFE is also used as a proxy for distance to roads.

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[20] Ford, S. (2020). "Deforestation leakage undermines conservation value of tropical and subtropical forest protected areas." *Global Ecology and Biogeography*, 29(11), 2014–2024. *https://doi.org/10.1111/geb.13172*

[21] Hansen M.C. et al. (2013). "High-resolution global maps of 21st-century forest cover change." *Science*, 342(6160), 850–853. *https://doi.org/10.1126/science.1244693*.

[22] Olson D. M. et al. (2001) "Terrestrial Ecoregions of the World: A New Map of Life on Earth: A new global map of terrestrial ecoregions provides an innovative tool for conserving biodiversity," *BioScience*, 51(11), 933–938, https://doi.org/10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2

[23] University of Southampton. (2024) "WorldPop." Hub. https://hub.worldpop.org/.

[24] de Ferranti, J. (2017). Digital Elevation Data based on NASA's Shuttle Radar Topography Mission (SRTM) data.

[25] Stevens, F. et al. (2015) "Disaggregating Census Data for Population Mapping Using Random Forests with Remotely-Sensed and Ancillary Data." *PLOS ONE* 10(2): e0107042. https://doi.org/10.1371/journal.pone.0107042

[26] Silva Junior et al. (2020). "Persistent collapse of biomass in Amazonian forest edges following deforestation leads to unaccounted carbon losses." *Science Advances* 6(40). DOI:10.1126/sciadv.aaz8360

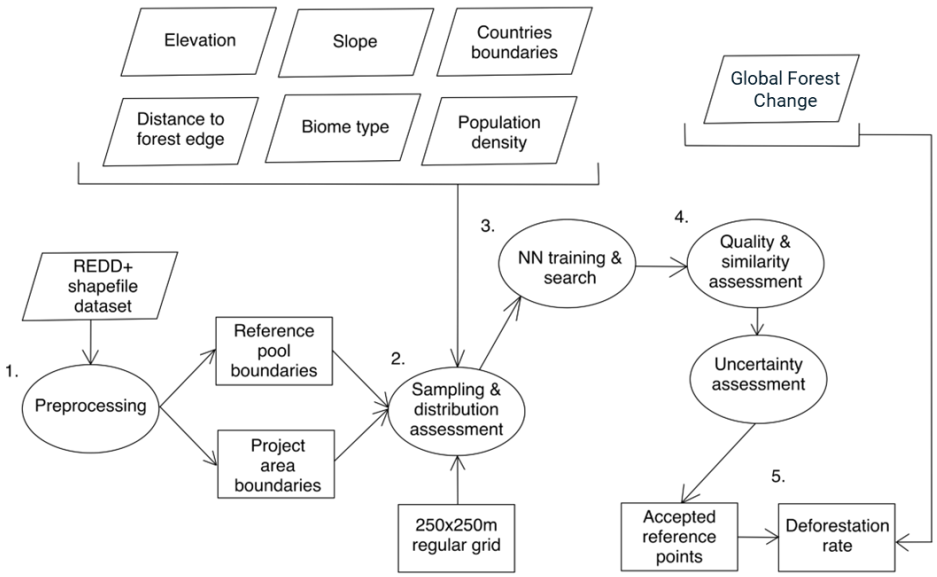
9.3 Approach

9.3.1 Sampling design

Various sampling designs have been developed to evaluate the effects of REDD+ projects on protected lands, ranging from area-based to pixel-based approaches.[27] The MSCI ESG Research baseline assessment follows a pixel-based approach to characterize the project area, as this approach has been found to accurately represent the geographic and socioeconomic conditions of the REDD+ project area.[28] The selected covariates (i.e., biome type, elevation, slope, distance to forest edges, and population density) are sampled on a regular 250 x 250 m grid. The entire workflow is illustrated in Figure 13.

The baseline assessment follows a consistent sampling design to extract points from both the project area and the reference regions. To account for spatial correlation, only reference pool points in proximity of the REDD+ project location are sampled. The size of the sampling zone is a function of the size of the project area, that is, the size of the sampling zone is five times the diagonal of the bounding box surrounding the project area (but no more than 1,400 km in diameter). This ensures that the number of reference pool points is 10 or more times greater than the number of points within the project area.

Figure 13: Workflow illustrating the methodology developed by MSCI ESG Research for assessing REDD+ baselines using a pixel-based approach



[27] Ehara, M. et al. (2021). "Allocating the REDD+ national baseline to local projects: A case study of Cambodia." *Forest Policy and Economics*, 129, 102474. *https://doi.org/10.1016/j.forpol.2021.102474*.

[28] Guizar-Coutiño, A. et al. (2022). "A global evaluation of the effectiveness of voluntary REDD+ projects at reducing deforestation and degradation in the moist tropics." *Conservation Biology*, 36(6), e13970. *https://doi.org/10.1111/cobi.13970*.

9.3.2 Matching analysis

This section describes the selection process of suitable pixels to construct a REDD+ project baseline. The matching design consists of five steps:

1. Preprocessing,
2. Distribution assessment,
3. Nearest neighbor (NN) training and search,
4. Quality and similarity assessment of matches, and
5. Deforestation rate calculation.

Step 1: Preprocessing

Each project is analyzed independently. As preprocessing steps, points intersecting a 10 km spill-over belt, as well as other REDD+ project areas, are discarded.

Step 2: Distribution assessment

The distribution of the project points and reference pool points for each of the four continuous covariates —distance to forest edges, population density, elevation and slope — are compared through a Kolmogorov-Smirnov test.[29] In cases where the distribution of the points falling within the project area does not match the distribution of the reference pool points for one or more covariates, additional sets of reference pool points are sampled and extracted by extending the buffer for the reference area.

Step 3: Nearest neighbor (NN) training and search

The continuous covariates are standardized using a min-max normalization. A nearest neighbor (NN) model is used for performing statistical matching:[30] exact matching is used for the discrete covariates, including country and biome type, while the Mahalanobis distance metric is used for the continuous covariates.[31]

For those REDD+ project areas intersecting with multiple terrestrial biomes, the project points are subdivided to generate *n* sets of points belonging to the same biome and country to ensure consistent bioclimatic conditions and environmental policies.

Step 4: Quality and similarity assessment of matches

The quality of the matches is assessed using the normalized distance between the reference pool points and the project points (Equation 9.1.). Only matches within the 95% confidence interval are considered suitable for defining the pixel-based reference region. The remaining matched reference pool points are discarded. All the points within the project area are kept.

$$\mathbf{dist} = \frac{|x_c - x_t|}{\sigma_t} \qquad 9.1.$$

[29] A Kolmogorov-Smirnov test assesses the maximum absolute difference between two cumulative distributions.

[30] Pedregosa, F. et al. (2011). "Scikit-learn: Machine Learning in Python." *Journal of Machine Learning Research*.

[31] The Mahalanobis distance metric measures the similarity between the treatment and matched control points.

Where x_c is the value of the reference pool point matched with the project area point x_t; while σ_t is the standard deviation calculated using all the project area points.

In cases where, after the application of the quality filter, matches need to be excluded from the analysis, an additional similarity assessment ensures that the remaining selected reference points maintain the representativeness of the project area's variance.

Thereby, a similarity score from two NN models is calculated. First, a NN model is trained on the remaining control pool points and used to find a match for each point within the project area. Then, a second NN model is trained on the project area points and a match is found for each of the remaining reference region points. The degree of intersection between the two models is then transformed to a score from 1 to 5, the similarity score (Equation *9.2.*). All projects' areas for which the MSCI ESG Research-defined reference region has a score lower than 5 out of 5 are excluded from the analysis.

$$\text{Similarity score} = \frac{RintP + PintR}{2} * 100 \qquad 9.2.$$

$$RintP = \frac{R_{accepted\ points}}{P_{all\ points}} \qquad 9.3.$$

$$PintR = \frac{P_{accepted\ points}}{R_{all\ points}} \qquad 9.4.$$

Where $RintP$ represents the intersection between the reference region accepted points ($R_{accepted\ points}$) and the all the project area points ($P_{all\ points}$). Consequently, $PintR$ represents the intersection between the project area accepted matches ($P_{accepted\ points}$) and all the reference region selected points ($R_{all\ points}$).

Step 5: Deforestation rate calculation

Based on the selected reference points, the deforestation rate for the reference region, including uncertainties, is calculated (Equation *9.5.*).[32]

$$\boldsymbol{r = \left(\frac{A_2}{A_1} * \frac{1}{t_2 - t_1}\right) - 1} \qquad 9.5.$$

Where t_1 and t_2 refer to points in time, e.g., the years 2000 and 2001, and A_1 and A_2 represent the forest cover extent at t_1 and t_2, respectively.

9.3.3 Uncertainty assessment

The two main sources of uncertainty in the MSCI ESG Research baseline assessment are sample matching algorithm uncertainty and dataset uncertainty. These uncertainties propagate through the

[32] Puyravaud, J.-P. (2003). "Standardizing the calculation of the annual rate of deforestation." *Forest Ecology and Management*, 177(1–3), 593–596. *https://doi.org/10.1016/S0378-1127(02)00335-3*.

analysis into the baseline calculation and are reflected in the deforestation rate uncertainty range presented.

As illustrated in Equation *9.1*, the quality of the matches is assessed by considering a normalized distance between the points. A match is discarded if the points are too far apart, more specifically, if their normalized distance does not fall within a 95% confidence interval. The accepted points constitute the pixel-based reference region from which the deforestation rate is calculated. To assess the uncertainty in this approach, a pixel-based reference region that is more or less similar to the project area is established by tightening and relaxing the confidence interval. The deforestation rate from those reference areas is then calculated and the maximum and minimum annual deforestation rates are taken as a measure of uncertainty of the predicted deforestation rate.

Each of the datasets in this assessment comes with an inherent uncertainty as outlined in

Table 2. Datasets do not provide uncertainty assessments on a grid-cell level and only in a few cases (land cover, elevation) a global uncertainty measure is provided. Therefore, to assess how dataset uncertainty affects the selection of the reference region, a random variation in the values of each continuous covariate, based on its uncertainty, is introduced. The reference matching process is then repeated and the deforestation rate for those new reference regions is calculated. The variation of the resulting deforestation rate due to the randomness introduced in the initial input points is taken as a measure of uncertainty and added to the deforestation baseline bounds.

For categorical variables (such as biomes), random variations are not well defined. To assess how uncertainty in those variables (i.e., misclassified biomes) affect the project matching, and therefore the deforestation rate assessment, two scenarios are created. In the first scenario, a strict match is enforced; for example, a match is only accepted if their biome type is the same. In the second scenario, matches are allowed independent of the biome type. The variation in deforestation rates resulting from both scenarios is an adequate indication of the model's sensitivity towards this variable.

Table 2: Dataset uncertainty and uncertainty assessment approach

Covariate	Uncertainty	Assessment method
Land cover	Potential forest/non-forest misclassification; classification probability = 97%.	Not assessed.
Biome	Potential biome misclassification.	Variation of reference region with respect to a two-scenarios input variation.
Population density	Biases in population density, geographical and temporal patterns.	Variation of reference region with respect to a variation of input.
Elevation	SRTM root mean square error = 9.73 m.	Variation of reference region with respect to a variation of input.
Slope	Elevation error propagated to slope and influenced by latitude.	Variation of reference region with respect to variation of input.

9.3.4 Baseline calculation

A total of three baseline scenarios are modelled for the MSCI ESG Research-defined reference region; these depend on the time interval between the year of project start and latest available year for the land cover dataset.

The first scenario applies to projects where the observational time interval is five or more years. In those cases, enough years are available for calculating an actual ex post deforestation rate from which to extract a baseline. In this scenario, the baseline is here defined as "ex post actual," and it is calculated by averaging five or more years of ex post deforestation rates.

The remaining projects do not have sufficient temporal coverage for actual ex post rates. Therefore, for this group of projects the ex ante — or historical — deforestation rates are used to extrapolate two baseline scenarios: the first ex post modelled baseline is calculated by averaging 5 and 10 years of historical deforestation rates, and assuming the resulting rate to be representative of future deforestation.[33] This modelled baseline is here defined as the "ex post modelled average." An alternative modelled baseline is assessed by fitting a line over historical rates and extrapolating the model results over the following 5 and 10 years, including the year of project start. Thus, baselines are calculated by averaging the modelled 5 and 10 years of ex post values. These baselines are here defined as "ex post modelled linear."

[33] Conservation International (2013). *Project Developer's Guidebook to VCS REDD Methodologies*.

10. Appendix – Key References

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11. Change log

Date	Key Changes
19-Sep-2024	Initial publication
29-May-2025	- Inclusion of new sub-criteria 1.5.5 Deforestation Risk Maps to analyze project's baseline assumptions using spatially allocated risk maps. - Inclusion of new sub-criteria to assess the proximity of planned REDD+ projects to road infrastructure within planned baseline deforestation (1.5.6.3 Deforestation Likelihood Given Distance to Roads). - Inclusion of new sub-criteria to assess the carbon stock accuracy for projects with significant areas of peatland (2.1.2.4 Peat Sampling). - Analysis of suitability of forest stratification in comparison to biome-based benchmarks (2.1.2.3 Stratification). - Addition of multiple third-party data providers to assess carbon stock (2.2.1.2 Carbon Stock Accuracy). - Assessment of pre- and post-project degradation trends in assessment of baseline reasonableness and observed permanence risk (3.1.2.3 Observed Risk). - More granular assessment of the size and suitability of benefit sharing agreements (4.1.2.1.1.2.3 Benefit Sharing). - More quantitative assessment of permanence, based on estimating the percentage impact of each risk, and comparing this to the level of mitigation and buffer pool (3 Permanence). - Multiplicative approach used for both baseline reasonableness and carbon stock validation to better account for potential underestimation or conservativeness (1.5 Baseline Reasonableness). - More detailed third-party analysis of the appropriateness of project's allometric equations (2.1.2.2 Allometric Equations). - Analysis of an expanded list of specific project activities conducted to support co-benefit assessments (4.1.2.1.3.2 Education Impact).

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